PRIMATE RESEARCH CENTER GRANT **Federal Award Date:** 11/02/2015

Department of Health and Human Services
National Institutes of Health
OFFICE OF THE DIRECTOR, NATIONAL INSTITUTES OF HEALTH

Grant Number: 5P51OD011132-55 REVISED
FAIN: P51OD011132

Principal Investigator(s):
MICHAEL M JOHNS, MD

Project Title: Support of Yerkes National Primate Research Center

Teresa Sussman
Associate Director
Office of Sponsored Programs
Emory University
1599 Clifton Road, 4th Floor
Atlanta, GA 30322

Award e-mailed to: osp@emory.edu

Period Of Performance:
Budget Period: 05/01/2015 – 04/30/2016
Project Period: 05/01/1997 – 04/30/2016

Dear Business Official:

The National Institutes of Health hereby revises this award (see "Award Calculation" in Section I and "Terms and Conditions" in Section III) to EMORY UNIVERSITY in support of the above referenced project. This award is pursuant to the authority of 42 USC 241 42 CFR 52 and is subject to the requirements of this statute and regulation and of other referenced, incorporated or attached terms and conditions.

Acceptance of this award including the "Terms and Conditions" is acknowledged by the grantee when funds are drawn down or otherwise obtained from the grant payment system.

Each publication, press release, or other document about research supported by an NIH award must include an acknowledgment of NIH award support and a disclaimer such as "Research reported in this publication was supported by the Office Of The Director, National Institutes Of Health of the National Institutes of Health under Award Number P51OD011132. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health." Prior to issuing a press release concerning the outcome of this research, please notify the NIH awarding IC in advance to allow for coordination.

Award recipients must promote objectivity in research by establishing standards that provide a reasonable expectation that the design, conduct and reporting of research funded under NIH awards will be free from bias resulting from an Investigator's Financial Conflict of Interest (FCOI), in accordance with the 2011 revised regulation at 42 CFR Part 50 Subpart F. The Institution shall submit all FCOI reports to the NIH through the eRA Commons FCOI Module. The regulation does not apply to Phase I Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) awards. Consult the NIH website http://grants.nih.gov/grants/policy/coi/ for a link to the regulation and additional important information.

If you have any questions about this award, please contact the individual(s) referenced in Section IV.

Sincerely yours,

Dawn Walker
Grants Management Officer
OFFICE OF THE DIRECTOR, NATIONAL INSTITUTES OF HEALTH

Additional information follows

SECTION I – AWARD DATA – 5P51OD011132-55 REVISED

Award Calculation (U.S. Dollars)

Salaries and Wages	$3,892,839
Fringe Benefits	$957,657
Personnel Costs (Subtotal)	$4,850,496
Supplies	$735,480
Travel Costs	$10,960
Alterations and Renovations	$600,000
Other Costs	$590,581
Federal Direct Costs	$6,787,517
Federal F&A Costs	$2,722,507
Approved Budget	$9,510,024
Total Amount of Federal Funds Obligated (Federal Share)	$9,510,024
TOTAL FEDERAL AWARD AMOUNT	$9,510,024
AMOUNT OF THIS ACTION (FEDERAL SHARE)	$0

SUMMARY TOTAL FEDERAL AWARD AMOUNT YEAR (55)	
GRANT NUMBER	**TOTAL FEDERAL AWARD AMOUNT**
5P51OD011132-55	$9,510,024
3P51OD011132-55S1	$723,570
TOTAL	**$10,233,594**

SUMMARY TOTALS FOR ALL YEARS		
YR	**THIS AWARD**	**CUMULATIVE TOTALS**
55	$9,510,024	$10,233,594

Fiscal Information:

CFDA Name:	Research Infrastructure Programs
CFDA Number:	93.351
EIN:	1580566256A1
Document Number:	PRR000165I
PMS Account Type:	G (Pooled)
Fiscal Year:	2015

IC	CAN	2015
OD	8014499	$9,510,024

NIH Administrative Data:
PCC: CMP01 / **OC**: 414E / **Released**: eRA Commons User Name 10/30/2015
Award Processed: 11/01/2015 11:03:27 PM

SECTION II – PAYMENT/HOTLINE INFORMATION – 5P51OD011132-55 REVISED

For payment and HHS Office of Inspector General Hotline information, see the NIH Home Page at http://grants.nih.gov/grants/policy/awardconditions.htm

SECTION III – TERMS AND CONDITIONS – 5P51OD011132-55 REVISED

This award is based on the application submitted to, and as approved by, NIH on the above-titled project and is subject to the terms and conditions incorporated either directly or by reference in the following:

a. The grant program legislation and program regulation cited in this Notice of Award.
b. Conditions on activities and expenditure of funds in other statutory requirements, such as those included in appropriations acts.

c. 45 CFR Part 75.
d. National Policy Requirements and all other requirements described in the NIH Grants Policy Statement, including addenda in effect as of the beginning date of the budget period.
e. Federal Award Performance Goals: As required by the periodic report in the RPPR or in the final progress report when applicable.
f. This award notice, INCLUDING THE TERMS AND CONDITIONS CITED BELOW.

(See NIH Home Page at http://grants.nih.gov/grants/policy/awardconditions.htm for certain references cited above.)

Research and Development (R&D): All awards issued by the National Institutes of Health (NIH) meet the definition of "Research and Development" at 45 CFR Part§ 75.2. As such, auditees should identify NIH awards as part of the R&D cluster on the Schedule of Expenditures of Federal Awards (SEFA). The auditor should test NIH awards for compliance as instructed in Part V, Clusters of Programs. NIH recognizes that some awards may have another classification for purposes of indirect costs. The auditor is not required to report the disconnect (i.e., the award is classified as R&D for Federal Audit Requirement purposes but non-research for indirect cost rate purposes), unless the auditee is charging indirect costs at a rate other than the rate(s) specified in the award document(s).

This institution is a signatory to the Federal Demonstration Partnership (FDP) Phase VI Agreement which requires active institutional participation in new or ongoing FDP demonstrations and pilots.

Carry over of an unobligated balance into the next budget period requires Grants Management Officer prior approval.

This award is subject to the requirements of 2 CFR Part 25 for institutions to receive a Dun & Bradstreet Universal Numbering System (DUNS) number and maintain an active registration in the System for Award Management (SAM). Should a consortium/subaward be issued under this award, a DUNS requirement must be included. See http://grants.nih.gov/grants/policy/awardconditions.htm for the full NIH award term implementing this requirement and other additional information.

This award has been assigned the Federal Award Identification Number (FAIN) P51OD011132. Recipients must document the assigned FAIN on each consortium/subaward issued under this award.

This award is not subject to the Transparency Act subaward and executive compensation reporting requirement of 2 CFR Part 170.

In accordance with P.L. 110-161, compliance with the NIH Public Access Policy is now mandatory. For more information, see NOT-OD-08-033 and the Public Access website: http://publicaccess.nih.gov/.

This award represents the final year of the competitive segment for this grant. See the NIH Grants Policy Statement Section 8.6 Closeout for complete closeout requirements at: http://grants.nih.gov/grants/policy/policy.htm#gps.

A final expenditure Federal Financial Report (FFR) (SF 425) must be submitted through the eRA Commons (Commons) within 120 days of the expiration date; see the NIH Grants Policy Statement Section 8.6.1 Financial Reports, http://grants.nih.gov/grants/policy/policy.htm#gps, for additional information on this submission requirement. The final FFR must indicate the exact balance of unobligated funds and may not reflect any unliquidated obligations. There must be no discrepancies between the final FFR expenditure data and the Payment Management System's (PMS) quarterly cash transaction data. A final quarterly federal cash transaction report is not required for awards in PMS B subaccounts (i.e., awards to foreign entities and to Federal agencies). NIH will close the awards using the last recorded cash drawdown level in PMS for awards that do not require a final FFR on expenditures or quarterly federal cash transaction

reporting. It is important to note that for financial closeout, if a grantee fails to submit a required final expenditure FFR, NIH will close the grant using the last recorded cash drawdown level. If the grantee submits a final expenditure FFR but does not reconcile any discrepancies between expenditures reported on the final expenditure FFR and the last cash report to PMS, NIH will close the award at the lower amount. This could be considered a debt or result in disallowed costs.

A Final Invention Statement and Certification form (HHS 568), (not applicable to training, construction, conference or cancer education grants) must be submitted within 120 days of the expiration date. The HHS 568 form may be downloaded at: http://grants.nih.gov/grants/forms.htm. This paragraph does not apply to Training grants, Fellowships, and certain other programs—i.e., activity codes C06, R13, R25, S10.

Unless an application for competitive renewal is submitted, a final progress report must also be submitted within 120 days of the expiration date. Instructions for preparing a Final Progress Report are at: http://grants.nih.gov/grants/funding/finalprogressreport.pdf. Any other specific requirements set forth in the terms and conditions of the award must also be addressed in the final progress report. Institute/Centers may accept the progress report contained in competitive renewal (type 2) in lieu of a separate final progress report. Contact the awarding IC for IC-specific policy regarding acceptance of a progress report contained in a competitive renewal application in lieu of a separate final progress report.

NIH strongly encourages electronic submission of the final progress report and the final invention statement through the Closeout feature in the Commons, but will accept an email or hard copy submission as indicated below.

Email: The final progress report and final invention statement may be e-mailed as PDF attachments to: NIHCloseoutCenter@mail.nih.gov.

Hard copy: Paper submissions of the final progress report and the final invention statement may be faxed to the NIH Division of Central Grants Processing, Grants Closeout Center, at 301-480-2304, or mailed to:

National Institutes of Health
Office of Extramural Research
Division of Central Grants Processing
Grants Closeout Center
6705 Rockledge Drive
Suite 5016, MSC 7986
Bethesda, MD 20892-7986 (for regular or U.S. Postal Service Express mail)
Bethesda, MD 20817 (for other courier/express deliveries only)

NOTE: If this is the final year of a competitive segment due to the transfer of the grant to another institution, then a Final Progress Report is not required. However, a final expenditure FFR is required and should be submitted electronically as noted above. If not already submitted, the Final Invention Statement is required and should be sent directly to the assigned Grants Management Specialist.

Treatment of Program Income:
Additional Costs

SECTION IV – OD Special Terms and Conditions – 5P51OD011132-55 REVISED

REVISION #1 : This award is revised to address the following issue:

CHANGE IN PI
This revision reflects the PO and GMS approval of the change of principal investigator from Dr. Stewart Caughman to Dr. Michael Johns, in accordance with the grantee's request dated October 15, 2015.

All previous terms and conditions remain in effect.

ORIP FUNDING PLAN FOR FY2015
This non-competing award reflects the NIH Fiscal Policy for Grant Awards for FY2015 (see NIH Guide Notice NOT-OD-15-050) and the implementation of the ORIP FY2015 grants funding policy: http://dpcpsi.nih.gov/orip/rf/fyg_fp2015

RESTRICTION ON CHIMPANZEE RESEARCH
All NIH-sponsored biomedical and behavioral and social science research involving NIH-owned and -supported chimpanzees must be in accordance with the policies and procedures described in NOT-OD-14-024 (http://grants.nih.gov/grants/guide/notice-files/NOT-OD-14-024.html) and NOT-OD-15-097 (http://grants.nih.gov/grants/guide/notice-files/NOT-OD-15-097.html). Any questions in regard to the NIH policies for the use of chimpanzees in research can be sent to your NIH ORIP Program Director and/or DPCPSI@nih.gov<mailto:DPCPSI@nih.gov>.

ALTERATIONS AND RENOVATIONS
This award includes funding support for three separate A&R projects for a combined total costs of $600,000 as follows:

Fire Suppression System $250,000
HVAC replacement $200,000
Roof replacement $150,000

DESIGN DOCUMENT REVIEW
The grantee shall submit Final Design Documents (95-100% complete construction design documents) for review to ORIP's architectural/engineering team. The documents must be sent in PDF format to ORIPCONSTRUCTION@mail.nih.gov, with the grant number in the subject line. Final Design Documents shall include detailed drawings, specifications, and detailed cost estimates.

KEY PERSONNEL
In addition to the PI, the following individuals are named as key personnel (individuals who have effort that ORIP staff is tracking):

Excluded by Requester

Written prior approval is required if any of the individual(s) named above withdraws from the project entirely, is absent from the project during any continuous period of 3 months or more, or reduces time devoted to the project by 25 percent or more from the level that was approved at the time of award.

PRIOR APPROVAL REQUEST
Any prior approval request (e.g., changes to key personnel as noted on the award, changes in human and animal subjects requiring prior approval, carryover requests) must be submitted to the assigned Grants Management Specialist and Programmatic Official. Please refer to Part II Chapter 8 the NIH Grants Policy Statement for the activities and/or expenditures that require NIH approval at http://grants.nih.gov/grants/policy/nihgps/nihgps.pdf

COMMUNICATIONS/PRESS RELEASE
If the grantee plans to issue a press release concerning the outcome of ORIP grant-supported research, it should notify Ms. Patricia Newman, ORIP Communications at 301-435-0744, in advance to allow for coordination.

The ORIP WWW home page is at http://dpcpsi.nih.gov/orip/

STAFF CONTACTS

The Grants Management Specialist is responsible for the negotiation, award and administration of this project and for interpretation of Grants Administration policies and provisions. The Program Official is responsible for the scientific, programmatic and technical aspects of this project. These individuals work together in overall project administration. Prior approval requests (signed by an Authorized Organizational Representative) should be submitted in writing to the Grants Management Specialist. Requests may be made via e-mail.

Grants Management Specialist: Jenelle D. Wiggins
Email: jenelle.wiggins@nih.gov **Phone**: (301) 435-0843 **Fax**: (301) 480-3777

Program Official: John D. Harding
Email: hardingj@mail.nih.gov **Phone**: 301-435-0776 **Fax**: 30- 480-3819

SPREADSHEET SUMMARY
GRANT NUMBER: 5P51OD011132-55 REVISED

INSTITUTION: EMORY UNIVERSITY

Budget	Year 55
Salaries and Wages	$3,892,839
Fringe Benefits	$957,657
Personnel Costs (Subtotal)	$4,850,496
Supplies	$735,480
Travel Costs	$10,960
Alterations and Renovations	$600,000
Other Costs	$590,581
TOTAL FEDERAL DC	$6,787,517
TOTAL FEDERAL F&A	$2,722,507
TOTAL COST	$9,510,024

Facilities and Administrative Costs	Year 55
F&A Cost Rate 1	44%
F&A Cost Base 1	$6,187,517
F&A Costs 1	$2,722,507

PRIMATE RESEARCH CENTER GRANT **Federal Award Date:** 07/17/2015

Department of Health and Human Services
National Institutes of Health
OFFICE OF THE DIRECTOR, NATIONAL INSTITUTES OF HEALTH

Grant Number: 5P51OD011132-55
FAIN: P51OD011132

Principal Investigator(s):
STEWART W CAUGHMAN, MD

Project Title: Support of Yerkes National Primate Research Center

Teresa Sussman
Associate Director
Office of Sponsored Programs
Emory University
1599 Clifton Road, 4th Floor
Atlanta, GA 30322

Award e-mailed to: osp@emory.edu

Period Of Performance:
Budget Period: 05/01/2015 – 04/30/2016
Project Period: 05/01/1997 – 04/30/2016

Dear Business Official:

The National Institutes of Health hereby awards a grant in the amount of $9,510,024 (see "Award Calculation" in Section I and "Terms and Conditions" in Section III) to EMORY UNIVERSITY in support of the above referenced project. This award is pursuant to the authority of 42 USC 241 42 CFR 52 and is subject to the requirements of this statute and regulation and of other referenced, incorporated or attached terms and conditions.

Acceptance of this award including the "Terms and Conditions" is acknowledged by the grantee when funds are drawn down or otherwise obtained from the grant payment system.

Each publication, press release, or other document about research supported by an NIH award must include an acknowledgment of NIH award support and a disclaimer such as "Research reported in this publication was supported by the Office Of The Director, National Institutes Of Health of the National Institutes of Health under Award Number P51OD011132. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health." Prior to issuing a press release concerning the outcome of this research, please notify the NIH awarding IC in advance to allow for coordination.

Award recipients must promote objectivity in research by establishing standards that provide a reasonable expectation that the design, conduct and reporting of research funded under NIH awards will be free from bias resulting from an Investigator's Financial Conflict of Interest (FCOI), in accordance with the 2011 revised regulation at 42 CFR Part 50 Subpart F. The Institution shall submit all FCOI reports to the NIH through the eRA Commons FCOI Module. The regulation does not apply to Phase I Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) awards. Consult the NIH website http://grants.nih.gov/grants/policy/coi/ for a link to the regulation and additional important information.

If you have any questions about this award, please contact the individual(s) referenced in Section IV.

Sincerely yours,

Gavin Wilkom
Grants Management Officer
OFFICE OF THE DIRECTOR, NATIONAL INSTITUTES OF HEALTH

Additional information follows

SECTION I – AWARD DATA – 5P51OD011132-55

Award Calculation (U.S. Dollars)

Salaries and Wages	$3,892,839
Fringe Benefits	$957,657
Supplies	$735,480
Travel Costs	$10,960
Alterations and Renovations	$600,000
Other Costs	$590,581
Federal Direct Costs	$6,787,517
Federal F&A Costs	$2,722,507
Approved Budget	$9,510,024
Total Amount of Federal Funds Obligated (Federal Share)	$9,510,024
TOTAL FEDERAL AWARD AMOUNT	$9,510,024
AMOUNT OF THIS ACTION (FEDERAL SHARE)	$9,510,024

SUMMARY TOTALS FOR ALL YEARS		
YR	**THIS AWARD**	**CUMULATIVE TOTALS**
55	$9,510,024	$9,510,024

Fiscal Information:

CFDA Name:	Research Infrastructure Programs
CFDA Number:	93.351
EIN:	1580566256A1
Document Number:	PRR000165I
PMS Account Type:	G (Pooled)
Fiscal Year:	2015

IC	CAN	2015
OD	8014499	$9,510,024

NIH Administrative Data:
PCC: CMP01 / **OC**: 414E / **Released**: eRA Commons User Name 07/16/2015
Award Processed: 06/15/2015 11:31:44 PM

SECTION II – PAYMENT/HOTLINE INFORMATION – 5P51OD011132-55

For payment and HHS Office of Inspector General Hotline information, see the NIH Home Page at http://grants.nih.gov/grants/policy/awardconditions.htm

SECTION III – TERMS AND CONDITIONS – 5P51OD011132-55

This award is based on the application submitted to, and as approved by, NIH on the above-titled project and is subject to the terms and conditions incorporated either directly or by reference in the following:

a. The grant program legislation and program regulation cited in this Notice of Award.
b. Conditions on activities and expenditure of funds in other statutory requirements, such as those included in appropriations acts.
c. 45 CFR Part 75.
d. National Policy Requirements and all other requirements described in the NIH Grants Policy Statement, including addenda in effect as of the beginning date of the budget period.
e. Federal Award Performance Goals: As required by the periodic report in the RPPR or in the final progress report when applicable.
f. This award notice, INCLUDING THE TERMS AND CONDITIONS CITED BELOW.

(See NIH Home Page at http://grants.nih.gov/grants/policy/awardconditions.htm for certain references cited above.)

Research and Development (R&D): All awards issued by the National Institutes of Health (NIH) meet the definition of "Research and Development" at 45 CFR Part§ 75.2**.** As such, auditees should identify NIH awards as part of the R&D cluster on the Schedule of Expenditures of Federal Awards (SEFA). The auditor should test NIH awards for compliance as instructed in Part V, Clusters of Programs. NIH recognizes that some awards may have another classification for purposes of indirect costs. The auditor is not required to report the disconnect (i.e., the award is classified as R&D for Federal Audit Requirement purposes but non-research for indirect cost rate purposes), unless the auditee is charging indirect costs at a rate other than the rate(s) specified in the award document(s).

This institution is a signatory to the Federal Demonstration Partnership (FDP) Phase VI Agreement which requires active institutional participation in new or ongoing FDP demonstrations and pilots.

Carry over of an unobligated balance into the next budget period requires Grants Management Officer prior approval.

This award is subject to the requirements of 2 CFR Part 25 for institutions to receive a Dun & Bradstreet Universal Numbering System (DUNS) number and maintain an active registration in the System for Award Management (SAM). Should a consortium/subaward be issued under this award, a DUNS requirement must be included. See http://grants.nih.gov/grants/policy/awardconditions.htm for the full NIH award term implementing this requirement and other additional information.

This award has been assigned the Federal Award Identification Number (FAIN) P51OD011132. Recipients must document the assigned FAIN on each consortium/subaward issued under this award.

This award is not subject to the Transparency Act subaward and executive compensation reporting requirement of 2 CFR Part 170.

In accordance with P.L. 110-161, compliance with the NIH Public Access Policy is now mandatory. For more information, see NOT-OD-08-033 and the Public Access website: http://publicaccess.nih.gov/.

This award represents the final year of the competitive segment for this grant. See the NIH Grants Policy Statement Section 8.6 Closeout for complete closeout requirements at: http://grants.nih.gov/grants/policy/policy.htm#gps.

A final expenditure Federal Financial Report (FFR) (SF 425) must be submitted through the eRA Commons (Commons) within 120 days of the expiration date; see the NIH Grants Policy Statement Section 8.6.1 Financial Reports, http://grants.nih.gov/grants/policy/policy.htm#gps, for additional information on this submission requirement. The final FFR must indicate the exact balance of unobligated funds and may not reflect any unliquidated obligations. There must be no discrepancies between the final FFR expenditure data and the Payment Management System's (PMS) quarterly cash transaction data. A final quarterly federal cash transaction report is not required for awards in PMS B subaccounts (i.e., awards to foreign entities and to Federal agencies). NIH will close the awards using the last recorded cash drawdown level in PMS for awards that do not require a final FFR on expenditures or quarterly federal cash transaction reporting. It is important to note that for financial closeout, if a grantee fails to submit a required final expenditure FFR, NIH will close the grant using the last recorded cash drawdown level. If the grantee submits a final expenditure FFR but does not reconcile any discrepancies between expenditures reported on the final expenditure FFR and the last cash report to PMS, NIH will close the award at the lower amount. This could be considered a debt or result in disallowed costs.

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Hard copy: Paper submissions of the final progress report and the final invention statement may be faxed to the NIH Division of Central Grants Processing, Grants Closeout Center, at 301-480-2304, or mailed to:

National Institutes of Health
Office of Extramural Research
Division of Central Grants Processing
Grants Closeout Center
6705 Rockledge Drive
Suite 5016, MSC 7986
Bethesda, MD 20892-7986 (for regular or U.S. Postal Service Express mail)
Bethesda, MD 20817 (for other courier/express deliveries only)

NOTE: If this is the final year of a competitive segment due to the transfer of the grant to another institution, then a Final Progress Report is not required. However, a final expenditure FFR is required and should be submitted electronically as noted above. If not already submitted, the Final Invention Statement is required and should be sent directly to the assigned Grants Management Specialist.

Treatment of Program Income:
Additional Costs

SECTION IV – OD Special Terms and Conditions – 5P51OD011132-55

ORIP FUNDING PLAN FOR FY2015
This non-competing award reflects the NIH Fiscal Policy for Grant Awards for FY2015 (see NIH Guide Notice NOT-OD-15-050) and the implementation of the ORIP FY2015 grants funding policy: http://dpcpsi.nih.gov/orip/rf/fyg_fp2015

RESTRICTION ON CHIMPANZEE RESEARCH
All NIH-sponsored biomedical and behavioral and social science research involving NIH-owned and -supported chimpanzees must be in accordance with the policies and procedures described in NOT-OD-14-024 (http://grants.nih.gov/grants/guide/notice-files/NOT-OD-14-024.html) and NOT-OD-15-097 (http://grants.nih.gov/grants/guide/notice-files/NOT-OD-15-097.html). Any questions in regard to the NIH policies for the use of chimpanzees in research can be sent to your NIH ORIP Program Director and/or DPCPSI@nih.gov<mailto:DPCPSI@nih.gov>.

ALTERATIONS AND RENOVATIONS

This award includes funding support for three separate A&R projects for a combined total costs of $600,000 as follows:

Fire Suppression System $250,000
HVAC replacement $200,000
Roof replacement $150,000

DESIGN DOCUMENT REVIEW
The grantee shall submit Final Design Documents (95-100% complete construction design documents) for review to ORIP's architectural/engineering team. The documents must be sent in PDF format to ORIPCONSTRUCTION@mail.nih.gov, with the grant number in the subject line. Final Design Documents shall include detailed drawings, specifications, and detailed cost estimates.

KEY PERSONNEL
In addition to the PI, the following individuals are named as key personnel (individuals who have effort that ORIP staff is tracking):

Excluded by Requester

Written prior approval is required if any of the individual(s) named above withdraws from the project entirely, is absent from the project during any continuous period of 3 months or more, or reduces time devoted to the project by 25 percent or more from the level that was approved at the time of award.

PRIOR APPROVAL REQUEST
Any prior approval request (e.g., changes to key personnel as noted on the award, changes in human and animal subjects requiring prior approval, carryover requests) must be submitted to the assigned Grants Management Specialist and Programmatic Official. Please refer to Part II Chapter 8 the NIH Grants Policy Statement for the activities and/or expenditures that require NIH approval at http://grants.nih.gov/grants/policy/nihgps/nihgps.pdf

COMMUNICATIONS/PRESS RELEASE
If the grantee plans to issue a press release concerning the outcome of ORIP grant-supported research, it should notify Ms. Patricia Newman, ORIP Communications at 301-435-0744, in advance to allow for coordination.

The ORIP WWW home page is at http://dpcpsi.nih.gov/orip/

STAFF CONTACTS

The Grants Management Specialist is responsible for the negotiation, award and administration of this project and for interpretation of Grants Administration policies and provisions. The Program Official is responsible for the scientific, programmatic and technical aspects of this project. These individuals work together in overall project administration. Prior approval requests (signed by an Authorized Organizational Representative) should be submitted in writing to the Grants Management Specialist. Requests may be made via e-mail.

Grants Management Specialist: Jenelle D. Wiggins
Email: jenelle.wiggins@nih.gov **Phone**: (301) 435-0843 **Fax**: (301) 480-3777

Program Official: John D. Harding
Email: hardingj@mail.nih.gov **Phone**: 301-435-0776 **Fax**: 30- 480-3819

SPREADSHEET SUMMARY
GRANT NUMBER: 5P51OD011132-55

INSTITUTION: EMORY UNIVERSITY

Budget	Year 55
Salaries and Wages	$3,892,839
Fringe Benefits	$957,657

Supplies	$735,480
Travel Costs	$10,960
Alterations and Renovations	$600,000
Other Costs	$590,581
TOTAL FEDERAL DC	$6,787,517
TOTAL FEDERAL F&A	$2,722,507
TOTAL COST	$9,510,024

Facilities and Administrative Costs	Year 55
F&A Cost Rate 1	44%
F&A Cost Base 1	$6,187,517
F&A Costs 1	$2,722,507

A. OVERALL COVER PAGE

Project Title: Support of Yerkes National Primate Research Center	
Grant Number: 5P51OD011132-55	**Project/Grant Period:** 05/01/1997 - 04/30/2016
Reporting Period: 05/01/2014 - 04/30/2015	**Requested Budget Period:** 05/01/2015 - 04/30/2016
Report Term Frequency: Annual	**Date Submitted:** 02/27/2015
Program Director/Principal Investigator Information: STEWART W CAUGHMAN , MD MOTH AB **Phone number:** (404) 727-5390 **Email:** scaughm@emory.edu	**Recipient Organization:** EMORY UNIVERSITY EMORY UNIVERSITY 1599 CLIFTON ROAD, 4TH FLOOR MAILSTOP: 1599-001-1BA ATLANTA, GA 303224250 **DUNS:** 066469933 **EIN:** 1580566256A1 **RECIPIENT ID:** Compass A: 8953
Change of Contact PD/PI: N/A	
Administrative Official: HOLLY SOMMERS Emory University Office of Sponsored Programs 1599 Clifton Road NE, 4th FL Atlanta, GA 30322 **Phone number:** 404.727.2503 **Email:** hsomme2@emory.edu	**Signing Official:** RENITA WILEY 1599 Clifton Road 4th Floor Atlanta, GA 30322 **Phone number:** 4047278366 **Email:** renita.wiley@emory.edu
Human Subjects: No	**Vertebrate Animals:** Yes
hESC: No	**Inventions/Patents:** Yes If yes, previously reported: Yes

B. OVERALL ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

The Yerkes National Primate Research Center is a unit of the Robert W. Woodruff Health Sciences Center of Emory University. The Principal Investigator of this grant, Dr. S. Wright Caughman, is the Executive Vice President of Health Affairs for the University. He reports to the President of Emory University, who reports to the Board of Trustees. The Yerkes Center Director Excluded by Requester reports to Dr. Caughman and serves as one of the Deans and Directors of the University. The Center Director is responsible for the overall administration and general operation of the Center with respect to research activities, support services, allocation of resources, faculty and staff appointments, base grant budget and other Center responsibilities.

With the support of the P51 grant, the Yerkes Primate Center operates two principal facilities: a Main Station on the Emory University Campus that provides animal housing facilities, research laboratories and support services and Field Station located Specific Animal Location north of Atlanta that provides housing for nonhuman primate breeding colonies and facilities for studies that include the social be and biology of semi-free ranging nonhuman primates. The central objectives of our Center are:

•Carry out basic and applied research using nonhuman primates in the service of developing knowledge, treatments, interventions, and cures that will benefit humanity.
•Provide regional and national resources for data, consultative expertise, biologic and genetic material and specialized facilities and equipment useful in supporting primate related research.
•Study the natural biology of primate species that are of research importance for the purpose of enhancing their scientific utility, health and well-being through appropriate laboratory and field studies.
•Develop improved practices of primate breeding, husbandry and genetic definition to help meet research needs for pedigreed, disease-free animals of defined quality, and assure the continued availability of species of biomedical research importance.
•Provide opportunities for research involvement and experience in primatology to graduate students, postdoctoral fellows, visiting scientists and faculty members, as well as high school students and teachers.
•Disseminate the findings of studies and technical advances in primate research to the scientific community by reports in internationally recognized, refereed journals, professional conferences, and on-site open-house opportunities

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

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B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

For this reporting period, is there one or more Revision/Supplement associated with this award for which reporting is required?

Yes

Revision/ Supplements #	Revision/ Supplements Title	Specific Aims	Accomplishments
3P51OD011132-54S1		The purpose of the supplement was to provide funds for the housing, husbandry support (per diem) and testing of specific pathogen free rhesus monkeys transferred from the New England Primate Research Center to the Yerkes National Primate Research Center. Indoor housing/caging to the existing Specific Compounds was developed with this funding, containing 2 sets of relocatable runs. each housing half the colony in Specific Animal There is also space between the interior runs into which we can bring existing exam tables and clinical equipment to enable us to provide treatment and any other clinical exams not necessitating single cage clinical housing.	The caging has been completed and 149 rhesus macaques have been transferred from NEPRC to Yerkes as a part of this supplement to expand the SPF breeding colony with these well characterized monkeys.. Specific Animal is being used to for Specific Animal larger groups from these small Location after having been held in quara either the Main Station or the Field Station for 3 months. As the animals are organized into larger social groups and stabilized, we anticipate an increase in production from this colony at the next breeding season.

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

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B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

In addition to routine dissemination, scientific publications, and sharing of research resources, we employ the following mechanisms to disseminate the scientific and technical achievements of the Center: 1) Host an exhibit booth, on behalf of all National Primate Research Centers, at the annual Society for Neuroscience meeting; 2) Presentations to the public at community meetings and other public fora as well as to junior high and high school students; 3) Talks to groups touring the Yerkes National Primate Research Center's two campuses; 4) Literature distributed to presentation and tour participants as well as that provided to other Emory University departments to distribute as appropriate; 5) Articles in Emory University publications (e.g., Emory Magazine); 6) An internal Lunch and Learn program for Yerkes employees--outside scientists also present lectures throughout the year; and 7) Yerkes Field Station Open House held twice a year.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

The goal for the coming award period is to continue to achieve scientific excellence and to provide the comprehensive infrastructure support necessary to host NIH supported scientific projects in order to meet national health objectives. In particular, among the program areas indicated above, we will specially emphasize research on models of stroke using nonhuman primates and HIV cure research, as well as transgenic nonhuman primate models of neurodegenerative diseases. Additionally, we have further developed several strong programs, including transplant medicine and autism. We are also working with WaNPRC in enhancing an electronic veterinary records program, the Animal Research Management System (ARMS).

Accomplishments

1. Overall Highlights

The Yerkes National Primate Research Center has demonstrated significant progress in meeting each of these objectives during the reporting period and consequently, has made significant contributions to behavioral, biomedical and translational research and research training at Emory University and via collaborations on a regional, national, and international basis. In particular, the Yerkes Primate Center has maintained outstanding core research programs, extensive collaborative relationships with scientists based in other Emory University departments and provided resources and services to a broad collaborative network of affiliate and collaborative investigators throughout the region and nation. These research programs, which involve the use of a variety of nonhuman primate species, and rodents where appropriate, are directed primarily toward four major research disciplines, representing the research divisions within the Primate Center: 1) Microbiology and Immunology; 2) Developmental and Cognitive Neuroscience, 3) Neuropharmacology and Neurologic Diseases and 4) Behavioral Neuroscience and Psychiatric Disorders. Also, through the Divisions of Animal Resources and Pathology, Yerkes provides support for outside investigators conducting research at the Yerkes Center, consistent with our ORIP mandated role as a regional and national resource.

This year also marked a transition in leadership for Yerkes—Excluded by Requester was selected as the new Excluded by Requester r to succeed Personal Info Dr. n was the former Director of the New England Primate Research Center and a Professor of Medicine at Excluded by d Medical School. assumed his responsibilities on August 1, 2014 and worked in concert Excluded by Requester during a two month transition period.

Key support units include:

Supporting components (see also below) provide the following administrative units, activities and services: (1) Associate Director of Animal Resources, (2) Associate Director of Pathology, (3) Research Services unit that provides support for onsite and off-site investigators, (4) Tissue Distribution program that collects and distributes nonhuman primate biological specimens, (5) Occupational Health and Initial Orientation/Training Program, (6) Environmental Health and Safety Program and (7) Regulatory Compliance. There continues to be a strong emphasis on training, both on the job and more formal training, such as AALAS certification classes that are offered at both the Main Station and Field Station. These courses plus regular Lunch and Learn sessions and various staff meetings and training sessions in the Animal Care units contribute to better communication and improved performance. Additionally, last year we provided Animal Resources personnel, including all animal care personnel with courses in leadership, management, and conflict resolution. This year we are providing follow-up programs and assessments.

The Division of Animal Resources is comprised of: (1) Veterinary Medicine; (2) Colony Management; (3) Animal Care-Main Station; (4) Animal Care-Field Station; (5) Behavioral Management; and (6) Animal Records, and Research Services. Through these units, the Division provides health care, research support, environmental enrichment, program management and maintenance of animal records for the diverse nonhuman primate population at the YNPRC. Primate breeding, including a specific pathogen free (SPF) colony are overseen, as well as the research colony, the rodent vivaria, and the Comparative AIDS Core.

Animal Census Tables

As of 2/13/2015, overall size of the NHP colony is as follows:

1. **Nonhuman primates supported partially, or in whole by the P51 base grant[1].**
Census date: 2/13/15 (*135 from NEPRC and supported by P51 supplement)

Genus, Species	Breeding Colony[2]				Animals not in breeding colony[3]				Total Colony Census
	M	F	U[4]	Total	M	F	U[4]	Total	
Cercocebus Torquatus Atys	18	57	1	76	41	33	0	74	150
Macaca Fascicularis	0	0	0	0	3	0	0	3	3
Macaca Mulatta (SPF)	416	890	29	1335*	64	104	8	176	1511
Macaca Mulatta (NSPF)	0	0	0	0	130	160	0	290	290
Macaca Nemestrina	0	0	0	0	0	0	0	0	0
Saimiri SPP	0	0	0	0	15	0	0	15	15
Totals	434	947	30	1411	253	297	8	558	1969

[1] SPF Mucaca Mulatta Breeding Colony is partially supported by a SPF U24 grant (U24 OD011023).
[2] Total number of animals in breeding colony including adult breeding animals and designated juvenile replacements at time of report.
[3] Animals on protocol or otherwise not in the breeding colony at the time of report.
[4] Sex undetermined.

2. Nonhuman primates not supported by the P51 base grant[1].
Census date: 2/13/15

Genus, Species	Breeding Colony[2]				Animals not in breeding colony[3]				Total Colony Census
	M	F	U[4]	Total	M	F	U[4]	Total	
Macaca Mulatta (SPF)	0	52	0	52	20	55	0	75	127
Macaca Mulatta (NSPF)	0	0	0	0	380	394	0	774	774
Cercocebus Torquatus Atys	0	0	0	0	16	2	0	18	18
Macaca Fascicularis	0	0	0	0	8	2	0	10	10
Macaca Nemestrina	0	0	0	0	2	1	0	3	3
Saimiri SPP	0	0	0	0	19	2	0	21	21
Totals	0	52	0	52	445	456	0	901	953

[1] Animals in these colonies are not supported by a SPF U24 or U42 grant.
[2] Total number of animals in breeding colony including adult breeding animals and designated juvenile replacements at time of report.
[3] Animals on protocol or otherwise not in the breeding colony at the time of report.
[4] Sex undetermined.

3. Non-primate colonies

None of the animals in the non-primate colonies are supported by the P51 base grant.

During the past year, the Center provided support for approximately 154 investigators and 153 projects that were performed at the Center. Approximately 57% of our FY14 awarded funding (excluding the P51) is AIDS-

related. All of our projects combined resulted in 293 published journal articles. This work was supported via the substantial outside funding garnered by investigators associated with the YNPRC. The total amount of these awards in the past year is to be determined, and will be reported in the electronic Annual Progress Report. Provision of specimens to investigators is another service provided by the Center, with some 1,513 specimens distributed in the reporting period. Students and Postdoctoral Fellows also are an integral part of the scientific fabric of Yerkes and participate in all elements of the research mission. In the last year, some 186 graduate and undergraduate students received training and experience in Yerkes laboratories. During this same period, the Center was home to 50 Postdoctoral Fellows. In addition, the Center hosts a summer research program for high school students and teachers, and frequently hosts scientific seminars and sponsors talks by faculty for the staff to promote understanding of the scientific mission.

2. Research Highlights

Division of Behavioral Neuroscience and Psychiatric Disorders:

Social Neuroscience: Excluded by Requester and colleagues have been exploring the role of the oxytocin system in regulating social cognition and neural activity in rhesus macaques. In collaboration with Excluded by Requester Yerkes Excluded by Requester h of Developmental and Cognitive Neuroscience has shown that oxytocin administered Excluded by Requester sally via a pediatric nebulizer increases oxytocin concentrations in the cerebrospinal fluid. Furthermore, group has used a sensitive *in situ* hybridization and a receptor autoradiography technique to map n distribution of oxytocin receptors in the rhesus macaque as well as the coppery titi monkey brain. These studies reveal that oxytocin receptors are concentrated in brain regions involved in auditory and visual attention, consistent with their role in regulating social cognition. These studies complement other studies in a variety of species supported by the Yerkes Silvio O. Conte Center for Oxytocin and Social Cognition grant funded by NIMH. These results have important implications for developing therapeutic strategies for autism.

Division of Developmental and Cognitive Neuroscience

Excluded by Requester dverse experiences and her colleagues are conducting research that contributes to our understanding of the role of early life stress in the etiology and pathophysiology of mood and anxiety disorders. The multidisciplinary approach and knowledge used bridge many different disciplines, from stress, neurobiology, neuroendocrinology, development, neuroimaging, genetics, behavior, psychobiology and psychopathology. They recently demonstrated that adverse maternal care in nonhuman primate yields long lasting changes in emotional reactivity, social and cognitive deficits, and stress hormones dysregulation. These behavioral alterations were associated with altered functional connectivity of prefrontal and amygdala regions reminiscent of the neurobehavioral impact reported in children exposed to early life stress.

Excluded by Requester ehavioral development and his colleagues have followed and characterized the ehavioral development of infant monkeys living without a functional amygdala since birth. Although neonatal amygdala damage led to social changes that were at best mild and transitory, the same damage resulted in profound changes in emotional and stress neuroendocrine reactivity, including increased activity of brain CRF systems and hypothalamic-pituitary-adrenal axis when the monkeys reach early adolescence. Data from such longitudinal studies are clinically relevant since persistent and elevated cortisol secretion maintained until adulthood can have broad-ranging physiological consequences detrimental to the health of individuals. They provide critical information on how early amygdala dysfunction could impact human physical and mental health.

Division of Microbiology and Immunology

HIV/AIDS Excluded by Requester and his colleagues have made significant progress in their studies of HIV pathogenesis, prevention, and therapy using the non-human primate model of SIV infection in macaques and Excluded by Requester beys. In recent studies and co-workers successfully conducted the first autologous poietic stem cell transplant in SIV-infected macaques treated with antiretroviral therapy, thus opening the way for further use the transplant model to "cure" SIV infection Excluded by Requester (Yerkes Division of Microbiology and Immunology) was a key contributor to a study showing how type I interferons protect from virus transmission and pathogenesis in the SIV macaque model. This study provides evidence supporting the

clinical use of interferons—in conjunction with standard antiretroviral therapy—to prevent and/or treat HIV infection and AIDS.

Division of Neuropharmacology and Neurologic Disease:

Monkey Model of Huntington's Disease: Excluded by Requester and his team have performed longitudinal assessment of a group of transgenic Huntington's disease monkeys that were created here at the center. This is the first long term (from infancy to adulthood) longitudinal study on the first transgenic monkey model of human inherited neurodegenerative disease that encompassed prodromal and symptomatic stage of the disease. His teams employed clinical assessment methods similar to those used in human patients including magnetic resonance imaging (MRI), cognitive behavioral assessment, gene and small RNA expression profiling studies and metabolomics studies, etc. HD monkeys develop a disease progression pattern similar to those observed in human patients, which include progressive regional brain atrophy, cognitive decline, motor impairment and dysregulated gene, small RNA and metabolite profile. With the successful production of second generation HD monkeys, HD monkeys hold great promise as a preclinical animal model for the development of novel therapeutics. His team is currently developing a "Transgenic Huntington's Disease Monkey Resource (THDMR)" to facilitate the preclinical application of the HD monkey model through the support of the ORIP.

Excluded by Requester ogy of Parkinson's Disease: and his colleagues made significant advances in our tanding of the pathology of non-dopaminergic systems in Parkinson's disease (PD). Using the MPTP-treated nonhuman primate model of PD, they demonstrated that a specific subset of thalamic neurons that play a critical role in attention and other cognitive functions undergo severe degeneration in parkinsonian monkeys. These findings are highly significant because they demonstrate that the MPTP-treated monkey model of PD displays pathologic features that more closely resemble those described in postmortem human PD brains than any other toxin- or genetic-based models of PD. These observations set the stage for future studies aimed at assessing the potential role of thalamic degeneration in the development of early cognitive impairments in PD.

Excluded by Requester man Primate Brain Connectivity: and colleagues have collaborated with members of the pported Human Connectome Project (HCP) consortium at Washington University to import and process MR images from nonhuman primates so that they can be viewed and analyzed using the HCP Workbench. The Workbench is a desktop app that allows users to upload structural and functional imaging data from hundreds of individual humans, each registered to a common space. The Workbench allows users to represent the cortex in various states of inflation, from fully folded to fully flattened, and provides tools for drawing regions of interest and carrying our surface-based analyses of structural and functional connectivity, with respect to cortical myeloarchitecture (derived directly from individuals' T1 and T2 scans). The human database is being expanded to include individual genetic and behavioral phenotypic data for correlation with variations in cortical structure and connectivity. NIH is supporting the widespread adoption of HCP imaging protocols (PAR-14-281), and the HCP Workbench is well on its way to becoming the standard platform for the analysis of human imaging data. Our goal is to make available information about brain structure and connectivity for nonhuman primates within the HCP framework. To this end, we have processed 39 chimpanzees and 18 macaques, each with T1, T2, and DTI scans, and constructed brain templates for each species, along with species-specific myeloarchitectonic maps derived from T1 and T2, and have begun a number of projects comparing the connectivity of specific cortical areas between humans, chimpanzees, and macaques. As more nonhuman primate scans are collected, they can be processed through the HCP pipeline, added to the databases, and analyzed using Workbench software. The potential exists for adding genetic, behavioral, and other phenotypic data, just as with the human datasets. Thus, we are creating a research infrastructure that will greatly facilitate comparison of brain organization between humans and nonhuman primates.

Division of Pathology:

Babesiosis: Excluded by Requester and his colleagues have made a significant progress in their studies understanding *Babesia microti* infection using a rhesus macaque model. The main focus of their work is to study acute *B. microti* infection transmission kinetics relevant to transfusion medicine, and to define the window period between the first detection of parasitemia and the first detectable antibody response. They observed variability in dynamics of parasite virulence between hamster adapted and monkey adapted *B. microti* strains. In addition, a phenomenon of recrudescence or persistent infection was seen with *B. microti* infection, and a low dose of only 50 organisms was able to transmit *Babesia* infection. The findings in this study show the

possible vulnerability in the United States blood supply considering that the blood volumes associated with transfusion are relatively large and the donor units with even very low numbers of *B. microti* could potentially represent a risk for transfusion transmission.

Subclinical hypertrophic cardiomyopathy in rhesus macaques: Excluded by Requester and colleagues are comparing rhesus macaques with subclinical hypertrophic cardiomyopathy (HCM) with unaffected rhesus macaques. Mutation of sarcomeric genes is the most frequent cause of hypertrophic cardiomyopathy and has been associated with approximately 50% of human HCM cases. The main focus of this work is to study the expression of two sarcomeric genes, MYH7 and MYPBC3, in hearts of affected rhesus macaques and determine any mutations. In addition, the level of cardiac biomarker B-type natriuretic peptide (BNP) in the serum samples of affected monkeys will be compared with those of unaffected macaques. BNP is a neurohormone secreted mainly in the cardiac ventricles in response to volume expansion and pressure overload. Any changes of this peptide in the affected rhesus will confirm a correlation between subclinical HCM phenotype and ventricular function.

Division of Transplant Medicine:

Excluded by Requester continue their work focusing on strategies to improve organ transplant Excluded by Requester studies have centered around the development of novel therapeutics to prevent rejection, cally novel domain antibodies which target key pathways critical for T cell activation. In addition his group has recently completed pilot studies to develop a model of kidney xenotransplantation. This work was recently accepted for publication and details the longest survival reported to date in a pig-to-nonhuman primate Excluded by Requester transplant model. group has made significant progress in their challenging pre- ted transplant model. Recent publications have focused on the BAFF/APRIL pathway and antibody mediated rejection.

Veterinary Medicine:

Excluded by Requester (Yerkes Division of Animal Resources) and her group have focused on the prevalence, risk diagnostics and pathology associated with Diabetes Mellitus in the sooty mangabey colony. The association of diabetes and other factors such as the SIV status of an animal and birth control techniques were ruled out as contributing factors to clinical disease in this colony. The presence of pancreatic insular amyloidosis was identified as the pathology associated with diabetes in the mangabeys. In addition, Excluded by Requester Excluded by Requester was awarded a grant to investigate the cost-saving potential and clinical application of automated compared to the traditional bin feeding system in group housed monkeys. One of the primary outcomes of this study is to determine whether the use of automated feeders and computer-controlled calorie restriction is a feasible method to reduce obesity and improve the metabolic health of overweight adult female macaques without inducing food competition and other adverse behaviors in a social setting.

3. Administrative Highlights

ADMINISTRATIVE INFORMATION

Scientific Advisory Committee: The Scientific Advisory Committee (SAC) comprised of the Center Director, Division Chiefs, Yerkes CFO, the Chief of Public Affairs, and staff scientists reviews all scientific proposals from non-Yerkes/Emory investigators for scientific merit and availability of resources, prior to review by the RAAC and initiation of any project using nonhuman primates at the Yerkes Center. A Study Intent Questionnaire (SIQ) is completed and submitted, via the Yerkes website, to the SAC facilitator who then forwards the SIQ to the appropriate Yerkes Division Chief/PI for further review. If the project is deemed feasible, the Yerkes Division Chief/PI will contact the investigator requesting completion of a Research Intent Proposal (RIP) that will be entered into the SAC database and reviewed by the SAC to determine whether Yerkes has the resources to support the proposed study. Yerkes/Emory investigators are not required to submit a SIQ, but must submit a RIP at the time they route a grant to Yerkes Business & Finance Office for review. RIP's submitted by Yerkes/Emory investigators are not reviewed by the committee but are recorded in the SAC database used for tracking resource allocation. This committee meets monthly in order to review requests in a timely manner.

Resource Allocation Advisory Committee: The Resource Allocation Advisory Committee (RAAC), prior to initiation of any IACUC protocol, must review all projects, both internal and external, requiring Center resources. This committee meets monthly to review and make recommendations regarding research applications requiring animal and other Center resources. This committee also tracks resource commitments and actions needed to meet these requirements in instances where resource limitations (e.g. animals or space) preclude immediate availability. A new subcommittee of RAAC was created to focus on individual animal assignments in order to improve the efficiency of the assignment process. An electronic RAAC program designed by Yerkes IT was implemented by this Committee. This program facilitates electronic submission and tracking of RAAC applications along with an innovative program for identifying animals for assignments.

Animal Resources Management: The Center has developed a new team for Animal Resources Management at the Main Station. This group meets monthly and includes members from Veterinary Staff, Animal Care, Behavioral Management, Research Resources, EHSO, Animal Records, Training and Facilities Management. The group reviews new and ongoing projects that affect animal resources such as animal acquisitions and shipments, quarantine, regulatory issues, new research protocols and facility maintenance and construction needs that affect animal housing areas. The goal of this group is to increase communication amongst all units of Division of Animal Resources and Facilities at the Main Station.

Colony Management: The Center has a Colony Director, a Colony Resources Manager and a team that oversees the animal colonies at the Field Station. This team balances colony production needs with research needs and resource availability. The Colony Management team works closely with the Assistant Director of Animal Resources at the Field Station, Associate Veterinarians and others at the Field Station.

A Colony Management Committee meets bimonthly to review progress and concerns, and plans for anticipated future research and colony maintenance requirements. The colony management group consists of representatives from colony management, veterinary medicine, research staff and animal care. Five members of the Colony Management team participate in the ORIP sponsored NPRC Breeding Colony Management Consortium, which includes representatives from all seven NPRC's. The Consortium hosts monthly teleconferences and meets annually, with the goal of facilitating communication and efficiencies of colony management between the NPRC's.

Regulatory Compliance: The Emory University Institutional Animal Care and Use Committee (IACUC) must approve all research involving animals at Yerkes. The Committee is charged with ensuring proper care, use, and humane treatment of animals used in research, testing and education.
Animals are not assigned to any research project until IACUC approval is received. The Emory IACUC is composed of 37 voting members (27 full and 10 alternate) and 20 nonvoting members divided into two Committees. Each Committee meets twice monthly both individually and as a combined group to evaluate all University research proposals that involve the use of laboratory animals. The proposals are provided to all IACUC members prior to the scheduled committee meeting. Each proposal receives a veterinary consult prior to review, then is presented by a primary and secondary reviewer at the meeting and then discussed by committee members and voted on at the meeting. The proposal may be approved, approved with stipulations, disapproved, or deferred for clarification or modifications. All research protocols receive a thorough review, regardless of whether they were submitted to an outside funding agency or are being internally funded. The latter type of proposal is also reviewed for scientific merit. Committee members are not present for review of proposals with which they are involved.

In addition to the approval of research applications involving animals, the Committee also inspects all research and animal facilities semi-annually and compiles reports and recommendations from these inspections. We have 17 members from Yerkes who serve on the IACUC.

Accreditation: The Yerkes NPRC is fully accredited by AAALAC, with the previous site visit having been in

February 2014 and letter of accreditation received in July 2014.

COMMITTEE REPORTS

The Center Director consults with and receives recommendations from a number of key committees in framing decisions regarding day-to-day operations of the Center as well as long-term planning.

Administrative Committee. Focus: Center administration functions, operations, facilities. Membership: Heads of all administrative units. Occurrence: Quarterly.

Animal Resource Management Committee. Focus: Oversight of colony and facility resources for Main Center animals. Coordinates animal-related center activities among all Animal Resources units. Membership: Associate Director for Animal Resources and representatives from Animal Care, Animal Records, Behavioral Management, Environmental Health and Safety, Facilities, Research Services and Veterinary Medicine units.

Chimpanzee Oversight Committee. Focus: Day-to-day management issues and to coordinate approaches to long-term planning for our chimpanzee colony. Membership: representatives from Animal Care, Behavioral Management, Facilities and Veterinary Medicine units and chimpanzee research groups. Occurrence: Monthly.

Colony Management Committee. Focus: Colony management for all nonhuman primates, including SPF and non-SPF colonies. Membership: Associate Director for Animal Resources, Assistant Director for Animal Resources, principal investigators and representatives from Animal Care, Colony Management, Facilities Management, Research Services, Veterinary Medicine and the Center's Nonhuman Primate Genomics Core. Occurrence: Bi-weekly.

Division Chiefs Committee. Focus: Scientific division business. Membership: Scientific Division Chiefs, Associate Director for Animal Resources and CFO. Occurrence: Bi-monthly.

Emergency Preparedness Committee. Focus: Review policies and plans and implement additional measures in relation to keeping animals secure and employees safe. Membership: Representatives from administrative and scientific units, including Public Affairs, Animal Care, Veterinary Medicine and Environmental Health and Safety. Occurrence: As needed.

Environmental Health and Safety Committee. Focus: Employee health and safety. Membership: Director and staff of the Environmental Health and Safety Office, representatives from administrative and scientific units. Occurrence: Quarterly or as necessary.

Executive Committee. Focus: Meets with the Director to consult on Center operations. Membership: CFO, Associate Director for Scientific Programs, Associate Director for Animal Resources and Associate Director of Pathology. Occurrence: Weekly.

Mangabey Committee. Focus: Oversight of managbey colony resources, including population management evaluation, resource requirements and scientific resource management. Membership: Associate Director for Animal Resources and representatives from the Colony Management, Genetics, Scientific and Veterinary Medicine units.

National Scientific Advisory Board (NSAB). Focus: Advisory board to the Center Director with regard to strategic planning, program activities, scientific growth of the Center and administrative organization and management. Membership: see below. Occurrence: Annually on site. Also by conference calls as necessary. The list of members is as follows:

Cognition/Aging
Excluded by Requester PhD
Professor & Chair, Department of Anatomy & Neurobiology
Boston University School of Medicine

Comparative Medicine and Veterinary Resources
Excluded by Requester DVM, DACLAM
Doctor R. Lee Clark Professor and Chair
Department of Veterinary Sciences
Director, Michale E. Keeling Center for Comparative Medicine and Research
University of Texas MD Anderson Cancer Center

Genetics
Excluded by Requester PhD
Associate Professor, Department of Molecular and Human Genetics and
Human Genome Sequencing Center
Baylor College of Medicine

Imaging
Excluded by Requester PhD
Professor of Physiology & Pharmacology and Radiology
Wake Forest University School of Medicine

Immunology, Virology and Infectious Diseases
Excluded by Requester MD
Director, AIDS and Cancer Virus Program
SAIC-Frederick, Inc.
Frederick National Laboratory

Neuroscience
Excluded by Requester PhD
Professor of Psychology and Psychiatry & Biobehavioral Sciences
Associate Director for Research of the Brain Research Institute
UCLA

Excluded by Requester PhD
Dean of Basic Sciences and the Graduate School of Biomedical Sciences
Professor, Department of Neuroscience, Box 1639
Icahn School of Medicine at Mount Sinai

Resource Allocation Advisory Committee. Focus: Reviews and recommends allocation of nonhuman primate resources and Center resources for research programs. Membership: Representatives from Administrative, Colony Management, Scientific and Veterinary Medicine units. Occurrence: Monthly.

Scientific Advisory Committee. Focus: Review of requests to initiate or renew scientific projects. Membership: Scientific Division Chiefs, representatives from administrative units, including Finance/Research Administration and Public Affairs. Occurrence: Monthly or as necessary.

Space Committee. Focus: Recommendations of space allocation to the Director. Membership: Representatives from Administrative and Scientific units. Occurrence: Monthly or as necessary.

Standard Operating Procedures Committee. Focus: Establishes, reviews and updates all Center SOPs. Membership: Representatives from Animal Resources and Environmental Health and Safety units. Occurrence: Quarterly or as necessary.

Yerkes Research Technology Advisory Committee. Focus: Develop, review and recommend Information Technology (IT) programs to the Director of IT in consultation with the Center's Executive Committee. Membership: Representatives from Administrative and Scientific units. Occurrence: Bi-monthly.

TRAINING

Scientific

The Center is actively involved in training and continuing education activities. Students and Postdoctoral Fellows are an integral part of the scientific fabric of Yerkes and participate in all elements of the research mission. In the last year, 111 undergraduate and 75 graduate students received training and experience in Yerkes laboratories. During this same period, the Center employed 50 Postdoctoral Fellows. Yerkes currently is the focal point for a substantial portion of the Neuroscience Graduate Program at Emory. The Director of the NIH training grant that supports students in the Graduate Neuroscience Program and many members of the Neuroscience Program Executive committee, all reside at Yerkes. Additionally, almost 30% of graduate students in the Neuroscience and Immunology programs are carrying out their dissertation research in Yerkes laboratories, including several MD/PhD students. Essentially all of our Divisions have NRSA or NSF-supported students and we have worked with each Division in facilitating the process for trainees' applications to NIH/NSF or private foundations for financial support. We have two institutional training grants, developed and administered at Yerkes: the NIGMS Training in Systems and Integrative Biology-Neuroscience and the NIH BP/ENDURE training grant that supports under-represented minority undergraduate students in Neuroscience. The Yerkes Center is also the administrator of the NIH-funded UDALL Center of Excellence for Parkinson's disease at Emory University and the home for three of the core scientists participating in this Center. In addition to research activities, the Parkinson's Disease Center is very active in education and community outreach for trainees and the general public. It also provides pilot grants to young investigators interested in developing new areas of research for Parkinson's disease.

The Division of Animal Resources (DAR) at Yerkes and at Emory's School of Medicine (SOM) continue their joint effort in supporting the Emory Laboratory Animal Medicine Residency Training Program. Since 2009, one of Yerkes veterinary faculty members is the Training Program Assistant Director. In addition, Yerkes veterinarians have taken responsibility as course directors for classes within the Residency Training program. Yerkes also supports two residency positions per year. Our goal is to train and retain laboratory animal veterinarians who will grow with Yerkes, and help develop programs of research around their own specialties. All veterinary faculty continue to be actively involved in the Emory Laboratory Animal Medicine Program and remain closely partnered with the Division of Animal Resources at the School of Medicine. In 2007, an NCRR R25 training grant enabled Yerkes to include an additional third year of specialized NHP training for three residents (one each year – funding to support years two and three of the training). In 2009, an administrative supplement to the R25 provided support for a fourth resident to enter the program. The three-year YNPRC NHP Residency Program builds upon our successful Emory/YNPRC two-year program and provides extensive nonhuman primate clinical and resource management experience for the residents. We have successfully recruited four trainees, all of them having completed the program between June 2009, and June 2011. In addition, all have obtained their ACLAM Board Certification, the gold standard to measure success of a Laboratory Medicine Training program. One of those trainees is now a full time veterinarian at Yerkes. In light of the success of this specialized Training Program, YNPRC decided to continue to support a third year Fellowship in Nonhuman Primate Medicine and Management. We have already recruited four trainees for the Fellowship Program. The first one completed her training in June 2013 and obtained her ACLAM Board certification in July 2013. She is now a full time clinical veterinarian at Yerkes. The second trainee finished her fellowship training in July 2014 and will take her ACLAM Board exam in June 2015. The third fellow is expected to complete his training and sit for his Board exam in June 2015. The remaining fellows will start the program respectively in July 2015 and 2016.

YNPRC has continued to provide opportunities for veterinary internships and externships. These opportunities

introduce veterinary students to the field of lab animal medicine and have sometimes led to students applying for lab animal residency positions as offered by the School of Medicine/YNPRC. Two of our current residents have been through our externship program. In 2014, eight externs and one intern came to Yerkes for a period of time which can vary between three to ten weeks. Students from veterinary technical schools also have participated in externships and have sometimes been motivated to apply for available technical positions at Yerkes where they could put to good use their newfound knowledge of nonhuman primates. We did hire one of the veterinary technician externs in 2014. The various students work closely with veterinary faculty, residents and technicians to gain a working knowledge and appreciation of the specialty of nonhuman primate medicine.

The Yerkes Center is closely linked with several components of the Emory University Clinical Translational Science Award (CTSA); (here called the Atlanta Clinical and Translational Science Institute – ACTSI – which includes Morehouse School of Medicine and the Georgia Institute of Technology). The key functional areas of the ACTSI that the Yerkes Center is involved with include brain imaging and education.

Yerkes has collaborated with the Institute on Neuroscience (ION) at Georgia State University to continue to enable high school students and middle and high school teachers to participate in scientific research. Success with this program has led to a five-year NIH grant to continue the ION program.
In addition, the Center regularly hosts scientific seminars and sponsors frequent talks (Lunch and Learn, Frontiers in Neuroscience) by faculty for the staff to promote understanding of the scientific mission.

Employee Training

As noted in the Core Service Units section, prior to beginning employment, all personnel are given a packet that provides information on the Yerkes Center, general information on primate research, the nonhuman primate behavioral management program, laboratory animal zoonoses information, personnel policies, Center security information, standards and procedures for working safely at the Center, training information, and biosafety issues (e.g., B-virus information). Supervisors are responsible for training employees in procedures that specifically relate to their areas of responsibility. Individuals with practical experience are appointed to train new employees/students within their units. All new employees (investigators, animal care personnel, research technicians, etc.) and students/volunteers receive an approximately 1 hour orientation that includes a slideshow related to organization of the Yerkes Center, procedures for handling incidents and potential exposures, and general guidelines for working safely in laboratory and animal research settings. All new employees complete training on Emory's Blackboard site, including a "Yerkes Orientation" module in addition to other modules as are relevant to the employee's job responsibilities. All personnel who will have animal contact are required to complete Animal User Orientations that cover nonhuman primate and/or rodent biology, U.S. regulations and guidelines for laboratory animals, IACUC policies, identifying and reporting sick animals and reporting animal welfare concerns. Animal Research personnel are required to complete applicable AALAS Learning Library online training modules and be added to an existing IACUC protocol prior to working with animals. A hands-on instructional tour of the nonhuman primate and/or rodent research facility is required for research personnel to gain access to these areas. General information memoranda are circulated providing any new information or reminding personnel of existing standards when necessary.

Training classes are provided as part of Yerkes continuing education efforts. These classes are based on the American Association for Laboratory Animal Science certification program. Although all Animal Care Technicians are encouraged to work toward certification by AALAS, the AALAS certification examination is not mandatory. Regular staff meetings are conducted at which time there is generally a review of some aspects of husbandry and care that relate to certification. Manuals for the Assistant Laboratory Animal Technician, Laboratory Animal Technician and the Laboratory Animal Technologist are made available to Yerkes technicians without charge for use in the in-house training program or for self-study. Additionally, the Emory University IACUC Office subscribes to the AALAS Learning Library for online, individualized training. The Yerkes Center pays the fee for the certification examination at each level. A salary increase is provided to individuals who achieve certification. Thirty percent of the Main Station animal care unit and 40.4% of the Field Station animal care unit are AALAS certified at some level. Opportunities for additional training are also

available when Animal Care Technicians attend National AALAS, SEAALAS and AALAS District IV meetings in 2015. Supervisors and Managers have been attending Webinars sponsored by NABR, OLAW, USDA and AAALAC. Additionally Continuing Education sessions are available for Veterinary Technicians through the Gwinnett Veterinary Medical Association monthly meetings as well as a series of lectures (scheduled 6-8 times a year) organized by the School of Medicine's DAR.

The Training Coordinator for the Yerkes Division of Animal Resources coordinates the training requirements for personnel who work with research animals. After completing the Animal User Orientations, trainings offered to animal users at Yerkes include 1) aseptic surgery technique (mandatory for anyone conducting surgery); 2) rodent biomethodology including restraint, blood collection techniques and injection procedures; 3) humane rodent euthanasia methods; 4) weaning training (a review of the IACUC weaning policy for mice and rats; 5) restraint training (a 2-part series on preparing nonhuman primate for studies involving physical restraint, specifically chair restraint; 6) behavioral management of nonhuman primates; and 7) an annual facility refresher for all research staff working with animals. Instructional manuals for identifying sick rodents are developed and distributed to animal research and animal care personnel. The Training Coordinator is a member of the IACUC Subcommittee on Training and Continuing Education, which develops the policy on rate, frequency and types of training and continuing education requirements for animal users at Emory University and Yerkes.

In addition to the initial orientation which includes information on zoonoses (including B-Virus), biosafety, personal protective equipment, and Center policies on safety, the Yerkes Environmental Health and Safety Officer conducts and/or facilitates annual training programs for all personnel. These annual training programs include but are not limited to: (1) B-virus training for all staff who work with nonhuman primates or nonhuman primate blood or tissues; (2) annual updates on the use of personal protective equipment to include a review of current requirements, demonstration on how to use PPE, and information on the storage, limitations of and decontamination and disposal of PPE; (3) information on hazards communications and the chemical hygiene plan, including how to work with hazardous chemicals, how to respond to a spill, labeling and storage requirements, disposal procedures and Safety Data Sheets (SDS); (4) biosafety reviews which include a review of biosafety level 1-4, blood borne pathogens standards, biological safety cabinets, emergency procedures, disposal practices, and a review of zoonoses; (5) radiation safety which includes discussion of the characteristics of radiation, safe use and storage, disposal, and employee monitoring; (6) ergonomics training for employees in animal care, research, or any other position that involves strenuous or repetitive physical activity; and (7) fire safety training which includes fire prevention strategies, evacuation plans, emergency procedures, and training for the use of fire extinguishers; and (8) respirator program which includes annual fit testing, training, and medical surveillance.

Patents, Licenses

Patents: 3
Licenses: 3

AWARDS, HONORS, SPECIAL RECOGNITION

Excluded by Requester

Staff member, Research Services
Yerkes National Primate Research Center, Emory University, Atlanta, GA
Emory University
Won second place for his presentation at the Southeastern American Association for Laboratory Animal Science (SEAALAS) meeting.
SEAALAS is the Southeastern branch of the American Association of Laboratory Animal Science (AALAS). AALAS is a membership association of professionals employed around the world in academia, government and private industry who are dedicated to the humane care and treatment of laboratory animals, as well as

the quality research that leads to scientific gains that benefit people and animals.

Excluded by Requester

Staff member, Colony Management
Yerkes National Primate Research Center, Emory University, Atlanta, GA
Emory University
Won first place for her presentation at the Southeastern American Association for Laboratory Animal Science (SEAALAS) meeting
SEAALAS is the Southeastern branch of the American Association of Laboratory Animal Science (AALAS). AALAS is a membership association of professionals employed around the world in academia, government and private industry who are dedicated to the humane care and treatment of laboratory animals, as well as the quality research that leads to scientific gains that benefit people and animals.

Excluded by Requester MD, PhD
Researcher
Yerkes National Primate Research Center, Emory University, Atlanta, GA
Emory University
Awarded the 2014 Emory Dean's Distinguished Faculty Lecture Award
This is the highest faculty honor in the Emory School of Medicine and is accorded to the faculty member who has made outstanding contributions and whose career represents the highest professional standards.

Excluded by Requester PhD
Researcher
Yerkes National Primate Research Center, Emory University, Atlanta, GA
Emory University
Elected a member of the Dystonia Medical Research Foundation Advisory Board
The Dystonia Medical Research Foundation works to advance research for more treatments and ultimately a cure, to promote awareness and education, and to support the needs and well being of affected individuals and families.

Excluded by Requester PhD
Researcher
Yerkes National Primate Research Center, Emory University, Atlanta, GA
Emory University
Received the MetLife Foundation/American Federation for Aging Research Award for Medical Research in Alzheimer's Disease
Excluded by Requester and his Germany-based colleague Excluded by Requester were recognized for pioneering a unifying principle for the onset and evolution of late-life brain disorders, such as Alzheimer's and Parkinson's diseases, based on similarities with rare, fatal disorders known as prion diseases.

INFRASTRUCTURE

Main Station 2014
Installation and repair of epoxy and MMA flooring throughout the facility: Neuroscience Building rooms Specific Animal Location Specific Animal Location RB building hallway and Specific Animal RB building cage wash area, IDB building rooms Specific Animal Location Small Primate Wing cage wash area, Eve Building cage wash area, RA building Specific Animal Location CID Building rooms Specific Animal Location D-Section Specific Animal Location

Carpet and VCT tile was installed in various areas throughout the facility.

Interior rooms and exterior buildings throughout the facility were painted.

Electrical upgrades and additions occurred throughout the facility. Light fixtures in several animal housing

facilities were replaced with more efficient, water proof fixtures.

A chemical fume hood and exhaust duct were installed in lab 1122.

Four replacement actuators were installed on the cooling tower serving the Vaccine Research Addition.

Air Handler #2 serving the Main Building was replaced. Digital controls were upgraded as part of the replacement project.

Retaining walls constructed of railroad ties were replaced with 6"x6"x8' pressure treated timbers.

A new Ford E350, 15-passenger shuttle bus was purchased.

Room 1109 Main Building was renovated. Renovation converted one large office into two private offices.

Field Station 2014

Installation and repair of epoxy and MMA flooring throughout the facility: Specific Animal Location Specific Animal Location

Interior rooms, compound walls and exterior of buildings throughout the facility were painted.

Electrical upgrades and additions occurred throughout the facility. Light fixtures in several animal housing facilities were replaced with more efficient, water proof fixtures.

Landscaping of grounds.

The perimeter fence was replaced with a high security, anti-climb and anti-dig fence. The new fence covers Facility Security

The roof of G-2 Test facility was replaced.

Specific Animal compound was modified to enhance drainage and prevent standing water. Modifications included grading and installation of perforated drainpipe.

New indoor caging was added at the Specific Animal Location to house up to 100 primates. The project included heating and ventilation equipment, an emergency generator, environmental monitoring system and a sewage lift station

PROGRESS IN CORE SERVICE UNITS

Division of Animal Resources

The Division of Animal Resources consists of the units of Veterinary Medicine, Animal Care: Main Station, Animal Care: Field Station, Colony Management, Behavioral Management, Research Services, Environmental Health and Safety, and Animal Records. Through these units, the Division is responsible for the husbandry, clinical care, research support, behavioral management, animal record maintenance, and experimental interventions for the diverse nonhuman primate (NHP) population and two Rodent Research Facilities at the YNPRC. Division activities are at the Main Station, which is located on the Emory University campus, and at the Field Station, which is located 30 miles northeast of the Main Station. The Center primate breeding colonies are maintained at the Field Station, including specific pathogen free (SPF) research and production colonies. Oversight is also provided for the NHP research colonies, the Comparative AIDS Core, and the

chimpanzee colony.

Division faculty participate in teaching a number of nonhuman primate, laboratory animal medicine, and behavioral management courses at Emory University, and provide mentorship to graduate and technical students enrolled in various programs. Faculty members actively contribute to the Center's experimental and clinical research activities both in supportive and lead roles.

There is a strong emphasis on training, both on-the-job and more formal training, including veterinary residency (detailed below), internship and externship training programs and formal continuing education classes for veterinary technicians in conjunction with Division of Animal Resources at Emory University. AALAS certification classes, primate behavior classes, and continuing education classes are offered at both the Main Station and the Field Station, as are management training courses for personnel in all units. These outlets, plus various staff meetings and training sessions, contribute to better communication and improve safety and animal care procedures within the Division.

The Division of Animal Resources has a position for an animal training coordinator. This individual developed a new centralized training program focused on animal related procedures that is provided for all new staff working with animals. This training captures both investigative staff as well as animal resource staff to ensure uniform distribution of essential information. The training coordinator also oversees specific training sessions on both rodent and NHP topics.

Yerkes Animal Resources hosts a monthly Comparative Medicine Seminar series in collaboration with the School of Medicine's Division of Animal Resources (DAR). The seminar series is devoted to discussion of topics pertinent to laboratory animal medicine and is attended by representatives from other institutions such as the CDC, VA Hospital, UGA, Zoo Atlanta, and other local universities. Continuing education credit is given for this series.
The Division, along with DAR, administers the Emory University Laboratory Animal Medicine Residency Program for veterinarians. This two-year ACLAM accredited program provides training for graduate veterinarians in laboratory animal medicine with the option of a third year dedicated to specialized primate training. Two residents are recruited each year; spending one year in the Division of Animal Resources at the School of Medicine and one or two years at Yerkes. The residents participate in formal coursework, a research project, clinical medicine, colony management, IACUC activities, surgery, imaging, behavioral management, facility management and pathology rotations. Yerkes has been a recipient of NIH support (R-25 together with an administrative supplement, concluded in 2012) to support a total of four residents to participate in an extended three-year residency focusing on primate health, care, and management. Since the expiration of that grant support, Yerkes continues to support a third year fellowship for one resident (of the two per year) who is specifically interested in primate studies.

The Yerkes NPRC is fully accredited by AAALAC, with the most recent site visit having been in February 2014, and letter of accreditation received in July 2014.

- Veterinary Medicine
  The Veterinary Medicine Unit provides clinical veterinary support for nonhuman primates and rodents housed at the Yerkes Center 24 hours per day 7 days per week. The clinical faculty is called upon to provide a wide range of clinical expertise to cover the diverse needs of the research and breeding colonies. In addition, the veterinary faculty provides research support to selected protocols by providing training as well as information to investigators about medical, surgical, and diagnostic procedures used in the research environment. Research support also consists of protocol review and consultation, sample collection, and maintenance of research and clinical data. Six of the twelve Yerkes veterinarians are Emory IACUC members (full or alternate) and participate in various IACUC and Emory committees. Two of the veterinarians devote 50-60% of their time to research in imaging and neurobiology and development. The Unit of Veterinary Medicine also supports surgical services, providing for and developing sophisticated surgical procedures used in clinical and research settings. Veterinarians are responsible for all nonhuman primate postoperative care. Particular emphasis has

been on the veterinary support for the transplant and continuously growing infectious disease research programs. The radiology section provides plain and contrast radiographic studies along with ultrasound and echocardiography as necessary for many research and clinical applications. Digital radiology is in place at both the Main Station and the Field Station. Anesthetic support is provided for multiple imaging studies using CT, MRI, and PET techniques. In collaboration with investigators, the Yerkes veterinarians provide information and expertise for development of new animal models as well as the refinement of existing models.
The preventive medicine program is administered through the Veterinary Unit, which includes the quarantine program for newly acquired animals and routine surveys of all NHPs. Routine surveys for the chimpanzee colony include tuberculin testing, physical examinations and vaccine administration. Additionally, blood is collected for serum chemistries, hematology, and for hepatitis serology. Routine surveys for other NHP species also include physical examinations, tuberculin testing and anthelmentic administration as well as the collection of blood specimens to characterize the colony in tissue typing and paternity. The sentinel and quarantine programs in the rodent research facilities are likewise overseen by Veterinary Medicine, and include full necropsy and histopathology evaluation, as well as parasitology testing and blood collections for serology every four months.

- Colony Management – Field Station

The mission of the Colony Management Unit, based at the Yerkes Field Station, is to oversee the nonhuman primate colonies in order to meet the Yerkes Center management, production and scientific needs. These responsibilities include the implementation of a colony management plan that matches resources with projected colony and research needs, ongoing genetic characterization/pedigree analysis, development and implementation of breeding plans, acquisition and disposition of animals and animal housing allocation. The Colony Management unit is charged with working closely with the Veterinary Unit, Animal Care, Research Services and the investigators to provide defined experimental animals and biological samples.

The Colony Management unit participates in annual health surveys and quarantine procedures, reporting and tracking births, animal accessibility training, sample collection for genetic testing, viral screening and for research protocols, contraception and immunization administration, tattooing and microchip insertion and the development of housing allocation plans to meet breeding and research needs. The group oversees the Specific Pathogen Free (SPF) rhesus breeding program. Colony management personnel are responsible for observation and charting of the complex social dynamics that exist within each social group, through opportunistic and formal observations of behavioral interactions within the social setting and recording and plotting these data to obtain hierarchical order. This information is essential to help maintain social group stability, the formation of new groups and the introduction of animals, including breeding age males

The Colony Management Unit has completed the transitioning of the rhesus breeding colonies at the FS to full SPF status, with all breeding compounds being composed of SPF rhesus (except one compound dedicated to the SIV negative sooty mangabey colony). A total of 149 SPF rhesus macaques have been acquired from New England Primate Research Center. These animals were acquired for immediate research assignments or to develop a new breeding colony at Yerkes.

Paternity analysis has been performed for the rhesus and sooty mangabey populations, which in turn has allowed for the creation of multigenerational pedigrees for each population. In the rhesus population, expressed allele haplotyping in currently underway for all subjects in the colony in collaboration with Excluded by Requester at the Wisconsin NPRC. In addition a SNP based assay to determine ancestry has been performed to determine if breeding animals are in fact Indian origin rhesus macaques. Our analysis identified a small number of subjects that were estimated to be between 15% and 25% Chinese hybrids. These subjects and their offspring have subsequently been removed from the breeding population. Finally, microsatellite based haplotype analysis of the MHC region has been completed within the sooty mangabey colony. Together these data help investigators better understand how variants influence transplantation success, vaccine development, and disease

progression.

In 2014, Colony Management added two key personnel: Colony Director and Breeding Colony Coordinator [redacted] Ph.D. is responsible for developing a resource based research program utilizing the data collected in the Colony Management Unit. [redacted] MA facilitates identification of suitable candidates for animal research assignments and provides support to the colony management department at Yerkes.

- Primate Care and Housing – Main Station

The Animal Care Unit at the Yerkes Main Station provides for the routine daily husbandry for research and colony animals located on the Emory Campus. The census of nonhuman primates maintained at the Main Station is approximately 1100, representing 6 different species including chimpanzees. Currently, the YNPRC has 102 animal holding rooms in 14 buildings. Each room has a holding capacity of 4-6 animal racks of four cages apiece. All of these buildings have the capability for social housing, depending on study assignment and clinical status of the animal. Space for a NHP nursery is available as needed. A new animal facility (DFF) completed construction in 2013 that contains both a BSL 3 animal facility and designated animal housing and support for transplant medicine research. The transplant portion of the building is currently operational, while the BSL3 is not yet occupied. Chimpanzees are housed in the [redacted] comprised of indoor/outdoor enclosures and one play area. The center has been reorganizing social groups of chimpanzees in order to relocate animals, create larger social groups and increase the number of chimpanzees living in compounds at the Field Station. The Main Station has two Vivaria, details of which are provided in the Rodent Care and Housing section of this report.

The Animal Care staff work closely with both the Veterinary and Behavior Management units. General husbandry procedures include routine observations and the reporting of any abnormal clinical signs or activity of the animals to the appropriate veterinary medical staff and to a supervisor. A standard workday consists of first verifying the health and well-being of all animals; ensuring that they have water and a cleaned environment prior to feeding. Enrichment takes place in the afternoon, and Animal Care technicians also have the responsibility of cleaning and re-stocking enrichment devices, as well as checking watering devices and a second feeding. Water is available to all animals ad libitum unless restricted water intake is required for health or research reasons. All of this takes place according to approved SOPs.

Oversight and support of animals housed at the Main Station is provided by the Animal Care Unit 24/7, and night staff are on site during the off hours to monitor the animals and administer any medications.

On-going training is a critical function of the Animal Care Unit. Technicians are offered classes to assist them in preparing to take certification tests offered by the American Association for Laboratory Animal Science (AALAS). To facilitate this process, technicians are divided into groups led by a certified technologist. Currently, one employee is certified at the CMAR level, 6 have attained LATG, 6 are certified LAT, and 6 certified at the ALAT level. Rotating members of the Animal Care staff are sponsored to attend regional and national AALAS conferences and upon their return make presentations to their colleagues on the knowledge gained during the meetings. AALAS certification is required for senior level positions and personnel attaining levels of AALAS certification are rewarded with salary increases.

As part of continuing education, Animal Care personnel meet bimonthly to review Standard Operating Procedures and other topics relevant to work. Research Scientists periodically give presentations on their work to Animal Care technicians to provide a better understanding of the research supported by daily husbandry and care activities. Animal care personnel participate in a behavioral management training program which focuses on identification of species typical as well as abnormal behavior of the primates housed at the center. This fosters positive interaction between Animal Care, Veterinary Medicine, and Research staff.

- Primate Care and Housing—Field Station

The Yerkes Field Station is located 30 miles northeast of Emory University and the Yerkes Main Center. It is situated on approximately Specific Animal in Gwinnett County. The Center completed installation of a new perimeter security fence in December of 2014. Facility Security

Facility Security

and support. The remainder has been left intact and undisturbed to provide a natural barrier between the facility and the surrounding community. The Field Station operations complement the Main Center by providing facilities for nonhuman primate breeding as well as unique opportunities for research activities. A number of programs, including genetic analysis and bio-behavioral research activities, take place at the Field Station.

The Animal Care administrative resources are designed and implemented in a similar manner to the Animal Care unit at the Main Center. There is considerable interaction on most levels between the two sites, with direct communication between the Assistant Director of Animal Resources at the Field Station and the Associate Director of Animal Resources.

The Animal Care Unit of the Field Station provides the around the clock daily husbandry and care for research and breeding colony animals housed at the facility. Census totals at the Field Station average 1800 animals and include rhesus macaques, sooty mangabeys, and chimpanzees. The major responsibilities of the Animal Care staff are to provide the daily feeding, cleaning, enrichment, care and observation of all animals, as well as to ensure the safety and appropriateness of the animal environment. Other duties of the Animal Care staff include, but are not limited to, recognizing and reporting abnormal clinical signs or behavioral activity by the animals to the appropriate veterinary or colony management staff, providing support and assistance during routine diagnostic and therapeutic procedures, and assisting with the administration of medicines that are part of the preventive medicine program. Additionally, Animal Care Technicians are cross trained so that they may assist research staff and veterinary staff with animal accessing and handling or to assist the colony management staff with issues pertaining to animal management. Animal Care Technician training includes an in-house behavioral management certification component in addition to continued and ongoing training and review of policies and procedures. Animal Care Technician IV's provide care after hours, including administering treatment and performing animal observations and facility security rounds. The Animal Care Operations Manager lives on site and is available to assist with after hour emergencies.

All four Managers and Supervisors have attained some level of AALAS technician certification. Additionally, one manager holds CMAR certification. Nine eligible animal care technicians are certified at the ALAT and LAT levels and four technicians at the LATg level. Several Colony Management and Veterinary Technicians are also certified at different levels.

A six person Facilities staff assists with maintaining the animal housing facilities and compounds as well as maintaining the facility physical plant. Both Animal Care staff and the Facilities staff work together, along with Veterinary and Behavioral Management staff, to provide safe enrichment structures and to monitor the safety of the animal areas and the security of the facility.

- Rodent Care and Housing - Main Station

The two Rodent Research Facilities are at approximately 80% occupancy. One facility is mainly used for animals involved in neuroscience research protocols, and the other to support investigators and research personnel involved in infectious diseases studies. The two facilities are staffed by a supervisor, a part time Assistant Operations Manager, seven full time Animal Care Technicians, and three part time Veterinary Technicians. A total of 24,335 mice, 1,484 rats and 3,116 voles were housed in the 2014 reporting period (10/1/2013 – 9/30/2014). The average daily census has continued to increase approximately 13% from the previous reporting period at 10,305, which includes rats, mice,

meadow and prairie voles.

There are in-house breeding colonies of two species of voles as well as transgenic voles that are not commercially available. The voles are used extensively for research in behavioral neurosciences. Some of these animals are housed in ABSL-2 containment and are assigned to studies associated with Adenovirus-Associated Vector (AAV) and Lentiviral Vector. Rats and mice are also used in studies with AAV and Lentiviral Vector and housed in ABSL-2. Mice experimentally infected with different agents such as Gammaherpesvirus, Influenza, Acinetobacter Baumannii, Francisella novicida and Salmonella typhimurium are also housed in ABSL-2.

A fully operational Animal ABSL-3 suite is located in one of the Rodent Research Facilities. Lymphocytic Choriomeningitis Virus, West Nile Virus, Vaccinia and Mycobacterium tuberculosis are some of the infectious agents used in the ABSL-3 suite.

A complete quarantine program is in place to accommodate investigators who require mice from non-approved vendors. In 2014 approximately 5 shipments of mice were processed through quarantine. The health status of some shipping institutions did not allow us to accept the mice in our facility. We used an outside company to quarantine some strains or perform rederivation. We also facilitated research collaboration with other institutions and transferred several shipments of mice and voles at the request of Yerkes' investigators. Housing and extensive support for different breeding colonies of more than 90 transgenic and knockout strains are provided for several investigators.

All rodents in the facilities are housed in micro-isolators. The micro- isolators are ventilated except in the biohazard/quarantine areas. All cages are opened only under biological safety hoods or changing stations. A comprehensive health monitoring program is in place. The testing of sentinels is performed either in-house or through outside laboratories.

Training of the Animal Care personnel is as described above under the "Primate Care and Housing" for the Main Center. One animal care technician and one veterinary technician working in the rodent research facilities are certified at the LATg level. Three other technicians have either ALAT or LAT level of certification.

- Behavioral Management

The behavioral management/enrichment program at the Yerkes Center aims to promote and maintain primate wellbeing through collaboration among the Behavioral Management, Veterinary Medicine, Animal Care, and Research Units. The behavioral management program includes daily implementation of the program, the conduct of scientific investigation to advance knowledge in this field, and regulatory aspects of primate welfare.

Elements of the program include social contact, animal training and other positive interactions with humans, feeding enrichment, structural enrichment, manipulable objects (durable and destructible), devices permitting foraging/grooming/ problem-solving, and sensory enrichment such as music and videotape viewing. Several enrichment techniques are used concurrently for each primate and they are scaled to the species, age class, and individual needs of animals, as well any requirements of research projects. The program is dynamic, permitting modification of techniques in accordance with in-house assessments and findings from the scientific literature. New items are added to the program through an approval system. Behavioral assessments are conducted by Behavioral Management staff to identify normal and abnormal behavior patterns. Animal care personnel receive training on normal and abnormal behavior, and on behavioral management. Animals exhibiting psychological distress are treated through an amplification of enrichment, training, adjustment of social dynamics, and/or pharmacological means under veterinary guidance. We have a positive reinforcement animal training program with specified goals of facilitating animal care, research and veterinary procedures. Daily enrichment and training are implemented by Animal Care and Behavioral Management personnel. Behavioral research on a variety of topics has been conducted, presented, and published. This

research contributes to the development of a firm scientific foundation to underlie improvements in the behavioral management/enrichment of nonhuman primates. Recent research topics include comparing socialization strategies for rhesus monkeys, determining the effects of different types of housing on mangabey behavior, evaluating factors that influence the expression of abnormal behavior, and examining the long-term influence of infant attachment style on chimpanzee behavior and health.

The regulatory responsibilities of the behavioral management unit involve working through the Emory University IACUC and addressing issues related to USDA oversight and the AAALAC accreditation process. A formal review of enrichment, social housing and animal training issues for each Emory/Yerkes research protocol using primates is performed by Behavioral Management staff as a part of the IACUC review process. Scientific justifications are evaluated for any requested restrictions on social housing or enrichment, animal training techniques are evaluated for appropriateness, and the use of subjects requiring special attention (e.g., infants) as defined by the USDA is scrutinized. This process permits tailoring enrichment implementation to specific research projects.

- Animal Records

The Yerkes animal records system transitioned in September 2013 to a new Animal Research Management System (ARMS) developed on Oracle 11g with Business Objects reporting service. This new system was developed in collaboration with the Washington National Primate Research Center (WaNPRC). All NHP records are maintained by the Animal Records Office. Computerized records were initiated in 1990, and animal record data prior to that time is primarily paper. The minimum data recorded for each animal includes species, sex, date of birth, and location, and annual survey data including body weight, tuberculin test results, immunizations, and project assignment. Clinical and laboratory data that may be generated are also included. With respect to IACUC protocols, computer based records are maintained on the specific IACUC assignment of the animal, the number of animals approved by the study, and number of animals that have been assigned to or used in the study. Information for the rodents is maintained through the Granite system from Topaz Technology with the Emory School of Medicine Department of Animal Resources. The Animal Records group is working closely with Topaz and Emory School of Medicine's DAR to implement an upgraded version of Topaz/Granite and obtain access to additional reporting features.

The Animal Records Unit is responsible for updating the ARMS data and ensuring that the Principal Investigators' accounts are charged the appropriate per diem and animal use fee rates on a monthly basis. Animal Records personnel also consult with grants management personnel to make sure that accounts are legitimate and that the funding for each study is used appropriately as stipulated in the project guidelines.

Animal Records has also worked with IT, RAAC, Colony Management and Vet Medicine in development of a new RAAC program that contains information uploaded from ARMS about the animal colony in conjunction with applications for animals assignments.

The Animal Records Supervisor continues to coordinate regularly with the Information Technology Department, Associate Director of Animal Resources and Administration to continue the adaptation of ARMS to meet Yerkes needs. Modifications and supplements to the ARMS system are ongoing in collaboration with WaNPRC.

- Research Services

The Research Services unit is responsible for carrying out a wide range of animal related administrative and technical research support activities for a large number of internal and external investigators and Animal Resources faculty.

Administrative support includes providing consultation to internal and external investigators during the

project development stage and after IACUC approval. Support is given to help with finalizing sample collection protocols, tracking blood volumes and developing budgets for grant submissions. Research Services personnel also assist collaborating investigators in the development of and adherence to IACUC protocols, including new applications, renewals, and modifications.

Research Services provides direct technical research support for both onsite and offsite investigators undertaking experimental studies. Experimental scheduling with investigators and laboratory staff, as well as other support teams, is arranged by Research Services. Research Services personnel are responsible for animal experimental interventions including collecting biological samples, administering infectious agents, experimental and clinical treatments, immunization and vaccinations, and assisting with minor surgeries and CSF collections. They also perform other necessary animal work; for example, animal observations, training animals for procedures and developing improved techniques to enhance efficiency.

Research Services is also responsible for the recording and entering of animal access records into the ARMS. These data includes animals' weights, TB test results, and clinical observations at time of access in addition to any experimental interventions.

Finally, Research Services provides support to the Division of Pathology tissue distribution program through the collection of biological samples from colony animals to help meet approved specimen requests from internal and external investigators.

- Environmental Health and Safety Office

The Yerkes Environmental Health and Safety Office is responsible for the overall management of the Environmental Health and Safety Program; Occupational Health Program; Orientation and Training Program; ABSL-3/BSL-3 Program; and Compliance and Quality Assurance Programs at Yerkes. The Yerkes Environmental Health and Safety Officer (YEHSO) has a dual reporting structure, reporting to the Associate Director for Animal Resources as well as to the Executive Director, EHSO, Emory University, as an Assistant Director. The YEHSO represents the EHSO on the Institutional Animal Care and Use Committee (IACUC). The YEHSO reviews IACUC protocols to address any occupational health and safety concerns. The YEHSO is also a voting member of the Emory University Institutional Biosafety and Research Health and Safety Committees.

The Emory EHSO is responsible for conducting a broad-based program for implementing mandated Federal and State laws, regulations, and guidelines, as promulgated by the Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), and the Georgia Department of Natural Resources (GADNR). The Emory EHSO provides oversight and guidelines for activities involving infectious agents, recombinant DNA, radioactive isotopes, hazardous chemicals, asbestos, lead and other occupational hazards.

The Occupational Health Program covers all employees, students, volunteers, and adjunct or visiting faculty working at Yerkes. The initial health assessment includes: 1) tuberculin test, T-spot or surveillance; 2) a baseline blood sample of all individuals working with animals or in a laboratory (serum is collected and stored in the serum bank); and 3) a health assessment determined by information collected in the employee access memo. The health assessment, which includes a physical examination, medical history and an evaluation of immunizations, is administered by Emory University's Employee Health Services. An Employee Health provider is on-site at the Main Station most Fridays to conduct new employee and annual health assessments, update immunizations, and provide respirator medical clearance. A physical agility assessment is required for Animal Care Technicians working with nonhuman primates. In 2014, 197 individuals were processed through the Center's Occupational Health Program and 98 employees received medical clearance to wear a respirator.

Annual health assessments are provided for employees who work in level 3 containment and those who wear a respirator. Allergies and health status are assessed in conjunction with the TB surveillance

at least annually for all employees.

A database is maintained to track TB testing and serum bank specimens. Individuals are notified via e-mail when their TB test/Surveillance or blood collection is due. In 2014, a total of 756 TB tests and 25 T-spots were completed and follow-up was provided when needed. This office works closely with Emory University's Employee Health Services and the local health department to report, and refer for follow-up treatment and care, any individual with a TB test that is read as positive. Also in 2014, 188 serum bank specimens were drawn and stored in the Center's serum bank.

The YEHSO has worked with Employee Health Services and other key individuals to provide employees immediate access to their health records through the PeopleSoft system.

In 2014, the Administrative Manager for the Yerkes Environmental Health and Safety office attended a 9 month Manager Development Program and completed a capstone project. The project resulted in the development and implementation of a program to have occupational health records scanned onto a secured server for records retention.

The Training and Compliance Coordinator completed graduate school in 2014 and received a Master's in Public Health. A capstone project on the development, implementation, and quality control for use of alkaline hydrolysis tissue digestion for pathological waste at Yerkes was completed as a requirement for the MPH. A poster was created from the project and presented at AALAS 65th National Meeting.

- Orientation and Training

The Yerkes Orientation and Training Program provides approximately 35 safety-related training programs. Many of these programs are now available as on-line courses. During 2014, 636 individuals completed Lab Safety training and 575 attended B-virus training.

Yerkes Orientation is presented through a live presentation that provides general information concerning the Center; covering the illness and exposure protocol and addressing safe work practices. Altogether, 224 individuals completed Yerkes Orientation in 2014, including orientation for 16 outside contractors.

During Yerkes Orientation, each person receives a packet of material related to the work they will be doing while at the Center. Individuals working with animals or animal specimens receive a copy of the "Laboratory Animal Zoonoses" packet. All new personnel receive the "Injury/Exposure Protocol" which details steps that should be taken in case of an injury or exposure while working at either the Main Station or the Field Station. New personnel are also asked to complete on-line modules via Blackboard (Emory's on-line classroom) or the Emory Learning Management System (ELMS). These modules are assigned in accordance to a person's job functions. Each person completes the Yerkes Orientation module, which covers the Standard Operating Procedures that apply to everyone working at the Center. Additional modules may include: Lab Safety Training; Biosafety Training; Bloodborne Pathogens Training; Personal Protective Equipment Training; Working in the Vivarium; ABSL-3 Laboratory Training; Cagewasher Safety Training; Radiation Safety Training; Animal Chemical Safety Training, MRI Safety Training, Respiratory Protection Training, and Vivarium ABSL-3 Training.

In addition, all personnel who will have research-related contact with animals are required to complete additional training related to the care and use of research animals. New research personnel attend a species specific didactic orientation with the Yerkes Division of Animal Resources Training Coordinator and complete AALAS (American Association for Laboratory Animal Science) modules on-line following the live orientation sessions. Successful completion of AALAS training is a requirement for IACUC protocol approval. A hands-on instructional tour of the nonhuman primate and/or rodent research facility is required for research personnel to gain access to these areas.

Individuals working with animals or in a laboratory also receive a form entitled "Understanding of

Laboratory Risks". It is a requirement that this form be signed by the supervisor and the new employee and returned to the office of the Occupational Health Program Coordinator before receiving an ID/access card to the Yerkes Center.

In accordance with the University's IACUC policy, all individuals working under an IACUC protocol must be added to that protocol before they can be granted access to the Center. All ID/access cards are held until verification is received that the protocol has been modified.

Individual access to ABSL-3/BSL-3 facilities is granted following completion of required training and mentoring, as well as any occupational health requirements. Personnel working in level 3 containment facilities are required to attend a live training session and update occupational health requirements annually in order to maintain access to the facility. In 2014, 52 individuals attended BSL-3 laboratory training and 49 individuals attended ABSL-3 facility training. Additional ABSL-3 Training programs are being developed to prepare for the new NHP BSL3 facility which completed construction in 2014.

In 2014, a new position was created for a Containment Manager who will have responsibility for the ABSL-3/BSL-3 facilities. There are (4) BSL-3 laboratory suites, (1) ABSL-3 rodent facility, and (1) NHP BSL-3 facility.

The Yerkes EHSO also worked with the Emory Fire Safety Department to conduct fire drills and provide hands-on training for the use of fire extinguishers. This training was offered at the Main Station and at the Field Station. In 2014, 105 individuals attended Fire Extinguisher training.

- Safety Program

  The Yerkes Environmental Health and Safety Officer (YEHSO) is responsible for implementation and monitoring of the Environmental Health and Safety Program at the Center. The Yerkes Environmental Health and Safety Officer provides guidance and oversight for regulatory compliance, environmental health and safety training, safety inspections, hazard identification, risk assessments, investigations related to employee injuries and exposures, and workers compensation program. This individual also develops and implements policies and procedures to support a safe and healthy work place. The YEHSO reviewed and followed up on 175 incident reports in the last year.

  The Yerkes Environmental Health and Safety Committee is made up of 19 representatives from various departments within the Center. The committee reviews injury and illness trends, Standard Operating Procedures related to safety, and compliance reports. The committee met four times in 2014.

- Compliance Program

  The Yerkes Training and Compliance Coordinator (TCC) is responsible for monitoring and maintaining employee compliance with required training programs.

  Yerkes' Quality Assurance (QA) Program conducted on-going QA monitoring events including weekly inspection of the Vivarium ABSL-3 facility, monitoring, trending and reporting animals outside of primary containment, and assessment of training compliance.

  The TCC has also collaborated with members of the Emory Environmental Health and Safety Office to streamline training modules and share training information. As the EHSO continues to work towards an online training system, the TCC will continue to liaise with EHSO to ensure that training guidelines and documentation are equivalent and accessible to employees, students and visitors. The TCC has also begun the process to transition on-line training from Blackboard to the Emory Learning and Management System (ELMS) by meeting with EHSO, ELMS administrators, and Yerkes IT.

Division of Pathology

The Division of Pathology, with oversight and management from the Yerkes Associate Director for Pathology,

provides diagnostic support to investigators from the Yerkes and Emory research communities as well as external investigators from academic institutions and the private sector working with laboratory animals in multiple and diverse research studies.

- Service Pathology
  The Service Pathology section contributes to colony surveillance, provides diagnostic support to the Yerkes Division of Animal Resources, and provides tissues and diagnostic services for scientific investigators (i.e., postmortem examinations, histopathology services, clinical pathology testing, etc.). It encompasses all aspects of diagnostic pathology, and includes the necropsy laboratory, histology and electron microscopy laboratory, molecular pathology and clinical pathology laboratory. Each unit is staffed by well-trained technical personnel under the direction of a veterinary pathologist. The necropsy laboratory consists of a senior lead research specialist, a lead research specialist and one research specialist. The clinical pathology unit is staffed by a supervisor, four medical technologists, two research specialists, and one medical technician. The histology and electron microscopy laboratory is operated by a supervisor and a histology/electron microscopy technologist. The molecular pathology laboratory is staffed by two immunohistochemistry technicians.

- Gross Postmortem Examinations
  The number of nonhuman primate necropsies performed in 2014 totaled 524 of which 380 were in support of experimental research protocols and 144 were clinical necropsies in support of the health and maintenance of the Yerkes colony. In addition, 254 necropsies were completed on other laboratory species (predominantly mice and rats) at the Center. Center pathologists performed postmortem examinations on all nonhuman primates that died or were euthanized, as well as rodent species submitted for clinical reasons, colony management or experimental purposes. In addition, the pathologists collaborated with internal and external investigators in their experimental studies and participated in symposia at the national and international levels presenting their research work, clinical and experimental information. Furthermore, the staff is actively involved in the procurement of nonhuman primate specimens for a large group of investigators from Yerkes and other research institutions.

  The Yerkes Division of Pathology plays a significant role in providing diagnostic and research support to the Emory School of Medicine's Division of Animal Resources (DAR), and the entire Emory laboratory-animal program. During 2014 55 cases were processed, analyzed and finalized for Emory School of Medicine's Division of Animal Resources.

  The veterinary pathologists participated in the training of the laboratory animal medicine residents enrolled in the Laboratory Animal Medicine Postgraduate Program at the School of Medicine at Emory as well as the veterinary medicine students that were selected to participate in the McClure Comparative Pathology Externship at the Center. They provided formal laboratory animal pathology instruction through several formal courses, and through direct training and supervision of veterinary students and residents emphasizing gross pathology and histopathological findings relevant to accurately diagnosing clinical and experimental cases.

  During 2014, the Histology and Electron Microscopy Laboratory processed 1,164 cases including nonhuman primate and rodent necropsies, biopsies, and various cases from investigators at Emory and outside the University. The number of paraffin blocks processed was 9,300 and 4,391 microscopic slides. There were 773 special stains prepared as well as 3,573 slides sectioned for other procedures. There were also 56 cases examined by electron microscopy.

  In the same period, the Molecular Pathology Core (MPC) Laboratory processed samples from nonhuman primates and rodents submitted by both Yerkes, Emory and external investigators. The lab processed 3028 unstained sections of which 966 slides were for Yerkes, 2002 for Emory and 60 for external investigators. Total of 576 slides were processed for immunohistochemistry of which 321 were for Yerkes, 104 for Emory and 151 for External requestors. *In situ* hybridization was performed on total

of 54 slides of which 27 were for Yerkes,18 for Emory and 9 for external investigators. The MPC also trained 11 researchers on the fluorescent microscope.

- Clinical Pathology

The Clinical Pathology Laboratory received 29,624 specimens in 2014. There were also 15,430 hematology examinations. These included CBCs, reticulocytes, differentials and white blood cells and platelet counts as well as coagulation tests and malaria examinations. There were 4,712 microbiology tests done. These included both clinical and experimental cultures, necropsy, nugent score, and sterility specimens.

There were 39 immunology flow cytometry determinations done using a variety of panels designed to accommodate individual researchers and research programs. A total of 4,448 chemistry panels were done, these included I-stat panels as well as comprehensive chemistry profiles (super chemistries) which were completed in house. Parasitology testing included 2,713 fecal examinations and impression smears. The clinical pathology laboratory also did 437 urine analyses, 133 bone marrow, 4 pregnancy tests and 2 spinal fluid exams as well as processing of 22 samples for virology cultures and the preparation of 1,684 samples sent out for serology testing.

Medical Technologists from the Clinical Pathology Laboratory are also in charge of phlebotomy for the Employee Health Program and for the procurement of volunteer blood samples for research. Technologists drew blood from 229 employees for post-exposure testing as well as 258 employees for biennial serum bank requirements. The Center's serum bank inventory is maintained by Yerkes' Clinical Pathology Laboratory staff. In addition, a total of 414 active human donors are registered to provide blood to 23 investigators as part of the Research Blood Donor Phlebotomy program. The total amounts drawn in 2014 were 2697 tubes and 23146 milliliters of blood.

Clinical Pathology technologists also aid in employee health infection control. Six Pathology employees are certified to administer and read TB tests.

- Tissue Archive and Biological Material Procurement Services

The Center's pathology archives include a collection of microslides and paraffin blocks of nonhuman primates necropsied since July 1966. Formalin fixed tissues from nonhuman primates are maintained for approximately 10 years prior to disposal. Formalin fixed great ape tissues have been retained since 1966. Tissues are collected from all major organ systems during necropsy examination for formalin fixation for subsequent use in the preparation of microslides for histological examination. Following examination, all microslides are filed by year and case number at the Center. In addition, formalin-fixed tissues and paraffin blocks have been maintained on file for each necropsy and biopsy case. Tissues are not routinely collected at necropsy from clinically normal animals that are euthanized for experimental reasons. The conversion of the Center's pathology archive to an electronic database continues and will be expanded in the coming years to facilitate not only rapid identification and location of samples but also to provide the capacity for data mining and better utilization of this resource in the future. We continue to expand this inventory to years preceding 1988 when the first electronic records were established at Yerkes working from hard copy reports that are also preserved by scanning onto electronic media.

An important contribution to biomedical research is the provision of biological specimens to investigators at Yerkes and other regional, national and international institutions. The Senior Program Coordinator within the Division of Pathology manages and provides oversight for biological specimen requests from internal and external investigators through the Yerkes Biological Materials Procurement Program. The collection and distribution of these specimens makes it possible for scientists to take full advantage of the materials available and allows non-Yerkes investigators to work with cells and tissues to which they would otherwise not have access. Yerkes serves as a national and international resource for biomedical investigators throughout the U.S. and other countries. In 2014, the Yerkes Center

processed 104 specimen requests that resulted in the collection and provision of 1,513 samples. These samples were provided to 59 investigators of which 29 were located at Yerkes and Emory and 30 investigators at institutions within the U.S. During this time period, 26 articles were published in peer-reviewed journals and 14 are currently in press, all resulting from the receipt of specimens from the Yerkes Center. Following is a breakdown of specimens provided:
Organs (Part & Whole): 381
Tissue: 1,122
Whole (carcass, head, arm, leg, eye, bones): 10

- Research Program and Research Project Support

Division of Pathology faculty collaborated with internal and external investigators in development of new protocols. This includes assistance with scientific expertise, preparation of experimental protocols, budget development and preparation, and submission of IACUC and Environmental Health and Safety protocols. Working with Yerkes Division of Animal Resources, the Division of Pathology also provides laboratory and scientific support during the entire performance of an experimental protocol, analysis of data and publication of results.

Division of Pathology faculty members contribute to multiple research programs such as renal/bone marrow/pancreatic transplant, SIV/AIDS infection, TB infection, babesiosis, evaluation of dengue pathogenesis, the optimization of novel malaria models, listeriosis, and causes of diarrhea in infant macaques, the testing of experimental vaccine platforms for HIV, malaria and influenza, cancer and diabetes in aging monkeys, immune activation in transgenic monkeys and cardiovascular diseases.

The Division also provides shipping services for the Center and its investigators, including shipment of clinical samples and hazardous (infectious) samples by IATA-certified shipping/research technicians. In 2014, Yerkes' Shipping Unit packaged and shipped 350 packages of biological samples shipping to investigators and laboratories in the United States, France, and Germany.

Finally, this division shares with the Division of Animal Resources the responsibility for oversight, monitoring and preparation of permit applications and periodic reports to various regulatory agencies including Fish and Wildlife Service, Georgia DNR, Drug Enforcement Administration, Centers for Disease Control and Prevention, and United States Department of Agriculture.

As well as responsibility for the aforementioned permits and regulatory agency licenses and registrations, the Senior Program Coordinator within the Division of Pathology assists internal investigators with determination of the necessary permits and registrations to facilitate their research projects. This includes research of proper permit or registrations needed, assistance with preparation and submission of applications, tracking review progress and receipt and dissemination of permits and registrations to the requesting investigator.

TRAINING

Scientific

The Center is actively involved in training and continuing education activities. Students and Postdoctoral Fellows are an integral part of the scientific fabric of Yerkes and participate in all elements of the research mission. In the last year, 111 undergraduate and 75 graduate students received training and experience in Yerkes laboratories. During this same period, the Center employed 50 Postdoctoral Fellows. Yerkes currently is the focal point for a substantial portion of the Neuroscience Graduate Program at Emory. The Director of the NIH training grant that supports students in the Graduate Neuroscience Program and many members of the Neuroscience Program Executive committee, all reside at Yerkes. Additionally, almost 30% of graduate students in the Neuroscience and Immunology programs are carrying out their dissertation research in Yerkes laboratories, including several MD/PhD students. Essentially all of our Divisions have NRSA or NSF-supported students and we have worked with each Division in facilitating the process for trainees' applications to NIH/NSF or private foundations for financial support. We have two institutional training grants, developed and administered at Yerkes: the NIGMS Training in Systems and Integrative Biology-Neuroscience and the NIH BP/ENDURE training grant that supports under-represented minority undergraduate students in Neuroscience. The Yerkes Center is also the administrator of the NIH-funded UDALL Center of Excellence for Parkinson's disease at Emory University and the home for three of the core scientists participating in this Center. In addition to research activities, the Parkinson's Disease Center is very active in education and community outreach for trainees and the general public. It also provides pilot grants to young investigators interested in developing new areas of research for Parkinson's disease.

The Division of Animal Resources (DAR) at Yerkes and at Emory's School of Medicine (SOM) continue their joint effort in supporting the Emory Laboratory Animal Medicine Residency Training Program. Since 2009, one of Yerkes veterinary faculty members is the Training Program Assistant Director. In addition, Yerkes veterinarians have taken responsibility as course directors for classes within the Residency Training program. Yerkes also supports two residency positions per year. Our goal is to train and retain laboratory animal veterinarians who will grow with Yerkes, and help develop programs of research around their own specialties. All veterinary faculty continue to be actively involved in the Emory Laboratory Animal Medicine Program and remain closely partnered with the Division of Animal Resources at the School of Medicine. In 2007, an NCRR R25 training grant enabled Yerkes to include an additional third year of specialized NHP training for three residents (one each year – funding to support years two and three of the training). In 2009, an administrative supplement to the R25 provided support for a fourth resident to enter the program. The three-year YNPRC NHP Residency Program builds upon our successful Emory/YNPRC two-year program and provides extensive nonhuman primate clinical and resource management experience for the residents. We have successfully recruited four trainees, all of them having completed the program between June 2009, and June 2011. In addition, all have obtained their ACLAM Board Certification, the gold standard to measure success of a Laboratory Medicine Training program. One of those trainees is now a full time veterinarian at Yerkes. In light of the success of this specialized Training Program, YNPRC decided to continue to support a third year Fellowship in Nonhuman Primate Medicine and Management. We have already recruited four trainees for the Fellowship Program. The first one completed her training in June 2013 and obtained her ACLAM Board certification in July 2013. She is now a full time clinical veterinarian at Yerkes. The second trainee finished her fellowship training in July 2014 and will take her ACLAM Board exam in June 2015. The third fellow is expected to complete his training and sit for his Board exam in June 2015. The remaining fellows will start the program respectively in July 2015 and 2016.

YNPRC has continued to provide opportunities for veterinary internships and externships. These opportunities introduce veterinary students to the field of lab animal medicine and have sometimes led to students applying for lab animal residency positions as offered by the School of Medicine/YNPRC. Two of our current residents have been through our externship program. In 2014, eight externs and one intern came to Yerkes for a period of time which can vary between three to ten weeks. Students from veterinary technical schools also have participated in externships and have sometimes been motivated to apply for available technical positions at Yerkes where they could put to good use their newfound knowledge of nonhuman primates. We did hire one of the veterinary technician externs in 2014. The various students work closely with veterinary faculty,

residents and technicians to gain a working knowledge and appreciation of the specialty of nonhuman primate medicine.

The Yerkes Center is closely linked with several components of the Emory University Clinical Translational Science Award (CTSA); (here called the Atlanta Clinical and Translational Science Institute – ACTSI – which includes Morehouse School of Medicine and the Georgia Institute of Technology). The key functional areas of the ACTSI that the Yerkes Center is involved with include brain imaging and education.

Yerkes has collaborated with the Institute on Neuroscience (ION) at Georgia State University to continue to enable high school students and middle and high school teachers to participate in scientific research. Success with this program has led to a five-year NIH grant to continue the ION program.
In addition, the Center regularly hosts scientific seminars and sponsors frequent talks (Lunch and Learn, Frontiers in Neuroscience) by faculty for the staff to promote understanding of the scientific mission.

Employee Training

As noted in the Core Service Units section, prior to beginning employment, all personnel are given a packet that provides information on the Yerkes Center, general information on primate research, the nonhuman primate behavioral management program, laboratory animal zoonoses information, personnel policies, Center security information, standards and procedures for working safely at the Center, training information, and biosafety issues (e.g., B-virus information). Supervisors are responsible for training employees in procedures that specifically relate to their areas of responsibility. Individuals with practical experience are appointed to train new employees/students within their units. All new employees (investigators, animal care personnel, research technicians, etc.) and students/volunteers receive an approximately 1 hour orientation that includes a slideshow related to organization of the Yerkes Center, procedures for handling incidents and potential exposures, and general guidelines for working safely in laboratory and animal research settings. All new employees complete training on Emory's Blackboard site, including a "Yerkes Orientation" module in addition to other modules as are relevant to the employee's job responsibilities. All personnel who will have animal contact are required to complete Animal User Orientations that cover nonhuman primate and/or rodent biology, U.S. regulations and guidelines for laboratory animals, IACUC policies, identifying and reporting sick animals and reporting animal welfare concerns. Animal Research personnel are required to complete applicable AALAS Learning Library online training modules and be added to an existing IACUC protocol prior to working with animals. A hands-on instructional tour of the nonhuman primate and/or rodent research facility is required for research personnel to gain access to these areas. General information memoranda are circulated providing any new information or reminding personnel of existing standards when necessary.

Training classes are provided as part of Yerkes continuing education efforts. These classes are based on the American Association for Laboratory Animal Science certification program. Although all Animal Care Technicians are encouraged to work toward certification by AALAS, the AALAS certification examination is not mandatory. Regular staff meetings are conducted at which time there is generally a review of some aspects of husbandry and care that relate to certification. Manuals for the Assistant Laboratory Animal Technician, Laboratory Animal Technician and the Laboratory Animal Technologist are made available to Yerkes technicians without charge for use in the in-house training program or for self-study. Additionally, the Emory University IACUC Office subscribes to the AALAS Learning Library for online, individualized training. The Yerkes Center pays the fee for the certification examination at each level. A salary increase is provided to individuals who achieve certification. Thirty percent of the Main Station animal care unit and 40.4% of the Field Station animal care unit are AALAS certified at some level. Opportunities for additional training are also available when Animal Care Technicians attend National AALAS, SEAALAS and AALAS District IV meetings in 2015. Supervisors and Managers have been attending Webinars sponsored by NABR, OLAW, USDA and AAALAC. Additionally Continuing Education sessions are available for Veterinary Technicians through the Gwinnett Veterinary Medical Association monthly meetings as well as a series of lectures (scheduled 6-8 times a year) organized by the School of Medicine's DAR.

The Training Coordinator for the Yerkes Division of Animal Resources coordinates the training requirements for personnel who work with research animals. After completing the Animal User Orientations, trainings

offered to animal users at Yerkes include 1) aseptic surgery technique (mandatory for anyone conducting surgery); 2) rodent biomethodology including restraint, blood collection techniques and injection procedures; 3) humane rodent euthanasia methods; 4) weaning training (a review of the IACUC weaning policy for mice and rats; 5) restraint training (a 2-part series on preparing nonhuman primate for studies involving physical restraint, specifically chair restraint; 6) behavioral management of nonhuman primates; and 7) an annual facility refresher for all research staff working with animals. Instructional manuals for identifying sick rodents are developed and distributed to animal research and animal care personnel. The Training Coordinator is a member of the IACUC Subcommittee on Training and Continuing Education, which develops the policy on rate, frequency and types of training and continuing education requirements for animal users at Emory University and Yerkes.

In addition to the initial orientation which includes information on zoonoses (including B-Virus), biosafety, personal protective equipment, and Center policies on safety, the Yerkes Environmental Health and Safety Officer conducts and/or facilitates annual training programs for all personnel. These annual training programs include but are not limited to: (1) B-virus training for all staff who work with nonhuman primates or nonhuman primate blood or tissues; (2) annual updates on the use of personal protective equipment to include a review of current requirements, demonstration on how to use PPE, and information on the storage, limitations of and decontamination and disposal of PPE; (3) information on hazards communications and the chemical hygiene plan, including how to work with hazardous chemicals, how to respond to a spill, labeling and storage requirements, disposal procedures and Safety Data Sheets (SDS); (4) biosafety reviews which include a review of biosafety level 1-4, blood borne pathogens standards, biological safety cabinets, emergency procedures, disposal practices, and a review of zoonoses; (5) radiation safety which includes discussion of the characteristics of radiation, safe use and storage, disposal, and employee monitoring; (6) ergonomics training for employees in animal care, research, or any other position that involves strenuous or repetitive physical activity; and (7) fire safety training which includes fire prevention strategies, evacuation plans, emergency procedures, and training for the use of fire extinguishers; and (8) respirator program which includes annual fit testing, training, and medical surveillance.

C. OVERALL PRODUCTS

C.1 PUBLICATIONS

Are there publications or manuscripts accepted for publication in a journal or other publication (e.g., book, one-time publication, monograph) during the reporting period resulting directly from this award?

Yes

Publications Reported for this Reporting Period

Public Access Compliance	Citation
Non-Compliant	Excluded by Requester CART peptides: regulators of body weight, reward and other functions. Nat Rev Neurosci. 2008 Oct;9(10):747-58. PubMed PMID: 18802445.
Non-Compliant	Excluded by Modulation of glycan recognition by clustered saccharide patches. Int Rev Cell Mol Biol. 2014;308:75-125. PubMed PMID: 24411170.
Complete	Excluded by Requester Ape duos and trios: spontaneous cooperation with free partner choice in chimpanzees. PeerJ. 2014;2:e417. PubMed PMID: 24949236; PubMed Central PMCID: PMC4060033.
Complete	Excluded by Requester An siRNA screen of membrane trafficking genes highlights pathways common to HIV-1 and M-PMV virus assembly and release. PLoS One. 2014;9(9):e106151. PubMed PMID: 25187981; PubMed Central PMCID: PMC4154853.
Complete	Excluded by Requester Excluded by Requester Epigenetic modifications are associated with inter-species gene expression variation in primates. Genome Biol. 2014;15(12):547. PubMed PMID: 25468404; PubMed Central PMCID: PMC4290387.
Complete	Excluded by Requester Excluded by Requester PACAP receptor gene polymorphism impacts fear responses in the amygdala and hippocampus. Proc Natl Acad Sci U S A. 2014 Feb 25;111(8):3158-63. PubMed PMID: 24516127; PubMed Central PMCID: PMC3939867.
Complete	Excluded by Requester AA. In vivo administration of a JAK3 inhibitor during acute SIV infection leads to significant increases in viral load during chronic infection. PLoS Pathog. 2014 Mar;10(3):e1003929. PubMed PMID: 24603870; PubMed Central PMCID: PMC3946395.
Non-Compliant	Excluded by Requester Postexposure protection of macaques from vaginal SHIV infection by topical integrase inhibitors. Sci Transl Med. 2014 Mar 12;6(227):227ra35. PubMed PMID: 24622515.
Complete	Excluded by Requester Excluded by Increased stability and limited proliferation of CD4+ central memory T cells differentiate nonprogressive simian immunodeficiency virus (SIV) infection of sooty mangabeys from progressive SIV infection of rhesus macaques. J Virol. 2014 Apr;88(8):4533-42. PubMed PMID: 24501416; PubMed Central PMCID: PMC3993768.
Complete	Excluded by Requester Disassembly of the divisome in Escherichia coli: evidence that FtsZ dissociates before compartmentalization. Mol Microbiol. 2014 Apr;92(1):1-9. PubMed PMID: 24506818;

	PubMed Central PMCID: PMC4004784.
Complete	Excluded by Requester A fast multiparameter MRI approach for acute stroke assessment on a 3T clinical scanner: preliminary results in a non-human primate model with transient ischemic occlusion. Quant Imaging Med Surg. 2014 Apr;4(2):112-22. PubMed PMID: 24834423; PubMed Central PMCID: PMC4014876.
Non-Compliant	Excluded by Requester [Conjunctival rhinosporidiois diagnosed in a biopsy specimen]. Rev Chilena Infectol. 2014 Apr;31(2):213-5. PubMed PMID: 24878912.
Complete	Excluded by Requester Islet cell xenotransplantation: a serious look toward the clinic. Xenotransplantation. 2014 May-Jun;21(3):221-9. PubMed PMID: 24806830; PubMed Central PMCID: PMC4047130.
Complete	Excluded by Requester Spontaneous leiomyomas of the gastroesophageal junction in a chimpanzee (Pan troglodytes). Comp Med. 2014 Jun;64(3):230-3. PubMed PMID: 24956216; PubMed Central PMCID: PMC4067588.
Complete	Excluded by Requester Systems analysis of West Nile virus infection. Curr Opin Virol. 2014 Jun;6:70-5. PubMed PMID: 24851811; PubMed Central PMCID: PMC4104408.
Complete	Excluded by Requester ROCK1 and LIM kinase modulate retrovirus particle release and cell-cell transmission events. J Virol. 2014 Jun;88(12):6906-21. PubMed PMID: 24696479; PubMed Central PMCID: PMC4054354.
Complete	Excluded by Requester Understanding the control of ingestive behavior in primates. Horm Behav. 2014 Jun;66(1):86-94. PubMed PMID: 24727080; PubMed Central PMCID: PMC4051844.
Complete	Excluded by Requester Excluded by Requester NK cell responses to simian immunodeficiency virus vaginal exposure in naive and vaccinated rhesus macaques. J Immunol. 2014 Jul 1;193(1):277-84. PubMed PMID: 24899503; PubMed Central PMCID: PMC4083479.
Complete	Excluded by Requester Excluded by Requester Live simian immunodeficiency virus vaccine correlate of protection: immune complex-inhibitory Fc receptor interactions that reduce target cell availability. J Immunol. 2014 Sep 15;193(6):3126-33. PubMed PMID: 25143442; PubMed Central PMCID: PMC4157094.
Non-Compliant	Excluded by Requester PAS-positive extracellular deposits within germinal centers of hyperplastic follicles during SIV infection in a rhesus macaque. J Med Primatol. 2014 Oct;43(5):374-7. PubMed PMID: 24628065; NIHMSID: 570338.
Complete	Excluded by Requester Control of Working Memory in Rhesus Monkeys (Macaca mulatta). J Exp Psychol Anim Learn Cogn. 2014 Oct;40(4):467-476. PubMed PMID: 25436219; PubMed Central PMCID: PMC4243171.
Complete	Excluded by Requester Excluded by Requester A new rhesus macaque assembly and annotation for next-generation sequencing analyses. Biol Direct. 2014 Oct 14;9(1):20. PubMed PMID: 25319552; PubMed Central PMCID: PMC4214606.

Complete	Excluded by Requester Excluded by Age-related effects in the neocortical organization of chimpanzees: gray and white matter volume, cortical thickness, and gyrification. Neuroimage. 2014 Nov 1;101:59-67. PubMed PMID: 24983715; PubMed Central PMCID: PMC4165649.
Complete	Excluded by Requester Excluded by Requester Influenza virus-specific neutralizing IgM antibodies persist for a lifetime. Clin Vaccine Immunol. 2014 Nov;21(11):1481-9. PubMed PMID: 25165027; PubMed Central PMCID: PMC4248769.
Complete	Excluded by Requester Multimodality vaccination against clade C SHIV: partial protection against mucosal challenges with a heterologous tier 2 virus. Vaccine. 2014 Nov 12;32(48):6527-36. PubMed PMID: 25245933; PubMed Central PMCID: PMC4343195.
Non-Compliant	Excluded by Requester Excluded by Rapid generation of fully human monoclonal antibodies specific to a vaccinating antigen. Nat Protoc. 2014 Nov 20;9(12):2903. PubMed PMID: 25411955.
Complete	Excluded by Requester Superiority of rapamycin over tacrolimus in preserving nonhuman primate Treg half-life and phenotype after adoptive transfer. Am J Transplant. 2014 Dec;14(12):2691-703. PubMed PMID: 25359003; PubMed Central PMCID: PMC4236286.
Complete	Excluded by Requester Excluded by Requester Autophagy is essential for effector CD8(+) T cell survival and memory formation. Nat Immunol. 2014 Dec;15(12):1152-61. PubMed PMID: 25362489; PubMed Central PMCID: PMC4232981.
In Process at NIHMS	Excluded by Requester The cortico-pallidal projection: An additional route for cortical regulation of the basal ganglia circuitry. Mov Disord. 2014 Dec 5;PubMed PMID: 25476969; NIHMSID: 641567.
Complete	Excluded by Requester Positive reinforcement methods to train chimpanzees to cooperate with urine collection. J Am Assoc Lab Anim Sci. 2015;54(1):66-9. PubMed PMID: 25651093; PubMed Central PMCID: PMC4311744.
Non-Compliant	Excluded by Requester B cell responses to influenza infection and vaccination. Curr Top Microbiol Immunol. 2015;386:381-98. PubMed PMID: 25193634.
Complete	Excluded by Requester Levetiracetam Ameliorates L-DOPA-Induced Dyskinesia in Hemiparkinsonian Rats Inducing Critical Molecular Changes in the Striatum. Parkinsons Dis. 2015;2015:253878. PubMed PMID: 25692070; PubMed Central PMCID: PMC4322303.
Complete	Excluded by Requester Alterations in neuronal activity in basal ganglia-thalamocortical circuits in the parkinsonian state. Front Neuroanat. 2015;9:5. PubMed PMID: 25698937; PubMed Central PMCID: PMC4318426.
Complete	Excluded by Requester Excluded by IAVI Africa HIV Prevention Partnership. Creating an African HIV clinical research and prevention trials network: HIV prevalence, incidence and transmission. PLoS One. 2015;10(1):e0116100. PubMed PMID: 25602351; PubMed Central PMCID: PMC4300215.

Complete	Excluded by Requester Innate immune sensing and response to influenza. Curr Top Microbiol Immunol. 2015;386:23-71. PubMed PMID: 25078919; PubMed Central PMCID: PMC4346783.
Complete	Excluded by Requester Excluded by Requester Vaccine-induced plasmablast responses in rhesus macaques: Phenotypic characterization and a source for generating antigen-specific monoclonal antibodies. J Immunol Methods. 2015 Jan;416:69-83. PubMed PMID: 25445326; PubMed Central PMCID: PMC4324134.
Complete	Excluded by Requester Excluded by Requester Transmitted virus fitness and host T cell responses collectively define divergent infection outcomes in two HIV-1 recipients. PLoS Pathog. 2015 Jan;11(1):e1004565. PubMed PMID: 25569444; PubMed Central PMCID: PMC4287535.
Complete	Excluded by Requester Temporal evolution of ischemic lesions in nonhuman primates: a diffusion and perfusion MRI study. PLoS One. 2015;10(2):e0117290. PubMed PMID: 25659092; PubMed Central PMCID: PMC4319749.
Non-Compliant	Excluded by Last but not least: new insights into how FtsN triggers constriction during Escherichiacoli cell division. Mol Microbiol. 2015 Jan 9;PubMed PMID: 25571948.
In Process at NIHMS	Excluded by Requester T Memory Stem Cells and HIV: a Long-Term Relationship. Curr HIV/AIDS Rep. 2015 Jan 13;PubMed PMID: 25578055; NIHMSID: 664440.
In Process at NIHMS	Excluded by Requester Reservoir host immune responses to emerging zoonotic viruses. Cell. 2015 Jan 15;160(1-2):20-35. PubMed PMID: 25533784; NIHMSID: 651472.
Non-Compliant	Excluded by Requester Excluded by Requester Vaccine-elicited CD4 T cells induce immunopathology after chronic LCMV infection. Science. 2015 Jan 16;347(6219):278-82. PubMed PMID: 25593185.
Complete	Excluded by Requester Excluded by Requester Malaria induces anemia through CD8+ T cell-dependent parasite clearance and erythrocyte removal in the spleen. MBio. 2015 Jan 20;6(1)PubMed PMID: 25604792; PubMed Central PMCID: PMC4324318.
Non-Compliant	Excluded by Requester Immunogenetic characterization of a captive colony of sooty mangabeys (Cercocebus atys) used for SIV research. J Med Primatol. 2015 Jan 21;PubMed PMID: 25645218.
Complete	Excluded by Requester Excluded by Requester An IL-27/NFIL3 signalling axis drives Tim-3 and IL-10 expression and T-cell dysfunction. Nat Commun. 2015 Jan 23;6:6072. PubMed PMID: 25614966; PubMed Central PMCID: PMC4311884.
Complete	Excluded by Requester Excluded by Requester Brain organization of gorillas reflects species differences in ecology. Am J Phys Anthropol. 2015 Feb;156(2):252-62. PubMed PMID: 25360547; PubMed Central PMCID: PMC4314362.

Complete	Excluded by Requester A new quantitative rating scale for dyskinesia in nonhuman primates. Behav Pharmacol. 2015 Feb;26(1-2):109-16. PubMed PMID: 25171151; PubMed Central PMCID: PMC4276436.
Complete	Excluded by Requester Excluded Combined use of Mycobacterium tuberculosis-specific CD4 and CD8 T-cell responses is a powerful diagnostic tool of active tuberculosis. Clin Infect Dis. 2015 Feb 1;60(3):432-7. PubMed PMID: 25362202; PubMed Central PMCID: PMC4293395.
Complete	Excluded by Requester The development of object recognition memory in rhesus macaques with neonatal lesions of the perirhinal cortex. Dev Cogn Neurosci. 2015 Feb;11:31-41. PubMed PMID: 25096364; PubMed Central PMCID: PMC4302071.
In Process at NIHMS	Excluded by Requester Progression of seed-induced A deposition within the limbic connectome. Brain Pathol. 2015 Feb 9;PubMed PMID: 25677332; NIHMSID: 669758.
In Process at NIHMS	Excluded by Requester Excluded by Requester Liver fibrosis occurs through dysregulation of MyD88-dependent innate B cell activity. Hepatology. 2015 Feb 24;PubMed PMID: 25711908; NIHMSID: 667741.
In Process at NIHMS	Excluded by Requester Excluded by Evaluation of human and non-human primate antibody binding to pig cells lacking GGTA1/CMAH/4GalNT2 genes. Xenotransplantation. 2015 Mar 1;PubMed PMID: 25728481; NIHMSID: 665047.
Non-Compliant	Excluded by Requester Excluded by Requester Effect of subthalamic nucleus stimulation on penicillin induced focal motor seizures in primate. Brain Stimul. 2015 Mar-Apr;8(2):177-84. PubMed PMID: 25511796.
Complete	Excluded by Requester Dopamine regulates distinctively the activity patterns of striatal output neurons in advanced parkinsonian primates. J Neurophysiol. 2015 Mar 1;113(5):1533-44. PubMed PMID: 25505120; PubMed Central PMCID: PMC4346722.
Complete	Excluded by Requester Systems biological analyses reveal the hepatitis C virus (HCV)-specific regulation of hematopoietic development. Hepatology. 2015 Mar;61(3):843-56. PubMed PMID: 25331524; PubMed Central PMCID: PMC4340762.
In Process at NIHMS	Excluded by Requester Up-regulation of Tim-3 on T cells during acute simian immunodeficiency virus infection and on antigen specific responders. AIDS. 2015 Mar 13;29(5):531-6. PubMed PMID: 25715103; NIHMSID: 663822.
In Process at NIHMS	Long-Term Effects of Castration on the Skeleton of Male Rhesus Monkeys (Macaca mulatta). American journal of primatology. NIHMSID: 667748.

Non-compliant Publications Previously Reported for this Project

Public Access Compliance	Citation
Non-Compliant	Excluded by Requester Triggering social interactions: chimpanzees respond to imitation by a humanoid robot

	and request responses from it. Anim Cogn. 2014 May;17(3):589-95. PubMed PMID: 24096704.
Non-Compliant	Excluded by Requester Exploiting CRISPR/Cas systems for biotechnology. Bioessays. 2014 Jan;36(1):34-8. PubMed PMID: 24323919.
Non-Compliant	Excluded by Requester Memory deficits in aging and neurological diseases. Prog Mol Biol Transl Sci. 2014;122:1-29. PubMed PMID: 24484696.
Non-Compliant	Excluded by Requester Monoamine transporter inhibitors and substrates as treatments for stimulant abuse. Adv Pharmacol. 2014;69:129-76. PubMed PMID: 24484977.
Non-Compliant	Excluded by Requester Excluded by Requester Plasmodium vivax trophozoite-stage proteomes. J Proteomics. 2015 Feb 6;115:157-76. PubMed PMID: 25545414.
Non-Compliant	Excluded by Requester Metacognition as discrimination: commentary on Smith et al (2014). J Comp Psychol. 2014 May;128(2):135-7; discussion 140-2. PubMed PMID: 24866002.
Non-Compliant	Excluded by Requester Evolution of responses to (un)fairness. Science. 2014 Oct 17;346(6207):1251776. PubMed PMID: 25324394.
Non-Compliant	Excluded by Requester A restriction enzyme based cloning method to assess the in vitro replication capacity of HIV-1 subtype C Gag-MJ4 chimeric viruses. J Vis Exp. 2014 Aug 31;PubMed PMID: 25225725.
Non-Compliant	Excluded by Requester Immunology Immune activation with HIV vaccines. Science. 2014 Apr 4;344(6179):49-51. PubMed PMID: 24700849.
Non-Compliant	Excluded by Requester Intersections of sex and corticotropin-releasing factor. Biol Psychiatry. 2014 Jun 1;75(11):838-9. PubMed PMID: 24837621.
Non-Compliant	Excluded by Requester Mother recognition and preference after neonatal amygdala lesions in rhesus macaques (Macaca mulatta) raised in a semi-naturalistic environment. Dev Psychobiol. 2014 Dec;56(8):1723-34. PubMed PMID: 25042548.
Non-Compliant	Excluded by Requester Altered GluN2B NMDA receptor function and synaptic plasticity during early pathology in the PS2APP mouse model of Alzheimer's disease. Neurobiol Dis. 2015 Feb;74:254-62. PubMed PMID: 25484285.
Non-Compliant	Excluded by Requester Excluded by Requester Early adverse experience increases emotional reactivity in juvenile rhesus macaques: relation to amygdala volume. Dev Psychobiol. 2014 Dec;56(8):1735-46. PubMed PMID: 25196846.
Non-Compliant	Excluded by Requester Emerging functions of the unfolded protein response in immunity. Nat Immunol. 2014 Oct;15(10):910-9. PubMed PMID: 25232821.
Non-Compliant	Excluded by Requester Human B cells induce dendritic cell maturation and favour Th2 polarization by inducing OX-40 ligand. Nat Commun. 2014 Jun 9;5:4092. PubMed PMID: 24910129.

Non-Compliant	Excluded by Requester Excluded by Requester Implementation of subcutaneous insulin protocol for non-critically ill hospitalized patients in andalusian tertiary care hospitals. Endocrinol Nutr. 2015 Feb;62(2):64-71. PubMed PMID: 25467634.
Non-Compliant	Excluded by Requester Chimpanzees prefer African and Indian music over silence. J Exp Psychol Anim Learn Cogn. 2014 Oct;40(4):502-5. PubMed PMID: 25546107.
Non-Compliant	Excluded by Requester Effects of spatial training on transitive inference performance in humans and rhesus monkeys. J Exp Psychol Anim Learn Cogn. 2014 Oct;40(4):477-89. PubMed PMID: 25546105.
Non-Compliant	Excluded by Requester Neonatal amygdala lesions alter mother-infant interactions in rhesus monkeys living in a species-typical social environment. Dev Psychobiol. 2014 Dec;56(8):1711-22. PubMed PMID: 24986273.
Non-Compliant	Excluded by Requester Excluded by The contribution of non-human primate models to the development of human vaccines. Discov Med. 2014 Dec;18(101):313-22. PubMed PMID: 25549702.
Non-Compliant	Excluded by Requester Excluded by Requester Type I interferon responses in rhesus macaques prevent SIV infection and slow disease progression. Nature. 2014 Jul 31;511(7511):601-5. PubMed PMID: 25043006.

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

The Yerkes National Primate Research Center website, www.yerkes.emory.edu, serves as one strategic communication channel to share information about the center, its vision, mission and values, research programs, animal care and community/educational outreach, to publicize the center's scientific advancements, to provide researchers with information about scientific resources and to encourage financial support of our research programs. Audiences for the Yerkes website are our employees and the Emory community, scientists nationwide, NIH employees, residents of the metro Atlanta area, donors, media, elected officials and anyone else interested in research with animals and/or a career in science. The site, which follows Emory University's Web Standard Template design, is divided into six main sections: Home, About, Research, Education, Support Yerkes and Search Yerkes.

The Home page features the center's core values, latest news headlines and rotating researcher spotlights and research topics, all with links to additional information. In the About section is a message from the director and information about the center's history, research advances, news releases, which are frequently based on scientific publications, animals, outreach, resources, service cores and related websites, such as nprcresearch.org and sites for other national primate research centers. This section also contains the Contact Us option.

The Research section features landing pages for each of the center's scientific divisions. From these pages, visitors can link to bios for researchers within each division. The Research landing page also features information about research techniques, service cores and pilot research projects. The Education section includes information about the center's summer program, the Institute on Neuroscience, as well as information about community outreach and the topics Yerkes researchers address during their talks.

Support Yerkes contains information about ways to financially support the center and its research, and includes profiles of researchers that tie to the center's funding priorities. The final section, Search Yerkes, allows site visitors to do just that. We have extensively tagged website content to facilitate searches on the site.

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Have inventions, patent applications and/or licenses resulted from the award during the reporting period?

Yes

If yes, has this information been previously provided to the PHS or to the official responsible for patent matters at the grantee organization? Yes

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b Resource Sharing.pdf

RESOURCE SHARING PLAN

Data sharing: Yerkes NPRC leadership and all Yerkes Core and Affiliated Scientists are committed to making the results of our research rapidly available to others. Results of studies conducted at the YNPRC are presented at national and international conferences and published in peer-reviewed journals in a timely fashion. Upon completion of experiments, data are shared in the form of peer-reviewed publications and the final versions of accepted manuscripts are deposited into the PubMed Central, in compliance with the Public Access Policy. Supplementary material is posted, when permitted, on the journal's website.

Other data may also be shared upon request within 30 days of acceptance for publication of the main findings from the final data set. Requests for data access are typically reviewed by the Principal Investigators and the Yerkes Director. Data and associated documentation are made available to users under a data-sharing agreement that provides for a commitment to: 1) using the data only for research purposes, 2) protection of data using appropriate secure computer technology; 3) restrictions on distributing data to third parties and destroying data upon completion of analysis; and 4) proper acknowledgement of the data resource. Upon completion of the data-sharing agreement, data will be made available through a password-protected website. Additional technical assistance will be made available at cost to the requestor.

Sharing tissues and biological samples: A comprehensive bank of tissues and other biological specimens from research conducted at the YNPRC is made available to collaborators and other investigators throughout the nation. We have routinely shared tissue and biological samples with outside investigators, as long as this does not compromise tissues needed by the Scientific, Animal Service or Core Service Components of Yerkes. Investigators are required to complete a material transfer agreement when requesting tissue or other biological samples.

Sharing sequence data: Sequence data are made available through National Center for Biotechnology Information, and viral clones and isolates are made available through the NIH AIDS Research Program (http://www.aidsreagent.org/) and/or directly through Yerkes Principal Investigators. Reagents developed during the course of research at Yerkes are made available to the NIH AIDS Research Program, or through material transfer agreements, with researchers at other institutions.

Sharing DNA samples: Extracted DNA samples from animals housed at the YNPRC are made available to qualified investigators through the NPRC Biomaterials Distribution Program. The recipient pays the shipping charges and a portion of the costs associated with collecting and processing the tissues. Before a request is filled, the recipient will be advised of the estimated costs. Investigators are required to complete a material transfer agreement when requesting DNA samples.

Sharing model organisms: The Yerkes NPRC will continue to make animals produced under this award available to NIH-funded both at the Yerkes Center and via a formally established mechanism in which animals are first offered to the other participating centers through a web-based animal locator system. Should the animals not be required, their description/information will be forwarded to ORIP representatives and other NPRCs in case they are needed by other NIH-supported investigators. In the past reporting period, no requests for sharing of model organisms have been received.

Genome-Wide Association Studies: N/A.

D. OVERALL PARTICIPANTS

D.1 WHAT INDIVIDUALS HAVE WORKED ON THE PROJECT?

Commons ID	S/K	Name	SSN	DOB	Degree(s)	Role	Cal	Aca	Sum	Foreign Org	Component(s)	Country	SS
eRA Commons User Name	Y	CAUGHMAN, STEWART W	SSN	DOB	AB,MOTH,MD,MD	PD/PI	EFFORT				Admin Core-5392 (Director)		NA
	N	Excluded by Requester				Technician					Other-6956 (Animal Care MS)		NA
	N					Technician					Other-6959 (Behavioral Management)		NA
	N					Technician					Other-6956 (Animal Care MS)		NA
	N					Technician					Other-6956 (Animal Care MS)		NA
	N					Technician					Other-6957 (Animal Care FS)		NA
	N					Technician					Other-6956 (Animal Care MS)		NA
	N					Technician					Other-6956 (Animal Care MS)		NA
	N					Technician					Other-6962 (Research Services)		NA
	N					Technician					Other-6958 (Colony Management)		NA
	N					Technician					Other-6958 (Colony Management)		NA
	N					Technician					Other-6957 (Animal Care FS)		NA
	N					Technician					Other-6957 (Animal Care FS)		NA
	N					Technician					Other-6954 (Veterinary Medicine MS)		NA
	N					Technician					Other-6956 (Animal Care		NA

											MS)		
	N	Excluded by Requester				Technician	EFFORT				Other-6954 (Veterinary Medicine MS)		NA
	N					Technician					Other-6954 (Veterinary Medicine MS)		NA
	N					Technician					Other-6968 (Molecular Pathology)		NA
	N					Technician					Other-6956 (Animal Care MS)		NA
	N					Technician					Other-6957 (Animal Care FS)		NA
	N					Technician					Core-6974 (Imaging Core)		NA
	N					Technician					Other-6956 (Animal Care MS)		NA
	N					Technician					Other-6954 (Veterinary Medicine MS)		NA
	N					Technician					Other-6958 (Colony Management)		NA
	N					Technician					Other-6957 (Animal Care FS)		NA
	N					Technician					Core-6974 (Imaging Core)		NA
	N					Technician					Other-6956 (Animal Care MS)		NA
	N					Technician					Project-6980 (Pilot Projects)		NA
	N					Technician					Other-6956 (Animal Care MS)		NA
	N					Technician					Other-6957 (Animal Care FS)		NA
	N					Technician					Core-6974 (Imaging Core)		NA

	N	Excluded by Requester				Technician	EFFORT		Other-6959 (Behavioral Management)		NA
	N					Technician			Other-6966 (Clinical Pathology)		NA
	N					Technician			Other-6958 (Colony Management)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6967 (Histology)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6958 (Colony Management)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6962 (Research Services)		NA
	N					Technician			Other-6955 (Veterinary Medicine FS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA

	N	Excluded by Requester				Technician	EFFORT		Core-6969 (Biomarkers Core)		NA
	N					Technician			Other-6966 (Clinical Pathology)		NA
	N					Technician			Core-6973 (Genomics Core)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6954 (Veterinary Medicine MS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6954 (Veterinary Medicine MS)		NA
	N					Technician			Other-6955 (Veterinary Medicine FS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6959 (Behavioral Management)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6958 (Colony Management)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6958 (Colony Management)		NA

	N	Excluded by Requester				Technician	EFFORT		Other-6959 (Behavioral Management)		NA
	N					Technician			Other-6955 (Veterinary Medicine FS)		NA
	N					Technician			Other-6959 (Behavioral Management)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6962 (Research Services)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Project-6991 (RRRP-Bloomsmith)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6968 (Molecular Pathology)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Core-6975 (Virology Core)		NA

	N	Excluded by Requester				Faculty	EFFORT		Core-6974 (Imaging Core)		NA
	N					Technician			Core-6969 (Biomarkers Core)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6954 (Veterinary Medicine MS)		NA
	N					Technician			Other-6958 (Colony Management)		NA
	N					Technician			Other-6953 (Associate Director - Animal Resources), Other-6959 (Behavioral Management)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6965 (Anatomic Pathology)		NA
	N					Technician			Other-6958 (Colony Management)		NA
	N					Technician			Other-6966 (Clinical Pathology)		NA
	N					Technician			Other-6958 (Colony Management)		NA

	N	Excluded by Requester				Technician	EFFORT		Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6962 (Research Services)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Other-6965 (Anatomic Pathology)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6959 (Behavioral Management)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6966 (Clinical Pathology)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6966 (Clinical Pathology)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Technician			Core-6973 (Genomics Core)		NA
	N					Technician			Core-6974 (Imaging Core)		NA
	N					Technician			Other-6956		NA

		Excluded by Requester										
			SSN	DOB			EFFORT			(Animal Care MS)		
	N					Technician				Core-6974 (Imaging Core)		NA
	N					Technician				Other-6957 (Animal Care FS)		NA
	N					Technician				Other-6957 (Animal Care FS)		NA
	N					Technician				Other-6954 (Veterinary Medicine MS)		NA
	N					Technician				Other-6957 (Animal Care FS)		NA
	N					Technician				Other-6957 (Animal Care FS)		NA
	N					Technician				Other-6955 (Veterinary Medicine FS)		NA
	N					Technician				Other-6956 (Animal Care MS)		NA
	N					Technician				Other-6955 (Veterinary Medicine FS)		NA
	N					Technician				Other-6956 (Animal Care MS)		NA
	N					Technician				Other-6957 (Animal Care FS)		NA
	N					Technician				Other-6962 (Research Services)		NA
	N					Technician				Other-6956 (Animal Care MS)		NA
	N					Technician				Other-6956 (Animal Care MS)		NA
	N					Technician				Other-6957 (Animal Care FS)		NA
	N					Technician				Other-6957 (Animal Care FS)		NA

	N	Excluded by Requester				Technician	EFFORT		Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA
	N					Statistician			Core-6973 (Genomics Core)		NA
	N					Technician			Other-6959 (Behavioral Management)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6958 (Colony Management)		NA
	N					Technician			Other-6962 (Research Services)		NA
	N					Faculty			Core-6974 (Imaging Core)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6954 (Veterinary Medicine MS)		NA
	N					Technician			Other-6957 (Animal Care FS)		NA

	N	Excluded by Requester				Technician	EFFORT		Other-6963 (Health and Safety)		NA
	N					Technician			Other-6954 (Veterinary Medicine MS)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Other-6965 (Anatomic Pathology)		NA
	N					Technician			Other-6956 (Animal Care MS)		NA
	N					Technician			Project-6980 (Pilot Projects)		NA
eRA Commons User Name	N		SSN	DOB	PHD,MS ,BA	Postdoctoral Scholar, Fellow, or Other Postdoctoral Position			Project-6991 (RRRP-Bloomsmith)		NA
	N					Postdoctoral Scholar, Fellow, or Other Postdoctoral Position			Project-6980 (Pilot Projects)		NA
	N			DOB		Postdoctoral Scholar, Fellow, or Other Postdoctoral Position			Core-6974 (Imaging Core)		NA
	N					Admin Support			Other-6953 (Associate Director - Animal Resources)		NA
	N					Animal Care Supervisor			Other-6956 (Animal Care MS)		NA
	N					Veterinary Medicine Supervisor			Other-6954 (Veterinary Medicine MS)		NA
	N					Histology Supervisor			Other-6967 (Histology)		NA
	N					Admin Support			Other-6976 (Division of Behavioral Neu…ric Disorders)		NA

	N	Excluded by Requester				Animal Care Operations Manager	EFFORT		Other-6956 (Animal Care MS)	NA
	N					Admin Support			Other-6957 (Animal Care FS)	NA
	Y					Veterinarian			Other-6954 (Veterinary Medicine MS)	NA
	N					Facilities/Shop Staff			Admin Core-6949 (Shop FS)	NA
	Y					Asst Director, Animal Resources			Core-6972 (Comparative AIDS Core), Other-6953 (Associate Director - Animal Resources), Other-6955 (Veterinary Medicine FS)	NA
	N					Admin Support			Admin Core-5392 (Director)	NA
	N					Clinical Pathology Supervisor			Other-6966 (Clinical Pathology)	NA
	N					HR Director			Admin Core-6198 (Human Resources)	NA
	N					Admin Support			Other-6956 (Animal Care MS)	NA
	N					Admin Support			Other-6978 (Division of Microbiology and Immunology)	NA
	N					Research Services Manager			Other-6962 (Research Services)	NA
	N					Animal Care Supervisor			Other-6956 (Animal Care MS)	NA
	Y					Veterinarian			Other-6955 (Veterinary Medicine FS)	NA

	N	Excluded by Requester				Facilities/Shop Staff	EFFORT		Admin Core-6224 (Shop MS)		NA
	N					Animal Care Operations Asc Manager			Other-6956 (Animal Care MS)		NA
	N					Health and Safety Professional			Other-6963 (Health and Safety)		NA
	N					Facilities/Shop Staff			Admin Core-6949 (Shop FS)		NA
	N					Facilities/Shop Staff			Admin Core-6224 (Shop MS)		NA
	N					Animal Care Supervisor			Other-6956 (Animal Care MS)		NA
	N					Director, Business and Finance			Admin Core-6197 (Business Services)		NA
	N					Facilities/Shop Staff			Admin Core-6951 (Transportation)		NA
	N					Facilities/Shop Staff			Admin Core-6951 (Transportation)		NA
	Y					Veterinarian			Other-6954 (Veterinary Medicine MS)		NA
	Y					Veterinarian			Other-6954 (Veterinary Medicine MS)		NA
	N					Animal Care Supervisor			Other-6956 (Animal Care MS)		NA
	N					Facilities/Shop Staff			Admin Core-6951 (Transportation)		NA
	N					Facilities/Shop Staff			Admin Core-6949 (Shop FS)		NA
	N					Laboratory Supervisor			Core-6969 (Biomarkers Core)		NA
	N					Animal			Other-6961		NA

		Excluded by Requester				Records Supervisor	EFFORT		(Animal Records)	
	N					Facilities/Shop Staff			Admin Core-6224 (Shop MS)	NA
	N					Admin Support			Other-6961 (Animal Records)	NA
	N					Animal Care Supervisor			Other-6957 (Animal Care FS)	NA
	Y					Veterinarian			Core-6974 (Imaging Core), Other-6954 (Veterinary Medicine MS)	NA
	Y					Veterinarian			Other-6954 (Veterinary Medicine MS)	NA
	N					Facilities/Shop Staff			Admin Core-6949 (Shop FS)	NA
	N					Facilities/Shop Staff			Admin Core-6224 (Shop MS)	NA
	N					Admin Support			Other-6953 (Associate Director - Animal Resources)	NA
	N					IT Director			Admin Core-6199 (Information Technology)	NA
	N					Admin Support			Other-6979 (Division of Neuropharmacol…ogic Diseases)	NA
	N					Animal Care Operations Asc Manager			Other-6956 (Animal Care MS)	NA
	N					Admin Support			Core-6974 (Imaging Core)	NA
	N					Admin Support			Other-6963 (Health and Safety)	NA
	N					Training			Other-6953	NA

		Excluded by Requester				Coordinator				EFFORT	(Associate Director - Animal Resources), Other-6959 (Behavioral Management)	
	N					Research Laboratory Manager					Core-6972 (Comparative AIDS Core), Other-6958 (Colony Management), Project-6991 (RRRP-Bloomsmith)	NA
	N					Animal Care Supervisor					Other-6957 (Animal Care FS)	NA
	N					Animal Care Operations Asc Manager					Other-6957 (Animal Care FS)	NA
	N					Facilities/Shop Staff					Admin Core-6949 (Shop FS)	NA
	N					Senior Director, Communications					Admin Core-6200 (Public Affairs)	NA
	N					Facilities/Shop Staff					Admin Core-6224 (Shop MS)	NA
	N					Admin Support					Other-6968 (Molecular Pathology)	NA
	Y					Veterinarian					Other-6955 (Veterinary Medicine FS)	NA
	N					Associate Radiation Safety Officer					Core-6975 (Virology Core)	NA
	N					Behavioral Mgt Technician Supervisor					Other-6959 (Behavioral Management)	NA
	N					Admin Support					Other-6961 (Animal Records)	NA

	N	Excluded by Requester				Research Technician Supervisor	EFFORT		Other-6958 (Colony Management)		NA
	N					Facilities/Shop Staff			Admin Core-6949 (Shop FS)		NA
	N					Animal Care Supervisor			Other-6956 (Animal Care MS)		NA
	Y					Pathologist			Other-6965 (Anatomic Pathology)		NA
	N					Animal Care Operations Manager			Other-6957 (Animal Care FS)		NA
	N					Animal Care Supervisor			Other-6956 (Animal Care MS)		NA
	N					Research Technician Supervisor			Other-6962 (Research Services)		NA
	Y					Veterinarian			Other-6955 (Veterinary Medicine FS)		NA
	Y					Chief Veterinarian			Other-6954 (Veterinary Medicine MS)		NA
	N					Admin Support			Other-6968 (Molecular Pathology)		NA
	N					Safety Officer			Other-6963 (Health and Safety)		NA
	N					Training Coordinator			Other-6953 (Associate Director - Animal Resources)		NA
	N					Executive Administrator/CFO			Admin Core-6197 (Business Services)		NA
	N					Supervisor			Admin Core-5392 (Director)		NA
	N					Admin Support			Other-6961 (Animal Records)		NA
	N					Admin Support			Other-6955 (Veterinary Medicine		NA

									FS)	
	Y	Excluded by Requester				Veterinarian	EFFORT		Other-6954 (Veterinary Medicine MS)	NA
eRA Commons User Name	Y			DOB		Asc. Dir, Pathology (Interim)			Other-6964 (Associate Director - Pathology), Other-6965 (Anatomic Pathology)	NA
	Y		SSN		PHD,PHD,MS,BS,BS,MS	Behavioral Mgt Unit Head			Core-6972 (Comparative AIDS Core), Other-6959 (Behavioral Management), Project-6991 (RRRP-Bloomsmith)	NA
	Y					Asc Dir, Animal Resources			Core-6972 (Comparative AIDS Core), Other-6953 (Associate Director - Animal Resources), Other-6954 (Veterinary Medicine MS)	NA
	Y				DVM	Core Co-Director			Core-6972 (Comparative AIDS Core)	NA
	Y				MD	Division Chief			Core-6972 (Comparative AIDS Core), Other-6978 (Division of Microbiology and Immunology)	NA
	Y				MS,BS,PHD,AB,DOTH	Division Chief			Other-6977 (Division of Developmental … Neuroscience)	NA
	Y				PHD,BS	Division			Other-6976	NA

		Excluded by Requester				Chief				(Division of Behavioral Neu…ric Disorders)		
eRA Commons User Name	Y		SSN	DOB	MD,BS	Center Director	EFFORT			Admin Core-5392 (Director)		NA
	Y				PHD	Core Co-Director				Core-6973 (Genomics Core)		NA
	Y				PHD	Center Director				Admin Core-5392 (Director)		NA
	Y				PHD,BS	Core Director				Core-6975 (Virology Core)		NA
	Y					Core Assistant Director				Core-6974 (Imaging Core)		NA
	Y					Core Director				Core-6969 (Biomarkers Core), Core-6972 (Comparative AIDS Core), Core-6973 (Genomics Core), Other-6958 (Colony Management)		NA

Glossary of acronyms:
S/K - Senior/Key
DOB - Date of Birth
Cal - Person Months (Calendar)
Aca - Person Months (Academic)
Sum - Person Months (Summer)
Foreign Org - Foreign Organization Affiliation
SS - Supplement Support
RE - Reentry Supplement
DI - Diversity Supplement
OT - Other
NA - Not Applicable

D.2 PERSONNEL UPDATES

D. 2.a Level of Effort

Will there be, in the next budget period, either (1) a reduction of 25% or more in the level of effort from what was approved by the agency for the PD/PI(s) or other senior/key personnel designated in the Notice of Award, or (2) a reduction in the level of effort below the minimum amount of effort required by the Notice of Award?

Yes

Personal Info from Emory University in September, 2014, and is no longer a part of Key Personnel. Excluded by Requester is now the new Center Director.

D. 2. b New Senior/Key Personnel

Are there, or will there be, new senior/key personnel?

Yes

File uploaded: YNPRC_NEW_KEY_PERSONNEL.pdf

D.2.c Changes in Other Support

Has there been a change in the active other support of senior/key personnel since the last reporting period?

No

D.2.d New Other Significant Contributors

Are there, or will there be, new other significant contributors?

No

D.2.e Multi-PI (MPI) Leadership Plan

Will there be a change in the MPI Leadership Plan for the next budget period?

NA

Program Director/Principal Investigator (Last, First, Middle): Caughman, S. Wright

P51 OD OD011132
Support of Yerkes National Primate Research Center

Excluded by Requester succeeded Excluded by Requester and became the new Center Director (Admin Core-5392-Director). Please see the following page for his biosketch and other support information.

OMB No. 0925-0001/0002 (Rev. 08/12 Approved Through 8/31/2015)

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

Excluded by Requester

Excluded by Requester

Excluded by Requester

Other Support

Excluded by Requester

ACTIVE

EFFORT

P51-OD011132 (Caughman) 05/01/2011 – 04/30/2016
NIH/NCRR $6,854,226
Support of Yerkes National Primate Research Center

This grant provides support for maintenance and operation of the Yerkes National Primate Research Center.
Role: Center Director (Director)

EFFORT

U19 AI095985 Excluded by Requester 07/01/2011 – 06/30/2016
NIH/NIAID $4,691,082
Consortium for AIDS Vaccine Research in Nonhuman Primates

We hypothesize that certain vaccines and immunologic interventions will be able to attenuate or even abrogate the early events following mucosal SIV/SHIV infection, including the initial local amplification of virus at the mucosal portal of entry as well as the subsequent trajectory of virus spread that leads to systemic dissemination.

Private Source Phase II Excluded by Requester 10/01/2014 – 09/30/2016
$1,186,911

EFFORT

Highly-parallel PCR analysis of latently-infected reservoirs.

The objectives of this proposal are to identify the cellular compartments and CD4+ T lymphocyte subpopulations that contain latent SIV-infected cells and to use highly-parallel qPCR transcriptional analysis to identify novel cell surface biomarkers expressed on these latently-infected cells.
Role: PI

EFFORT

5UL1TR000454-08 Excluded by Requester 09/17/2007 – 05/31/2017
NIH / NCATS $5,168,749
Atlanta Clinical and Translational Science Institute (ACTSI)

In response to a national effort, the Atlanta Clinical and Translational Science Institute created a partnership of Emory, Morehouse SOM, Georgia Tech and other institutions to concentrate basic, translational, and clinical investigators, community clinicians, professional societies, and industry collaborators in dynamic programs and research projects. The major aims are discovery, training, and community engagement to create a new citywide home for clinical and translation research.
Role: Executive Council Member

E. OVERALL IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Main Station 2014
Installation and repair of epoxy and MMA flooring throughout the facility: Neuroscience Building rooms Specific Animal Location
Specific Animal Location

Carpet and VCT tile was installed in various areas throughout the facility.

Interior rooms and exterior buildings throughout the facility were painted.

Electrical upgrades and additions occurred throughout the facility. Light fixtures in several animal housing facilities were replaced with more efficient, water proof fixtures.

A chemical fume hood and exhaust duct were installed in lab 1122.

Four replacement actuators were installed on the cooling tower serving the Vaccine Research Addition.

Air Handler #2 serving the Main Building was replaced. Digital controls were upgraded as part of the replacement project.

Retaining walls constructed of railroad ties were replaced with 6"x6"x8' pressure treated timbers.

A new Ford E350, 15-passenger shuttle bus was purchased.

Room 1109 Main Building was renovated. Renovation converted one large office into two private offices.

Field Station 2014
Installation and repair of epoxy and MMA flooring throughout the facility: Specific Animal Location
Specific Animal Location
ges in
oms, compound walls and exterior of buildings throughout the facility were painted.

Electrical upgrades and additions occurred throughout the facility. Light fixtures in several animal housing facilities were replaced with more efficient, water proof fixtures.

Landscaping of grounds.

Facility Security

The roof of G-2 Test facility was replaced.

Specific Animal Location
compound was modified to enhance drainage and prevent standing water. Modifications included grading and installation of drainpipe.

New indoor caging was added at Specific Animal compound to house up to 100 primates. The project included heating and ventilation equipment, an emergency generator, environmental monitoring system and a sewage lift station

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

Not Applicable

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

NOTHING TO REPORT

F. OVERALL CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. OVERALL SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

File(s) uploaded:
G_P51 APR.pdf
G_Project Breakdown.pdf
G_Investigator Breakdown.pdf
G_Infrastrucure Improvements.pdf
G_IACUC_Appproval.pdf
G_Colony Statistics Table.pdf
G_Tissue Distribution Program.pdf
G_AIDS Dollars.pdf
G_Publication Breakdown.pdf
G_Investigators Trained.pdf
G_ORG_CHART.pdf
G_Projects Animal Resources.pdf
G_Projects BNPD.pdf
G_Projects EVC.pdf
G_Projects MI.pdf
G_Projects Pathology.pdf
G_Projects DCN.pdf
G_Projects NND.pdf

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Does this project include one or more applicable clinical trials that must be registered in ClinicalTrials.gov under FDAAA?

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Are there personnel on this project who are newly involved in the design or conduct of human subjects research?

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Does this project involve vertebrate animals?

Yes

G.8 PROJECT/PERFORMANCE SITES

Organization Name:	DUNS	Congressional District	Address
Primary: EMORY UNIVERSITY	066469933		Emory University Yerkes National Primate Research Center Atlanta GA 30322
EMORY UNIVERSITY	066469933		EMORY UNIVERSITY 1599 CLIFTON ROAD, 4TH FLOOR ATLANTA GA 303224250

G.9 FOREIGN COMPONENT

No foreign component

G.10 ESTIMATED UNOBLIGATED BALANCE

G.10.a Is it anticipated that an estimated unobligated balance (including prior year carryover) will be greater than 25% of the current year's total approved budget?

No

G.11 PROGRAM INCOME

Is program income anticipated during the next budget period?

Yes

Anticipated Amount	Source(s)
2945494	Animal use fees, per diem, and recharge services

G.12 F&A COSTS

Not Applicable

A. Specific Aims

The Yerkes National Primate Research Center is a unit of the Robert W. Woodruff Health Sciences Center of Emory University. The Principal Investigator of this grant, Dr. S. Wright Caughman, is the Executive Vice President of Health Affairs for the University. He reports to the President of Emory University, who reports to the Board of Trustees. The Yerkes Center Director, Excluded by Requester reports to Dr. Caughman and serves as one of the Deans and Directors of the University. The Center Director is responsible for the overall administration and general operation of the Center with respect to research activities, support services, allocation of resources, faculty and staff appointments, base grant budget and other Center responsibilities.

With the support of the P51 grant, the Yerkes Primate Center operates two principal facilities: a Main Station on the Emory University Campus that provides animal housing facilities, research laboratories and support s Field Station located 30 miles north of Atlanta that provides housing for nonhuman breeding colonies and facilities for studies that include the social behavior and biology of semi-free ranging nonhuman primates. The central objectives of our Center are:

Specific Animal Location

- Carry out basic and applied research using nonhuman primates in the service of developing knowledge, treatments, interventions, and cures that will benefit humanity.
- Provide regional and national resources for data, consultative expertise, biologic and genetic material and specialized facilities and equipment useful in supporting primate related research.
- Study the natural biology of primate species that are of research importance for the purpose of enhancing their scientific utility, health and well-being through appropriate laboratory and field studies.
- Develop improved practices of primate breeding, husbandry and genetic definition to help meet research needs for pedigreed, disease-free animals of defined quality, and assure the continued availability of species of biomedical research importance.
- Provide opportunities for research involvement and experience in primatology to graduate students, postdoctoral fellows, visiting scientists and faculty members, as well as high school students and teachers.
- Disseminate the findings of studies and technical advances in primate research to the scientific community by reports in internationally recognized, refereed journals, professional conferences, and on-site open-house opportunities

B. Studies and Results

1. Overall Highlights

The Yerkes National Primate Research Center has demonstrated significant progress in meeting each of these objectives during the reporting period and consequently, has made significant contributions to behavioral, biomedical and translational research and research training at Emory University and via collaborations on a regional, national, and international basis. In particular, the Yerkes Primate Center has maintained outstanding core research programs, extensive collaborative relationships with scientists based in other Emory University departments and provided resources and services to a broad collaborative network of affiliate and collaborative investigators throughout the region and nation. These research programs, which involve the use of a variety of nonhuman primate species, and rodents where appropriate, are directed primarily toward four major research disciplines, representing the research divisions within the Primate Center: 1) Microbiology and Immunology; 2) Developmental and Cognitive Neuroscience, 3) Neuropharmacology and Neurologic Diseases and 4) Behavioral Neuroscience and Psychiatric Disorders. Also, through the Divisions of Animal Resources and Pathology, Yerkes provides support for outside investigators conducting research at the Yerkes Center, consistent with our ORIP mandated role as a regional and national resource.

This year also marked a transition in leadership for Yerkes— Excluded by Requester was selected as the new Director to succeed Personal Info after serving as Director for more than 13 years. Dr. Excluded by Requester was the former Director of the New England Primate Research Center and a Professor of Medicine at d Medical School, Excluded by Requester assumed his responsibilities on August 1, 2014 and worked in concert

Excluded by Requester during a two month transition period.

Key support units include:

Supporting components (see also below) provide the following administrative units, activities and services: (1) Associate Director of Animal Resources, (2) Associate Director of Pathology, (3) Research Services unit that provides support for onsite and off-site investigators, (4) Tissue Distribution program that collects and distributes nonhuman primate biological specimens, (5) Occupational Health and Initial Orientation/Training Program, (6) Environmental Health and Safety Program and (7) Regulatory Compliance. There continues to be a strong emphasis on training, both on the job and more formal training, such as AALAS certification classes that are offered at both the Main Station and Field Station. These courses plus regular Lunch and Learn sessions and various staff meetings and training sessions in the Animal Care units contribute to better communication and improved performance. Additionally, last year we provided Animal Resources personnel, including all animal care personnel with courses in leadership, management, and conflict resolution. This year we are providing follow-up programs and assessments.

The Division of Animal Resources is comprised of: (1) Veterinary Medicine; (2) Colony Management; (3) Animal Care-Main Station; (4) Animal Care-Field Station; (5) Behavioral Management; and (6) Animal Records, and Research Services. Through these units, the Division provides health care, research support, environmental enrichment, program management and maintenance of animal records for the diverse nonhuman primate population at the YNPRC. Primate breeding, including a specific pathogen free (SPF) colony are overseen, as well as the research colony, the rodent vivaria, and the Comparative AIDS Core.

Animal Census Tables

As of 2/13/2015, overall size of the NHP colony is as follows:

1. Nonhuman primates supported partially, or in whole by the P51 base grant[1].

Census date: 2/13/15 (*135 from NEPRC and supported by P51 supplement)

Genus, Species	Breeding Colony[2]				Animals not in breeding colony[3]				Total Colony Census
	M	F	U[4]	Total	M	F	U[4]	Total	
Cercocebus Torquatus Atys	18	57	1	76	41	33	0	74	150
Macaca Fascicularis	0	0	0	0	3	0	0	3	3
Macaca Mulatta (SPF)	416	890	29	1335*	64	104	8	176	1511
Macaca Mulatta (NSPF)	0	0	0	0	130	160	0	290	290
Macaca Nemestrina	0	0	0	0	0	0	0	0	0
Saimiri SPP	0	0	0	0	15	0	0	15	15
Totals	434	947	30	1411	253	297	8	558	1969

[1] SPF Mucaca Mulatta Breeding Colony is partially supported by a SPF U24 grant (U24 OD011023).
[2] Total number of animals in breeding colony including adult breeding animals and designated juvenile replacements at time of report.
[3] Animals on protocol or otherwise not in the breeding colony at the time of report.
[4] Sex undetermined.

2. Nonhuman primates not supported by the P51 base grant[1].

Census date: 2/13/15

Genus, Species	Breeding Colony[2]				Animals not in breeding colony[3]				Total Colony Census
	M	F	U[4]	Total	M	F	U[4]	Total	
Macaca Mulatta (SPF)	0	52	0	52	20	55	0	75	127
Macaca Mulatta (NSPF)	0	0	0	0	380	394	0	774	774
Cercocebus Torquatus Atys	0	0	0	0	16	2	0	18	18
Macaca Fascicularis	0	0	0	0	8	2	0	10	10
Macaca Nemestrina	0	0	0	0	2	1	0	3	3
Saimiri SPP	0	0	0	0	19	2	0	21	21
Totals	0	52	0	52	445	456	0	901	953

[1] Animals in these colonies are not supported by a SPF U24 or U42 grant.
[2] Total number of animals in breeding colony including adult breeding animals and designated juvenile replacements at time of report.
[3] Animals on protocol or otherwise not in the breeding colony at the time of report.
[4] Sex undetermined.

3. Non-primate colonies

None of the animals in the non-primate colonies are supported by the P51 base grant.

During the past year, the Center provided support for approximately 154 investigators and 153 projects that were performed at the Center. Approximately 57% of our FY14 awarded funding (excluding the P51) is AIDS-related. All of our projects combined resulted in 293 published journal articles. This work was supported via the substantial outside funding garnered by investigators associated with the YNPRC. The total amount of these awards in the past year is to be determined, and will be reported in the electronic Annual Progress Report. Provision of specimens to investigators is another service provided by the Center, with some 1,513 specimens distributed in the reporting period. Students and Postdoctoral Fellows also are an integral part of the scientific fabric of Yerkes and participate in all elements of the research mission. In the last year, some 186 graduate and undergraduate students received training and experience in Yerkes laboratories. During this same period, the Center was home to 50 Postdoctoral Fellows. In addition, the Center hosts a summer research program for high school students and teachers, and frequently hosts scientific seminars and sponsors talks by faculty for the staff to promote understanding of the scientific mission.

2. Research Highlights

Division of Behavioral Neuroscience and Psychiatric Disorders:

Excluded by Requester Neuroscience and colleagues have been exploring the role of the oxytocin system in ng social cognition and neural activity in rhesus macaques. In collaboration Yerk Excluded by Requester Division of Developmental and Cognitive Neuroscience has shown that oxytocin administere intranasally via a pediatric nebulizer increases oxytocin concentrations in the cerebrospinal fluid. Furthermore, Excluded by Requester group has used a sensitive *in situ* hybridization and a receptor autoradiography technique to map in distribution of oxytocin receptors in the rhesus macaque as well as the coppery titi monkey brain. These studies reveal that oxytocin receptors are concentrated in brain regions involved in auditory and visual attention, consistent with their role in regulating social cognition. These studies complement other studies in a

variety of species supported by the Yerkes Silvio O. Conte Center for Oxytocin and Social Cognition grant funded by NIMH. These results have important implications for developing therapeutic strategies for autism.

Division of Developmental and Cognitive Neuroscience

Excluded by Requester dverse experiences and her colleagues are conducting research that contributes to our understanding of the role of early life stress in the etiology and pathophysiology of mood and anxiety disorders. The multidisciplinary approach and knowledge used bridge many different disciplines, from stress, neurobiology, neuroendocrinology, development, neuroimaging, genetics, behavior, psychobiology and psychopathology. They recently demonstrated that adverse maternal care in nonhuman primate yields long lasting changes in emotional reactivity, social and cognitive deficits, and stress hormones dysregulation. These behavioral alterations were associated with altered functional connectivity of prefrontal and amygdala regions reminiscent of the neurobehavioral impact reported in children exposed to early life stress.

Excluded by Requester ehavioral development and his colleagues have followed and characterized the ehavioral development of infant monkeys living without a functional amygdala since birth. Although neonatal amygdala damage led to social changes that were at best mild and transitory, the same damage resulted in profound changes in emotional and stress neuroendocrine reactivity, including increased activity of brain CRF systems and hypothalamic-pituitary-adrenal axis when the monkeys reach early adolescence. Data from such longitudinal studies are clinically relevant since persistent and elevated cortisol secretion maintained until adulthood can have broad-ranging physiological consequences detrimental to the health of individuals. They provide critical information on how early amygdala dysfunction could impact human physical and mental health.

Division of Microbiology and Immunology

Excluded by Requester DS and his colleagues have made significant progress in their studies of HIV enesis, prevention, and therapy using the non-human primate model of SIV infection in macaques and mangabeys. In recent studies Excluded by Requester co-workers successfully conducted the first autologous hematopoietic stem cell transplant in SIV-infected macaques treated with antiretroviral therapy, thus opening the way for further use the transplant model to "cure" SIV infection Yerkes Division of Excluded by Requester Microbiology and Immunology) was a key contributor to a study showing how type I interferons protect fr virus transmission and pathogenesis in the SIV macaque model. This study provides evidence supporting the clinical use of interferons—in conjunction with standard antiretroviral therapy—to prevent and/or treat HIV infection and AIDS.

Division of Neuropharmacology and Neurologic Disease:

Monkey Model of Huntington's Disease Excluded by and his team have performed longitudinal assessment of a group of transgenic Huntington's disease monkeys that were created here at the center. This is the first long term (from infancy to adulthood) longitudinal study on the first transgenic monkey model of human inherited neurodegenerative disease that encompassed prodromal and symptomatic stage of the disease. His teams employed clinical assessment methods similar to those used in human patients including magnetic resonance imaging (MRI), cognitive behavioral assessment, gene and small RNA expression profiling studies and metabolomics studies, etc. HD monkeys develop a disease progression pattern similar to those observed in human patients, which include progressive regional brain atrophy, cognitive decline, motor impairment and dysregulated gene, small RNA and metabolite profile. With the successful production of second generation HD monkeys, HD monkeys hold great promise as a preclinical animal model for the development of novel therapeutics. His team is currently developing a "Transgenic Huntington's Disease Monkey Resource (THDMR)" to facilitate the preclinical application of the HD monkey model through the support of the ORIP.

Pathology of Parkinson's Disease Excluded by Requester and his colleagues made significant advances in our understanding of the pathology of non-dopaminergic systems in Parkinson's disease (PD). Using the MPTP-treated nonhuman primate model of PD, they demonstrated that a specific subset of thalamic neurons that play a critical role in attention and other cognitive functions undergo severe degeneration in parkinsonian monkeys. These findings are highly significant because they demonstrate that the MPTP-treated monkey model of PD displays pathologic features that more closely resemble those described in postmortem human PD brains than any other toxin- or genetic-based models of PD. These observations set the stage for future studies aimed at assessing the potential role of thalamic degeneration in the development of early cognitive impairments in PD.

Nonhuman Primate Brain Connectivity: [Excluded by Requester] and colleagues have collaborated with members of the NIH-supported Human Connectome Project (HCP) consortium at Washington University to import and process MR images from nonhuman primates so that they can be viewed and analyzed using the HCP Workbench. The Workbench is a desktop app that allows users to upload structural and functional imaging data from hundreds of individual humans, each registered to a common space. The Workbench allows users to represent the cortex in various states of inflation, from fully folded to fully flattened, and provides tools for drawing regions of interest and carrying our surface-based analyses of structural and functional connectivity, with respect to cortical myeloarchitecture (derived directly from individuals' T1 and T2 scans). The human database is being expanded to include individual genetic and behavioral phenotypic data for correlation with variations in cortical structure and connectivity. NIH is supporting the widespread adoption of HCP imaging protocols (PAR-14-281), and the HCP Workbench is well on its way to becoming the standard platform for the analysis of human imaging data. Our goal is to make available information about brain structure and connectivity for nonhuman primates within the HCP framework. To this end, we have processed 39 chimpanzees and 18 macaques, each with T1, T2, and DTI scans, and constructed brain templates for each species, along with species-specific myeloarchitectonic maps derived from T1 and T2, and have begun a number of projects comparing the connectivity of specific cortical areas between humans, chimpanzees, and macaques. As more nonhuman primate scans are collected, they can be processed through the HCP pipeline, added to the databases, and analyzed using Workbench software. The potential exists for adding genetic, behavioral, and other phenotypic data, just as with the human datasets. Thus, we are creating a research infrastructure that will greatly facilitate comparison of brain organization between humans and nonhuman primates.

Division of Pathology:

Babesiosis [Excluded by Requester] and his colleagues have made a significant progress in their studies understanding *Babesia microti* infection using a rhesus macaque model. The main focus of their work is to study acute *B. microti* infection transmission kinetics relevant to transfusion medicine, and to define the window period between the first detection of parasitemia and the first detectable antibody response. They observed variability in dynamics of parasite virulence between hamster adapted and monkey adapted *B. microti* strains. In addition, a phenomenon of recrudescence or persistent infection was seen with *B. microti* infection, and a low dose of only 50 organisms was able to transmit *Babesia* infection. The findings in this study show the possible vulnerability in the United States blood supply considering that the blood volumes associated with transfusion are relatively large and the donor units with even very low numbers of *B. microti* could potentially represent a risk for transfusion transmission.

Subclinical hypertrophic cardiomyopathy in rhesus macaques [Excluded by Requester] and colleagues are comparing rhesus macaques with subclinical hypertrophic cardiomyopathy (HCM) with unaffected rhesus macaques. Mutation of sarcomeric genes is the most frequent cause of hypertrophic cardiomyopathy and has been associated with approximately 50% of human HCM cases. The main focus of this work is to study the expression of two sarcomeric genes, MYH7 and MYPBC3, in hearts of affected rhesus macaques and determine any mutations. In addition, the level of cardiac biomarker B-type natriuretic peptide (BNP) in the serum samples of affected monkeys will be compared with those of unaffected macaques. BNP is a neurohormone secreted mainly in the cardiac ventricles in response to volume expansion and pressure overload. Any changes of this peptide in the affected rhesus will confirm a correlation between subclinical HCM phenotype and ventricular function.

Division of Transplant Medicine:

[Excluded by Requester] continue their work focusing on strategies to improve organ transplant [Excluded by Requester] studies have centered around the development of novel therapeutics to prevent rejection, cally novel domain antibodies which target key pathways critical for T cell activation. In addition his group has recently completed pilot studies to develop a model of kidney xenotransplantation. This work was recently accepted for publication and details the longest survival reported to date in a pig-to-nonhuman primate [Excluded by Requester] transplant model. [Excluded by Requester] group has made significant progress in their challenging pre- ted transplant model. Recent publications have focused on the BAFF/APRIL pathway and antibody mediated rejection.

Veterinary Medicine:

Excluded by Requester (Yerkes Division of Animal Resources) and her group have focused on the prevalence, risk diagnostics and pathology associated with Diabetes Mellitus in the sooty mangabey colony. The association of diabetes and other factors such as the SIV status of an animal and birth control techniques were ruled out as contributing factors to clinical disease in this colony. The presence of pancreatic insular amyloidosis was identified as the pathology associated with diabetes in the mangabeys. In addition, Excluded by Requester was awarded a grant to investigate the cost-saving potential and clinical application of automated feeders compared to the traditional bin feeding system in group housed monkeys. One of the primary outcomes of this study is to determine whether the use of automated feeders and computer-controlled calorie restriction is a feasible method to reduce obesity and improve the metabolic health of overweight adult female macaques without inducing food competition and other adverse behaviors in a social setting.

3. Administrative Highlights

ADMINISTRATIVE INFORMATION

Scientific Advisory Committee: The Scientific Advisory Committee (SAC) comprised of the Center Director, Division Chiefs, Yerkes CFO, the Chief of Public Affairs, and staff scientists reviews all scientific proposals from non-Yerkes/Emory investigators for scientific merit and availability of resources, prior to review by the RAAC and initiation of any project using nonhuman primates at the Yerkes Center. A Study Intent Questionnaire (SIQ) is completed and submitted, via the Yerkes website, to the SAC facilitator who then forwards the SIQ to the appropriate Yerkes Division Chief/PI for further review. If the project is deemed feasible, the Yerkes Division Chief/PI will contact the investigator requesting completion of a Research Intent Proposal (RIP) that will be entered into the SAC database and reviewed by the SAC to determine whether Yerkes has the resources to support the proposed study. Yerkes/Emory investigators are not required to submit a SIQ, but must submit a RIP at the time they route a grant to Yerkes Business & Finance Office for review. RIP's submitted by Yerkes/Emory investigators are not reviewed by the committee but are recorded in the SAC database used for tracking resource allocation. This committee meets monthly in order to review requests in a timely manner.

Resource Allocation Advisory Committee: The Resource Allocation Advisory Committee (RAAC), prior to initiation of any IACUC protocol, must review all projects, both internal and external, requiring Center resources. This committee meets monthly to review and make recommendations regarding research applications requiring animal and other Center resources. This committee also tracks resource commitments and actions needed to meet these requirements in instances where resource limitations (e.g. animals or space) preclude immediate availability. A new subcommittee of RAAC was created to focus on individual animal assignments in order to improve the efficiency of the assignment process. An electronic RAAC program designed by Yerkes IT was implemented by this Committee. This program facilitates electronic submission and tracking of RAAC applications along with an innovative program for identifying animals for assignments.

Animal Resources Management: The Center has developed a new team for Animal Resources Management at the Main Station. This group meets monthly and includes members from Veterinary Staff, Animal Care, Behavioral Management, Research Resources, EHSO, Animal Records, Training and Facilities Management. The group reviews new and ongoing projects that affect animal resources such as animal acquisitions and shipments, quarantine, regulatory issues, new research protocols and facility maintenance and construction needs that affect animal housing areas. The goal of this group is to increase communication amongst all units of Division of Animal Resources and Facilities at the Main Station.

Colony Management: The Center has a Colony Director, a Colony Resources Manager and a team that oversees the animal colonies at the Field Station. This team balances colony production needs with research needs and resource availability. The Colony Management team works closely with the Assistant Director of

Animal Resources at the Field Station, Associate Veterinarians and others at the Field Station.

A Colony Management Committee meets bimonthly to review progress and concerns, and plans for anticipated future research and colony maintenance requirements. The colony management group consists of representatives from colony management, veterinary medicine, research staff and animal care. Five members of the Colony Management team participate in the ORIP sponsored NPRC Breeding Colony Management Consortium, which includes representatives from all seven NPRC's. The Consortium hosts monthly teleconferences and meets annually, with the goal of facilitating communication and efficiencies of colony management between the NPRC's.

Regulatory Compliance: The Emory University Institutional Animal Care and Use Committee (IACUC) must approve all research involving animals at Yerkes. The Committee is charged with ensuring proper care, use, and humane treatment of animals used in research, testing and education.
Animals are not assigned to any research project until IACUC approval is received. The Emory IACUC is composed of 37 voting members (27 full and 10 alternate) and 20 nonvoting members divided into two Committees. Each Committee meets twice monthly both individually and as a combined group to evaluate all University research proposals that involve the use of laboratory animals. The proposals are provided to all IACUC members prior to the scheduled committee meeting. Each proposal receives a veterinary consult prior to review, then is presented by a primary and secondary reviewer at the meeting and then discussed by committee members and voted on at the meeting. The proposal may be approved, approved with stipulations, disapproved, or deferred for clarification or modifications. All research protocols receive a thorough review, regardless of whether they were submitted to an outside funding agency or are being internally funded. The latter type of proposal is also reviewed for scientific merit. Committee members are not present for review of proposals with which they are involved.

In addition to the approval of research applications involving animals, the Committee also inspects all research and animal facilities semi-annually and compiles reports and recommendations from these inspections. We have 17 members from Yerkes who serve on the IACUC.

Accreditation: The Yerkes NPRC is fully accredited by AAALAC, with the previous site visit having been in February 2014 and letter of accreditation received in July 2014.

COMMITTEE REPORTS

The Center Director consults with and receives recommendations from a number of key committees in framing decisions regarding day-to-day operations of the Center as well as long-term planning.

Administrative Committee. Focus: Center administration functions, operations, facilities. Membership: Heads of all administrative units. Occurrence: Quarterly.

Animal Resource Management Committee. Focus: Oversight of colony and facility resources for Main Center animals. Coordinates animal-related center activities among all Animal Resources units. Membership: Associate Director for Animal Resources and representatives from Animal Care, Animal Records, Behavioral Management, Environmental Health and Safety, Facilities, Research Services and Veterinary Medicine units.

Chimpanzee Oversight Committee. Focus: Day-to-day management issues and to coordinate approaches to long-term planning for our chimpanzee colony. Membership: representatives from Animal Care, Behavioral Management, Facilities and Veterinary Medicine units and chimpanzee research groups. Occurrence: Monthly.

Colony Management Committee. Focus: Colony management for all nonhuman primates, including SPF and non-SPF colonies. Membership: Associate Director for Animal Resources, Assistant Director for

Animal Resources, principal investigators and representatives from Animal Care, Colony Management, Facilities Management, Research Services, Veterinary Medicine and the Center's Nonhuman Primate Genomics Core. Occurrence: Bi-weekly.

Division Chiefs Committee. Focus: Scientific division business. Membership: Scientific Division Chiefs, Associate Director for Animal Resources and CFO. Occurrence: Bi-monthly.

Emergency Preparedness Committee. Focus: Review policies and plans and implement additional measures in relation to keeping animals secure and employees safe. Membership: Representatives from administrative and scientific units, including Public Affairs, Animal Care, Veterinary Medicine and Environmental Health and Safety. Occurrence: As needed.

Environmental Health and Safety Committee. Focus: Employee health and safety. Membership: Director and staff of the Environmental Health and Safety Office, representatives from administrative and scientific units. Occurrence: Quarterly or as necessary.

Executive Committee. Focus: Meets with the Director to consult on Center operations. Membership: CFO, Associate Director for Scientific Programs, Associate Director for Animal Resources and Associate Director of Pathology. Occurrence: Weekly.

Mangabey Committee. Focus: Oversight of managbey colony resources, including population management evaluation, resource requirements and scientific resource management. Membership: Associate Director for Animal Resources and representatives from the Colony Management, Genetics, Scientific and Veterinary Medicine units.

National Scientific Advisory Board (NSAB). Focus: Advisory board to the Center Director with regard to strategic planning, program activities, scientific growth of the Center and administrative organization and management. Membership: see below. Occurrence: Annually on site. Also by conference calls as necessary. The list of members is as follows:

Cognition/Aging
Excluded by Requester PhD
Professor & Chair, Department of Anatomy & Neurobiology
Boston University School of Medicine

Comparative Medicine and Veterinary Resources
Excluded by Requester DVM, DACLAM
Doctor R. Lee Clark Professor and Chair
Department of Veterinary Sciences
Director, Michale E. Keeling Center for Comparative Medicine and Research
University of Texas MD Anderson Cancer Center

Genetics
Excluded by Requester PhD
Associate Professor, Department of Molecular and Human Genetics and
Human Genome Sequencing Center
Baylor College of Medicine

Imaging
Excluded by Requester PhD
Professor of Physiology & Pharmacology and Radiology
Wake Forest University School of Medicine

Immunology, Virology and Infectious Diseases

Excluded by Requester MD
Director, AIDS and Cancer Virus Program
SAIC-Frederick, Inc.
Frederick National Laboratory

Neuroscience
Excluded by Requester PhD
Professor of Psychology and Psychiatry & Biobehavioral Sciences
Associate Director for Research of the Brain Research Institute
UCLA

Excluded by Requester PhD
Dean of Basic Sciences and the Graduate School of Biomedical Sciences
Professor, Department of Neuroscience, Box 1639
Icahn School of Medicine at Mount Sinai

Resource Allocation Advisory Committee. Focus: Reviews and recommends allocation of nonhuman primate resources and Center resources for research programs. Membership: Representatives from Administrative, Colony Management, Scientific and Veterinary Medicine units. Occurrence: Monthly.

Scientific Advisory Committee. Focus: Review of requests to initiate or renew scientific projects. Membership: Scientific Division Chiefs, representatives from administrative units, including Finance/Research Administration and Public Affairs. Occurrence: Monthly or as necessary.

Space Committee. Focus: Recommendations of space allocation to the Director. Membership: Representatives from Administrative and Scientific units. Occurrence: Monthly or as necessary.

Standard Operating Procedures Committee. Focus: Establishes, reviews and updates all Center SOPs. Membership: Representatives from Animal Resources and Environmental Health and Safety units. Occurrence: Quarterly or as necessary.

Yerkes Research Technology Advisory Committee. Focus: Develop, review and recommend Information Technology (IT) programs to the Director of IT in consultation with the Center's Executive Committee. Membership: Representatives from Administrative and Scientific units. Occurrence: Bi-monthly.

TRAINING

Scientific

The Center is actively involved in training and continuing education activities. Students and Postdoctoral Fellows are an integral part of the scientific fabric of Yerkes and participate in all elements of the research mission. In the last year, 111 undergraduate and 75 graduate students received training and experience in Yerkes laboratories. During this same period, the Center employed 50 Postdoctoral Fellows. Yerkes currently is the focal point for a substantial portion of the Neuroscience Graduate Program at Emory. The Director of the NIH training grant that supports students in the Graduate Neuroscience Program and many members of the Neuroscience Program Executive committee, all reside at Yerkes. Additionally, almost 30% of graduate students in the Neuroscience and Immunology programs are carrying out their dissertation research in Yerkes laboratories, including several MD/PhD students. Essentially all of our Divisions have NRSA or NSF-supported students and we have worked with each Division in facilitating the process for trainees' applications to NIH/NSF or private foundations for financial support. We have two institutional training grants, developed and administered at Yerkes: the NIGMS Training in Systems and Integrative Biology-Neuroscience and the NIH BP/ENDURE training grant that supports under-represented minority undergraduate students in Neuroscience. The Yerkes Center is also the administrator of the NIH-funded UDALL Center of Excellence for Parkinson's

disease at Emory University and the home for three of the core scientists participating in this Center. In addition to research activities, the Parkinson's Disease Center is very active in education and community outreach for trainees and the general public. It also provides pilot grants to young investigators interested in developing new areas of research for Parkinson's disease.

The Division of Animal Resources (DAR) at Yerkes and at Emory's School of Medicine (SOM) continue their joint effort in supporting the Emory Laboratory Animal Medicine Residency Training Program. Since 2009, one of Yerkes veterinary faculty members is the Training Program Assistant Director. In addition, Yerkes veterinarians have taken responsibility as course directors for classes within the Residency Training program. Yerkes also supports two residency positions per year. Our goal is to train and retain laboratory animal veterinarians who will grow with Yerkes, and help develop programs of research around their own specialties. All veterinary faculty continue to be actively involved in the Emory Laboratory Animal Medicine Program and remain closely partnered with the Division of Animal Resources at the School of Medicine. In 2007, an NCRR R25 training grant enabled Yerkes to include an additional third year of specialized NHP training for three residents (one each year – funding to support years two and three of the training). In 2009, an administrative supplement to the R25 provided support for a fourth resident to enter the program. The three-year YNPRC NHP Residency Program builds upon our successful Emory/YNPRC two-year program and provides extensive nonhuman primate clinical and resource management experience for the residents. We have successfully recruited four trainees, all of them having completed the program between June 2009, and June 2011. In addition, all have obtained their ACLAM Board Certification, the gold standard to measure success of a Laboratory Medicine Training program. One of those trainees is now a full time veterinarian at Yerkes. In light of the success of this specialized Training Program, YNPRC decided to continue to support a third year Fellowship in Nonhuman Primate Medicine and Management. We have already recruited four trainees for the Fellowship Program. The first one completed her training in June 2013 and obtained her ACLAM Board certification in July 2013. She is now a full time clinical veterinarian at Yerkes. The second trainee finished her fellowship training in July 2014 and will take her ACLAM Board exam in June 2015. The third fellow is expected to complete his training and sit for his Board exam in June 2015. The remaining fellows will start the program respectively in July 2015 and 2016.

YNPRC has continued to provide opportunities for veterinary internships and externships. These opportunities introduce veterinary students to the field of lab animal medicine and have sometimes led to students applying for lab animal residency positions as offered by the School of Medicine/YNPRC. Two of our current residents have been through our externship program. In 2014, eight externs and one intern came to Yerkes for a period of time which can vary between three to ten weeks. Students from veterinary technical schools also have participated in externships and have sometimes been motivated to apply for available technical positions at Yerkes where they could put to good use their newfound knowledge of nonhuman primates. We did hire one of the veterinary technician externs in 2014. The various students work closely with veterinary faculty, residents and technicians to gain a working knowledge and appreciation of the specialty of nonhuman primate medicine.

The Yerkes Center is closely linked with several components of the Emory University Clinical Translational Science Award (CTSA); (here called the Atlanta Clinical and Translational Science Institute – ACTSI – which includes Morehouse School of Medicine and the Georgia Institute of Technology). The key functional areas of the ACTSI that the Yerkes Center is involved with include brain imaging and education.

Yerkes has collaborated with the Institute on Neuroscience (ION) at Georgia State University to continue to enable high school students and middle and high school teachers to participate in scientific research. Success with this program has led to a five-year NIH grant to continue the ION program.
In addition, the Center regularly hosts scientific seminars and sponsors frequent talks (Lunch and Learn, Frontiers in Neuroscience) by faculty for the staff to promote understanding of the scientific mission.

Employee Training

As noted in the Core Service Units section, prior to beginning employment, all personnel are given a packet

that provides information on the Yerkes Center, general information on primate research, the nonhuman primate behavioral management program, laboratory animal zoonoses information, personnel policies, Center security information, standards and procedures for working safely at the Center, training information, and biosafety issues (e.g., B-virus information). Supervisors are responsible for training employees in procedures that specifically relate to their areas of responsibility. Individuals with practical experience are appointed to train new employees/students within their units. All new employees (investigators, animal care personnel, research technicians, etc.) and students/volunteers receive an approximately 1 hour orientation that includes a slideshow related to organization of the Yerkes Center, procedures for handling incidents and potential exposures, and general guidelines for working safely in laboratory and animal research settings. All new employees complete training on Emory's Blackboard site, including a "Yerkes Orientation" module in addition to other modules as are relevant to the employee's job responsibilities. All personnel who will have animal contact are required to complete Animal User Orientations that cover nonhuman primate and/or rodent biology, U.S. regulations and guidelines for laboratory animals, IACUC policies, identifying and reporting sick animals and reporting animal welfare concerns. Animal Research personnel are required to complete applicable AALAS Learning Library online training modules and be added to an existing IACUC protocol prior to working with animals. A hands-on instructional tour of the nonhuman primate and/or rodent research facility is required for research personnel to gain access to these areas. General information memoranda are circulated providing any new information or reminding personnel of existing standards when necessary.

Training classes are provided as part of Yerkes continuing education efforts. These classes are based on the American Association for Laboratory Animal Science certification program. Although all Animal Care Technicians are encouraged to work toward certification by AALAS, the AALAS certification examination is not mandatory. Regular staff meetings are conducted at which time there is generally a review of some aspects of husbandry and care that relate to certification. Manuals for the Assistant Laboratory Animal Technician, Laboratory Animal Technician and the Laboratory Animal Technologist are made available to Yerkes technicians without charge for use in the in-house training program or for self-study. Additionally, the Emory University IACUC Office subscribes to the AALAS Learning Library for online, individualized training. The Yerkes Center pays the fee for the certification examination at each level. A salary increase is provided to individuals who achieve certification. Thirty percent of the Main Station animal care unit and 40.4% of the Field Station animal care unit are AALAS certified at some level. Opportunities for additional training are also available when Animal Care Technicians attend National AALAS, SEAALAS and AALAS District IV meetings in 2015. Supervisors and Managers have been attending Webinars sponsored by NABR, OLAW, USDA and AAALAC. Additionally Continuing Education sessions are available for Veterinary Technicians through the Gwinnett Veterinary Medical Association monthly meetings as well as a series of lectures (scheduled 6-8 times a year) organized by the School of Medicine's DAR.

The Training Coordinator for the Yerkes Division of Animal Resources coordinates the training requirements for personnel who work with research animals. After completing the Animal User Orientations, trainings offered to animal users at Yerkes include 1) aseptic surgery technique (mandatory for anyone conducting surgery); 2) rodent biomethodology including restraint, blood collection techniques and injection procedures; 3) humane rodent euthanasia methods; 4) weaning training (a review of the IACUC weaning policy for mice and rats; 5) restraint training (a 2-part series on preparing nonhuman primate for studies involving physical restraint, specifically chair restraint; 6) behavioral management of nonhuman primates; and 7) an annual facility refresher for all research staff working with animals. Instructional manuals for identifying sick rodents are developed and distributed to animal research and animal care personnel. The Training Coordinator is a member of the IACUC Subcommittee on Training and Continuing Education, which develops the policy on rate, frequency and types of training and continuing education requirements for animal users at Emory University and Yerkes.

In addition to the initial orientation which includes information on zoonoses (including B-Virus), biosafety, personal protective equipment, and Center policies on safety, the Yerkes Environmental Health and Safety Officer conducts and/or facilitates annual training programs for all personnel. These annual training programs include but are not limited to: (1) B-virus training for all staff who work with nonhuman primates or nonhuman primate blood or tissues; (2) annual updates on the use of personal protective equipment to include a review of

current requirements, demonstration on how to use PPE, and information on the storage, limitations of and decontamination and disposal of PPE; (3) information on hazards communications and the chemical hygiene plan, including how to work with hazardous chemicals, how to respond to a spill, labeling and storage requirements, disposal procedures and Safety Data Sheets (SDS); (4) biosafety reviews which include a review of biosafety level 1-4, blood borne pathogens standards, biological safety cabinets, emergency procedures, disposal practices, and a review of zoonoses; (5) radiation safety which includes discussion of the characteristics of radiation, safe use and storage, disposal, and employee monitoring; (6) ergonomics training for employees in animal care, research, or any other position that involves strenuous or repetitive physical activity; and (7) fire safety training which includes fire prevention strategies, evacuation plans, emergency procedures, and training for the use of fire extinguishers; and (8) respirator program which includes annual fit testing, training, and medical surveillance.

Patents, Licenses

Patents: 3
Licenses: 3

AWARDS, HONORS, SPECIAL RECOGNITION

Excluded by Requester

Staff member, Research Services
Yerkes National Primate Research Center, Emory University, Atlanta, GA
Emory University
Won second place for his presentation at the Southeastern American Association for Laboratory Animal Science (SEAALAS) meeting.
SEAALAS is the Southeastern branch of the American Association of Laboratory Animal Science (AALAS). AALAS is a membership association of professionals employed around the world in academia, government and private industry who are dedicated to the humane care and treatment of laboratory animals, as well as the quality research that leads to scientific gains that benefit people and animals.

Excluded by Requester

Staff member, Colony Management
Yerkes National Primate Research Center, Emory University, Atlanta, GA
Emory University
Won first place for her presentation at the Southeastern American Association for Laboratory Animal Science (SEAALAS) meeting
SEAALAS is the Southeastern branch of the American Association of Laboratory Animal Science (AALAS). AALAS is a membership association of professionals employed around the world in academia, government and private industry who are dedicated to the humane care and treatment of laboratory animals, as well as the quality research that leads to scientific gains that benefit people and animals.

Excluded by Requester MD, PhD

Researcher
Yerkes National Primate Research Center, Emory University, Atlanta, GA
Emory University
Awarded the 2014 Emory Dean's Distinguished Faculty Lecture Award
This is the highest faculty honor in the Emory School of Medicine and is accorded to the faculty member who has made outstanding contributions and whose career represents the highest professional standards.

Excluded by Requester PhD

Researcher
Yerkes National Primate Research Center, Emory University, Atlanta, GA

Emory University
Elected a member of the Dystonia Medical Research Foundation Advisory Board
The Dystonia Medical Research Foundation works to advance research for more treatments and ultimately a cure, to promote awareness and education, and to support the needs and well being of affected individuals and families.

Excluded by Requester PhD
Researcher
Yerkes National Primate Research Center, Emory University, Atlanta, GA
Emory University
Received the MetLife Foundation/American Federation for Aging Research Award for Medical Research in Alzheimer's Disease
Excluded by Requester and his Germany-based colleague Excluded by Requester were recognized for pioneering a unifying principle for the onset and evolution of late-life brain disorders, such as Alzheimer's and Parkinson's diseases, based on similarities with rare, fatal disorders known as prion diseases.

INFRASTRUCTURE

Main Station 2014
Installation and repair of epoxy and MMA flooring throughout the facility: Neuroscience Building rooms
Specific Animal Location
Specific Animal Location

Carpet and VCT tile was installed in various areas throughout the facility.

Interior rooms and exterior buildings throughout the facility were painted.

Electrical upgrades and additions occurred throughout the facility. Light fixtures in several animal housing facilities were replaced with more efficient, water proof fixtures.

A chemical fume hood and exhaust duct were installed in lab 1122.

Four replacement actuators were installed on the cooling tower serving the Vaccine Research Addition.

Air Handler #2 serving the Main Building was replaced. Digital controls were upgraded as part of the replacement project.

Retaining walls constructed of railroad ties were replaced with 6"x6"x8' pressure treated timbers.

A new Ford E350, 15-passenger shuttle bus was purchased.

Room 1109 Main Building was renovated. Renovation converted one large office into two private offices.

Field Station 2014
Installation and repair of epoxy and MMA flooring throughout the facility
Specific Animal Location
Specific Animal Location

Interior rooms, compound walls and exterior of buildings throughout the facility were painted.

Electrical upgrades and additions occurred throughout the facility. Light fixtures in several animal housing facilities were replaced with more efficient, water proof fixtures.

Landscaping of grounds.

Facility Security

The roof of G-2 Test facility was replaced.

Specific Animal Location

compound was modified to enhance drainage and prevent standing water. Modifications included and installation of perforated drainpipe.

Specific Animal Location

door caging was added at compound to house up to 100 primates. The project included heating and ventilation equipment, an emergency generator, environmental monitoring system and a sewage lift station

PROGRESS IN CORE SERVICE UNITS

Division of Animal Resources

The Division of Animal Resources consists of the units of Veterinary Medicine, Animal Care: Main Station, Animal Care: Field Station, Colony Management, Behavioral Management, Research Services, Environmental Health and Safety, and Animal Records. Through these units, the Division is responsible for the husbandry, clinical care, research support, behavioral management, animal record maintenance, and experimental interventions for the diverse nonhuman primate (NHP) population and two Rodent Research Facilities at the YNPRC. Division activities are at the Main Station, which is located on the Emory University campus, and at the Field Station, which is located 30 miles northeast of the Main Station. The Center primate breeding colonies are maintained at the Field Station, including specific pathogen free (SPF) research and production colonies. Oversight is also provided for the NHP research colonies, the Comparative AIDS Core, and the chimpanzee colony.

Division faculty participate in teaching a number of nonhuman primate, laboratory animal medicine, and behavioral management courses at Emory University, and provide mentorship to graduate and technical students enrolled in various programs. Faculty members actively contribute to the Center's experimental and clinical research activities both in supportive and lead roles.

There is a strong emphasis on training, both on-the-job and more formal training, including veterinary residency (detailed below), internship and externship training programs and formal continuing education classes for veterinary technicians in conjunction with Division of Animal Resources at Emory University. AALAS certification classes, primate behavior classes, and continuing education classes are offered at both the Main Station and the Field Station, as are management training courses for personnel in all units. These outlets, plus various staff meetings and training sessions, contribute to better communication and improve safety and animal care procedures within the Division.

The Division of Animal Resources has a position for an animal training coordinator. This individual developed a new centralized training program focused on animal related procedures that is provided for all new staff working with animals. This training captures both investigative staff as well as animal resource staff to ensure uniform distribution of essential information. The training coordinator also oversees specific training sessions on both rodent and NHP topics.

Yerkes Animal Resources hosts a monthly Comparative Medicine Seminar series in collaboration with the School of Medicine's Division of Animal Resources (DAR). The seminar series is devoted to discussion of topics pertinent to laboratory animal medicine and is attended by representatives from other institutions such

as the CDC, VA Hospital, UGA, Zoo Atlanta, and other local universities. Continuing education credit is given for this series.
The Division, along with DAR, administers the Emory University Laboratory Animal Medicine Residency Program for veterinarians. This two-year ACLAM accredited program provides training for graduate veterinarians in laboratory animal medicine with the option of a third year dedicated to specialized primate training. Two residents are recruited each year; spending one year in the Division of Animal Resources at the School of Medicine and one or two years at Yerkes. The residents participate in formal coursework, a research project, clinical medicine, colony management, IACUC activities, surgery, imaging, behavioral management, facility management and pathology rotations. Yerkes has been a recipient of NIH support (R-25 together with an administrative supplement, concluded in 2012) to support a total of four residents to participate in an extended three-year residency focusing on primate health, care, and management. Since the expiration of that grant support, Yerkes continues to support a third year fellowship for one resident (of the two per year) who is specifically interested in primate studies.

The Yerkes NPRC is fully accredited by AAALAC, with the most recent site visit having been in February 2014, and letter of accreditation received in July 2014.

- Veterinary Medicine
  The Veterinary Medicine Unit provides clinical veterinary support for nonhuman primates and rodents housed at the Yerkes Center 24 hours per day 7 days per week. The clinical faculty is called upon to provide a wide range of clinical expertise to cover the diverse needs of the research and breeding colonies. In addition, the veterinary faculty provides research support to selected protocols by providing training as well as information to investigators about medical, surgical, and diagnostic procedures used in the research environment. Research support also consists of protocol review and consultation, sample collection, and maintenance of research and clinical data. Six of the twelve Yerkes veterinarians are Emory IACUC members (full or alternate) and participate in various IACUC and Emory committees. Two of the veterinarians devote 50-60% of their time to research in imaging and neurobiology and development. The Unit of Veterinary Medicine also supports surgical services, providing for and developing sophisticated surgical procedures used in clinical and research settings. Veterinarians are responsible for all nonhuman primate postoperative care. Particular emphasis has been on the veterinary support for the transplant and continuously growing infectious disease research programs. The radiology section provides plain and contrast radiographic studies along with ultrasound and echocardiography as necessary for many research and clinical applications. Digital radiology is in place at both the Main Station and the Field Station. Anesthetic support is provided for multiple imaging studies using CT, MRI, and PET techniques. In collaboration with investigators, the Yerkes veterinarians provide information and expertise for development of new animal models as well as the refinement of existing models.
  The preventive medicine program is administered through the Veterinary Unit, which includes the quarantine program for newly acquired animals and routine surveys of all NHPs. Routine surveys for the chimpanzee colony include tuberculin testing, physical examinations and vaccine administration. Additionally, blood is collected for serum chemistries, hematology, and for hepatitis serology. Routine surveys for other NHP species also include physical examinations, tuberculin testing and anthelmentic administration as well as the collection of blood specimens to characterize the colony in tissue typing and paternity. The sentinel and quarantine programs in the rodent research facilities are likewise overseen by Veterinary Medicine, and include full necropsy and histopathology evaluation, as well as parasitology testing and blood collections for serology every four months.

- Colony Management – Field Station
  The mission of the Colony Management Unit, based at the Yerkes Field Station, is to oversee the nonhuman primate colonies in order to meet the Yerkes Center management, production and scientific needs. These responsibilities include the implementation of a colony management plan that matches resources with projected colony and research needs, ongoing genetic characterization/pedigree analysis, development and implementation of breeding plans, acquisition and disposition of animals and animal housing allocation. The Colony Management unit is charged with working closely with the

Veterinary Unit, Animal Care, Research Services and the investigators to provide defined experimental animals and biological samples.

The Colony Management unit participates in annual health surveys and quarantine procedures, reporting and tracking births, animal accessibility training, sample collection for genetic testing, viral screening and for research protocols, contraception and immunization administration, tattooing and microchip insertion and the development of housing allocation plans to meet breeding and research needs. The group oversees the Specific Pathogen Free (SPF) rhesus breeding program. Colony management personnel are responsible for observation and charting of the complex social dynamics that exist within each social group, through opportunistic and formal observations of behavioral interactions within the social setting and recording and plotting these data to obtain hierarchical order. This information is essential to help maintain social group stability, the formation of new groups and the introduction of animals, including breeding age males

The Colony Management Unit has completed the transitioning of the rhesus breeding colonies at the FS to full SPF status, with all breeding compounds being composed of SPF rhesus (except one compound dedicated to the SIV negative sooty mangabey colony). A total of 149 SPF rhesus macaques have been acquired from New England Primate Research Center. These animals were acquired for immediate research assignments or to develop a new breeding colony at Yerkes.

Paternity analysis has been performed for the rhesus and sooty mangabey populations, which in turn has allowed for the creation of multigenerational pedigrees for each population. In the rhesus population, expressed allele haplotyping in currently underway for all subjects in the colony in collaboration with Excluded by Requester at the Wisconsin NPRC. In addition a SNP based assay to determine ancestry has been performed to determine if breeding animals are in fact Indian origin rhesus macaques. Our analysis identified a small number of subjects that were estimated to be between 15% and 25% Chinese hybrids. These subjects and their offspring have subsequently been removed from the breeding population. Finally, microsatellite based haplotype analysis of the MHC region has been completed within the sooty mangabey colony. Together these data help investigators better understand how variants influence transplantation success, vaccine development, and disease progression.

In 2014, Colony Management added two key personnel: Colony Director and Breeding Colony Coordinator. Excluded by Requester Ph.D. is responsible for developing a resource based research program utilizing the data collected in the Colony Management Unit. Excluded by Requester MA facilitates identification of suitable candidates for animal research assignments and provides support to the colony management department at Yerkes.

- Primate Care and Housing – Main Station

The Animal Care Unit at the Yerkes Main Station provides for the routine daily husbandry for research and colony animals located on the Emory Campus. The census of nonhuman primates maintained at the Main Station is approximately 1100, representing 6 different species including chimpanzees. Currently, the YNPRC has 102 animal holding rooms in 14 buildings. Each room has a holding capacity of 4-6 animal racks of four cages apiece. All of these buildings have the capability for social housing, depending on study assignment and clinical status of the animal. Space for a NHP nursery is available as needed. A new animal facility (DFF) completed construction in 2013 that contains both a BSL 3 animal facility and designated animal housing and support for transplant medicine research. The transplant portion of the building is currently operational, while the BSL3 is not yet occupied.

Specific Animal Location

Chimpanzees are housed in the [redacted] comprised of indoor/outdoor enclosures and one play area. The center has been reorganizing social groups of chimpanzees in order to relocate animals, create larger social groups and increase the number of chimpanzees living in compounds at the Field Station. The Main Station has two Vivaria, details of which are provided in the Rodent Care and Housing section of this report.

The Animal Care staff work closely with both the Veterinary and Behavior Management units. General husbandry procedures include routine observations and the reporting of any abnormal clinical signs or activity of the animals to the appropriate veterinary medical staff and to a supervisor. A standard workday consists of first verifying the health and well-being of all animals; ensuring that they have water and a cleaned environment prior to feeding. Enrichment takes place in the afternoon, and Animal Care technicians also have the responsibility of cleaning and re-stocking enrichment devices, as well as checking watering devices and a second feeding. Water is available to all animals ad libitum unless restricted water intake is required for health or research reasons. All of this takes place according to approved SOPs.

Oversight and support of animals housed at the Main Station is provided by the Animal Care Unit 24/7, and night staff are on site during the off hours to monitor the animals and administer any medications.

On-going training is a critical function of the Animal Care Unit. Technicians are offered classes to assist them in preparing to take certification tests offered by the American Association for Laboratory Animal Science (AALAS). To facilitate this process, technicians are divided into groups led by a certified technologist. Currently, one employee is certified at the CMAR level, 6 have attained LATG, 6 are certified LAT, and 6 certified at the ALAT level. Rotating members of the Animal Care staff are sponsored to attend regional and national AALAS conferences and upon their return make presentations to their colleagues on the knowledge gained during the meetings. AALAS certification is required for senior level positions and personnel attaining levels of AALAS certification are rewarded with salary increases.

As part of continuing education, Animal Care personnel meet bimonthly to review Standard Operating Procedures and other topics relevant to work. Research Scientists periodically give presentations on their work to Animal Care technicians to provide a better understanding of the research supported by daily husbandry and care activities. Animal care personnel participate in a behavioral management training program which focuses on identification of species typical as well as abnormal behavior of the primates housed at the center. This fosters positive interaction between Animal Care, Veterinary Medicine, and Research staff.

- Primate Care and Housing—Field Station

The Yerkes Field Station is located 30 miles northeast of Emory University and the Yerkes Main Center. It is situated on approximately Specific Animal in Gwinnett County. The Center completed installation of a new perimeter security fence in December of 2014. Facility Security Facility Security Facility Security The remainder has been left intact and undisturbed to provide a natural barrier between the facility and the surrounding community. The Field Station operations complement the Main Center by providing facilities for nonhuman primate breeding as well as unique opportunities for research activities. A number of programs, including genetic analysis and bio-behavioral research activities, take place at the Field Station.

The Animal Care administrative resources are designed and implemented in a similar manner to the Animal Care unit at the Main Center. There is considerable interaction on most levels between the two sites, with direct communication between the Assistant Director of Animal Resources at the Field Station and the Associate Director of Animal Resources.

The Animal Care Unit of the Field Station provides the around the clock daily husbandry and care for research and breeding colony animals housed at the facility. Census totals at the Field Station average 1800 animals and include rhesus macaques, sooty mangabeys, and chimpanzees. The major responsibilities of the Animal Care staff are to provide the daily feeding, cleaning, enrichment, care and observation of all animals, as well as to ensure the safety and appropriateness of the animal

environment. Other duties of the Animal Care staff include, but are not limited to, recognizing and reporting abnormal clinical signs or behavioral activity by the animals to the appropriate veterinary or colony management staff, providing support and assistance during routine diagnostic and therapeutic procedures, and assisting with the administration of medicines that are part of the preventive medicine program. Additionally, Animal Care Technicians are cross trained so that they may assist research staff and veterinary staff with animal accessing and handling or to assist the colony management staff with issues pertaining to animal management. Animal Care Technician training includes an in-house behavioral management certification component in addition to continued and ongoing training and review of policies and procedures. Animal Care Technician IV's provide care after hours, including administering treatment and performing animal observations and facility security rounds. The Animal Care Operations Manager lives on site and is available to assist with after hour emergencies.

All four Managers and Supervisors have attained some level of AALAS technician certification. Additionally, one manager holds CMAR certification. Nine eligible animal care technicians are certified at the ALAT and LAT levels and four technicians at the LATg level. Several Colony Management and Veterinary Technicians are also certified at different levels.

A six person Facilities staff assists with maintaining the animal housing facilities and compounds as well as maintaining the facility physical plant. Both Animal Care staff and the Facilities staff work together, along with Veterinary and Behavioral Management staff, to provide safe enrichment structures and to monitor the safety of the animal areas and the security of the facility.

- Rodent Care and Housing - Main Station

The two Rodent Research Facilities are at approximately 80% occupancy. One facility is mainly used for animals involved in neuroscience research protocols, and the other to support investigators and research personnel involved in infectious diseases studies. The two facilities are staffed by a supervisor, a part time Assistant Operations Manager, seven full time Animal Care Technicians, and three part time Veterinary Technicians. A total of 24,335 mice, 1,484 rats and 3,116 voles were housed in the 2014 reporting period (10/1/2013 – 9/30/2014). The average daily census has continued to increase approximately 13% from the previous reporting period at 10,305, which includes rats, mice, meadow and prairie voles.

There are in-house breeding colonies of two species of voles as well as transgenic voles that are not commercially available. The voles are used extensively for research in behavioral neurosciences. Some of these animals are housed in ABSL-2 containment and are assigned to studies associated with Adenovirus-Associated Vector (AAV) and Lentiviral Vector. Rats and mice are also used in studies with AAV and Lentiviral Vector and housed in ABSL-2. Mice experimentally infected with different agents such as Gammaherpesvirus, Influenza, Acinetobacter Baumannii, Francisella novicida and Salmonella typhimurium are also housed in ABSL-2.

A fully operational Animal ABSL-3 suite is located in one of the Rodent Research Facilities. Lymphocytic Choriomeningitis Virus, West Nile Virus, Vaccinia and Mycobacterium tuberculosis are some of the infectious agents used in the ABSL-3 suite.

A complete quarantine program is in place to accommodate investigators who require mice from non-approved vendors. In 2014 approximately 5 shipments of mice were processed through quarantine. The health status of some shipping institutions did not allow us to accept the mice in our facility. We used an outside company to quarantine some strains or perform rederivation. We also facilitated research collaboration with other institutions and transferred several shipments of mice and voles at the request of Yerkes' investigators. Housing and extensive support for different breeding colonies of more than 90 transgenic and knockout strains are provided for several investigators.

All rodents in the facilities are housed in micro-isolators. The micro- isolators are ventilated except in the biohazard/quarantine areas. All cages are opened only under biological safety hoods or changing

stations. A comprehensive health monitoring program is in place. The testing of sentinels is performed either in-house or through outside laboratories.

Training of the Animal Care personnel is as described above under the "Primate Care and Housing" for the Main Center. One animal care technician and one veterinary technician working in the rodent research facilities are certified at the LATg level. Three other technicians have either ALAT or LAT level of certification.

- Behavioral Management

The behavioral management/enrichment program at the Yerkes Center aims to promote and maintain primate wellbeing through collaboration among the Behavioral Management, Veterinary Medicine, Animal Care, and Research Units. The behavioral management program includes daily implementation of the program, the conduct of scientific investigation to advance knowledge in this field, and regulatory aspects of primate welfare.

Elements of the program include social contact, animal training and other positive interactions with humans, feeding enrichment, structural enrichment, manipulable objects (durable and destructible), devices permitting foraging/grooming/ problem-solving, and sensory enrichment such as music and videotape viewing. Several enrichment techniques are used concurrently for each primate and they are scaled to the species, age class, and individual needs of animals, as well any requirements of research projects. The program is dynamic, permitting modification of techniques in accordance with in-house assessments and findings from the scientific literature. New items are added to the program through an approval system. Behavioral assessments are conducted by Behavioral Management staff to identify normal and abnormal behavior patterns. Animal care personnel receive training on normal and abnormal behavior, and on behavioral management. Animals exhibiting psychological distress are treated through an amplification of enrichment, training, adjustment of social dynamics, and/or pharmacological means under veterinary guidance. We have a positive reinforcement animal training program with specified goals of facilitating animal care, research and veterinary procedures. Daily enrichment and training are implemented by Animal Care and Behavioral Management personnel. Behavioral research on a variety of topics has been conducted, presented, and published. This research contributes to the development of a firm scientific foundation to underlie improvements in the behavioral management/enrichment of nonhuman primates. Recent research topics include comparing socialization strategies for rhesus monkeys, determining the effects of different types of housing on mangabey behavior, evaluating factors that influence the expression of abnormal behavior, and examining the long-term influence of infant attachment style on chimpanzee behavior and health.

The regulatory responsibilities of the behavioral management unit involve working through the Emory University IACUC and addressing issues related to USDA oversight and the AAALAC accreditation process. A formal review of enrichment, social housing and animal training issues for each Emory/Yerkes research protocol using primates is performed by Behavioral Management staff as a part of the IACUC review process. Scientific justifications are evaluated for any requested restrictions on social housing or enrichment, animal training techniques are evaluated for appropriateness, and the use of subjects requiring special attention (e.g., infants) as defined by the USDA is scrutinized. This process permits tailoring enrichment implementation to specific research projects.

- Animal Records

The Yerkes animal records system transitioned in September 2013 to a new Animal Research Management System (ARMS) developed on Oracle 11g with Business Objects reporting service. This new system was developed in collaboration with the Washington National Primate Research Center (WaNPRC). All NHP records are maintained by the Animal Records Office. Computerized records were initiated in 1990, and animal record data prior to that time is primarily paper. The minimum data recorded for each animal includes species, sex, date of birth, and location, and annual survey data including body weight, tuberculin test results, immunizations, and project assignment. Clinical and

laboratory data that may be generated are also included. With respect to IACUC protocols, computer based records are maintained on the specific IACUC assignment of the animal, the number of animals approved by the study, and number of animals that have been assigned to or used in the study. Information for the rodents is maintained through the Granite system from Topaz Technology with the Emory School of Medicine Department of Animal Resources. The Animal Records group is working closely with Topaz and Emory School of Medicine's DAR to implement an upgraded version of Topaz/Granite and obtain access to additional reporting features.

The Animal Records Unit is responsible for updating the ARMS data and ensuring that the Principal Investigators' accounts are charged the appropriate per diem and animal use fee rates on a monthly basis. Animal Records personnel also consult with grants management personnel to make sure that accounts are legitimate and that the funding for each study is used appropriately as stipulated in the project guidelines.

Animal Records has also worked with IT, RAAC, Colony Management and Vet Medicine in development of a new RAAC program that contains information uploaded from ARMS about the animal colony in conjunction with applications for animals assignments.

The Animal Records Supervisor continues to coordinate regularly with the Information Technology Department, Associate Director of Animal Resources and Administration to continue the adaptation of ARMS to meet Yerkes needs. Modifications and supplements to the ARMS system are ongoing in collaboration with WaNPRC.

- Research Services

The Research Services unit is responsible for carrying out a wide range of animal related administrative and technical research support activities for a large number of internal and external investigators and Animal Resources faculty.

Administrative support includes providing consultation to internal and external investigators during the project development stage and after IACUC approval. Support is given to help with finalizing sample collection protocols, tracking blood volumes and developing budgets for grant submissions. Research Services personnel also assist collaborating investigators in the development of and adherence to IACUC protocols, including new applications, renewals, and modifications.

Research Services provides direct technical research support for both onsite and offsite investigators undertaking experimental studies. Experimental scheduling with investigators and laboratory staff, as well as other support teams, is arranged by Research Services. Research Services personnel are responsible for animal experimental interventions including collecting biological samples, administering infectious agents, experimental and clinical treatments, immunization and vaccinations, and assisting with minor surgeries and CSF collections. They also perform other necessary animal work; for example, animal observations, training animals for procedures and developing improved techniques to enhance efficiency.

Research Services is also responsible for the recording and entering of animal access records into the ARMS. These data includes animals' weights, TB test results, and clinical observations at time of access in addition to any experimental interventions.

Finally, Research Services provides support to the Division of Pathology tissue distribution program through the collection of biological samples from colony animals to help meet approved specimen requests from internal and external investigators.

- Environmental Health and Safety Office

The Yerkes Environmental Health and Safety Office is responsible for the overall management of the

Environmental Health and Safety Program; Occupational Health Program; Orientation and Training Program; ABSL-3/BSL-3 Program; and Compliance and Quality Assurance Programs at Yerkes. The Yerkes Environmental Health and Safety Officer (YEHSO) has a dual reporting structure, reporting to the Associate Director for Animal Resources as well as to the Executive Director, EHSO, Emory University, as an Assistant Director. The YEHSO represents the EHSO on the Institutional Animal Care and Use Committee (IACUC). The YEHSO reviews IACUC protocols to address any occupational health and safety concerns. The YEHSO is also a voting member of the Emory University Institutional Biosafety and Research Health and Safety Committees.

The Emory EHSO is responsible for conducting a broad-based program for implementing mandated Federal and State laws, regulations, and guidelines, as promulgated by the Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), and the Georgia Department of Natural Resources (GADNR). The Emory EHSO provides oversight and guidelines for activities involving infectious agents, recombinant DNA, radioactive isotopes, hazardous chemicals, asbestos, lead and other occupational hazards.

The Occupational Health Program covers all employees, students, volunteers, and adjunct or visiting faculty working at Yerkes. The initial health assessment includes: 1) tuberculin test, T-spot or surveillance; 2) a baseline blood sample of all individuals working with animals or in a laboratory (serum is collected and stored in the serum bank); and 3) a health assessment determined by information collected in the employee access memo. The health assessment, which includes a physical examination, medical history and an evaluation of immunizations, is administered by Emory University's Employee Health Services. An Employee Health provider is on-site at the Main Station most Fridays to conduct new employee and annual health assessments, update immunizations, and provide respirator medical clearance. A physical agility assessment is required for Animal Care Technicians working with nonhuman primates. In 2014, 197 individuals were processed through the Center's Occupational Health Program and 98 employees received medical clearance to wear a respirator.

Annual health assessments are provided for employees who work in level 3 containment and those who wear a respirator. Allergies and health status are assessed in conjunction with the TB surveillance at least annually for all employees.

A database is maintained to track TB testing and serum bank specimens. Individuals are notified via e-mail when their TB test/Surveillance or blood collection is due. In 2014, a total of 756 TB tests and 25 T-spots were completed and follow-up was provided when needed. This office works closely with Emory University's Employee Health Services and the local health department to report, and refer for follow-up treatment and care, any individual with a TB test that is read as positive. Also in 2014, 188 serum bank specimens were drawn and stored in the Center's serum bank.

The YEHSO has worked with Employee Health Services and other key individuals to provide employees immediate access to their health records through the PeopleSoft system.

In 2014, the Administrative Manager for the Yerkes Environmental Health and Safety office attended a 9 month Manager Development Program and completed a capstone project. The project resulted in the development and implementation of a program to have occupational health records scanned onto a secured server for records retention.

The Training and Compliance Coordinator completed graduate school in 2014 and received a Master's in Public Health. A capstone project on the development, implementation, and quality control for use of alkaline hydrolysis tissue digestion for pathological waste at Yerkes was completed as a requirement for the MPH. A poster was created from the project and presented at AALAS 65th National Meeting.

- Orientation and Training

The Yerkes Orientation and Training Program provides approximately 35 safety-related training

programs. Many of these programs are now available as on-line courses. During 2014, 636 individuals completed Lab Safety training and 575 attended B-virus training.

Yerkes Orientation is presented through a live presentation that provides general information concerning the Center; covering the illness and exposure protocol and addressing safe work practices. Altogether, 224 individuals completed Yerkes Orientation in 2014, including orientation for 16 outside contractors.

During Yerkes Orientation, each person receives a packet of material related to the work they will be doing while at the Center. Individuals working with animals or animal specimens receive a copy of the "Laboratory Animal Zoonoses" packet. All new personnel receive the "Injury/Exposure Protocol" which details steps that should be taken in case of an injury or exposure while working at either the Main Station or the Field Station. New personnel are also asked to complete on-line modules via Blackboard (Emory's on-line classroom) or the Emory Learning Management System (ELMS). These modules are assigned in accordance to a person's job functions. Each person completes the Yerkes Orientation module, which covers the Standard Operating Procedures that apply to everyone working at the Center. Additional modules may include: Lab Safety Training; Biosafety Training; Bloodborne Pathogens Training; Personal Protective Equipment Training; Working in the Vivarium; ABSL-3 Laboratory Training; Cagewasher Safety Training; Radiation Safety Training; Animal Chemical Safety Training, MRI Safety Training, Respiratory Protection Training, and Vivarium ABSL-3 Training.

In addition, all personnel who will have research-related contact with animals are required to complete additional training related to the care and use of research animals. New research personnel attend a species specific didactic orientation with the Yerkes Division of Animal Resources Training Coordinator and complete AALAS (American Association for Laboratory Animal Science) modules on-line following the live orientation sessions. Successful completion of AALAS training is a requirement for IACUC protocol approval. A hands-on instructional tour of the nonhuman primate and/or rodent research facility is required for research personnel to gain access to these areas.

Individuals working with animals or in a laboratory also receive a form entitled "Understanding of Laboratory Risks". It is a requirement that this form be signed by the supervisor and the new employee and returned to the office of the Occupational Health Program Coordinator before receiving an ID/access card to the Yerkes Center.

In accordance with the University's IACUC policy, all individuals working under an IACUC protocol must be added to that protocol before they can be granted access to the Center. All ID/access cards are held until verification is received that the protocol has been modified.

Individual access to ABSL-3/BSL-3 facilities is granted following completion of required training and mentoring, as well as any occupational health requirements. Personnel working in level 3 containment facilities are required to attend a live training session and update occupational health requirements annually in order to maintain access to the facility. In 2014, 52 individuals attended BSL-3 laboratory training and 49 individuals attended ABSL-3 facility training. Additional ABSL-3 Training programs are being developed to prepare for the new NHP BSL3 facility which completed construction in 2014.

In 2014, a new position was created for a Containment Manager who will have responsibility for the ABSL-3/BSL-3 facilities. There are (4) BSL-3 laboratory suites, (1) ABSL-3 rodent facility, and (1) NHP BSL-3 facility.

The Yerkes EHSO also worked with the Emory Fire Safety Department to conduct fire drills and provide hands-on training for the use of fire extinguishers. This training was offered at the Main Station and at the Field Station. In 2014, 105 individuals attended Fire Extinguisher training.

- Safety Program

The Yerkes Environmental Health and Safety Officer (YEHSO) is responsible for implementation and monitoring of the Environmental Health and Safety Program at the Center. The Yerkes Environmental Health and Safety Officer provides guidance and oversight for regulatory compliance, environmental health and safety training, safety inspections, hazard identification, risk assessments, investigations related to employee injuries and exposures, and workers compensation program. This individual also develops and implements policies and procedures to support a safe and healthy work place. The YEHSO reviewed and followed up on 175 incident reports in the last year.

The Yerkes Environmental Health and Safety Committee is made up of 19 representatives from various departments within the Center. The committee reviews injury and illness trends, Standard Operating Procedures related to safety, and compliance reports. The committee met four times in 2014.

- Compliance Program
  The Yerkes Training and Compliance Coordinator (TCC) is responsible for monitoring and maintaining employee compliance with required training programs.

  Yerkes' Quality Assurance (QA) Program conducted on-going QA monitoring events including weekly inspection of the Vivarium ABSL-3 facility, monitoring, trending and reporting animals outside of primary containment, and assessment of training compliance.

  The TCC has also collaborated with members of the Emory Environmental Health and Safety Office to streamline training modules and share training information. As the EHSO continues to work towards an online training system, the TCC will continue to liaise with EHSO to ensure that training guidelines and documentation are equivalent and accessible to employees, students and visitors. The TCC has also begun the process to transition on-line training from Blackboard to the Emory Learning and Management System (ELMS) by meeting with EHSO, ELMS administrators, and Yerkes IT.

Division of Pathology

The Division of Pathology, with oversight and management from the Yerkes Associate Director for Pathology, provides diagnostic support to investigators from the Yerkes and Emory research communities as well as external investigators from academic institutions and the private sector working with laboratory animals in multiple and diverse research studies.

- Service Pathology
  The Service Pathology section contributes to colony surveillance, provides diagnostic support to the Yerkes Division of Animal Resources, and provides tissues and diagnostic services for scientific investigators (i.e., postmortem examinations, histopathology services, clinical pathology testing, etc.). It encompasses all aspects of diagnostic pathology, and includes the necropsy laboratory, histology and electron microscopy laboratory, molecular pathology and clinical pathology laboratory. Each unit is staffed by well-trained technical personnel under the direction of a veterinary pathologist. The necropsy laboratory consists of a senior lead research specialist, a lead research specialist and one research specialist. The clinical pathology unit is staffed by a supervisor, four medical technologists, two research specialists, and one medical technician. The histology and electron microscopy laboratory is operated by a supervisor and a histology/electron microscopy technologist. The molecular pathology laboratory is staffed by two immunohistochemistry technicians.

- Gross Postmortem Examinations
  The number of nonhuman primate necropsies performed in 2014 totaled 524 of which 380 were in support of experimental research protocols and 144 were clinical necropsies in support of the health and maintenance of the Yerkes colony. In addition, 254 necropsies were completed on other laboratory species (predominantly mice and rats) at the Center. Center pathologists performed postmortem examinations on all nonhuman primates that died or were euthanized, as well as rodent species submitted for clinical reasons, colony management or experimental purposes. In addition, the

pathologists collaborated with internal and external investigators in their experimental studies and participated in symposia at the national and international levels presenting their research work, clinical and experimental information. Furthermore, the staff is actively involved in the procurement of nonhuman primate specimens for a large group of investigators from Yerkes and other research institutions.

The Yerkes Division of Pathology plays a significant role in providing diagnostic and research support to the Emory School of Medicine's Division of Animal Resources (DAR), and the entire Emory laboratory-animal program. During 2014 55 cases were processed, analyzed and finalized for Emory School of Medicine's Division of Animal Resources.

The veterinary pathologists participated in the training of the laboratory animal medicine residents enrolled in the Laboratory Animal Medicine Postgraduate Program at the School of Medicine at Emory as well as the veterinary medicine students that were selected to participate in the McClure Comparative Pathology Externship at the Center. They provided formal laboratory animal pathology instruction through several formal courses, and through direct training and supervision of veterinary students and residents emphasizing gross pathology and histopathological findings relevant to accurately diagnosing clinical and experimental cases.

During 2014, the Histology and Electron Microscopy Laboratory processed 1,164 cases including nonhuman primate and rodent necropsies, biopsies, and various cases from investigators at Emory and outside the University. The number of paraffin blocks processed was 9,300 and 4,391 microscopic slides. There were 773 special stains prepared as well as 3,573 slides sectioned for other procedures. There were also 56 cases examined by electron microscopy.

In the same period, the Molecular Pathology Core (MPC) Laboratory processed samples from nonhuman primates and rodents submitted by both Yerkes, Emory and external investigators. The lab processed 3028 unstained sections of which 966 slides were for Yerkes, 2002 for Emory and 60 for external investigators. Total of 576 slides were processed for immunohistochemistry of which 321 were for Yerkes, 104 for Emory and 151 for External requestors. *In situ* hybridization was performed on total of 54 slides of which 27 were for Yerkes,18 for Emory and 9 for external investigators. The MPC also trained 11 researchers on the fluorescent microscope.

- Clinical Pathology

The Clinical Pathology Laboratory received 29,624 specimens in 2014. There were also 15,430 hematology examinations. These included CBCs, reticulocytes, differentials and white blood cells and platelet counts as well as coagulation tests and malaria examinations. There were 4,712 microbiology tests done. These included both clinical and experimental cultures, necropsy, nugent score, and sterility specimens.

There were 39 immunology flow cytometry determinations done using a variety of panels designed to accommodate individual researchers and research programs. A total of 4,448 chemistry panels were done, these included I-stat panels as well as comprehensive chemistry profiles (super chemistries) which were completed in house. Parasitology testing included 2,713 fecal examinations and impression smears. The clinical pathology laboratory also did 437 urine analyses, 133 bone marrow, 4 pregnancy tests and 2 spinal fluid exams as well as processing of 22 samples for virology cultures and the preparation of 1,684 samples sent out for serology testing.

Medical Technologists from the Clinical Pathology Laboratory are also in charge of phlebotomy for the Employee Health Program and for the procurement of volunteer blood samples for research. Technologists drew blood from 229 employees for post-exposure testing as well as 258 employees for biennial serum bank requirements. The Center's serum bank inventory is maintained by Yerkes' Clinical Pathology Laboratory staff. In addition, a total of 414 active human donors are registered to

provide blood to 23 investigators as part of the Research Blood Donor Phlebotomy program. The total amounts drawn in 2014 were 2697 tubes and 23146 milliliters of blood.

Clinical Pathology technologists also aid in employee health infection control. Six Pathology employees are certified to administer and read TB tests.

- Tissue Archive and Biological Material Procurement Services

The Center's pathology archives include a collection of microslides and paraffin blocks of nonhuman primates necropsied since July 1966. Formalin fixed tissues from nonhuman primates are maintained for approximately 10 years prior to disposal. Formalin fixed great ape tissues have been retained since 1966. Tissues are collected from all major organ systems during necropsy examination for formalin fixation for subsequent use in the preparation of microslides for histological examination. Following examination, all microslides are filed by year and case number at the Center. In addition, formalin-fixed tissues and paraffin blocks have been maintained on file for each necropsy and biopsy case. Tissues are not routinely collected at necropsy from clinically normal animals that are euthanized for experimental reasons. The conversion of the Center's pathology archive to an electronic database continues and will be expanded in the coming years to facilitate not only rapid identification and location of samples but also to provide the capacity for data mining and better utilization of this resource in the future. We continue to expand this inventory to years preceding 1988 when the first electronic records were established at Yerkes working from hard copy reports that are also preserved by scanning onto electronic media.

An important contribution to biomedical research is the provision of biological specimens to investigators at Yerkes and other regional, national and international institutions. The Senior Program Coordinator within the Division of Pathology manages and provides oversight for biological specimen requests from internal and external investigators through the Yerkes Biological Materials Procurement Program. The collection and distribution of these specimens makes it possible for scientists to take full advantage of the materials available and allows non-Yerkes investigators to work with cells and tissues to which they would otherwise not have access. Yerkes serves as a national and international resource for biomedical investigators throughout the U.S. and other countries. In 2014, the Yerkes Center processed 104 specimen requests that resulted in the collection and provision of 1,513 samples. These samples were provided to 59 investigators of which 29 were located at Yerkes and Emory and 30 investigators at institutions within the U.S. During this time period, 26 articles were published in peer-reviewed journals and 14 are currently in press, all resulting from the receipt of specimens from the Yerkes Center. Following is a breakdown of specimens provided:
Organs (Part & Whole): 381
Tissue: 1,122
Whole (carcass, head, arm, leg, eye, bones): 10

- Research Program and Research Project Support

Division of Pathology faculty collaborated with internal and external investigators in development of new protocols. This includes assistance with scientific expertise, preparation of experimental protocols, budget development and preparation, and submission of IACUC and Environmental Health and Safety protocols. Working with Yerkes Division of Animal Resources, the Division of Pathology also provides laboratory and scientific support during the entire performance of an experimental protocol, analysis of data and publication of results.

Division of Pathology faculty members contribute to multiple research programs such as renal/bone marrow/pancreatic transplant, SIV/AIDS infection, TB infection, babesiosis, evaluation of dengue pathogenesis, the optimization of novel malaria models, listeriosis, and causes of diarrhea in infant macaques, the testing of experimental vaccine platforms for HIV, malaria and influenza, cancer and diabetes in aging monkeys, immune activation in transgenic monkeys and cardiovascular diseases.

The Division also provides shipping services for the Center and its investigators, including shipment of

clinical samples and hazardous (infectious) samples by IATA-certified shipping/research technicians. In 2014, Yerkes' Shipping Unit packaged and shipped 350 packages of biological samples shipping to investigators and laboratories in the United States, France, and Germany.

Finally, this division shares with the Division of Animal Resources the responsibility for oversight, monitoring and preparation of permit applications and periodic reports to various regulatory agencies including Fish and Wildlife Service, Georgia DNR, Drug Enforcement Administration, Centers for Disease Control and Prevention, and United States Department of Agriculture.

As well as responsibility for the aforementioned permits and regulatory agency licenses and registrations, the Senior Program Coordinator within the Division of Pathology assists internal investigators with determination of the necessary permits and registrations to facilitate their research projects. This includes research of proper permit or registrations needed, assistance with preparation and submission of applications, tracking review progress and receipt and dissemination of permits and registrations to the requesting investigator.

C. Significance

The significance of the Center's mission arises from the conduct of a research program focused on scientific problems relevant to human health and the NIH mission in providing resource infrastructure and expertise in appropriate scientific and veterinary specialties to support such a program and to enhance the Center's ability to serve as a resource to core investigators as well as to scientists regionally, nationally and internationally. The program is aligned with the NIH mission, the ORIP strategic plan and with national health priorities.

The Yerkes National Primate Center and its closely affiliated scientific centers (Emory Vaccine Center, Emory Center for AIDS Research, and the Emory Transplant Center) have produced a cadre of interdisciplinary teams to address issues in vaccinology, immunology, immunobiology, neuropharmacology, behavioral neuroscience, cognitive neuroscience, behavioral neuroendocrinology, visual neuroscience, imaging, and functional genomics. This network provides a rich fabric of scientific and technological expertise that enhances the scientific outcomes of all scientists doing research at Yerkes, including core staff scientists, and outside investigators from Emory University Departments and other institutions.

D. Plans

The goal for the coming award period is to continue to achieve scientific excellence and to provide the comprehensive infrastructure support necessary to host NIH supported scientific projects in order to meet national health objectives. In particular, among the program areas indicated above, we will specially emphasize research on models of stroke using nonhuman primates and HIV cure research, as well as transgenic nonhuman primate models of neurodegenerative diseases. Additionally, we have further developed several strong programs, including transplant medicine and autism. We are also working with WaNPRC in enhancing an electronic veterinary records program, the Animal Research Management System (ARMS).

E. Publications

Please see Section C: Products for a list of publications as generated by My Bibliography.

Breakdown of Individual Projects

Below is the breakdown of individual projects by project type:

Project Type	Number of Projects
Management Projects	13
Research Projects	133
Pilot Projects	7
Total	153

Breakdown of Investigators Supported by P51

Below is the breakdown of investigator by type:

Investigator Type	Number of Investigators
Core Scientists	16
Affiliate Scientsts	123
Visiting Scientists	15
Total	154

Infrastructure Improvements

Main Station 2014

Installation and repair of epoxy and MMA flooring throughout the facility: Neuroscience Building Specific Animal Location Specific Animal RB building hallway and Specific Animal Location RB building cage wash area, IDB building Specific Animal Specific Small Primate Wing cage wash area, Eye Building cage wash area, RA building Specific Animal Location CID Building Specific Animal Location

Carpet and VCT tile was installed in various areas throughout the facility.

Interior rooms and exterior buildings throughout the facility were painted.

Electrical upgrades and additions occurred throughout the facility. Light fixtures in several animal housing facilities were replaced with more efficient, water proof fixtures.

A chemical fume hood and exhaust duct were installed in lab 1122.

Four replacement actuators were installed on the cooling tower serving the Vaccine Research Addition.

Air Handler #2 serving the Main Building was replaced. Digital controls were upgraded as part of the replacement project.

Retaining walls constructed of railroad ties were replaced with 6"x6"x8' pressure treated timbers.

A new Ford E350, 15-passenger shuttle bus was purchased.

Room 1109 Main Building was renovated. Renovation converted one large office into two private offices.

Field Station 2014

Installation and repair of epoxy and MMA flooring throughout the facility: Specific Animal Location Specific Animal Location

Interior rooms, compound walls and exterior of buildings throughout the facility were painted.

Electrical upgrades and additions occurred throughout the facility. Light fixtures in several animal housing facilities were replaced with more efficient, water proof fixtures.

Landscaping of grounds.

The perimeter fence was replaced with a high security, anti-climb and anti-dig fence. The new fence covers Facility Security

The roof of G-2 Test facility was replaced.

The Specific Animal Location was modified to enhance drainage and prevent standing water. Modifications included grading and installation of perforated drainpipe.

New indoor caging was added at the Specific Animal Location to house up to 100 primates. The project included heating and ventilation equipment, an emergency generator, environmental monitoring system and a sewage lift station

EMORY UNIVERSITY | Institutional Animal Care and Use Committee

EMORY UNIVERSITY
Institutional Animal Care and Use Committee
1599 Clifton Road, 5th Floor, Room 5.207 1599-001-1AU Atlanta, Georgia 30322-4250
Phone: 404-712-0734 Fax: 404-727-8452
Email: IACUC@emory.edu
Web Site: www.iacuc.emory.edu

Dear Excluded by Requester

Your IACUC protocol #2003042 "Maintenance of the Yerkes Primate Center Animal Colony" has been reviewed and approved by the IACUC. It has now been assigned the IACUC protocol number "YER-2003042-022518GA" and was approved on "2/25/2015" and will expire on "2/25/2018". Please note, for Animal Welfare Act species, an annual review is required for the protocol to remain valid. An annual renewal is required to be submitted by the PI.
This was a three year renewal of YER-2000753-022815, which is now terminated.

For Act Species: Your annual renewal must be submitted 30 days prior to the expiration in order for the review and processing to occur. Please put this date on your calendar: 1/25/16

Surgical Inclusion Statement:
Please Note:
All researchers using animals at Emory University must comply with the 8th edition of the new "Guide for the Care and Use of Laboratory Animals." The "Guide" p115, states the following: "Researchers conducting surgical procedures must have appropriate training to ensure that good surgical technique is practiced—that is, asepsis, gentle tissue handling, minimal dissection of tissue, appropriate use of instruments, effective hemostasis, and correct use of suture materials and patterns (Brown et al. 1993; Heon et al. 2006)....The IACUC, together with the AV(attending veterinarian), is responsible for determining that personnel performing surgical procedures are appropriately qualified and trained in the procedures."
The approval of this protocol requires a training program to ensure proficiency regarding aseptic surgical technique. Prior to approval of your protocol, all personnel planning on performing surgery must have attended a surgery training lecture.
After IACUC approval of your protocol, you are required to contact Excluded by Requester in the EU-DAR to schedule a proficiency assessment within one month of starting any surgical procedures. For Yerkes protocols, please contact Excluded by Requester for rodent surgery training or Excluded by Requester for non-human primate surgery training in the Yerkes DAR.
*All personnel that are performing surgery are required to have this proficiency assessment in order to comply with the IACUC protocol.

Protocol Funding
Funding: NIH - National Institutes of Health, Other

Species: NHP - Chimpanzee, NHP - OTHER

EMORY UNIVERSITY | Institutional Animal Care and Use Committee

NOTE: The number of animals is shown inside the protocol and will reflect modifications, transfers, or animal usage as processed in the system.

Protocol Review Requirements:
The USDA requires annual renewal of research projects using animals and PHS policy requires a de novo review of your protocol every three years before animal use approval can be extended. Both must be reviewed and approved by the IACUC prior to the anniversary or expiration date of this study. Emory's Animal Welfare Assurance Number is A3180-01.

IACUC Protocol Dissemination Policy:
Please note that all individuals listed on the approved protocol must have access to the protocol and any subsequent modifications. It is expected that all protocol associates will be familiar with the protocol and will have an up-to-date version of the protocol available to them at all times. It is the responsibility of the PI to ensure that all individuals on the protocol have access to, and are familiar with the protocol. PDF versions of the protocol can be generated from the approved protocol in Topaz Web P&R, by accessing the reports icon and then selecting " Protocol Detail Report".

If there are additions or changes to this protocol, you must submit an amendment form in TOPAZ.

You can access this approved protocol on your dashboard under "My Protocols".

If you have any questions, please call the IACUC office at 404-712-0734.

Sincerely,

Excluded by Requester [redacted] DVM
Director, Emory IACUC

1599 Clifton Road NE
5th Floor, Room 5.207
Atlanta, GA 30322

Animal Census Tables

As of 2/13/2015, overall size of the NHP colony is as follows:

1. **Nonhuman primates supported partially, or in whole by the P51 base grant[1].**
Census date: 2/13/15 (*135 from NEPRC and supported by P51 supplement)

Genus, Species	Breeding Colony[2]				Animals not in breeding colony[3]				Total Colony Census
	M	F	U[4]	Total	M	F	U[4]	Total	
Cercocebus Torquatus Atys	18	57	1	76	41	33	0	74	150
Macaca Fascicularis	0	0	0	0	3	0	0	3	3
Macaca Mulatta (SPF)	416	890	29	1335*	64	104	8	176	1511
Macaca Mulatta (NSPF)	0	0	0	0	130	160	0	290	290
Macaca Nemestrina	0	0	0	0	0	0	0	0	0
Saimiri SPP	0	0	0	0	15	0	0	15	15
Totals	434	947	30	1411	253	297	8	558	1969

[1] SPF Mucaca Mulatta Breeding Colony is partially supported by a SPF U24 grant (U24 OD011023).
[2] Total number of animals in breeding colony including adult breeding animals and designated juvenile replacements at time of report.
[3] Animals on protocol or otherwise not in the breeding colony at the time of report.
[4] Sex undetermined.

2. **Nonhuman primates not supported by the P51 base grant[1].**
Census date: 2/13/15

Genus, Species	Breeding Colony[2]				Animals not in breeding colony[3]				Total Colony Census
	M	F	U[4]	Total	M	F	U[4]	Total	
Macaca Mulatta (SPF)	0	52	0	52	20	55	0	75	127
Macaca Mulatta (NSPF)	0	0	0	0	380	394	0	774	774
Cercocebus Torquatus Atys	0	0	0	0	16	2	0	18	18
Macaca Fascicularis	0	0	0	0	8	2	0	10	10
Macaca Nemestrina	0	0	0	0	2	1	0	3	3
Saimiri SPP	0	0	0	0	19	2	0	21	21
Totals	0	52	0	52	445	456	0	901	953

[1] Animals in these colonies are not supported by a SPF U24 or U42 grant.
[2] Total number of animals in breeding colony including adult breeding animals and designated juvenile replacements at time of report.
[3] Animals on protocol or otherwise not in the breeding colony at the time of report.
[4] Sex undetermined.

3. **Non-primate colonies**

None of the animals in the non-primate colonies are supported by the P51 base grant.

Tissue Distribution Program

An important contribution to biomedical research is the provision of biological specimens to investigators at Yerkes and other regional, national and international institutions. The Senior Program Coordinator within the Division of Pathology manages and provides oversight for biological specimen requests from internal and external investigators through the Yerkes Biological Materials Procurement Program. The collection and distribution of these specimens makes it possible for scientists to take full advantage of the materials available and allows non-Yerkes investigators to work with cells and tissues to which they would otherwise not have access. Yerkes serves as a national and international resource for biomedical investigators throughout the U.S. and other countries. In 2014, the Yerkes Center processed 104 specimen requests that resulted in the collection and provision of 1,513 samples. These samples were provided to 59 investigators of which 29 were located at Yerkes and Emory and 30 investigators at institutions within the U.S. During this time period, 26 articles were published in peer-reviewed journals and 14 are currently in press, all resulting from the receipt of specimens from the Yerkes Center. Following is a breakdown of specimens provided:

Organs (Part & Whole): 381
Tissue: 1,122
Whole (carcass, head, arm, leg, eye, bones): 10

Percentage of AIDS-related grant dollars:

Approximately 57% of our FY14 awarded funding (excluding the P51) is AIDS-related.

Publication Breakdown

Below are the numbers of publications by type:

i. Peer-reviewed journal articles supported by activities directly attributable to the P51 grant: 293
ii. Book chapters: 4
iii. Other publications (non-peer reviewed):

Please note, due to system issues with MyNCBI and RPPR, we were unable to include several peer-reviewed publications in Section C of the RPPR. The number of publications included in section C is 276, and we are including the following 17 publications for a total of 293 reported above:

1. Excluded by Requester
Excluded by (2013). Synaptogenesis and development of pyramidal neuron dendritic morphology in the chimpanzee neocortex resembles human. Proc Nat Acad Sci, 110, Suppl 2, 10395-10401. PMID: 23754422. PMCID: PMC3690614

2. In Press

3. Excluded by Requester (2015). Coalitions in theory and reality: A review of pertinent variables and processes. Behaviour 152: 1-56

4. In Press

5. Excluded by Letter from the Editor-in-Chief: Irreproducible Results. Yerkes National Primate Research Center, Emory University, 954 Gatewood Rd NE, Atlanta, GA 30329, USA. Journal of Drug and Alcohol Research. Vol. 3 (2014), Article ID 235879.doi:10.4303/jdar/235879

6. Excluded by Requester
Excluded by Requester An MHC-defined primate model reveals significant rejection of bone marrow after mixed chimerism induction despite full MHC matching. Am J Transplant. 2010 Nov;10(11):2396-409. PMID: 20849552; PMC2980834

7. In Press

8. In Press

9. Excluded by Requester
Excluded by Requester Oestradiol alters central 5-HT1A receptor binding potential differences

related to psychosocial stress but not differences related to 5-HTTLPR genotype in female rhesus monkeys. J Neuroendocrinol. 2014 Feb;26(2):80-8. PMID: 24382202; PMC3962807

10. In Press

11. In Press

12. In Press

13. Excluded by Requester (2014). Effects of spatial training on transitive inference performance in humans and rhesus monkeys. Journal of Experimental Psychology: Animal Learning and Cognition, 40, 477-489. doi: 10.1037/xan0000038. PMCID in process

14. In Press

15. In Press

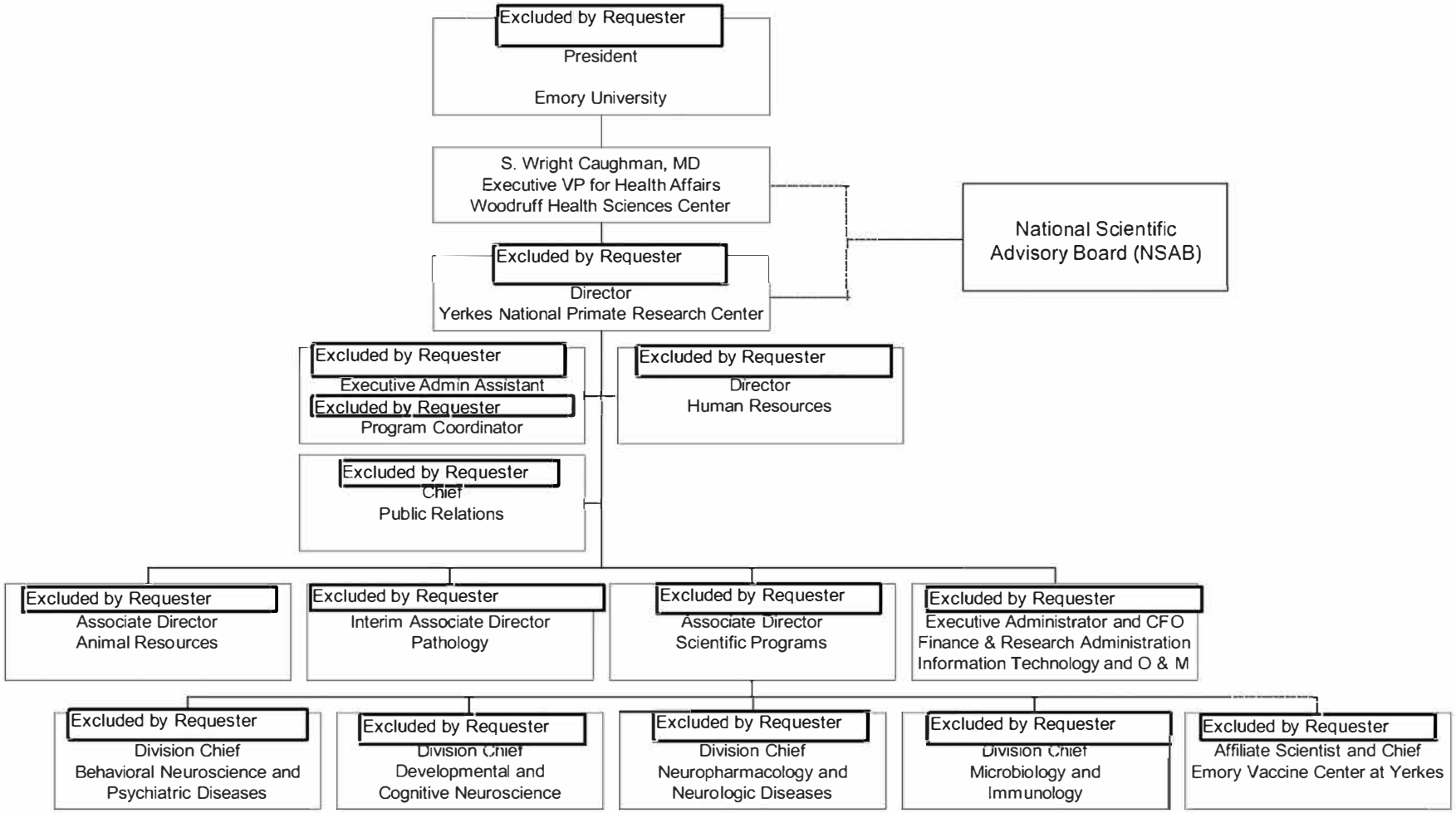
16. Excluded by Requester Mycobacterium tuberculosis Hip1 modulates macrophage responses through proteolysis of GroEL2. PLoS Pathog. 2014 May 15;10(5):e1004132. PMID: 24830429; PMCID: PMC4022732

17. In Press

Investigators Trained at YNPRC

The following table shows the number of investigators trained at the Yerkes National Primate Research Center during 2014:

Postdoctoral Fellows			50
Graduate Students			75
Undergraduate Students			111
Others			15
	Veterinary Residents	3	
	Veterinary Externs	8	
	Veterinary Interns	1	
	ION Program High School Students	3	
Total			251


Excluded by Requester
President
Emory University
S. Wright Caughman, MD
Executive VP for Health Affairs
Woodruff Health Sciences Center
National Scientific Advisory Board (NSAB)
Excluded by Requester
Director
Yerkes National Primate Research Center
Excluded by Requester
Executive Admin Assistant
Excluded by Requester
Program Coordinator
Excluded by Requester
Director
Human Resources
Excluded by Requester
Chief
Public Relations
Excluded by Requester
Associate Director
Animal Resources
Excluded by Requester
Interim Associate Director
Pathology
Excluded by Requester
Associate Director
Scientific Programs
Excluded by Requester
Executive Administrator and CFO
Finance & Research Administration
Information Technology and O & M
Excluded by Requester
Division Chief
Behavioral Neuroscience and
Psychiatric Diseases
Excluded by Requester
Division Chief
Developmental and
Cognitive Neuroscience
Excluded by Requester
Division Chief
Neuropharmacology and
Neurologic Diseases
Excluded by Requester
Division Chief
Microbiology and
Immunology
Excluded by Requester
Affiliate Scientist and Chief
Emory Vaccine Center at Yerkes

ANIMAL RESOURCES

Excluded by Requester

Division Chief

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **BEHAVIORAL MANAGEMENT TECHNIQUES TO ENHANCE SOOTY MANGABEY**

NPRC UNIT: Animal Resources

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

Yerkes' sooty mangabey (Cercocebus atys) colony is the only viable captive breeding colony of this species in the world, and they are a unique animal model for AIDS research, as they are natural hosts of the SIVsmm virus, and the source of HIV-2 in humans. It is of extreme importance that this unique mangabey resource be maintained as a genetically and demographically balanced, self-sustaining colony, with the capacity to produce progeny sufficient to meet future research requirements. The behavioral research studies included in this project will address some of the major behavioral management challenges associated with the breeding program for the Yerkes mangabey colony and enhance their value as an animal model in important AIDS research.

In this last year, the behavioral research program has included conducting studies: (1) evaluating various types of environmental enrichment for run-housed mangabeys; (2) determining the impact of different styles of run housing and different amounts of space on mangabey behavior; (3) documenting changes in female behavior over time; and (4) comparing methods for training mangabeys to cooperate with a research procedure.

GRANT NUMBER: 3P51OD011132-54S1

SUPPORT PERCENTAGE: 100% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **BEHAVIORAL MANAGEMENT OF NONHUMAN PRIMATES**

NPRC UNIT: **Animal Resources**

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

Maintaining a healthy, productive research colony of nonhuman primates is crucial to the ability to support diverse biomedical research programs. Behavioral management programs for captive nonhuman primates help to facilitate the psychological health of the primates by the application of environmental enrichment techniques, socialization strategies, and animal training procedures. Behavioral evaluation is completed so that behavioral problems can be detected and treated. Various aspects of behavioral management programs will benefit from scientific evaluation, and this project includes some such evaluations.

Over the course of the last year, the enrichment program was implemented for all primates, with special emphasis on singly-housed and pair-housed animals who received a variety of enrichment. The social housing program has conducted and documented over 400 introductions of unfamiliar primates, increasing the percentage of our primates who are socially housed. The positive reinforcement training program has expanded with an emphasis on training chimpanzees and training monkeys to shift and to tolerate restraint. Research evaluating various aspects of behavioral management has been published. One published study describes a method for training chimpanzees to cooperate with urine collection, one compares options for pair housing of rhesus macaques, and one examines abnormal behavior patterns in mangabeys.

GRANT NUMBER: 3P51OD011132-54S1

SUPPORT PERCENTAGE: 100% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **PRIMATE GENETIC ANALYSIS AND PEDIGREE MANAGEMENT**

NPRC UNIT: Animal Resources

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

Samples have and continue to be collected from all rhesus macaques and sooty mangabeys within the Yerkes' breeding colony. This includes animals from both the SPF colonies dedicated to AIDS research and the animals from the NSPF animals. Each of these samples has been genotyped for 96 polymorphic single nucleotide polymorphims spread throughout the autosomal chromosomes. These data are used to determine parentage, pedigree and selected genetic markers for all of our macaques and mangabeys maintained at the Field Station. The ability to characterize specific genetic components has enabled us to better meet specific investigator needs to develop more diverse research endeavors, to selectively breed for specific genetic traits and to undertake specific phenotypic comparisons. To manage this data set, we are establishing a full-scale database system that will be able to assimilate genetic, parentage, pedigree, and demographic variable on all the animals. This database system will be incorporated into ARMS, which will enable Yerkes' investigators and veterinarians to track, manage and view an animal's record in a single query.

GRANT NUMBER: 3P51OD011132-54S1

SUPPORT PERCENTAGE: 100% of P51 funds support this study.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **MATERNAL STRESS & OBESITY ALTER MILK & IMPAIR INFANT GROWTH**

NPRC UNIT: Animal Resources

AFFILIATE SCIENTIST: Exclude d by Re que ster **PI**

ABSTRACT:

Evidence from human and animal studies show that chronic stress exposure and obesity synergize to elevate circulating stress and pro-inflammatory signals. What is less clear and particularly important for nursing mothers, however, is whether these signals translate to milk and affect infant development. Human milk contains many hormonal and immunological signals including cytokines, adipokines, immunoglobulins (Ig), and growth factors that mediate infant health and development; however, it is not known whether and to what extent maternal stress and obesity may alter these and produce adverse growth trajectories for infants. Because stressor exposure and diet are difficult to manipulate in postpartum women, social subordination in group-housed rhesus macaques represents a translational model to assess how maternal factors may affect milk biology and negatively impact infant growth and health. To disentangle prepartum maternal stress from postpartum stress, fifty-six newborns will be cross-fostered to mothers of the same or different ranks. In addition, half of the mother-infant dyads will be maintained on a low calorie diet through lactation while the other half will be switched to a rich dietary condition. Behavioral assessments of maternal care, nursing patterns, and social rank will be obtained throughout lactation. Food intake in the mothers and infants during weaning will be monitored through automated feeders. Aim 1 will test the hypothesis that chronic social stress and adiposity will synergize to increase stress and inflammatory signals in milk. This aim will be accomplished by measuring cortisol, cytokine and adipokine markers in milk and serum from lactating rhesus monkeys of different social rank (dominant vs. subordinate) and postpartum diet exposure (high calorie vs. low calorie). Aim 2 tests the hypothesis that chronic social stress and adiposity will interact to decrease immune defense components in milk. Milk levels of sIgA in lactating dams will be evaluated in parallel with stress and inflammatory markers studied in Aim 1. Finally, Aim 3 will determine the contribution of milk signals studied in Aims 1 and 2 to infant growth and health trajectories. Specifically, it will test the hypothesis that pro-inflammatory cytokines and adipokines significantly predict infant growth in addition to milk energy in a rich dietary environment. Taken together, findings from this study will better define how milk signals induced by maternal stress and obesity may affect infant and health.

During Year 1 of this R21, we recruited 14 mother-infant pairs into the study. We collected milk, blood, feces, body composition and growth measures on these subjects at 48-72hrs, 2 weeks, 6 weeks, 12 weeks, and 24 weeks of age as described in the original proposal. We anticipate to complete enrollment of the remaining subjects during Year 2. This project employed significant Yerkes resources, including rhesus macaques and procedure rooms.

GRANT NUMBER: NIH 1 R21 HD079969-01

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **USE OF NOVEL AUTOMATED FEEDERS TO CONTROL OBESITY OF SOCIALLY-HOUSED MACAQUES**

NPRC UNIT: Animal Resources

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

The current proposal seeks to evaluate the feasibility and potential benefits of a novel automated, computer-controlled feeding system for veterinary and colony management purposes. Using rhesus macaques (*Macaca mulatta*) in large breeding troops at Yerkes National Primate Research Center (YNPRC) Field Station, the current proposal has three primary goals: 1) to compare food wastage associated with automated feeders to traditional bin feeders; 2) to determine whether automated feeders increase food competition in social groups fed *ad libitum* monkey chow; and 3) to determine if automated feeder enabled caloric restriction is a feasible method to reduce adiposity and improve metabolic health of overweight adult female macaques without inducing food competition in a complex social environment.

As of 2/23/15, twenty-four obese adult female rhesus macaques pertaining have been enrolled into the study to achieve Specific Aims 2 and 3. Twenty of these animals were fed ad libitum a standard monkey chow diet while the remaining twelve animals were calorie restricted up to 40% of their baseline values. Blood was collected to measure metabolic parameters and focal behavior observations were done to determine difference in food competition between the two feeding conditions. Data collection for this aim will be complete by the end of March 2015. Two different compounds fed from bins vs. automated feeders are being used to achieve Specific Aim 1. Data collection for this aim will be completed by May 2015. Data analyses will be completed during the next four months.

This project employs significant Yerkes resources, including colony management staff, animal care staff, veterinary staff, and rhesus macaques.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **TRANSLATIONAL STRATEGIES FOR PANCREATIC ISLET XENOTRANSPLANTATION**

NPRC UNIT: Animal Resources

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

The goals of this project are: 1) to critically examine the role of Gal-specific immunity on engraftment and long-term survival of neonatal porcine islets and 2) to optimize the immunosuppresive regimen required for neonatal porcine islet engraftment, examining alternative, readily translatable agents.

Genetically modified donor sources have emerged as a crucial component in overcoming the heightened antigenicity associated with xenotransplantation. This has been highlighted by the identification of the galactose-α1,3-galactose (gal) epitope as a target of preformed antibody. Utilizing gal-deficient neonatal porcine islet donors we have previously published results demonstrating improved engraftment and long-term functional survival in a non-human primate model of xenoislet transplantation. Next generation transgenics are being developed to circumvent hyperacute rejection. Most germane to islet transplantation are those modifications designed to attenuate the instant blood mediated inflammatory reaction (IBMIR). This process characterized by antibody binding, complement activation, neutrophilic/monocytic infiltration, platelet aggregation, and endothelial activation is responsible for damaging up to 73% of intraportally infused islets.. The efficient assessment of newly developed transgenics has been limited by current models. Therefore, we developed a novel dual transplant model that enables the rigorously controlled comparison of genetic donor islet modifications within a single non-human primate recipient.

Building upon these studies we have begun to investigate and screen the development of next generation transgenics. In collaboration with the National Swine Resource and Research Center, gal-deficient neonatal porcine islet donors were genetically modified to upregulate expression of the complement regulatory proteins CD55 and CD59, as well as, CD39 and thrombomodulin. When compared to gal-deficient xenoislets, the multi-transgene xenoislets bound less IgM/IgG ($p<0.001$) and displayed a trend towards decreased complement deposition ($p=0.165$). In an additional collaboration we are also exploring the effects of upregulated hCD46 on IBMIR. The best of these islet preparations will be reintroduced into survival models. Each experiment employs significant Yerkes resources, including veterinary staff, Rhesus macaques, operating room time and staff, and pathology services. This grant was transferred to Duke University under Excluded by Requester on 5/1/14.

GRANT NUMBER: NIH 5U01AI090956

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **ADJUVANT THERAPIES IMPROVING ANTI-REJECTION EFFECTS OF COSTIMULATION**

NPRC UNIT: Animal Resources

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

This project addresses one of the central challenges facing transplantation: finding strategies for lifelong acceptance of allografts, without ongoing reliance on immunosuppression, and with preservation of protective immunity. Finding solutions to tolerance-induction in renal transplantation would represent a major step forward for the field and would fundamentally change the lives of transplant recipients worldwide. The approval of Belatacept, a second generation CD28 pathway costimulation blocker represents the first new class of agents approved as a cornerstone immunosuppressant since the inception of the calcineurin inhibitor (CNI) era in the early 1980s. Unfortunately widespread adoption of this new reagent has, in part, been hindered by higher rates and grades of rejection. We have worked over the past year to identify potential mechanisms responsible for this increased rate of rejection as well as identify and test therapeutics targeting key pathways involved in belatacept-resistant rejection.

We have performed kidney transplants in MHC-mismatched rhesus macaques treated with belatacept. At the time of graft rejection, we have obtained graft-infiltrating cells for analysis. Recipients were treated with regimens of anti-CD154 dAb, anti-CD28 dAb, anti-CD122, belatacept, and combinations of these drugs. We have also tested the efficacy of weaning belatacept and anti-CD40L treatment in an NHP model of renal transplant by spacing out dosing regimen over time.

These results have significant implications for adjunct therapies to combine with belatacept and improve both patient and graft survival. They also have the potential to impact the development of novel costimulation-based tolerance regimens as this will likely involve targeting of more than one costimulatory pathway and/or Tcell subset. Our preliminary results suggest that both CD80/86-CD28 and CD40/CD40L pathways have potential to influence clinical practice in the near future. Each experiment employs significant Yerkes resources, including veterinary staff, Rhesus macaques, operating room time and staff, and pathology services.

As of 12/31/2014, there was a change of Prinicpal investigator status for grant (Project I-IV) from Excluded by Requester to Excluded by Requester

GRANT NUMBER: NIH 5U19 AI1051731-12

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **TRANSPLANT TOLERANCE IN NON-HUMAN PRIMATES PROJECT 1**

NPRC UNIT: Animal Resources

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

This project addresses one of the central challenges facing transplantation: finding strategies for lifelong acceptance of allografts, without ongoing reliance on immunosuppression, and with preservation of protective immunity. Finding solutions to tolerance-induction in renal transplantation would represent a major step forward for the field and would fundamentally change the lives of transplant recipients worldwide. The approval of Belatacept, a second generation CD28 pathway costimulation blocker, represents the first new class of agents approved as a cornerstone immunosuppressant since the inception of the calcineurin inhibitor (CNI) era in the early 1980s. Unfortunately widespread adoption of this new reagent has, in part, been hindered by higher rates and grades of rejection. We have worked over the past year to identify potential mechanisms responsible for this increased rate of rejection as well as identify and test new therapeutics targeting alternate costimulatory pathways.

We have performed kidney transplants in MHC-mismatched rhesus macaques. At the time of graft rejection, we have obtained graft-infiltrating cells for analysis. Recipients were treated with regimens of anti-CD154 dAb, anti-CD28 dAb, anti-CD122, belatacept, and combinations of these drugs. We have also tested the efficacy of weaning belatacept and anti-CD40L treatment in an NHP model of renal transplant by spacing out dosing regimen over time.

These results have significant implications for alternate costimulatory blockade therapies that may reduce rates of acute rejection and improve both patient and graft survival. Results of spacing out immunosuppresive treatments over time are also promising for achieving long-term graft acceptance. Our preliminary results suggest that both the CD80/86-CD28 and CD40/CD40L pathways have potential to influence clinical practice in the near future. Each experiment employs significant Yerkes resources, including veterinary staff, Rhesus macaques, operating room time and staff, and pathology services.

As of 12/31/2014 there was a change of Prinicpal investigator status for grant (Project I-IV) from Excluded by Requester to Excluded by Requester

GRANT NUMBERS: NIH 5U19 AI1051731-12

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **TRANSPLANT TOLERANCE IN NON-HUMAN PRIMATES PROJECT II**

NPRC UNIT: Animal Resources

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

Renal transplantation represents first-line therapy for patients with ERSD, with the most recent data documenting significant one-year success rates. However, patients continue to face high morbidity and mortality after transplant, both from chronic allograft rejection and from the toxicities associated with standard immunosuppressive regimens. Given these duel risks, the ultimate goal is the induction of immune tolerance after transplantation, which promises life-long acceptance of an allograft, without the need for ongoing immunosuppression and importantly, with preservation of protective immunity.

In the past year, we have made significant progress towards this aim. We have succeeded, for the first time, in creating, stable, multilineage mixed-chimerism in a rhesus macaque model, and have shown that this chimerism can induce donor-specific tolerance to a skin allograft. We believe that this represents a major milestone for this field. We have also focused on determining the persistence, trafficking, and phenotypic alterations that occur to Tregs after adoptive transfer. Our results show significant implications for the limitations of adoptive therapy with Tregs and suggest that strategies to enhance both the survival and phenotypic integrity of Tregs should be sought. We are now exploring the impact of IL-2 on Treg persistence and phenotypic integrity. Each experiment employs significant Yerkes resources, including veterinary staff, Rhesus macaques, operating room time and staff, and pathology services.

A subcontract award for this project (II) was awarded to University of Washington unde Excluded by Requester on 7/31/2014. As of 12/31/2014. there was a change of Prinicpal investigator status for grant (Project I-IV) from Excluded by Requester to Excluded by Requester

GRANT NUMBERS: NIH 5U19 AI1051731-12

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **TRANSPLANT TOLERANCE IN NON-HUMAN PRIMATES PROJECT III**

NPRC UNIT: Animal Resources

AFFILIATE SCIENTISTS: Excluded by R equester

ABSTRACT:

This projects work is exploring the use of adhesion blockade as an adjuvant to costimulation-blockade based regimens. We have focused on the use of LFA-1 blockade as an adjuvant to belatacept-based immunosuppression in a rhesus macaque transplant renal transplant model. Our group has extensive prior experience with this combination in both primate and human islet transplantation. The pairing was shown to be effective in prolonging islet graft survival, however, clinical development of the humanized antibody, efalizumab, was halted due to patient complications. We sought to test the combination of belatacept with LFA-1 in a solid organ model. We initially tested two primatized formulations of the anti-LFA1 antibody, TS-1/22:IgG1 (R1) and IgG4 (R4), as well as the fully mouse antibody used in previous studies by our group. Our results indicate that previous successes with LFA-1 blockade in islet transplantation will be more challenging to replicate in a primarily-vascularized solid organ model. Our continuing work will explore whether LFA-1 blockade can be optimized and deleterious effects on protective immunity lessened by selective targeting the activated confirmation of LFA-1. Each experiment employs significant Yerkes resources, including veterinary staff, Rhesus macaques, operating room time and staff, and pathology services.

A subcontract award for this project (III) was awarded to Duke University unde Excluded by R equester on 7/1/2014.
As of 12/31/2014 there was a change of Prinicpal investigator status for grant (Project I-IV) from Excluded by Requester
Excluded by R equester to Excluded by R equester

GRANT NUMBER: NIH 5U19 AI1051731-12

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **TRANSPLANT TOLERANCE IN NON-HUMAN PRIMATES**

NPRC UNIT: Animal Resources

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

The studies specifically address two of the most pressing questions facing the kidney transplant clinician: 1) how to treat the patient who develops alloantibody after transplantation, and 2) how to successfully transplant the highly sensitized patient. The goal of this study is the development of novel strategies to successfully transplant highly sensitized recipients that combine a generalized ablative regimen of plasma cell targeting newly identified signally pathways with a more focused tolerogenic costimulation-based strategy. We used a clinically relevant rhesus macaque model of sensitization and state of the art assays to measure alloreactive B cells, plasma cells and antibodies.

We have developed a model that best approximates allosensitization by kidney or skin rejection in order to effectively develop strategies for desensitization. Our experimental protocol involves kidney transplantation into healthy rhesus macaques that undergo unilateral native nephrectomy or skin transplantation in order to enable the full development of acute rejection and alloantibody development. We also observed the natural history of sensitization after transplantation in animals receiving no immunosuppression. We have shown that desensitization with the proteasome inhibitor, bortezomib combined with costimulation blockade significantly reduces donor specific antibody. The effects of bortezomib have been generally well tolerated and the effects on graft survival are currently being assessed. Each experiment employs significant Yerkes resources, including veterinary staff, Rhesus macaques, operating room time and staff, and pathology services.

As of 12/31/2014, there was a change of Prinicpal investigator status from Excluded by Requester to Excluded by Requester

GRANT NUMBERS: NIH 5U19 AI1051731-12

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

BEHAVIORAL NEUROSCIENCE AND PSYCHIATRIC DISORDERS

Excluded by Requester

Division Chief

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **MODELING VULNERABILITY FOR PTSD: HISTORY OF PRIOR STRESS, HIPPOCAMPAL**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

This Private Source studied utilized chronic variable stress in a mouse model to examine the role of fear, extinction, and HPA axis responsiveness in genetically wild type mice and in mice with hippocampal BDNF deletions. This study has now ended.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **ONTOGENIC FACTORS IN ADOLESCENT-EMERGENT DEPRESSION & DECISION-MAKING**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

This NIH NIMH BRAINS award aimed to isolate cellular and behavioral predictors and mechanisms of adolescent-emergent depressive-like behavior. We aimed to develop strategies to treat depressive-like behavior during adolescence and to thereby effect long-term positive outcomes in vulnerable adolescent populations.

During the funding period, we tested the utility of a cytoskeletal regulatory drug called fasudil in the context of aberrant reward-related decision-making, anhedonia, and amotivation related to stressor exposure. We used two models of depression tailored to male and female adolescent rodents. We discovered that this drug has marked benefits in both sexes, and these benefits exceeded those generated by Prozac, the primary antidepressant on the market. We generated evidence that this drug acts by normalizing or augmenting endogenous dendritic spine motility in the adolescent prefrontal cortex and by enhancing the expression of the trkB receptor within the medial prefrontal cortex. These experiments laid the groundwork for intracranial manipulations aimed at determining anatomical loci of action and cellular mechanisms. We also showed during this period that the beneficial effects of this drug -- in terms of both acute and chronic treatment -- were selective to adolescent, and not adult, rodents, and we have established in vivo single-cell imaging techniques to further isolate neurobiological correlates of antidepressant-like action. We additionally characterized the trajectory of dendritic spine proliferation and refinement during adolescence in mice exposed to the primary stress hormone corticosterone.

GRANT NUMBERS: NIH NIMH: R01 MH101477

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **NEUROTROPHIC APPROACHES TO ADOLESCENT-ONSET COCAINE ABUSE**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

This proposal supported efforts to reverse the long-term behavioral consequences of early-life (adolescent) cocaine self-administration using the novel trkB agonist 7,8-dihydroxyflavone (7,8-DHF). We hypothesized that treatment initiated during adolescence would have long-term beneficial consequences in both male and female subjects.

We made substantial progress during the funding period, showing that 7,8-DHF indeed blocked cocaine-induced reward-seeking habits, but that the drug was selectively active in mice that escalated in cocaine self-administration across adolescence. By contrast, this drug faciliated response extinction in mice with a history of "low" response profiles. These experiments laid the groundwork for replication in the context of intravenous, rather than oral, cocaine self-administration. Notably, we found that in female mice, a history of low, stable cocaine self-administration resulted in several abnormalities in adulthood. These included increased propensity to engage in reward-seeking habits, and increased liklihood of relapse behavior. This pattern was selective to adolescent cocaine self-administration, since mice that self-administered cocaine later, in peri-adolescence, were unaffected.

GRANT NUMBER: Private Source Award

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **MECHANISTIC, STRUCTURAL & FUNCTIONAL CHARACTERIZATION OF POSTNATAL DENDRITIC SPINE ONTOGENY**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

The 100 billion neurons comprising the adult brain are wired together using complex structural protrusions called dendrites and axons that extend from the cell soma and form additional small protrusions termed spines. Because mature dendritic spines house synapses—points of adhesion between cells that allow for chemical communication—spine *density* and *shape* determine a neuron's ability to communicate within broad networks and control mood, memory, cognition, and behavior. During adolescence, synapses initially markedly proliferate in prefrontal cortical regions responsible for mood regulation and decision-making; a period of pruning that eliminates up to 45-48% of synapses, lengthens remaining spines, and refines gross brain structure into adult form follows.

We hypothesize that the persistent, unremitting nature of *adolescent-onset* depression results at least in part from the effects that insults such as stress hormone exposure have on the normative trajectory of prefrontal cortical dendritic spine refinement. In this case, pharmacotherapeutic interventions that target cellular morphology rather than classical neurotransmitter systems may have lasting consequences by optimizing structural maturation within discrete cortico-limbic circuits. Thus, specific aims of this grant were: 1) high-resolution capture of cytoskeletal atrophy after stress hormone exposure in adolescence; 2) identification of biochemical mechanisms using *in vivo* viral-mediated gene transfer; and 3) *treatment* of depressive-like behavior using a corticosteroid-based model of adolescent-onset depression and pharmacological agent that acts on the actin cytoskeleton.

During the funding period, we discovered that subchronic corticosteroid exposure in adolescence, but not adulthood, resulted in context-dependent habits in adulthood. Targeted amygdalo-hippocampal silencing of tropomyosin receptor kinase B (trkB) recapitulated these effects, while the trkB agonist 7,8-dihydroxyflavone *rescued* corticosterone-induced behavioral deficiencies and also had durable antidepressant-like effects. These findings suggest that a stress-sensitive amygdalo-hippocampal neurocircuit, which is regulated by top-down prefrontal cortical control, coordinates actions and habits; this network may be especially vulnerable to stressor exposure in adolescence.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **MOLECULAR AND CIRCUIT-LEVEL SYNERGIES AFTER EARLY-LIFE COCAINE**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

Adolescence is a period of vulnerability to the development of many psychiatric disorders, including substance dependence disorders that persist across the lifespan. Incubation of certain biological factors associated with addiction may play a causal role. We explored this hypothesis in the context of cocaine-induced stimulus-response habits, which are considered a causal factor in the development and maintenance of addiction. We have discovered that mice exposed to subchronic cocaine in adolescence, but not adulthood, are behaviorally insensitive to changes in action-outcome contingencies in adulthood, generating instead reward-seeking habits. In concert, orbitofrontal prefrontal cortex (oPFC) dendritic spines are eliminated, and remaining spines retain an immature, adolescent-like morphology. Fasudil, a Rho-kinase inhibitor, blocks cocaine-induced habits, and this effect is dependent on Abl-family kinase signaling within the oPFC. Regulation of behavioral outcomes by cytoskeletal-targeting agents clearly links the structural effects of cocaine with long-term maladaptive outcomes.

Abl-family-kinase signaling can be stimulated by inhibiting NR2B-containing N-methyl D-aspartate (NMDA) receptors. Accordingly, we also found that the NR2B inhibitor ifenprodil blocked habits by augmenting new response-outcome associative conditioning, and it interfered with cue-induced reinstatement of cocaine seeking when paired with extinction conditioning in cocaine self-administering mice. Together, these findings suggest that treatment strategies aimed at reversing the chronic effects of adolescent cocaine exposure may benefit from targeting NM.D.A receptor and cytoskeletal regulatory signaling and augmenting the development and maintenance of goal-directed response strategies, thereby “breaking” cocaine-induced habits.

GRANT NUMBER: NIH NIDA: R21 DA034808

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **SELECTIVE TARGETING OF P13K TO RESTORE HIGHER COGNITIVE FUNCTION IN FXS**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

Dysregulated neuronal signaling and protein synthesis, caused by loss of FMRP, may underlie cognitive impairment in the inherited intellectual disability Fragile X syndrome (FXS). It remains unclear how FMRP deficiency leads to broad defects in signal transduction and protein synthesis. We hypothesize that increased expression of specific components of the PI3K signaling complex due to lack of FMRP-mediated regulation generates the observed defects in activity-dependent protein synthesis and is a major cause of neuronal dysfunction in FXS. We have reported that reduction of elevated levels of the PI3K catalytic subunit p110β or the PI3K enhancer PIKE, two confirmed FMRP targets, rescues molecular, cellular and behavioral defects in mouse and *Drosophila* FXS models. Postnatal reduction of p110β in the prefrontal cortex restores higher-order cognition in a prefrontal cortex-selective FXS mouse model and in *Fmr1* knockout mice. These findings suggest a crucial role of increased PI3K expression in FXS-associated neuronal and cognitive deficiencies. In the coming year, we will replicate these behavioral neuroscience studies using a pharmacological, rather than viral-mediated, inhibitor of p110β.

This grant supports a collaborative project betweer Excluded by Requester lab (Cincinnati) and Excluded by Requeste lab (Emory) aimed at understanding the mechanisms by which postnatal *Fmr1* expression regulates complex decision-making, anxiety-like behavior, and the PI3K signaling pathway.

GRANT NUMBER: NIH NIMH: R21 MH103748

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **COMMONALITIES AND VULNERAB. IN CONTEXT-INDUCED REWARD SEEKING HABITS**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

Adolescent substance abuse increases the likelihood of developing lifelong addiction, and the domestic costs associated with substance dependence are estimated by some to exceed those associated with both cancer and cardiovascular disease combined. Effectively treating adolescent-onset drug dependence would mitigate these costs; however mechanisms of vulnerabilities remain unclear. We have shown that adolescent cocaine exposure eliminates dendritic spines in the orbitofrontal prefrontal cortex (oPFC), widely implicated in addiction psychopathology, and that spine elimination *persists into adulthood* (2012, *J. Neuroscience*). Hence, cocaine-induced structural reorganization of the adolescent brain – and particularly the oPFC – may confer long-term vulnerabilities to habitual drug seeking and relapse.

It is widely accepted that psychostimulant exposure reorganizes dendritic spines, but whether the effects of cocaine exposure on neural structure are causally related to addiction vulnerability *at any age* represents a lively debate in the field. Direct evidence supporting any single position is limited, as few labs are equipped with the tools to model addictive behavior in animal systems, to capture and enumerate dendritic spine structure, *and* to manipulate the molecular regulators of dendritic spine structure within discrete neurocircuits to isolate causal relationships. We have these capabilities, and we aim to determine mechanisms of vulnerability to the development of cocaine-induced stimulus-response habits, particularly in the case of adolescent cocaine exposure. We have discovered that mice with a history of adolescent cocaine exposure, but that developed a resilient phenotype, have larger dendritic spine heads in the oPFC in adulthood, evidence of synaptic strengthening. We also imaged dendritic spines in the prelimbic cortex, which is associated relapse-like behavior (e.g., see the work of Kalivas and colleagues). Here, we have identified a different phenomenon, in that “cocaine vulnerable” mice show dendritic spine head enlargements, indicating that synaptic strengthening in the prelimbic cortex is associated with cocaine vulnerability following exposure during adolescence. These spine modifications were detected multiple weeks following cocaine exposure, elucidating the durable consequences of cocaine exposure that can persist well into adulthood.

GRANT NUMBER: NIH NIDA: R03 DA036737

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **TRAINING PROGRAM IN THE NEUROBIOLOGY OF DRUG ABUSE**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

This is a training grant in the neurobiology of drug abuse. It supports predoctoral fellows during their dissertation research, as well as postdoctoral fellows. In this reporting period,the training grant in the neurobiology of drug abuse ended on June 30, 2014 and has not been renewed.

GRANT NUMBERS: NIH 5T32DA015040

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **LONGITUDINAL EPIGENETIC MODIFICTION OF FKBP5 IN RHESUS MONKEYS**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

Over the past year, we found that genetics predisposition and environmental factors interact to shape the development and function of the human brain and ultimately moderate the risk to suffer from psychiatric disorders. We have shown a molecular mechanism for a gene by environment interaction of FKBP5 with childhood abuse on posttraumatic stress disorder in human Excluded by Requester Nat Neurosci, 2013). We have investigated epigenetic, endocrine and behavioral changes longitudinally in a non-human primate model of early life maltreatment that will enable us to determine the timeframe in which the organism is most vulnerable to stressful events and when the epigenetic modifications in FKBP5 are established that last into adulthood. These experiments will lay the groundwork for future experiments investigating preventive and therapeutic possibilities for early life stress exposure in close homology to the human biology.

GRANT NUMBER: NARSAD 20895

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **A SMART WIRELESS HOMECAGE FOR HIGH THROUGHPUT LONGITUDINAL ANIMALS STUDIES**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

A Smart Wireless Homecage for high throughput longitudinal Animal Studies *In vivo* electrophysiology has been a powerful tool in studying the functional organization of the nervous system in animals to generate the knowledge that will eventually aid in prevention, diagnosis, and treatment of disease and dysfunction in humans. It has provided groundbreaking information on areas ranging from the organization of primary visual cortex to neural correlates of working memory, which has helped in the treatment of disorders ranging from schizophrenia to epilepsy to depression. Many experimental questions, particularly in behavioral neuroscience and development of neuroprosthetic technologies, require long-term experiments on awake freely behaving subjects, and logistical constraints such as cost, life-span, and housing often necessitate using small animals, such as rodents. The technical challenges to this approach, which can affect the quality of the acquired data, center on finding ways to record data for extended periods while creating an enriched environment for the subjects as close as possible to their natural habitat. Moreover, these experiments are extremely labor-intensive, and therefore, costly. There is a need to automate data collection from multiple subjects in parallel for statistical validation with minimum human intervention. The current research is to develop and test a new technology to overcome these challenges. We propose to develop a new version of the EnerCage system, an inductively-powered wireless data acquisition system for electrophysiology experiments on small freely behaving animal subjects, which is the size of a standard home cage. The key advantage of the new EnerCage system is that it will be fully compatible with the existing animal facility infrastructure, and allow researchers to run long-term experiments on a large number of small animals in parallel without occupying their precious laboratory space or engaging their highly- trained staff in laborious monitoring tasks. Other advantages of the EnerCage system are wirelessly powering and communicating with any electronic instrument for recording physiological parameters, stimulating the nervous system, or injecting drugs. The EnerCage system is also capable of accurately tracking the 3-D position and orientation of a magnetic tracer affixed to the animal body, which unlike optical methods does not require the animal to be in the line of sight.

GRANT NUMBER: R21 EB018561-01

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **FEAR AND DOPAMINE IN THE BASOLATERAL AMYGDALA**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

Activation of neurons in the basolateral amygdala (BLA) plays an essential role in the cellular processes that underlie the normal, adaptive, behavioral response to threatening, as well as rewarding, environmental stimuli. Importantly, release of the neurotransmitter dopamine has also been shown to play a central role in the response to threatening or rewarding stimuli. Moreover, several neuropsychiatric disorders such as schizophrenia, which are commonly associated with emotional disturbances, are thought to result, at least in part, from abnormal dopamine transmission. Compelling evidence now suggests that region-specific release of dopamine into the BLA is an absolute requirement for the formation of fearful memories. Hence, dopamine depletion prevents the formation of fear memories, an effect that can be rescued by allowing dopamine release to occur only within the BLA. More specifically, pharmacological agents that selectively modulate the activity of D1 family dopamine receptors (D1R, including D1 and D5) in the BLA can also modulate fear memory formation and consolidation. Significantly, gene knockout mice with a global deletion of D1 receptors show an impairment of fear memory formation. In other brain regions, D1 receptors are believed to activate the protein kinase-A (PKA) cascade. Importantly, inactivation of the PKA pathway impairs fear memory formation. Together, these data suggest that activation of the D1 - PKA cascade in the BLA may play a critical role in the formation of fear memories. Similarly, recent studies have indicated that synchronized neural activity, both within the BLA and between the BLA and target structures such as the medial prefrontal cortex (mPFC), play a major role in memory formation and recall. Dopamine has long been known to play a critical role in synchronizing neural activity. However, no study has systematically examined the molecular, cellular, and network-level mechanisms by which D1 receptor activation may facilitate fear memory formation. The studies outlined in this proposal are designed to address this significant knowledge gap. We have strong preliminary data to support our hypothesis that: D1 receptor activation in BLA principal neurons acts to facilitate synaptic plasticity by a PKA-dependent enhancement of intrinsic membrane oscillations and spike timing precision. The resulting highly synchronized firing of principal neurons in distinct frequency ranges, and subsequent phase locking of synchronized activity between the BLA and mPFC, facilitates fear memory formation.

The specific aims of this proposal have been designed to answer three specific questions relating to this hypothesis: SA#1. Does activation of the D1 - PKA cascade facilitate intrinsic oscillatory activity in the BLA? SA#2. Is activation of the D1 - PKA cascade necessary for synaptic plasticity in BLA afferent inputs? SA#3. Can activation of the D1 - PKA cascade facilitate coherent oscillations between the BLA and mPFC during fear learning?

GRANT NUMBER: R01 MH069852-10

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **STRESS-INDUCED GENE REGULATION: BNST CRF NEURONS AND THE PHYSIOLOGY OF ANXIETY**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

Activity of neurons in the bed nucleus of the stria terminalis (BNST) plays a central role in the normal adaptive response to stress. However, chronic release of stress hormones into the BNST also plays a critical role in several central and peripheral pathologies, including anxiety disorders, posttraumatic stress disorder (PTSD), stress-induced drug abuse, cardiovascular disease, as well as gastrointestinal disorders. To date the cellular mechanisms underlying the switch from a normal adaptive response to a psychopathological state remain unknown. The long-term objectives of this proposal are to delineate the cellular mechanisms contributing to the pathological switch in BNST function, with the hope of identifying novel targets for clinical intervention. The selective serotonin (5-HT) reuptake inhibitors (SSRIs) are the first line drugs of choice in treating many stress-related disorders suggesting that abnormal 5-HT function in key areas, such as the BNST may play an important role in the development of these disorders. We have shown that 5-HT inhibits the majority of BNST neurons in vitro, and evokes an anxiolytic response in vivo. Moreover, acute release of the stress hormone corticotrophin releasing factor (CRF) facilitates the inhibitory response of BNST neurons to 5-HT, suggesting that an interaction between these two systems contributes to the normal adaptive response to stress. Our data suggest that repeated restraint stress (RRS) results in a long lasting enhancement of anxiety-like behavior that is associated with a significant reduction in the mRNA expression of inhibitory 5-HT1A receptor subunits, and an increase in excitatory 5-HT2C/7 receptor subunits in BNST neurons. These data suggest that RRS switches the 5-HT response of BNST neurons from inhibition to excitation. In addition, RRS selectively attenuates the expression of mRNA for the Kv4.2 subunit of the inhibitory transient outward potassium current (IA). Significantly, pilot data suggests that the response to RRS can be blocked by prior administration of a CRF1 receptor antagonist, or a histone-deacetylase inhibitor, which alters gene transcription. Our hypothesis is that in RRS, repeated CRF1 receptor activation initiates a cascade of events that disrupts transcriptional regulation of gene expression resulting in an increase in the excitability of BNST neurons, and particularly CRF-containing neurons, and shifting their response to 5-HT in favor of excitation. We propose that similar shifts in BNST excitability may contribute to the etiology of anxiety disorders and PTSD. Here, we will use patch clamp electrophysiology, molecular biology, and behavioral studies in rats and in a novel transgenic mouse in which a green fluorescent protein (GFP) is expressed in CRF-neurons to test our hypotheses.

GRANT NUMBER: R01MH072908-10

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **THE IMPACT OF OXYTOCIN ON THE NEURAL REPRESENTATION SOCIAL STIMULI**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

Behavioral evidence across species suggests that oxytocin plays a general role in many aspects of social cognition, yet the neurobiological substrates through which it acts at the neural circuit level are not fully understood. An intriguing but untested idea is that centrally released oxytocin acting on limbic brain regions allows for the neural processing of social cues to gate activity in areas involved in seeking reward, thus facilitating the motivation to socially interact and the reinforcement of conspecific cues. Our long-term goal is to elucidate how oxytocin modulates the oxytocin receptor rich regions underlying social information processing and reward to enhance social cognition. The objective is to record from chronic electrode implants within these regions during social behavioral paradigms in rodents. Our central hypothesis is that the motivation to interact socially is determined by a balance between positive and negative valence cues, and that oxytocin acts to enhance how positive valence cues and/or suppress how negative valence cues modulate the functional neural connections between cue and reward processing areas, helping to reinforce their encoding. The rationale for our proposal is that, once we know how oxytocin affects functional connectivity between these areas in natural social contexts, our improved knowledge about oxytocin's sites of action will enable direct manipulation of these circuits to enhance prosocial behavior. Two complementary specific aims in two different rodent models will be pursued, each chosen to maximize our ability to deduce the electrophysiological effects of either oxytocin loss of function (Aim 1) or gain of function (Aim 2) during social interactions. Our study's significance lies in the fact that it will implicate a specific central limbic circuit in mediating oxytocin's role in facilitating social motivation and socially reinforced learning. The combination of in vivo electrophysiology with oxytocin manipulation in freely moving, socially interacting rodents is an innovation that will enable key questions to be addressed about how real-time neural activity within limbic circuits is dynamically modulated by oxytocin in natural social interactions.

The oxytocin (OT) system has emerged as one of the most viable targets for pharmacologically enhancing social cognition in psychiatric disorders with compromised social functioning, including autism spectrum disorder (ASD). In animals, central OT modulates social cognition and behavior, including maternal nurturing, social recognition and social attachment, through its actions in the amygdala (Amy) and brain reward systems. In human subjects, intranasal (IN) administration of OT increases attention to eyes of others, enhances face and emotion recognition, and facilitates socially reinforced learning. IN-OT enhances some aspects of social cognition in subjects with ASD as well. The overarching hypothesis of our Research Strategy is that OT increases the salience and reinforcing value of social stimuli by modulating Amy activity and functional connectivity with brain regions involved in reward. There are 37 clinical trials examining the effects of IN-OT on social cognition or in psychiatric disorders registered on Clinicaltrials.gov. Yet the mechanisms by which IN-OT modulates social cognition are unknown. Indeed, it is not even clear whether the effects of IN-OT on social cognition are mediated by brain OT receptors (OXTR). The goal of this Center is to launch an integrated, coordinated and rigorous research program to discover the neural mechanisms by which OT modulates social cognition. The Center will create a vibrant intellectual research and training environment, and coordinate outreach activities by forging relationships with numerous organizations in the Atlanta area.

GRANT NUMBER: 5P50MH100023-02

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **EPIGENETICS OF NEURONAL PLASTICITY IN AUDITORY CORTEX IN A SENSORY MEMORY MODEL**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

Identifying the molecular mechanisms and circuitry that underlie auditory fear-learning is critical for the understanding disorders that involve a dysregulation of fear-learning such as PTSD. Here we proposed to identify genes that are epigenetically modified in response to an auditory fear-conditioning paradigm. We hypothesize that genes involved in synaptic plasticity such as Homer1a and Arc will have different epigenetic motifs in response to fear-learning in comparison to controls resulting in an upregulation their expression, potentially playing a role in memory consolidation. We hypothesize that BDNF release either in the auditory cortex or the amygdala is upstream of epigenetic changes in Homer 1a and Arc in the auditory cortex. Finally, we hypothesize that the BDNF induced epigenetic modification and differential expression of Arc and Homer1a is necessary for the consolidation of fear memories, therefore conditional knockouts of either trkB or BDNF in the auditory cortex will have deficits in the expression of fear 24 and 48 hours after fear-learning. We have made marked progress towards achieving the proposed goals of both aims 1 and 2 of this R21 proposal during the first year of this work, as outlined below.

Auditory Cortex is required for consolidation of cued auditory fear memories. Our pilot data demonstrates that the auditory cortex is involved in fear memory consolidation and/or storage for pure tone cues. Inhibiting auditory cortical activity with a GABA receptor agonist, Muscimol, during auditory fear conditioning does not affect the acquisition of fear (Fig.1, gray box), but does impair the expression of learned fear relative to saline-injected controls, when tested with CS-only tone trials 1 and 2 days later. These data justify now investigating the underlying molecular and epigenetic mechanisms operating in auditory cortex to support fear learning. In summary, we have made very good progress towards both aims of this exploratory / developmental R21 proposal in the first year and look forward to completing the proposed aims in Year 2.

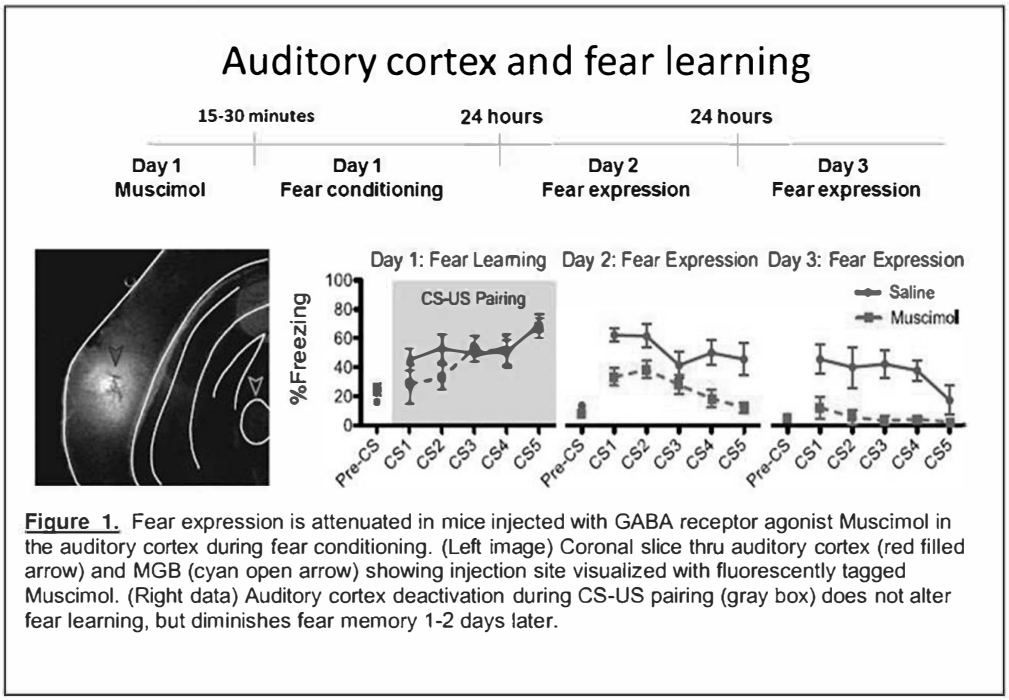


Figure 1. Fear expression is attenuated in mice injected with GABA receptor agonist Muscimol in the auditory cortex during fear conditioning. (Left image) Coronal slice thru auditory cortex (red filled arrow) and MGB (cyan open arrow) showing injection site visualized with fluorescently tagged Muscimol. (Right data) Auditory cortex deactivation during CS-US pairing (gray box) does not alter fear learning, but diminishes fear memory 1-2 days later.

GRANT NUMBER:
R21 MH102191

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **FUNCTIONAL DISSECTION OF THE TAC2-NK3R PATHWAY TO PREVENT FEAR CONSOLIDATION**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

We have been quite successful during the first year of making progress on the Specific Aims. In fact, the first manuscript describing the initial results from this grant is being reported in a manuscript that was recently accepted to *Neuron*. Using amygdala tissue punches from mice after auditory fear conditioning (FC), we performed an mRNA microarray. Using average linkage hierarchical clustering, the microarray heat map shows differential gene regulation at 30 minutes and at 2 hours after fear learning, which is a critical period for consolidation of fear memories (Excluded by Requester 2002). Moreover, from the top candidates of this microarray, the only gene which is specifically highly expressed in the amygdala and belongs to a 'druggable' pathway with available agonists and antagonists which cross the blood-brain barrier and can be used systemically is *Tac2* . This could potentially translate to the treatment of human disorders with altered fear learning. Therefore we focused on understanding and manipulating the *Tac2* pathway. Independent replication studies with additional fear conditioned mice show that *Tac2* is rapidly up-regulated at 30 minutes after FC, returning to basal levels at 2 hours (ANOVA $F_{3,28} = 5.014$, $P \leq 0.01$, Post-hoc *$P \leq 0.05$ vs Home Cage (HC) and 2hrs). Moreover, in an additional replication, *Tac2* mRNA up-regulation only occurred when the conditioned and unconditioned stimuli are paired, but not when they are unpaired, suggesting that within this paradigm, *Tac2* increased expression is specific to associative cued fear learning and independent of non-specific stress and/or contextual learning (ANOVA $F_{2,36} = 3.93$, $P \leq 0.05$, Post-hoc *$P \leq 0.05$ vs HC and unpaired). To further understand the role of the *Tac2* gene, we temporarily silenced the activity of neurons expressing this gene in the CeA during fear learning using designer receptors exclusively activated by designer drugs (DREADD) technology. The mice were infected with a DREADD Gi-coupled receptor via the pAAV-hSyn-double floxed hM4D-mCherry virus (hM4Di-mCherry AAV). This elicited specific expression of the mCherry reporter in *Tac2* cells within the CeA, but not any other area of the brain, suggesting the insertion of the DREADD receptor on the plasma membrane (Excluded by Requester et al., 2011). When animals were tested for fear expression, 24hrs later in the absence of CNO, the *Tac2*-Cre+/hM4Di-mCherry mice presented less freezing, suggesting impaired fear memory consolidation (Student's t test, $t = 3.257$, **$P \leq 0.01$). In summary, the centromedial amygdala (CeM), a subdivision of the central amygdala (CeA), is believed to be the main output station of the amygdala for fear expression. We provide evidence that the *Tac2* gene, expressed by neurons specifically within the CeM, is required for modulating fear memories. *Tac2* is colocalized with GAD65 and CaMKIIα but not with *PKCd* and *Enk* neurons in the CeM. Moreover, the *Tac2* product, NkB, and its specific receptor, Nk3R, are also involved in the consolidation of fear memories. Increased *Tac2* expression, through a stress-induced PTSD-like model, or following lentiviral CeA overexpression, are sufficient to enhance fear consolidation. This effect is blocked by the Nk3R antagonist, osanetant. Concordantly, silencing of *Tac2*-expressing neurons in CeA with DREADDs impairs fear consolidation. Together these studies provide a new understanding of the role of the *Tac2* gene and CeM in fear processing and may provide novel approaches to intervention for fear-related disorders.

GRANT NUMBER: R21 MH101492

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **GENETIC AND TRAUMA-RELATED RISK FACTORS FOR PTSD**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

Related to objective progress from the original MH071537 "Genetic and Trauma-Related Risk Factors for PTSD" which began in its first renewal period (year 6 of continuation grant) in 2010: since the initiation of the R01 project in 2006, there have been >50 original manuscripts published or in press, > 10 reviews or book chapters have arisen from the PI and co-I's related to this project, and over 40 abstracts and posters have been presented at international meetings from this work.

Additionally, in part as a result of the work from the parent grant's success, Dr. Ressler and the research team are considered leaders in the genetic environmental risk factors for PTSD. As an example of this recognition, Excluded by Requester has been the invited to give grand rounds and scientific talks on the group's work on PTSD and fear models in animals recently at Penn, Harvard/Mclean, UCSF, Innsbruck, University of Sydney, NYU, Columbia, and Duke, to name a few. He has also been invited to speak at several international symposia on these topics at recent meetings. He was recently named a member of the Institute of Medicine, as a member of the Board of Scientific Counselors for NIMH, and he was recently named Chair of the Scientific Advisory Board for the Army STARRS DOD/NIH project to understand suicide and trauma-related psychopathology in soldiers.

Specifically related to the Aims of the first renewal, which focuses on a Genome Wide Association Study of PTSD, we have made tremendous progress since the grant began. Our enrollment has surpassed 7000, so we are on schedule in this regard. We have performed extensive quality control and direct comparisons of the two main genome wide association platforms (Affymetrix Axiom and Illumina Omniquad 1M), and we have assured ourselves that for our salivary DNA based project, the Illumina platform is superior. Since last year, we have now run GWAS on >4000 subjects. Finally, as part of our initial GWAS studies, combined with our analyses of genes expressed in the mouse amygdala with fear, we identified the PACAP/PAC1 gene pathway as being robustly associated with PTSD, initially published 2011 in *Nature.* That work has been expanded and is the focus of a separate R01 to understand mechanisms of PACAP/PAC1 related functioning in fear and PTSD. For the 2014 progress report, we are outlining updated data collection and findings, both related to methodology and new gene pathways, arising from our work utilizing GWAS to understand the genomic architecture of PTSD.

GRANT NUMBER: R01 MH-071537

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **NEURAL SUBSTRATES OF PHASIC VS SUSTAINED FEAR**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

AFFILIATE SCEINTIST: Excluded by Requester

ABSTRACT:

The general goal of this project, which is now concluding, has been to better understand the role of the amygdala and the bed nucleus of the stria terminalis (BNST), and of their interactions, in phasic (i.e., transient) versus sustained fear states. We are especially interested in sustained fear because a growing body of evidence suggests a special relation between sustained fear (especially as measured using the fear-potentiated startle [FPS] paradigm) and clinical anxiety. In healthy controls, and in most of our rats, FPS is not sustained but is instead transient. We have found that another common fear measure, freezing, shows just the opposite time course. We found that this is not due to behavioral incompatibility (i.e., it is not because freezing precludes FPS) because when phasic threat stimuli are presented during sustained presentation of other threat stimuli (to which rats freeze), startle potentiation is not diminished. The view that startle is inherently phasic is supported by findings from another recently completed study which showed robust FPS to each when presented separately (with a 60-sec inter-trial interval) but to neither when presented contiguously, to the same rats, to create a continuous long-duration threat stimulus (i.e., alternating lights and tones with a 0-sec ITI). Because rats *do* show a sustained freezing response to such stimuli, the loss of FPS does not reflect a loss of fear, but rather a switch from phasic to sustained fear systems and their affiliated behaviors. We have previously argued and have now strengthened the case that the BNST selectively mediates sustained threat responses by showing, for example, that bilateral excitotoxic BNST lesions block freezing evoked by 8-min clicker presentations (that were previously paired with shock), but not the freezing responses evoked by phasically-presented 30-sec clicker CSs. We also found recently that inactivation of the BNST with muscimol during conditioning disrupts freezing when rats are tested without drug several days later, but does not disrupt the later expression of FPS to the same stimulus. These findings contradict the prevailing view that fear is a unitary state and that different fear-associated behaviors are simply different manifestations of that state. The data suggest instead that different fear memories (or engrams) are formed during the same experience, and are necessary for different fear behaviors (i.e., for FPS and freezing). Based on these and other findings, we have proposed that BNST activation not only mediates sustained fear, but also inhibits the amygdala and amygdala-dependent phasic fear behaviors such as FPS. Normally, this may help coordinate the transition from amygdala-dependent phasic fear to BNST-dependent sustained fear. As the BNST comes on-line, the amygdala and amygdala-dependent fear behaviors would necessarily be inhibited. However, if this inhibitory signal were either not sent or not received, normally phasic threat responses might become abnormally sustained (i.e., as in the PTSD and panic disorder patients noted above). In recent months, we have conducted preliminary tests of this hypothesis by evaluating the effects of electrical BNST stimulation on amygdala-dependent FPS. Consistent with our hypothesis, we found that BNST stimulation significantly disrupts amygdala-dependent FPS. Depending on stimulation intensity, the animals do not show any other overt behavioral responses, and the effects are not observed when stimulating just outside the BNST. These uncertainties are unavoidable given the limitations of electrical stimulation, but could be resolved with more advanced techniques such as optogenetics. To that end, we are currently piloting some of the procedures necessary for that approach, and have submitted applications to NIH and elsewhere requesting funds for a more thorough investigation of BNST modulation of amygdala function using optogenetics and other advanced techniques.

GRANT NUMBER: 5R01MH080330

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **FUNCTIONAL NEURAL CONNECTIVITY DURING SOCIAL BONDING IN VOLES**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST:

ABSTRACT:

The goal of this project is to use electrophysiological recordings in the prefrontal cortex (mPFC) and nucleus accumbens of female prairie voles to examine the neural correlates of social bond formation in prairie voles (NAcc). It is hypothesized that increased coherence between these regions will occur during mating. Oxytocin is hyothesized to play a role in increasing connectivity between these brain regions. We have now completed recordings from 6 female prairie voles while they are interacting and mating with a male. In 5 of the 6 animals there is a strong increase in coherence between the mPFC and the NAcc in the 5-6 Hz theta range. The coherence is much stronger than when the animals are engaged in other behaviors such as self-grooming. Granger analysis reveals that it is the mPFC that is driving the NAcc, giving directionality to this functional coupling. While this is interesting, it is purely correlational. Therefore, in the last year we developed an optogenetic approach in which we inject a ChR2 expressing virus into the mPFC and it is expressed in neurons that project to the NAcc. We then implant an optical probe into the NAcc which allows us to activate the neural projections from the mPFC to the NAcc at the same frequency as the maximum coherence. We also developed a testing apparatus in which computer software tracks the experimental subject and activates the 5-6 Hz light pulses when the subject is in close contact with a male. Our results demonstrate that 5-6 Hz light pulses delivered to the NAcc of animals expressing ChR2 in mPFC projection neurons when they are in close contact with a male facilitates the development of a partner preference. This is the first optogenetic experiment ever performed in a prairie vole. We plan to submit the paper in the Spring 2015.

GRANT NUMBER: R21 10906314

SUPPORT PERCENTAGE: 5% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **NOVEL APPROACHES TO ENHANCE SOCIAL COGNITION BY STIMULATING CENTRAL OXYTOCIN**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

The goal of this project is to explore the effect of melanocortin receptor (MC) agonists on social cognition. Since MC4 receptor agonists stimulate the release of oxytocin, and oxytocin improves social cognition in patients with autism, we propose that MC4R agonists may be useful for improving social cognition in clinical populations. In this project we use partner preferences in prairie voles as a preclinical model of social cognition. We sought to determine whether MC4R agonist given acutely or developmentally could enhance partner preference formation.

A manuscript describing the effects of melanocortin agonist (e.g. MT II) on partner preference formation in male and female prairie voles and the distribution of melanocortin receptor mRNA in the prairie vole is currently In Press In this manuscript we also demonstrate that MT II potentiates terminal oxytocin release in the NAcc by stimulating somatodendritic release within the PVN. We further showed that infusing an oxytocin receptor antagonist into the NAcc prevents the probonding effects of MT II. We also examined the effect of early-life exposure of the melanocortin agonist MT II as well as a small molecule MC4R agonist from Pfizer on later life social behaviors in prairie voles. Male and female prairie voles were injected daily the first week of life with MT II, saline or the small molecule agonist and tested for social behavior later in life. Female prairie voles receiving MT II as neonates displayed more affiliative behavior as neonates and were more likely to form partner preferences than those receiving saline. Males treated in this way displayed less aggressive play fighting, but partner preferences were not affected. In contrast, the small molecule MC4R agonist facilitated later life partner preferences later in life of both male and female prairie voles. Using immediate early gene markers, we also showed that MT II in neonates results in the activation of oxytocin, vasopressin and CRF neurons in the PVN. This manuscript has been published in *Neuropharmacology*.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 5% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **OXYTOCIN RECEPTORS AND SOCIAL BEHAVIOR**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

The goal of this project is to explore the relationship between genetic polymophisms in the oxytocin receptor gene, oxytocin receptor gene expression in the brain, and social behaviors in prairie voles. In addition, we explore the effect of early-life social deprivation on later life social behaviors. Finally, we explore the potential for melanocortin receptor (MCR) agonists, which stimulate oxytocin release, for enhancing social behaviors in voles.

We established breeder pairs in which both parents were C/T heterozygotes at the SNP that predicts OTR expression. Offspring were tested on a battery of social behavior tests. We discovered that males with a C/C genotype (and thus lower OTR expression in the NAcc) are less likely to form a partner preference than males with a T/T genotype. Furthermore, we confirmed that T/T animals express more OTR in the NAcc than C/C animals in a large cohort of >60 animals. This is the most robust genotype-phenotype relationship I have ever seen. We have also now sequenced 70 kb of the OTR gene including the surrounding area from C/C with high (N=10) and low (N=10) OTR expression as well T/T with relatively low (N=10) expression and the more typical high expression (N=10). We are in the processes of analyzing this data to identify candidate regions that may be more causally involved in the gene expression.

We had previously shown that animals with low OTR expression in the NAcc are more susceptible to the negative effects of early-life social neglect. We reported in the last funding period that a melanocortin agonist, MT II, when given during the first week of life increases the probability that females will develop social bonds when they become adults (Excluded by Requester et al., 2014). We have further shown that MT II given in the first week of life rescues the social deficits in prairie voles induced by early life social isolation. Under Revision

Under Revision

GRANT NUMBER: R01MH096983

SUPPORT PERCENTAGE: 5% of P51 funds support this project

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **SILVIO O. CONTE CENTER FOR OXYTOCIN AND SOCIAL COGNITION**

NPRC UNIT: Behavioral Neuroscience and Psychiatric Disorders

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

The goal of this project is to explore the effects of oxytocin on functional connectivity and social cognition using prairie voles, rats, rhesus macaques and healthy human subjects in individuals with autism. The Conte Center uses a highly collaborative, coordinated and integrative approach across all models to discover general principles of oxytocin function and mechanisms of action.

For Project 1 we have recruited a Postdoctoral fellow who will conduct the electrophysiological recording in the prairie vole amygdala, prefrontal cortex and nucleus accumbens. We have continued to develop the technology to record from neurons from these multiple brain regions simultaneously from free, behaving animals. We have also overcome setbacks in our valproate rat model of autism. For Project 2 we have identified new electrophysiological recording probes that will allow us to record from several brain regions in a rhesus macaque brain while infusing oxytocin or antagonist into the nucleus basalis. For Project 3, the 10 male rhesus macaques have been moved from the field station to the main station and they are being trained to voluntarily inhale oxytocin from the pediatric nebulizer and to perform the social tasks on touch screen monitors. In Project 4 we have completed the development of the video game to assess social cognition and have begun to recruit autistic subjects and perform clinical assessments prior to their participation in the task. In the Neurochemistry Core we have published two papers describing the distribution of oxytocin receptors in the rhesus and titi monkey brain. These results demonstrate that the oxytocin receptor in the rhesus macaque is highly concentrated in brain regions that regulate visual attention, including the nucleus basalis of Meynert.

GRANT NUMBER: NIH P50 MH100023

SUPPORT PERCENTAGE: 10% of P51 funds support this project.

EMORY VACCINE CENTER

Excluded by Requester **Ph.D., Director**

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **VACCINE INDUCED IMMUNITY IN THE YOUNG AND AGED**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

Research funded by this CCHI U19 during the past several years has permitted us to investigate the molecular mechanisms driving innate and adaptive immune responses to flavivirus infections and vaccinations, in humans. In particular, research performed in Project 2 during the previous two cycles of funding has resulted in several seminal advances, including:

(i) Insights into the molecular mechanisms by which the yellow fever vaccine 17D (YF-17D) stimulates robust and durable immune responses [Excluded by Requester] *J. Exp. Med 2006*).

(ii) The application of systems biological approaches to identify molecular signatures to predict the immunogenicity of YF-17D in humans [Excluded by Requester] *Nature Immunol. 2008*).

(iii) The experimental validation of genes contained within the aforementioned predictive signatures, which resulted in the discovery of a novel pathway by which GCN2, an amino acid sensing molecule involved in the ancient integrated stress response, programmed dendritic cells towards autophagy and enhanced antigen presentation to T cells [Excluded by Requester] *Science 2014*).

(iv) The application of systems based approaches to characterize the nature of the innate response during acute dengue viral infections in humans, and the resulting identification of a novel mechanism by which CD14+CD16+ inflammatory monocytes induced the differentiation of resting B cells to plasmablasts [Excluded by Requester] *al, Cell Host & Microbe, 2014*). These exciting advances have stimulated many important questions, and the work proposed in the current cycle of funding is aimed at addressing some of these questions.

During year 1 of this third cycle of funding, we have made considerable progress towards Aims 1 and 2.

With respect to Aim 1, our recent work shows that yellow fever vaccine strain YF-17D infects dendritic cells and stimulates the stress response kinase GCN2, which is necessary for antigen cross presentation and induction of antigen specific CD8+ T cell responses [Excluded by Requester] *Science 2014*). However, the detailed molecular mechanisms controlling the integrated stress responses by YF-17D are far more complicated. Our results show that YF-17D virus infects both dendritic cells and non-immune epithelial cells, triggering PKR activation and stress granules formation. However, the relative pathogenic wild type virus YF-Asibi appears to be able to escape this mechanism.

The objective of Aim 2 is to understand the innate response of dendritic cells to YF-17D and Asibi and its relevance in the induction of T-cell responses. Our studies show YF-17D, but not Asibi, infection of human DCs results in increased activation of human DCs.

GRANT NUMBER: NIH 2U19AI057266-11

SUPPORT PERCENTAGE: 0% of P51funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **NIAID TETRAMER FACILITY**

NPRC UNIT: **Emory Vaccine Center**

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

The NIH Tetramer Facility operates under an NIH-sponsored contract and provides custom synthesis and distribution of soluble MHC-peptide tetramer reagents that can be used to stain antigen-specific T cells.

Our contract to run the NIH Tetramer Facility was renewed in 2013. The official award was for a single year, with options for the NIH to award non-competitive renewals for up to six additional years, and we expect to be awarded all of the option years. We experienced a 13% increase in reagent shipments in 2014 over the previous year, and we expect an even greater increase in 2015. The facility is cited in greater than 100 publications per year. In addition to maintaining our long-standing custom production and distribution system, we perform R&D projects related to advancing MHC tetramer technology. Our R&D efforts over the last year have focused on successful development of a mammalian system for expression of class I MHC molecules in a peptide exchange competent form that will allow us to produce many more class I MHC tetramers in a significantly shorter time period. We are currently changing our research focus to methods for peptide exchange in mouse class II MHC. If successful, turn around time for production of new mouse class II tetramers will be reduced by months with significant cost savings.

GRANT NUMBER: HHSN272201300006C

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **ROLE OF ANTIGEN-SPECIFIC T CELL RESPONSES IN THE CONTROL OF TB**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

Project TBRU Core B: Immunology Core of the Emory U19 TBRU (Blumberg/Ernst, PIs)
The Immunology Core of the TBRU is led by John Altman. With his group at the Emory Vaccine Center and their expertise in MHC tetramer technology, development of advanced flow cytometry methods, and development of novel viral vector antigen delivery systems for in vitro T cell assays, and along with the collaboration of Alessandro Sette's group at the La Jolla Institute of Allergy and Immunology and their expertise in epitope mapping, application of MHC peptide binding algorithms, and HLA typing, the Immunology Core of the TBRU will be able to perform the most sophisticated-to-date analyses of the phenotypes of T cell responses to Mycobacterium tuberculosis (Mtb) in humans (Projects 1 and 2) and rhesus macaques (Project 3). The activities of the Immunology Core include both provision of centralized standard support services and reagents, as well as development of important novel reagents and research activities. Standard support services include provision of MHC typing in humans and macaques; maintenance and distribution of peptide libraries; and construction, validation, and distribution of MHC tetramers, all to be used by every TBRU project. Innovative research activities include application of a viral antigen delivery system that will enable screening of more than 60 Mtb antigens for T cell responses in rhesus macaques, development of novel cell lines and MHC tetramer reagents for mapping epitopes and their MHC restriction elements, and application of CyTOF mass cytometry technology—including the use of mass-tagged MHC tetramers—to enable multiparametric descriptions of Mtb-specific T cells that will be tested for their use as biomarkers indicative of defined disease and infection states.

GRANT NUMBER: 1U19AI111211

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **CENTER FOR AIDS RESEARCH AT EMORY (CFAR)**

NPRC UNIT: EMORY VACCINE CENTER

CORE SCIENTISTS: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

The CFAR provides research facilities, institutional infrastructure and leadership, support for the recruitment and development of faculty, communication of scientific findings, and the promotion of interactions between CFAR members and outside institutions and communities through an Administrative Core, a Developmental Core, and five Science Cores: Biostatistics & Biomedical Informatics, Clinical Research, Immunology, Prevention Science, and Virology & Molecular Biomarkers.

Excluded by Requester was awarded an R37, "Targeting PD-1 Pathway for Functional Cure of AIDS." to develop therapeutic approaches that achieve functional cure (long term control of HIV in the absence of combination antiretroviral therapy). The goal of this grant is to identify a functional cure for HIV by targeting PD-1 inhibitory pathway using anti-PD-1 antibody combined with ART and vaccination.

Excluded by Requester (PI) received an R01, "Mucosal Protection Against SIV Generated by PIV5 Priming and VLP Boosting," which seeks to use novel vectors to generate immune responses in the rectum that can protect from the earliest events of HIV infection.

Excluded by Requester was awarded an R21, "Targeting SIV Reservoirs with Type I Interferons." Using the SIV-infected rhesus macaques model, he will investigate directly in vivo the potential of type 1 interferon administration as a novel intervention targeting the persistent reservoirs of latently infected cells in the setting of ART-mediated suppression of virus replication, and elucidate the potential of targeting co-inhibitory pathways to reduce the reservoir during SIV infection.

GRANT NUMBER: P30 AI050409

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **NK CELL-MEDIATED REGULATION OF T CELL IMMUNITY IN TV/HIV CO-INFECTION**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

One third of the world's population is infected with *Mycobacterium tuberculosis* (Mtb), and over 10 million are co-infected with human immunodeficiency virus (HIV). Latent Mtb infection (LTBI) represents immune containment; however HIV infection increases the risk of reactivation of LTBI from a 5-10% lifetime risk in HIV-uninfected individuals to a 10% annual risk in HIV-positive individuals. HIV-associated dysregulation of innate immunity and impairment of adaptive immunity by depletion of CD4 T helper cells likely contribute to loss of immune control of LTBI and progression to TB disease in HIV co-infected individuals. However, the parameters of immune control of LTBI that are perturbed in the setting of HIV co-infection have not been defined. Studies of Mtb infection in humans and animal models have demonstrated that both innate and adaptive immunity, particularly T cells, are critical for immune control of LTBI. Interestingly, recent evidence indicates innate immune cells play an important role in modulating antigen-specific T cell responses. Natural killer (NK) cells have been shown to modulate antigen-specific T cells by direct mechanisms, such as lysis of activated and/or antigen-specific CD4 and CD8 T cells, and indirect mechanisms, such as editing dendritic cell populations that prime effector T cell responses, and limiting the capacity of antigen presenting cells to stimulate antigen-specific T cell proliferation. Thus, innate immune cells can shape the profiles of antigen-specific T cell responses to a pathogen. The focus of this project is to examine how the innate immune response modulates Mtb-specific T cell immunity and determine how the regulatory pathways linking innate and adaptive immunity to Mtb are perturbed in the setting of HIV co-infection. We are testing the hypotheses that (1) NK cells modulate the phenotype and functional profile of Mtb-specific memory T cells, and (2) that co-infection with HIV perturbs NK cell-mediated regulation of Mtb-specific memory T cell responses by promoting NK cell lysis of Mtb-specific CD4 and CD8 T cells, thereby contributing to loss of immune control of LTBI and increased risk of progression to TB disease in HIV/Mtb co-infected individuals. We are (1) defining the phenotypic profiles, functional capacities, and NK cell receptor genotypes in persons with LTBI and HIV co-infection; (2) determining the relationship between NK cell profiles and the phenotype and function of Mtb-specific CD4 and CD8 T cell responses; and (3) defining the direct and indirect mechanisms whereby NK cells modulate Mtb-specific CD4 and CD8 T cell immunity in LTBI, and how the mechanisms of cross-talk between NK cells and Mtb-specific T cells are dysregulated in the setting of HIV co-infection. Defining immune pathways involved in the generation, maintenance, and regulation of protective memory T cell responses to Mtb infection, and identifying the mechanisms whereby HIV infection impairs protective T cell immunity to Mtb, will be of vital importance to facilitate development of effective TB vaccines and targeted immunotherapeutic interventions and treatment of individuals co-infected with HIV and Mtb that are necessary to curb the TB epidemic worldwide.

During this reporting period, all necessary regulatory approvals for the study have been obtained from the Emory University IRB, and the Kenya Medical Research Institute (KEMRI) Scientific and Ethics Unit. Standard operating procedures (SOPs), case report forms (CRFs) and databases have been developed for the study, and are now in use. A piloting phase of the study has been completed at the KEMRI/CDC field site in Kisumu, Kenya. Enrollment of participants, with *Mtb* and HIV co-infection commenced in October 2014. Emory study staff has conducted training for KEMRI/CDC-based staff in blood sample processing and immunology assay SOPs. Specific immunology assays have been optimized Excluded by Requester lab at the EVC at Yerkes.

GRANT NUMBER: 1R01AI111948-01

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **ROLE OF ANTIGEN-SPECIFIC T CELL RESPONSES IN THE CONTROL OF TB**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

Project 1: **Identification** of human Mtb-specific T cell signatures that are associated with resolved and persistent Mtb infection (Dual PD's: Excluded by Requester

Identifying immune correlates of control and protection to *Mycobacterium tuberculosis* (Mtb) infection is essential for designing vaccines for TB. The overall goals of our TBRU project are to identify antigen-specific T cell responses that are associated with distinct outcomes of Mtb infection: clearance, persistence, and progression to active disease. We currently lack the knowledge or tools to distinguish individuals who harbor persistent Mtb infection from those who may have resolved infection via immune-mediated clearance of bacteria. In Project 1 we are focusing on **"Identification of human Mtb-specific T cell signatures that are associated with resolved and persistent Mtb infection."** We are testing the hypothesis that distinct Mtb-specific memory T cell profiles are associated with bacterial clearance or persistence. This is supported by our data showing that distinct antigen-specific memory T cell phenotypes and functions are associated with LTBI, active TB disease and clinically resolved TB. We are using chemotherapy-mediated clearance to model immune-mediated clearance of Mtb, as the treatment regimen for LTBI should result in significant reduction or elimination of bacteria. We are enrolling individuals with LTBI in a low-exposure setting (Atlanta, GA) and systematically comparing their antigen-specific T cell responses before and after treatment. We are delineating the spectrum of antigens recognized by Mtb-specific memory CD4 and CD8 T cells, characterizing their memory phenotypes, functional capacities and transcriptional profiles (Aim 1). Using statistical analyses, we are deriving Mtb-specific T cell signatures that represent bacterial clearance and persistence and evaluating these (with Project 3), in non-human primates (NHP) and determining the prevalence of these signatures in treatment-naive individuals with LTBI in Kenya (Aim 2). We are longitudinally assessing the dynamics of Mtb-specific memory T cell responses and their homeostatic turnover in LTBI (Aim3). We are also comparing clearance/persistence signatures with those associated with progression to TB (with Project 2). Overall, these studies will provide insights into protective immunity to TB and new tools to evaluate Mtb persistence or clearance in LTBI.

During this reporting period, the study protocol has been written and submitted for approval by the Emory University IRB. Standard operating procedures (SOPs), case report forms (CRFs) and databases are currently being developed for the study. Monthly conference calls are in place to facilitate regular communication between all PI's of the projects and cores of this TBRU U19 project. Experiments have been initiated in Drs. Excluded by Requester laboratories to develop and optimize the diluted whole blood response spectrum assay, which will be utilized to measure T cell responses to a broad spectrum of Mtb antigens. Enrollment of participants with LTBI from the DeKalb County Board of Health Refugee Clinic is expected to commence in March 2015.

GRANT NUMBER: 1U19AI111211 (Dual PIs: Excluded by Requester

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **DETERMINANTS OF NEUTRALIZATION BREADTH IN EARLY HIV-1 INFECTION**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

Antibodies that neutralize genetically diverse HIV-1 strains, known as broadly neutralizing antibodies (bnAbs) have been recovered from a subset of HIV-1 infected subjects during chronic infection. However, the mechanisms that expand the otherwise narrow neutralization capacity observed during early infection are currently undefined. Furthermore, it remains unknown whether bnAbs can be generated through immunization. Our previous data suggests that neutralizing antibdoy epitope localization, the route and pace of viral escape, and patterns of immunoglobulin hypermutation program the pathway towards neutralization breadth. In the past year, we have characterized the initial neutralizing antibody targets for a panel of subtype A and C HIV-1 seroconvertors who developed varying levels of neutralization breadth at 3 years after infection. We have indentified and cloned the transmitted/founder envelope variant for each individual, as well as the early neutralizing antibody escape variants. We are using the soluble transmitted/founder envelope proteins (gp120 and/or gp140) to tag and sort autologous memory B cells from each individual, and PCR amplify and clone paired immunglobulin heavy and light chain variable domains from those B cells. These monoclonal antibodies are being characterized genetically, phentoypically, and structurally. This information will alow us to define the early viral and immune events that lead to the development of bnAbs in some HIV-1 infected individuals, but not others, highlighting potential immunization approaches to elicit bnAbs.

GRANT NUMBER: 5R01AI058706-12

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **SYSTEMS BIOLOGY OF MALARIA AS A MODEL FOR HOST-PATHOGEN INTERACTIONS**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

The Malaria Host Pathogen Interaction Center (MaHPIC) project is a large multidisciplinary, multi-institutional, multi-investigator project to study malaria systems biology based on both non-human primate infections and human clinical samples. The work is designed to integrate data generated by the six core research facilities (malaria, immune profiling, functional genomics, proteomics, lipidomics, and metabolomics) via the informatics, mathematical modeling, and computational analysis cores. The overarching hypothesis of this work is that by studying these model systems with these approaches, we will provide insights into the mechanisms and the indicators for human malarial disease.

During the current period, we completed a third 100-day study in rhesus macaques that included daily sample collection and assessment, and started a fourth such study. The immune profiling and various 'omics' cores have been analyzing all rhesus samples generated to date and preparing publications. Mathematical modeling teams have been developing models and the Informatics team has been developing resources for internal and external data sharing. We also generated vivax parasites from Saimiri boliviensis infections for complementary proteomic analysis. Our progress has been detailed in major 6-month progress reports and presented in an onsite meeting in April 2014 with our fourteen-member outside scientific advisory board and NIAID officials, as required per this contract.

GRANT NUMBER: HHSN272201200031C

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: VIROLOGIC CORRELATES OF HETEROSEXUAL TRANSMISSION

NPRC UNIT: EMORY VACCINE CENTER

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

In this NIH funded project, we examine why most heterosexual epidemiologically linked couples, a single HIV-1 virion from a swarm of viral variants present in the chronically infected donor establishes a new infection in the recipient, as well as those factors which allow a subset of infected individuals to then contract a second heterologous virus from a different donor, a process known as superinfection.

Our ability to pursue the above goals has depended upon a partnership with the International AIDS Vaccine Initiative (IAVI) which helps coordinate many aspects of sample acquisition, storage, and analysis Excluded by Requester al). To understand why transmitted founder (TF) virions appear better able to establish infection than non transmitted donor variants, we previously eliminated enrichment of TF variants within a donor's genital track as a potential explanation for this seemingly monophyletic transmission. To determine if TF virions are better able to infect specific mucosal target cells or perhaps interact differently with components of the innate immune system, we are cloning full length HIV genomes in an effort to create infectious molecular clones Excluded by Requester al) for subsequent testing. A collaboration with colleagues at Microsoft Research involving analysis of non-envelope viral genes from 137 epidemiologically linked transmission pairs revealed a selection bias favoring transmission of amino acid residues predicted to cause an increase in the viral replicative fitness Excluded by Requester al). We previously showed that superinfected subjects mount weak antibody dependent neutralization responses against an initial infecting virus. We now show that these individuals also tend to exhibit low antibody-dependent cellular cytotoxicity responses prior to superinfection et al). Results from these studies should prove helpful in guiding ongoing efforts to develop a protective vaccine against HIV. Excluded by Requester

GRANT NUMBER: 5R37AI051231

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: CTL AND HIV POLYMORPHISMS IN HETEROSEXUAL TRANSMISSION

NPRC UNIT: EMORY VACCINE CENTER

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

This multi-investigator project explores cellular immune responses influencing HIV-1 transmission, acquisition, and early control of pathogenesis. This analysis requires a detailed understanding of how viral sequence determinants interact with immune components in chronically infected transmitters and in newly infected individuals. Unique cohorts of heterosexual discordant couples (only one partner initially infected) are critical in facilitating these analyses.

Prior studies showed transmitted HIV gag mutations and viral loads in seroconvertors were inversely correlated, suggesting these mutations might impair the replicative fitness of virus in vivo. Subsequent studies using sophisticated cloning methods (Excluded by Requester et al) confirmed the link between gag mutations in recipients and the in vitro replicative capacity of chimeric viruses containing cloned clade C gag genes derived from these subjects. To assess how cytotoxic T-cell (CTL) pressure influences viral mutations and how these changes in turn influence clinical outcomes, full length single genome HIV sequences were generated from two Rwandan transmission pairs where female recipients shared 3 HLA class I alleles. Although antibody neutralization profiles for these recipients were similar, longitudinal viral loads were quite disparate, with superior control being associated with a less fit transmitted founder virus, and broader T cell responses mounted early against this virus and its progeny (Excluded by Requester et al). Fine mapping of the MHC complex down to single nucleotide polymorphisms (SNPs) also demonstrated how resulting cellular immune pressure partially explains viral load control (Excluded by Requester et al). Finally, a collaboration with colleagues at Microsoft Research involving analysis of non envelope viral genes from 137 epidemiologically linked transmission pairs revealed a selection bias favoring transmission of amino acid residues predicted to cause an increase in the viral replicative fitness (Excluded by Requester et al). Together these findings may well prove fruitful in subsequent vaccine design efforts.

GRANT NUMBER: 5R01AI064060

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **B-CELL BIOLOGY OF MUCOSAL IMMUNE PROTECTION FROM SIV CHALLENGE**

NPRC UNIT: EMORY VACCINE CENTER

CORE SCIENTISTS: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

Developing a safe and effective vaccine is critical for curtailing the spread of HIV-1. This consortium's goals are to define underlying mechanisms for enhanced antibody avidity and protection, as well as early events in infection of the vaginal mucosa.

The program includes four research projects, four science support cores, and an administrative core. Project 1 aims to identify mechanisms by which GM-CSF mediates enhanced protection from low dose SIV vaginal challenge, and will determine whether adding an optimized protein boost further enhances protection. Project 2 is investigating the potential and underlying mechanism for improved antibody responses observed through a TLR-4/TLR-7/8 ligand adjuvant, delivered in a novel synthetic nanoparticle formulation, and to determine if these enhance the quality of protective mucosal B-cell and T-cell responses to SIV VLPs. Project 3 is determining the effects of GM-CSF and nanoparticle delivered TLR ligand adjuvants on follicular T-cells and their function in molding the quality of the humoral immune response. Project 4 is similarly investigating the potential for these adjuvanting approaches to activate a subset of IL-21 producing neutrophils equipped with B cell helper function. An NHP Core provides and maintains genetically characterized female macaques. Additional Cores characterize antiviral antibody responses at the level of single cells and mucosal secretions. A B-cell biomarker core is developing unique reagents for defining B-cell responses. Two initial consortium projects just concluded. Novel strategies were developed to identify macaque plasmablasts whose phenotypic markers differ markedly from those in humans. More than 80% of vaccine-induced plasmablast responses were antigen specific by functional ELISPOT. Single cell sorting and cell expression cloning have enabled the recovery of antigen specific monoclonal antibodies (Excluded by Reques et al). These accomplishments will provide invaluable tools in examining early vaccine or pathogen induced plasmablast responses including antibody breadth, specificity, affinity, etc. Moreover, these techniques will have great benefit in studying antibody responses to other pathogens and vaccines.

GRANT NUMBER: 5U19AI096187

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **OVERCOMING MATERNAL ANTIBODY-MEDIATED IMMUNOSUPPRESSION**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

Maternally derived antibodies are crucial for protecting infants during their first months of life. This is best exemplified in infants with agammaglobulinemia, who thrive during the first year of life, but succumb to repeated infections after the levels of circulating maternal antibodies wane. There is, however, one downside to maternal antibodies; they suppress vaccine-induced activation of the infant immune system. Because maternal antibodies suppress vaccine-induced activation of the infant immune system, any necessary and life-saving vaccines, such as measles, are given at delayed times, up to a year after birth. This leaves a wide window of time during which the infant is vulnerable to infection but unable to develop the antibody response necessary for its own protection.

Understanding how to activate the infant immune system in the presence of maternal antibodies is a critical area of research because it could lead to the development of more efficacious infant vaccines. Toward this end, we immunized cohorts of female mice, allowed them to proceed to memory phase and mated them to generate offspring pups that bear antigen-specific maternal antibodies. We also setup controls to yield pups without maternal antibodies. We are in the process of testing these pups with either soluble antigens or with adjuvants to see if maternal suppression can be overcome.

GRANT NUMBER: 1R01AI100110-01

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **COADMINISTRATION OF CAPSID MODIFIED ADENOVIRUS FOR MALARIA**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

Plasmodium vivax is the most widely distributed human malaria parasite, responsible for 80% of the clinical cases in South and Southeast Asia and 70% in the Americas. The wider geographic distribution of *P. vivax* in comparison to *P. falciparum* is explained by the unique biological features of this parasite. Although the implementation of transmission control measures has had a significant impact on morbidity and mortality, the emergence and spread of drug-resistant parasites is a growing concern. The development of novel tools to control the disease is therefore a global priority. This project is building on our experience developing chimeric recombinant proteins and recombinant adenovirus vectors to develop a coadministration vaccination regimen that combines these two vaccine platforms. The overall goal of this project is to simplify the immunization schedule by reducing the need for boosting at regular intervals. We are modifying an existing adenovirus vector by insertion of a promiscuous T cell epitope within the capsid structure. We hypothesize that the high copy number of T cell epitopes displayed by capsid incorporation will significantly enhance the immune responses.

We have described in a previous progress report the design and expression of a novel capsid modified vector that includes the incorporation of a promiscuous T cell epitope within the Ad5 hexon. The vector also expresses a chimeric multi-stage vaccine candidate as a transgene. The sequences were derived from the rodent malaria parasite *P. yoelii* to conduct proof-of-principle efficacy studies in mice. Experiments were run using the capsid-modified vector for priming immunization in comparative experiments with the wild-type recombinant vector. A previously standardized prime-boost immunization regimen was used for these experiments that utilize chimeric recombinant proteins for boosting immunization. Significant differences in protective efficacy were recorded with more robust protection when the modified vector was used. The results support further development of this capsid-modified vector as a relevant component of coadministration immunization regimen in malaria. Experiments are on course to test immunogenicity and efficacy of co-administration of the hexon modified recombinant vector and the recombinant protein using different routes of immunization.

GRANT NUMBER: 5R21AI095718-02

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **CHIMERIC HYBRID TRANSMISSION BLOCKING VACCINE FOR MALARIA**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

The overall goal of this project is to develop and evaluate the potential efficacy of a novel *Plasmodium vivax* transmission blocking vaccine (TBV) based on Pvs25. Although Pvs25 vaccine constructs have reached a phase of clinical development, a main concern in the field is its poor immunogenicity. We have recently shown that cognate CD4+ help, provided by the genetic linkage of *P. yoelii* promiscuous T cell epitopes to a merozoite vaccine candidate, improves vaccine efficacy by a direct effect on the quality of the antibody response. We hypothesized that chimeric proteins that exhibit such configuration can be used as a carrier molecule to enhance the immunogenicity of Pvs25 and induce a robust transmission blocking immunity. We have designed and expressed a *P. vivax* carrier protein that we have called helper module (PvHM). The PvHM protein has been tested for immunogenicity in BALB/c and C57BL6 mice. Based on the evidence that the functional activity of antibodies against the merozoite protein fragment included in PvHM requires a correct refolded structure, antibodies elicited by immunization with PvHM in mice were also compared with antibodies elicited by immunization with a recombinant protein that did not include the helper epitopes. These experiments showed enhanced immunogenicity of PvHM.

We have described in a previous progress report the expression and purification of the hybrid PvHM-Pvs25 recombinant protein that incorporates the *P. vivax* carrier protein genetically linked to *P. vivax* Pvs25. Comparative experiments in CB6F1J, BALB/c and C57BL6 mice have shown significant differences in antibody titers in BALB/c mice with high antibody responses in animals immunized with the fusion protein. Interestingly, antibody responses in animals immunized with the fusion protein were also very robust against the helper module. Such antibody responses were maintained at high levels over 450 days after the priming immunization. Sera samples collected from rabbits immunized with the fusion protein or with the native protein were tested for functional activity by our collaborators at the Caucaseco Scientific Research Center in Cali, Colombia using the standard membrane feeding assays. These experiments revealed potent transmission blocking activity using three different *P. vivax* wild isolates. The overall results support further investigations of this fusion protein as a multi-stage vaccine.

GRANT NUMBER: 1R21AI094402-01A1

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **FOCUS 2: CHAVI-ID**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

The overall goal of our studies to understand vaccine-induced innate immune signals influence T follicular helper (Tfh) cell differentiation, activation, and maintenance, as well as germinal center induction and maintenance, and how this impacts long term humoral specificity, breadth, and persistence.

Aim 1. To determine the ability of different DC subsets to induce Tfh cell differentiation and persistence as well as germinal center and antibody responses. Our preliminary data suggest that pDCs do not play a critical role in the induction of a GC response following vaccination with YF17D. This however does not suggest that pDCs do not play a role in Tfh cell or GC B cell development. YF17D is known to activate multiple TLR and RLR pathways (Excluded by Requester et al. 2006) and it is possible that there are multiple redundant pathways involved in the induction of Tfh cells and GC B cells. Additional experiments utilizing defined adjuvants known to target specific innate immune pathways will help to aid understanding the role of pDCs in Tfh cell differentiation. Further experiments using other the other transgenic mice will help elucidate the roles of additional DC subsets.

Aim 2. To determine the roles of pattern recognition receptors and innate immune signaling pathways in the development of Tfh cells, GC reactions, and the resulting antibody affinity, breadth, and persistence. We have generated a strain of mice from a cross between Aicda-Cre and MyD88 floxed mice. Currently, as we are working to establish a usable size of this mouse colony, we have initiated several pilot studies using chimeric mice reconstituted with bone marrow from either Aicda-cre^{+} x MyD88^{loxp} or Aicda-Cre^{-} x MyD88^{loxp} mice. Preliminary results indicate that the loss of MyD88 signaling in activated B cells (ex-AID+ cells) leads to marked reduction in yellow-fever virus-specific IgG levels in serum of vaccinated mice. Intriguingly, the differences in antibody levels were not observed early after vaccination, but rather at a point in time that roughly follows the establishment of germinal center responses (between Day 28 and Day 34-post vaccination). To further investigate this phenomenon, we are currently assessing (i) levels of antibodies generated against the myriad of immunogens, (ii) magnitude and persistence of germinal center B cells, (iii) frequency of memory B cells (tracked by YFP expression serving as reporter of Cre recombinase activity), and (iv) frequency of Tfh cells using this AID-Cre MyD88loxp mouse model system.

Aim 3. Determine whether Camk4 plays a role in Tfh responses. Our study results support the conclusion that Camk4 functions as a negative regulator of immune responses through T cells.

GRANT NUMBER: Privat eSourc e

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **PROGRAMMING INNATE IMMUNITY TO INDUCE PROTECTIVE ANTIBODIES AGAINST HIV**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

The overarching goal of this project is to accelerate the development of an AIDS vaccine by learning how to optimally stimulate effective humoral immunity against HIV by using adjuvants that target the innate immune system in non-human primates (NHPs). Specifically, we are determining if synthetic nanoparticle formulated TLR 4 and/or 7/8 ligand based adjuvants can induce enhanced magnitude, quality and persistence of HIV envelope protein (ENV) specific antibody responses in NHPs, in comparison with the clinically licensed adjuvant, alum. We have made significant progress in the activities proposed under Objective 1. The specific aim of this objective is to determine the best adjuvants that induce enhanced magnitude, quality and persistence of ENV-specific antibody responses. All immunizations have been completed and the durability of the immune response is being followed close to 9-12 months post final immunization. A three month period is needed to euthanize 48 animals included in the study and hence the time period of 9-12 months post final immunization has been indicated. Flow cytometry based assaying of innate responses following primary immunization, ENV specific CD4+ T cell responses, ENV specific plasmablast responses in peripheral blood and long-lived plasma cell responses in bone marrow following boost immunizations and finally anti Env Tier 1 and Tier 2 neutralizing antibody responses post final vaccination has been studied up to 6 months post final vaccination. Upon termination of the experiment at 9-12 months, persistence of neutralizing antibody responses and long-lived Env specific plasma cells will be evaluated to further understand the durability of the immune response stimulated by these adjuvants. Vaccine specific B cell plasmablast responses in peripheral blood and bone marrow have been described in humans by [redacted] lab. With previous experiments in NHPs using HIV or SIV antigens, these novel assays have now been optimized for NHPs. Correlations of early plasmablast and long-lived plasma cell responses with Tier 1 and Tier 2 neutralizing antibody responses has been performed. In addition, distribution of Env specific plasma cell responses in various lymphoid organs has been studied in animals (n=6) immunized either with alum or GLA and 3M052 formulated in PLGA nanoparticles. These plasma cell responses have been correlated with Tier 1 and Tier 2 neutralizing antibody responses at ~ 4 weeks post final vaccination. Excluded by Requester lab has optimized flow cytometry based approaches to analyze emergence of follicular T helper cells in rhesus macaque peripheral blood, lymphoid and mucosal tissues. Excluded by Requester labs have been continuing to optimize both the nanoparticle and polymersome platforms in order to select a lead candidate for testing in NHPs. In one such effort, we are following up a recent study demonstrating that polyethylene glycol - polypropylene sulfide (PEG-PPS) polymersomes elicit a strong CD4 response, while nanoparticles generate a strong CD8 response. Polymerosomes stimulating a strong CD4 response has been now used in Objective 2 for comparison as a delivery vehicle for the 3M052 adjuvant with PLGA or alum based delivery systems. This study is in progress.

Excluded by Requester

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **MUCOSAL ANTIGEN-PRESENTING CELLS IN REGULATING IMMUNE RESPONSE**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

The overall goal of this project, 'Understanding the Role of Mucosal Antigen-Presenting Cells in Regulating Immune Response,' is to understand how the innate immune system regulates adaptive immune responses, and to harness this understanding in designing vaccines. The subject of the research funded by the present grant during the current cycle focused on the central problem of how/ the immune system launches robust immunity against invading pathogens, while maintaining tolerance to self. This problem assumes a particular significance in the intestine because of the trillions of commensal microorganisms and food antigens that confront the intestinal immune system every day. Recent advances suggest that DCs and macrophages play a fundamental role in maintaining the balance between immunity and tolerance. The hypothesis of the application was that balance between immunity and tolerance in the intestine is a complex function of the subset of antigen-presenting cell (APC), the microbiota, and instructive signals from stromal elements. This hypothesis is being tested in the following specific aims: Aim 1; to determine whether distinct subsets of lamina propria DCs and macrophages differentially bias the class of innate and adaptive immune responses. Aim 2: To determine whether commensal bacterial flora regulate the functions of lamina propria DCs and macrophages and their ability to induce Th17 versus T regulatory responses. Aim 3: To determine the innate responses of lamina propria DCs and macrophages to oral administration of adjuvants or vaccines, and the effects of such responses on the adaptive immune response. Research performed in each of these Aims has yielded exciting and unexpected results. For example, we have characterized the phenotypes, functions and regional localization of intestinal APC subsets, and defined a novel transcription factor that programs intestinal DCs to induce T regulatory responses.

A major finding to emerge from our work over the past year is the important role played by the integrated stress response in programming dendritic cells to modulate the type of T cell responses. The integrated stress response is an ancient homeostatic mechanism that enables cells to sense and adapt to diverse stress signals, including nutritional deprivation. General controlled repressed (GCN2) kinase, a sensor of amino acid starvation, is an orchestrator of the ISR and plays a central role in modulating cellular metabolism as an adaptation to amino acid deprivation. Despite its key role in cellular metabolism, the impact of this ancient stress response pathway in immunity is poorly understood. Our recent work has revealed a role for GCN2 in sensing viral infections and programming dendritic cells (DCs) to undergo autophagy and enhanced antigen presentation to T cells (Excluded by Requester *Science 2014; 343(6168):313-7*). Our continuing work with this molecule is beginning to reveal exciting new roles for GCN2 in programming dendritic cell function and immune responses. We are currently studying its role in modulating (i) mucosal immune responses (ii) lung Th2 responses.

GRANT NUMBER: 5R37AI048638-14 REVIS MERIT AWARD

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **POLARIZING T CELL RESPONSES IN VIVO WITH DENDRITIC CELLS**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

The major goal of this project is to determine the innate immune receptors and signaling pathways that program dendritic cells to acquire regulatory functions, and whether these represent targets for immune modulation in the context of autoimmune diseases. During the past year, we have continued to make significant progress in addressing the Specific Aims of the proposal and award.

We have been investigating the role of TLR signaling in hematopoietic versus non-hematopoietic tissues in the intestine, in regulating mucosal immune responses. Surprisingly, our data suggest that non-hematopoietic expression of MyD88 plays a dominant role in induction of mucosal immune responses.

In the past year, we further analyzed the CXCL15$^{-/-}$ (lungkine) deficient mice and evaluated the kinetics of the anti- *Salmonella* CD4^{+} T cell responses in both mucosal (PP) and the systemic sites (Spleen). Our results indicate a critical role for commensal derived flagellin in inducing the steady state levels of both CXCL15 and CCL20 on FAE.

We are also studying the role of nutrient sensors in modulating mucosal immune responses. Our preliminary results suggest that mucosal activation of GCN2 is important in controlling the deleterious effects caused by DSS-induced colitis.

GRANT NUMBER: 5R37DK057665-16

SUPPORT PERCENTAGE: 0% of funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **SYSTEMS BIOLOGICAL ANALYSIS OF INNATE RESPONSES TO VACCINATION**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

A major challenge in vaccinology is that the efficacy of a vaccine can only be ascertained retrospectively, upon infection. The identification of molecular signatures induced rapidly after vaccination, which correlate with and predict, the later development of protective immune responses, would represent a strategy to prospectively determine vaccine efficacy. Such a strategy would be particularly useful when evaluating the efficacy or immunogenicity of untested vaccines, or in identifying individuals with sub-optimal responses amongst high risk populations such as infants or the elderly. We and others have recently used a systems biology approach to identify early gene signatures that correlate with, and predict the later immune responses in humans vaccinated with the live attenuated yellow fever vaccine YFV-17D. Despite this promising advance, the extent to which such approaches can reveal the immunological mechanisms of action of vaccines, and help discover new correlates of protective immunity, remains untested. Furthermore, the potential public health impact of these strategies in predicting the immunogenicity, or even efficacy, of vaccines that induce sub-optimal responses in immunocompromised populations such as the elderly, needs to be rigorously evaluated. Within this context, the aims of the present grant are: Aim 1: Systems biological approaches to identify molecular signatures that predict the sub-optimal immunogenicity of the herpes zoster vaccine, a pneumococcal polysaccharide vaccine (PPV23), and the trivalent inactivated influenza vaccine (TIV); Aim 2: Systems biological analysis of transcriptional and micro RNA networks in dendritic cells from young versus elderly, stimulated in vitro with the herpes zoster vaccine, PPV23 and TIV; Aim 3: Systems biological analysis of innate responses during herpes zoster re-activation, and during acute infections caused by Streptococcus pneumoniae The successful completion of these aims will: (i) address important public health concerns regarding impaired immunogenicity of these vaccines in the elderly (ii) provide biological insight into novel innate correlates of immunity, and (iii) represent the first comprehensive evaluation of immune responses to any vaccine in the elderly versus young.

During the past year, we have made substantial progress on several fronts:

1. Refining and validating the signatures that we used to predict the immunogenicity of influenza vaccination in healthy young adults, using additional studies from 6 consecutive flu seasons. One of these studies is the Vax001 study in which we have studied immune responses in young versus elderly humans.
2. Functionally validating the genes contained within the gene signatures.
3. Analyzing innate and adaptive responses to vaccination with the zoster vaccine (study vax005).

GRANT NUMBER: 5U19AI090023-05

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **MODULATION OF INNATE IMMUNE DEFENSES BY MYCOBACTERIUM TUBERCULOSIS**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

Tuberculosis (TB) remains a major threat to global public health and infection, with Mycobacterium tuberculosis (Mtb) estimated to result in over 2 million deaths annually. Understanding how Mtb modulates host immunty is important for developing vaccines and new drugs for TB. This grant focuses on understanding the immunomodulatory and biochemical mechanisms underlying Mtb Hip1, a novel virulence factor.

In this project period, we published 2 original manuscripts and one book chapter directly related to this project and one additional collaborative manuscript. The following are the highlights of our findings. First, in a paper published in the Journal of Immunology, we provided insights into how *Mycobacterium tuberculosis* (Mtb) employs multiple strategies to modulate host dendritic cell (DC) responses. While the ability of Mtb to modulate macrophage responses are known there is increasing evidence that Mtb interferes with the ability of DCs to initiate antigen-specific T cell responses to infection. However, the Mtb factors that impair DC functions are not well understood. In this study we showed that Mtb impairs DC cytokine secretion, maturation and antigen presentation through the cell envelope-associated serine hydrolase Hip1. Compared to wild type, a *hip1* mutant strain of Mtb induced enhanced levels of IL-12 and other proinflammatory cytokines in DCs via MyD88- and TLR2/9-dependent pathways, indicating that Hip1 limits optimal DC activation and inflammatory responses. Infection with the *hip1* mutant also resulted in higher levels of the co-stimulatory molecules CD40, CD86, and MHC class II indicating that Mtb impairs DC maturation through Hip1. Further, we showed that wild type Mtb promotes sub-optimal antigen presentation, as DCs infected with the *hip1* mutant showed increased capacity to present antigen to OT-II- and early secreted antigenic target 6 (ESAT-6)-specific transgenic CD4 T cells and enhanced Th1 and Th17 polarization. Overall, these data provide new insights into how Mtb modulates DC functions to impact antigen-specific T cell responses.

Second, we published a paper in PLOS Pathogens showing that **Hip1 modulates macrophage responses through proteolysis of GroEL2.** We provided key mechanistic insights into the molecular and biochemical basis of Hip1 function. We established that Hip1 is a serine protease with activity against protein and peptide substrates. Further, we showed that the Mtb GroEL2 protein is a direct substrate of Hip1 protease activity and that cleavage of GroEL2 is specifically inhibited by serine protease inhibitors and is optimal at intraphagosomal pH conditions. We mapped the cleavage site within the N-terminus of GroEL2 and confirmed that this site is required for proteolysis of GroEL2 during Mtb growth. Interestingly, we discovered that Hip1-mediated cleavage of GroEL2 converts the protein from a multimeric to a monomeric form. Moreover, ectopic expression of cleaved GroEL2 monomers into the *hip1* mutant complemented the hyperinflammatory phenotype of the *hip1* mutant and restored wild type levels of cytokine responses in infected macrophages. Our studies point to Hip1-dependent proteolysis as a novel regulatory mechanism that helps Mtb respond rapidly to changing host immune environments during infection. These findings position Hip1 as an attractive target for inhibition for developing immunomodulatory therapeutics against Mtb.

GRANT NUMBER: 5R01AI083366-04REVIS

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **MICROPARTICLE DELIVERY OF IMMUNOMODULATORS TO ENHANCE TUBERCULOSIS VACCINES**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

This project is using microparticles conjugated to TLR ligands as adjuvants, while simultaneously silencing IL-10 expression to test the hypothesis that the current BCG vaccine for tuberculosis can be improved through immune modulation of innate immunity.

GRANT NUMBER: GRA Immunoengineering Seed Grant Excluded by Requester GA-Tech)

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: REGULATION OF T CELL IMMUNITY BY THE CYTOSOLIC RIG-I LIKE RECEPTORS

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

Type I interferon, regulated by the innate immune sensors of viral infection, play a key role in activation of innate and adaptive immune responses during virus infection. However, it is not clear how innate immune sensing regulates protective T cell immune responses during virus infection. We study West Nile virus (WNV) infection, a neurotropic mosquito-borne flavivirus of significant public health concern throughout the world, to dissect the viral and host factors that govern immunity to infection. Following WNV infection of DCs, the RLRs induce a robust type I interferon-mediated antiviral innate immune response that is critical for controlling virus replication. We recently discovered that the RLR LGP2, which lacks the critical caspase-activation and recruitment domains required for innate immune signaling, was found to function in a T cell-intrinsic manner to promote $CD8^+$ T cell survival and effector functions. The absence of LGP2 in $CD8^+$ T cells led to enhanced cell surface expression of death receptors, activation of extrinsic apoptosis signaling, and reduced cytokine secretion. Surprisingly, the protein mitochondrial antiviral signaling (MAVS), which is the essential adaptor to RLR signaling and a known binding partner of LGP2, was not required for promoting T cell survival. These findings demonstrate that LGP2 functions in a MAVS-independent manner to promote T cell immunity. Our studies have defined a key role for the RLRs at the interface between innate (DCs) and adaptive (T cells) immunity during virus infection. However, the mechanism underlying RLR regulation of T cell immunity is not well understood. In this study, we evaluated the cell-intrinsic role of the RIG-I like receptors in dendritic cells and determine what effect this has on programming innate and adaptive immune responses that control of WNV infection. In Aim 2, we will evaluate how the RIG-I like receptor LGP2 controls CD4+ and CD8+ T cell effector and memory responses during WNV infection.

We have initiated studies in Aim 2 and begun evaluating the impact of the RLRs within T cells. We were interested in evaluating the phenotype of RIG-$I^{-/-}$ T cells *in vivo* in parallel with *in vitro* characterization. Our initial studies required us to conduct further characterization of RIG-$I^{-/-}$ mice. The RIG-$I^{-/-}$ mice are on a mixed background (C57BL/6, 129 Sv/Ev, and ICR) due to the fact that generation of the knockouts on a C57BL/6 background were embryonic lethal. We conducted several experiments, including an *in vitro* mixed lymphocyte reaction (MLR) using C57BL/6 stimulator APCs and responder C57BL/6 versus RIG-$I^{-/-}$ $CD4^+$ or $CD8^+$ T cells. We observed no differences in proliferation compared to C57BL/6 (data not shown), which verified no MHC mismatches, thus allowing us to move forward with our *in vivo* assessment of RIG-$I^{-/-}$ mice.

To compare whether wild-type (WT) or RIG-$I^{-/-}$ mice had differences in generation of WNV-specific T cells, we inoculated WT or RIG-$I^{-/-}$ with a pathogenic strain of WNV, WNV-Texas (WNV-TX). Our preliminary results suggest that WNV-specific CD4 T cell responses are unaffected by intrinsic loss of RIG-I expression (Figure 2), however, further studies are needed to evaluate RIG-I function in T cells within the global knockout mice and in mice which only lack RIG-I signaling in T cells. As follow-up, we are currently crossing WNV antigen-specific CD8 T cell transgenic mice (NS4B mice) with RIG-$I^{-/-}$ to generate WNV-specific CD8 T cells that lack RIG-I. We plan to transfer these RIG-$I^{-/-}$ NS4B CD8 T cells into mice and assess generation of WNV-specific responses when RIG-I is restricted to T cell populations. These analyses will help define how cell-intrinsic loss of RIG-I alters antigen-specific T cell responses, and characterize the role of RLR signaling to regulation of antigen-specific T cell responses.

GRANT NUMBER: 1R56AI110516-01

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **RIG-I-LIKE RECEPTOR REGULATION OF T CELL IMMUNITY AGAINST FLAVIVIRUS INFECTION**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

The goal of Project 4 (subcontract) is to understand the crosstalk between innate immune sensing and regulation of protective T cell immune response during flavivirus infection. West Nile virus (WNV) and Japanese encephalitis virus (JEV) are emerging mosquito-borne flaviviruses that globally cause annual epidemics of virus-induced encephalitis. There is no approved vaccine or therapy for use in humans to treat WNV infection and the current vaccines to prevent JEV infection do not provide life-long protective immunity. Protection against WNV and JEV is mediated by both innate and adaptive immune responses. The RIG-I like receptors (RLR) are cytosolic pathogen recognition receptors that recognize non-self RNA and signal through the MAVS adaptor protein to trigger innate antiviral immunity against WNV and JEV. In addition to their role in innate immunity, our laboratory recently discovered that components of the RLR pathway are critical for programming protective adaptive immune responses responsible for clearing virus during the later stages of infection. This includes MAVS-mediated regulation of humoral and cell-mediated immune responses (CD8+, CD4+ and Treg responses) as well as LGP2-mediated regulation of T cell immunity during WNV infection. LGP2 was found to function in a cell-intrinsic manner to control CD8+ T cell survival and effector properties. These findings establish that the RLRs regulate the interface between innate and adaptive immunity during flavivirus infection. However, the immunological mechanism underlying RLR regulation of T cell immunity against flavivirus infection and vaccination are not well understood. Project 4 studies will (1) determine the role of RLR signaling and function in regulation of T cell priming; (2) define the T-cell intrinsic function of MAVS and LGP2 in regulating effector and memory T cell responses; (3) determine how MAVS and LGP2 function to regulate memory T cell recall responses. This work will reveal novel insights into innate immune regulation of immunological memory and identify new therapeutic targets and strategies for vaccine protection against flavivirus infection.

In this reporting period, our laboratory has been able to conduct an extensive analysis of RIG-I like receptor (RLR) signaling and WNV infection analysis in human DCs. First, we have been able to show that RLR signaling pathway is active in both monocyte DC (moDC) and myeloid DC (mDC). Next, we were able to demonstrate that moDCs, but not mDCs, are permissive for WNV infection. Finally, we have now performed mRNA-seq analysis on WNV-infected moDCs and discovered that there is considerable heterogeneity in the innate immune response to WNV infection and this is independent of viral load or replication. Interestingly, the heterogeneity in the host response to WNV infection can be overcome by treating moDCs with a RIG-I or MDA5 agonist or IFN-β treatment. This presents an outstanding question that is going to an important line of investigation over this next reporting period- What are the host factors and processes that account for heterogeneity in the host response to virus infection between different human blood donors and how come we do not observe this level of heterogeneity following agonist or type I IFN treatment? In addition, we have now initiated studies to evaluate the importance of DCs in promoting immunity during WNV infection. We are in the process of generating RIG-Ifloxed and LGP2floxed mice that when crossed with CD11c-cre mice, we will be able to evaluate the cell-intrinsic roles of these receptors in promoting DC responses to WNV infection.

GRANT NUMBER: U19AI083019-06 Excluded by Requester University of Washington)

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **GENERATION OF MAVS CONDITIONAL KO MICE TO STUDY CELL-TYPE SPECIFIC IMMUNITY**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

West Nile virus (WNV), a category B NIAID priority agent, is a neurotropic flavivirus that is the leading cause of mosquito-borne encephalitis of humans in the United States. The continuing spread of WNV, combined with the lack of specific therapeutics or vaccines to combat or prevent infection, imparts a pressing need to identify the viral and host processes that control infection and immunity. The pathogenesis of WNV in humans is poorly defined, but a mouse model of WNV infection, which faithfully recapitulates the major phases of WNV pathogenesis observed in humans, has provided significant insights into the mechanisms that cause WNV disease. The innate immune response, mediated by RIG-I like receptor (RLR) signaling, and humoral and cell-mediated responses, are critical for protection against WNV infection. The RLR signaling pathway functions to trigger antiviral immune defenses and program protective immunity during WNV infection. Our studies have recently revealed a novel connection between RLR signaling and regulation of $CD8^+$ T cell immunity during virus infection. In support of our findings, other groups have now implicated MAVS, the central adaptor protein required for RLR-mediated innate immune signaling, with regulation of $CD8^+$ T cell responses during chronic viral infection, driving $CD4^+$ T cell polarization during bacterial infection, and regulating T_H1 and T_H17 responses during autoimmune encephalitis, thus demonstrating the importance of RLR signaling in programming T cell immunity. However, the immunological mechanism underlying MAVS regulation of T cell immunity is not well understood. We seek to fill this gap in our knowledge by developing a new research tool to study MAVS immune regulation in a cell and tissue-specific manner. In Aim 1, we will generate *Mavs*$^{fl/fl}$ mice that can be crossed with cre-expressing mice to ablate MAVS expression in a context-dependent manner. In Aim 2, we will generate MAVS-DC KO and MAVS-CD8 KO mice, which lack MAVS expression in Dendritic cells (DCs) and $CD8^+$ T cells, respectively. We will use these mice to evaluate protection against WNV infection, control of viral pathogenesis, and development of $CD8^+$ T cell immune responses. The results from this study will reveal the immunological mechanisms underlying MAVS-mediated immune regulation of T cell immunity during WNV infection. These studies will potentially uncover the therapeutic and immune-modulating potential of the RLR signaling pathway during virus infection and vaccination.

We were able to successfully generate MAVSfl/fl mice that are now ready to be bred onto the CD11c-cre and CD8-cre expressing mice. The MAVSfl/fl mice have now arrived in our laboratory and we will be breeding these mice to these cre-recombinase expressing lines over the next couple of months. This is a very significant achievement as this procedure typically takes more than a year to accomplish. We will initiate Aim 2 studies in Year 2 of this proposal. In Aim 2, we will evaluate the role of MAVS in regulating CD8+ T cell immune responses to WNV infection. In the first subaim, we will cross the MAVSfl/fl mice with CD11c-cre and CD8-cre mice to generate MAVS-DC KO and MAVS-T cell KO mice. We will perform a thorough immunological and analysis of immune cells to determine if there are defects in immune cell development/homeostasis. Next, we will infect these mice with WNV and evaluate virus replication in peripheral and CNS tissues and evaluate tissue pathology by histology. Finally, in the third subaim, we will evaluate CD8+ T cell responses to WNV infection in the MAVS-DC KO and MAVS-T cell KO mice.

GRANT NUMBER: 1R03AI109194-01

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **A NOVEL DRUG TARGET AND MEDIATOR OF ANTIBIOTIC RESISTANCE**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

Drug resistant Gram-negative bacterial pathogens are an increasing cause of hospital-acquired infections, mortality, and a huge burden on healthcare costs. Acinetobacter baumannii is a major cause of such infections and strains have recently emerged which are resistant even to the last line of defense drugs, polymyxin B and colistin (polymyxin E), which target and disrupt the lipid A portion of lipopolysaccharide (LPS) in the outer membrane. Understanding the mechanism of this resistance at the molecular level would facilitate the development of novel therapeutics aimed at reversing resistance, in much the same way that beta-lactamase inhibitors can counteract penicillin resistance. To this end, we have recently identified a novel protein that we have named Proprietary Info

Proprietary Info

In the first year of the R33 portion of this project we have successfully optimized the high-throughput screen (HTS) to begin identifying compounds with inhibitory activity. We have completed a significant portion of the HTS, identifying several compounds with such inhibitory activity. We have also completed a portion of the virtual screening, identifying several inhibitory compounds with mild activity. We are now completing both the HTS and virtual screening, and beginning to try and optimize the compounds that represent lead hits thus far.

GRANT NUMBER: 4R33AI098800-03

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **A NOVEL RNAI-LIKE SYSTEM CONTROLS BACTERIAL INNATE IMMUNE EVASION AND VIRULENCE**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

Bacterial pathogens are a major cause of morbidity and mortality worldwide and antibiotic-resistant bacteria threaten to send us back to the pre-antibiotic era. In order to cause disease, bacterial pathogens must rapidly adapt to the host environment and counteract immune defenses so they can survive and replicate. We have identified a novel regulatory system that is induced during infection of host cells by the intracellular pathogen *Francisella novicida*. The CRISPR (Clustered Regularly Interspaced Palindromic Repeats)-CAS (CRISPR-associated) system is a recently described bacterial defense against invading foreign DNA derived from bacteriophages or plasmids. It has been unclear if these systems have additional functions in bacterial physiology. We demonstrate a novel RNAi-like function of this system in targeting an endogenous mRNA, regulating the expression of a bacterial lipoprotein (BLP). We now propose to further elucidate critical mechanistic details of how Cas9 mediates degradation of endogenous mRNA. In addition, we will study the conditions in which the Cas9 regulatory system is induced during infection, and test its role in the virulence of the antibiotic-resistant pathogens *Staphylococcus aureus* and *Enterococcus faecalis*. This work will lead to a deeper understanding of host-pathogen interactions, and will also be applied for research and translational purposes. We will determine whether we can "program" this system to target the degradation of any endogenous bacterial mRNA, thus creating a bacterial RNAi-like knockdown system with numerous research and biotechnological applications. We will also further determine the potential of Cas9 system mutants to serve as attenuated vaccine strains, potentially providing a novel means by which to combat pathogenic bacteria including antibiotic-resistant strains.

In the past year, we have explored the contribution of Cas9-mediated BLP repression to a very basic aspect of bacterial physiology, membrane integrity. We reasoned that the ability to regulate BLP levels might be critical to bacterial membrane structure, and indeed revealed that Cas9 plays an important role in enhancing membrane integrity as measured by resistance to uptake of propidium iodide (Figure 1). Furthermore, we observed that Cas9-dependent BLP repression is essential for resistance to the membrane-targeting antibiotic polymyxin B (Figure 2), as well as resistance to other antibiotics including kanamycin and streptomycin (likely because these latter antibiotics can access the bacterial cytosol more easily). This is the first description of a role for Cas9 in the basic physiological process of controlling membrane integrity and the first demonstration of its role in promoting antibiotic resistance, a severe and growing public health problem.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **CRISPR/CAS SYSTEMS IN BACTERIAL GENE REGULATION AND VIRULENCE**

NPRC UNIT: Emory Vaccine Center

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

CRISPR-Cas systems have recently been described to mediate bacterial defense against invading foreign nucleic acid derived from bacteriophages or plasmids, which they target for degradation. These systems have not previously been shown to target mRNA or control endogenous gene expression. We demonstrate that the CRISPR-Cas protein Cas9 targets an endogenous mRNA, revealing a novel bacterial RNA silencing machinery and genetic regulatory paradigm. Since Cas9 targeting of a BLP mRNA in *F. novicida* is the only currently known example of CRISPR-Cas-mediated endogenous gene regulation, we will employ this model to answer fundamental questions about the mechanism of action of this system, as well as the parameters controlling its induction. This will lead to the elucidation of basic foundational principles governing Cas9 and CRISPR-Cas biology. The proposed research will have a sustained and powerful impact on our understanding of Cas9, CRISPR-Cas systems, RNA silencing, genetic regulatory mechanisms, bacterial virulence, and innate immune evasion, and lay the framework for a much broader knowledge of how diverse bacterial pathogens cause disease.

Our most significant advance over the last year has been our elucidation that the Cas9 complex is involved in enhancing envelope integrity through the regulation of BLP (published in *PNAS*, reference below). The *cas9* mutant (and other mutant strains lacking components of this complex; tracrRNA and scaRNA) exhibited greatly increased sensitivity to the membrane-damaging antibiotic polymyxin B as compared to wild-type bacteria, as well as sensitivity to several other antibiotics and membrane-damaging agents. Interestingly, expression of CRISPR-Cas components can be induced by bacterial envelope stress, disruptions in envelope protein localization and the presence of bacteriophage. Taken together, this suggests that CRISPR-Cas systems are induced in response to membrane stressors, and their regulatory activity can subsequently result in the enhancement of envelope integrity to promote resistance to such stressors. It is therefore tempting to speculate that the CRISPR-Cas response to envelope stress serves two distinct purposes: 1) the activation of its canonical function as the adaptive, foreign nucleic acid restriction system and, 2) the regulation of envelope structure and content to enhance the integrity of the bacterial envelope and combat membrane stress, which represents a previously unappreciated role in bacterial physiology and a significant shift in the understanding of these systems.

GRANT NUMBER: 1R01AI110701-01

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

MICROBIOLOGY AND IMMUNOLOGY

Excluded by Requester

M.D., Division Chief

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: PROJ 1: B-CELL BIOLOGY OF MUCOSAL IMMUNE PROTECTION FROM SIV

NPRC UNIT: Microbiology and Immunology

CORE SCIENTISTS: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

Despite the fact that heterosexual mode of transmission remains the predominant mode of HIV transmission worldwide, little is known about the efficacy of these vaccines to protect against repeated intravaginal infections in monkeys. Therefore in M15 trial, we evaluated the efficacy of DNA/MVA vaccine using SIVsmE660 intravaginal challenges. DNA/MVA vaccine elicited a strong SIV specific CD4 and CD8 T cell responses in blood of vaccinated groups. A strong anti-Env IgG antibody response was observed in serum and vaginal secretions of vaccinated animals. The antibodies from vaccinated animals displayed a strong neutralization activity against tier 1 E660 isolates and ADCC activity. Following the 12 weekly intravaginal challenges, enhanced protection from acquisition was observed in vaccinated animals but only in animals with a TRIM5α restrictive genotype. With this information from M15 trial, we designed M19 trial where we propose to further enhance the antibody response by adding a protein boost to the DNA/MVA vaccine. The envelope immunogens used in this trial are derived from 1086c clade C. This envelope was down selected from a series of envelopes based on its ability to express most of the epitopes recognized by broadly neutralizing mAbs and ability to induce both tier 1 and 2 neutralizing antibodies in rhesus macaques. The M19 trial has 3 groups with 22 animals per group. Eighteen animals in each group will be challenged and 4 animals are for pre-challenge euthanasia. Group1 receives two DNA primes on 0 and 8 weeks followed by MVA boost on weeks 16 and 24. These animals will be immunized with protein/nanoparticle on weeks 32 and 38. Group2 will be immunized with DNA on 0 and 8 weeks followed by MVA boost on 16, 24 and 38 weeks. Group3 will serve as a control. All these animals will be challenged with 12 weekly intravaginal challenges. Both the cell-mediated and antibody responses will be analyzed at various time points. The pGA1/SHIV1086c DNA expressing SIV_{mac239}-Gag-Pol and HIV-Env 1086c clade C used in this trial has been successfully constructed and characterized for the expression of immunogens by flow cytometry and immunoblotting. The formation of VLPs was confirmed by electron microscopy. We just started DNA immunizations. Results from this trial will be reported next year.

GRANT NUMBER: U19AI096187

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **TARGETING MTOR AND CD40 PATHWAYS FOR ADJUVANTING HIV VACCINES**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTISTS: Excluded by Requester

AFFILIATE SCIENTIST:

ABSTRACT:

The goal of an HIV vaccine is to generate robust and durable protective antibody. Vital to this goal is the induction of CD4 T follicular helper cells (T_{FH}). However, very little is known about the T_{FH} response to HIV vaccination and its relative contribution to magnitude and quality of vaccine-elicited antibody titers. We investigated these questions in the context of a DNA/ modified vaccinia virus Ankara (MVA) SIV+/- gp140 boost in rhesus macaques. In addition, we sought to understand whether vaccine-induced T_{FH} cells circulate in blood and whether these responses were representative of lymph node (LN) T_{FH} responses. We show that booster MVA immunization induced a distinct and transient accumulation of Ki-67$^+$, CD4$^+$ T cells expressing CXC chemokine receptor (CXCR5) in blood at day 7-post immunization, which correlated with peak vaccine-specific interferon-(IFN)γ and interleukin (IL)-21 responses. The magnitude of blood Ki-67$^+$ CXCR5$^+$ CD4$^+$ T cells correlated with the frequency of T_{FH} and B cells in the germinal centers (GC). Interestingly, gp140 boost in alum induced a skewing towards CXCR3 expression on GC T_{FH} cells, which was strongly associated with longevity, avidity, and neutralization potential of vaccine-elicited antibody response. However, CXCR3$^+$ T_{FH} cells preferentially expressed the HIV co-receptor CCR5 and vaccine-induced CXCR3$^+$ T_{FH} cells were a positive correlate of peak viral load following SIV251 infection. Taken together, our findings demonstrate that vaccine regimens that elicit CXCR3 biased T_{FH} cell responses favor antibody persistence and avidity but may predispose to higher acute viremia in the event of breakthrough infections.

GRANT NUMBER: P01AI088575

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **CD40L ADJUVANTED CLADE C DNA AND MVA HIV VACCINES**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTISTS: Excluded by Requester

ABSTRACT:

In this study, we are evaluating two agents for their ability to enhance the immunogenicity and protection against a pathogenic SHIV in rhesus macaques. One of them is **CD40L adjuvant** and second is MVA with deletions in four immune evasion genes (**MVAΔ4**). CD40 ligand serves as an adjuvant for both T cells and B cells. Our recent studies have shown that CD40L expressed on the surface of SIV VLPs made by our DNA vaccine enhances the protection from acquisition of heterologous mucosal SIV infection. Further the enhanced protection was found to be associated with higher avidity and low level of neutralization against tier 2 E660 virus. In continuation with these studies, the current project is aimed to study the efficacy of CD40L adjuvanted DNA/MVA vaccine modality in inducing the protective immune responses against the HIV envelope and SHIV challenge. Similarly, MVAΔ4 has been shown to improve the antibody responses by 25 fold. Here, we will test the potential of this enhanced antibody response to improve protection against a heterologous SHIV challenge. To test these two agents, we initiated a monkey trial. This trial has a total of 5 groups with 10 animals per each group. Both groups 1 and 2 will receive non-adjuvanted DNA primes but group 1 will be boosted with MVA and group 2 will be boosted with MVAΔ4. Groups 3 and 4 will receive CD40L adjuvanted DNA primes but group 3 will be boosted with MVA and group 4 will be boosted with MVAΔ4. Group 5 will not receive vaccination and serve as a control group. DNA primes will be given on weeks 0 and 8, and MVA boosts will be given on weeks 16 and 32. All animals will receive intrarectal SHIV challenges at week 56. Both the cell-mediated and antibody responses will be analyzed at various time points. The DNA vaccine constructs used in this trial have been successfully made and characterized for the expression of immunogens by flow cytometry and immunoblotting. The formation of VLPs was confirmed by electron microscopy. We just started DNA immunizations. Results from this trial will be reported next year.

GRANT NUMBER: U19 AI109633

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **TARGETING PD-1 PATHWAY FOR FUNCTIONAL CURE OF AIDS**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTISTS: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

The objective of this trial is to study the therapeutic effects of PD-1 blockade in combination with long-term anti-retroviral therapy. Twenty-seven chronically SIV infected rhesus macaques (RM) were infected with SIVmac251 intra-rectally for 24-30 weeks. Animals were divided into 2 cohorts, a saline alone treatment group and a PD-1 blockade treatment group. PD-1 treated animals were given a 3mg/kg dose at day 0, 3, 7, 10, and 14 with ART therapy initiated at Day 10 post blockade. Seven out of the 11 animals in the PD-1 treatment group and eleven out of the 16 ART alone have fully suppressed plasma viremia to below the level of detection. The PD-1 treatment group had a significantly greater fold change ($P < 0.05$) from baseline viral load at day 10 post initiation of ART therapy. Moreover, time to suppression is almost 75% greater at 14 days post ART therapy in the PD-1 treated animals versus the ART alone treated RM. PD-1 blockade increased *in vivo* proliferation of both total CD4 and CD8 T cells as well as GagCM9 tetramer + CD8 T cells. Total frequencies of tetramer + CD8 T cells did not change. We also observed a slight increase in the cytolytic potential of SIV specific CD8 T cells at day 7 post blockade compared to the saline control treated animals. The initial conclusions for the first part of the trial suggest that PD-1 blockade synergizes with ART therapy to aid in more rapid control of viral replication after the initiation of ART therapy.

GRANT NUMBER: R37AI112787

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **GUT HOMING CELLS IN SIV INFECTION**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTISTS: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

This project will dissect the role of white blood cell traffic to the gastrointestinal (GI) tract in the regulation of simian immunodeficiency virus replication and disease progression in vivo. The studies center on the maintenance or disruption of GI integrity which is at the heart of the progressive phases of HIV infection. Moreover, novel imaging techniques will be used to precisely document the outcome of blocking traffic of (infected) cells to the GI tract in efforts to understand the mechanisms leading to disease both at early and later stages.

During this period we have used the anti alpha4/Beta7 blockade while challenging female rhesus macaques with low repeated doses of SIVmac251 intravaginally. These studies have shown that treatment with this anti-integrin receptor prevented infection in 50% of the animals treated relative to control antibody treated macaques after 6 consecutive challenges. Of interest was the fact that in those animals that did become infected in spite of the anti alpha4/Beta7 treatment, the onset of infection was much delayed and disease progression was essentially warded off. A second approach was to treat monkeys with a primatized antibody to MAdCAM-1, the ligand to alpha4/Beta7 during acute infection. This treatment not only did not mirror the anti alpha4/Beta7 blockade but resulted in higher viral laods and disease progression. Finally, the anti alpha4/Beta7 was tested therapeutically in conjunction with antiretroviral therapy and shown to provide initial benefit in sparing the gut mucosa, CD4 T cell recovery.

GRANT NUMBER: R01 AI098628

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **IMPACT OF EARLY ART ON SIV RESERVOIRS**

NPRC UNIT: Microbiology and Immunology

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

The search for an HIV cure remains a major priority in contemporary biomedical research. In this project, entitled "Impact of early ART on SIV reservoirs" we set out to investigate the hypothesis that the cellular and anatomic distribution of the persistent virus reservoirs will be substantially different if ART is initiated prior to peak viremia compared to after viral set point has been reached. The work will be completed in collaboration Excluded by Requester from the University of Pennsylvania School of Medicine, as well as Excluded by Requester Excluded by from Frederick National Labs. This project was awarded by at the end of March 2014. Private Source We have made significant progress in terms of the organizational aspect of this project as well as the optimization of a number of novel assays to quantify the SIV reservoir. However, due to unforeseen circumstances specifically related to Material Transfer Agreements for the use of antiretroviral drugs for this project, we have not yet been able to start the in vivo protocol. Our accomplishments to date include:

1. We have successfully competed for funding for an additional 4 rhesus macaques to be included in this study. These animals will be included in the control group that was not part of the budget of the project funded by Private Source This $60,000 grant was awarded to Excluded by through the Yerkes Pilot Research Program.
2. The subcontract with the University of Pennsylvania for the work to be performed by Excluded by Requester has been established and Excluded by Requester has been working closely with Excluded by Requester (post-doctoral fellow in Excluded by laboratory) to further optimize the integrated SIV DNA assay.
3. We have received approval for the animal protocol from the Emory University Institutional Animal Care and Use Committee (IACUC).
4. Our request for animal allocation for this project has been approved and 12 rhesus macaques of appropriate age and genetic background have been assigned to the project. All 12 animals have completed the required one-month period of quarantine / conditioning following transfer to the Yerkes Main Center and are ready to begin the study once the antiretroviral drugs have been obtained.
5. We have acquired appropriate stocks of titrated SIVmac251 for infection of rhesus macaques in this study provided by the Yerkes Comparative AIDS Core / Excluded by Requester
6. We have optimized SIV reservoir quantification assays. These assays include: 1) the integrated SIV DNA assay, in collaboration with Excluded by 2) SIV TILDA, in collaboration with Excluded by Requester 3) SIV quantitative viral outgrowth assay (QVOA); 4) SIV RNA-DNAscope detection in situ (work of Excluded by Requester
7. Although we do not have the drugs in hand for this project, we are currently treating four SIV-infected infant rhesus macaques under a different protocol / funding mechanism, which has given us valuable experience as we prepare to begin this larger project. In order to formulate the "triple injection" of PMPA+FTC+DTG for use in rhesus macaques Excluded by Requester has shared with us an unpublished recipe with enhanced delivery capabilities. We have successfully formulated this triple regimen in the lab and are monitoring our animals for safety and efficacy with no concerns to date.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **DEFINING THE INTRAHEPATIC IMMUNE RESPONSE TO HEPATITIS C VIRUS**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

Hepatic stellate cells (HSC) are a novel population of intrahepatic APC that undergo dramatic phenotypic and functional changes in response to liver injury or infection. This process is known to be important for liver fibrogenesis, but little is known of the importance of HSC in attenuating T cell responses. Our preliminary work indicates a transition from immunostimulatory to immunoinhibitory function upon activation of HSC. To understand the role of HSC in liver immunity, we investigated the molecular interactions between mouse hepatic stellate cells (HSC), dendritic cells (DC), and naïve CD4+ T-cells. We found that HSC alone does not strongly present antigen to naïve CD4+ T cells, but, in the presence of DC and TGFβ1, preferentially induce FoxP3+ regulatory T cells (Treg). This Treg induction was associated with retinoid metabolism by HSC and was dependent on retinoic acid. Thus, we conclude that HSC preferentially generate FoxP3+ Treg and therefore may play a role in the tolerogenic nature of the liver. Thus, the work proposed here will focus on HSC and their ability to modulate T cell immunity and T regulatory cell induction during liver fibrosis in a mouse model.

GRANT NUMBER: R01DK083356

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **MECHANISMS OF HEPATITIS C VIRUS PERSISTENCE**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

Analysis of HCV effects on liver dendritic cell (DC) recruitment, differentiation, maturation and activation. Our preliminary data indicate that the chronic HCV liver microenvironment may play an instructive role in the differentiation, lineage commitment and activation of migratory DC progenitors. In HCV-infected liver we observed: (i) a decreased level of a novel population identified as CD34+ CD141+ HLADR+ myeloid DC progenitors, (ii) a larger proportion of mature DCs compared to uninfected liver and (iii) an activated DC population expressing high levels of the T cell co-stimulatory molecules CD40, CD80 and CD83. We utilize multiparameter flow cytometric analysis to characterize the composition, differentiation status, and activation states of the intrahepatic DC subsets in HCV infected patients. We sort progenitor populations to assess in vitro and in vivo differentiation potential utilizing transfer experiments into NOD/SCID/IL2rnull mice, and finally, we utilize gene array technology to discern differences in the lineage commitment for the CD34+ progenitor population between HCV infected and uninfected liver. These studies identify DC subsets with a role in the antiviral response to HCV.

GRANT NUMBER: R01AI70101

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **PERSISTENT HCV REPLICATION AND T CELL IMMUNITY IN PREGNANCY**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

Globally, about 1% of pregnant women are persistently infected with the hepatitis C virus (HCV). Vertical transmission occurs in 3-5% of cases and accounts for most new childhood HCV infections. HCV-specific CD8+ cytotoxic T-lymphocytes (CTLs) play a vital role in the clearance of acute infections, but in the 60-80% of infections that persist these cells become functionally exhausted or select mutant viruses that escape T-cell recognition. Increased HCV replication during pregnancy suggests that maternofetal immune tolerance mechanisms may further impair HCV-specific CTLs, limiting their selection pressure on persistent viruses. To assess this possibility, we characterized the circulating viral quasispecies during and after consecutive pregnancies. This revealed a loss of escape mutations in class I epitopes in pregnancy associated with emergence of more fit viruses. The apparent relaxation of CTL selection pressure ended after childbirth, when escape mutants again predominated in the quasispecies at these epitopes and viral load dropped sharply. Importantly, viruses that were transmitted perinatally were those with enhanced fitness due to reversion of escape mutations. Our findings indicate that immunoregulatory changes of pregnancy reduce CTL selection pressure on HCV class I epitopes, thereby facilitating vertical transmission of viruses with optimized replicative fitness.

GRANT NUMBER: R01AI096882

SUPPORT PERCENTAGE: 0% of P51 funds support this project

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **DIFFERENTIAL EXPRESSION OF TRASNCRIPTION FACTORS IN SIV-SPECIFIC CD8+ T CELLS**

NPRC UNIT: Microbiology & Immunology

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

Protective immunity against vaginal challenge in SIVΔnef-vaccinated macaques develops at 20 weeks after vaccination, whereas the magnitude of SIV-specific CD8+ T cell responses peaks at 5 weeks. SIV-specific CD8+ T cells phenotypically mature from week 5 to 20, suggesting that the quality of the CD8+ T cell response may correlate with protection.

Highly parallel qRT-PCR was used to characterize the expression of 18 transcription factors (TFs) in T cells sorted into naïve, central, transitional, and effector memory subsets, and in SIV Gag CM9 and Tat SL8-specific CD8+ T cells obtained at week 5 and week 20 after SIV239deltanef vaccination. Unsupervised clustering organized T cell samples into groups concordant with cell surface phenotype. SIV-specific CD8+ cells segregated into wk 5 and wk 20 clusters. Principal component analysis suggested the Gag-specific cells are more effector-like and the Tat-specific cells more transitional or central memory-like. Our data indicate distinct transcriptional profiles of the different memory T cell subsets and clear differences between wk 5 and wk 20 SIV-specific CD8+ T cell transcriptomes. The mature wk 20 CD8+ T cell response temporally correlated with protection is characterized by the expression of transcription factors associated with both central memory and effector memory T cells. Additionally, wk 20 Gag-specific cells exhibit a more effector-like expression profile than Tat-specific cells, which is consistent with the Tat epitope exhibiting more rapid CTL escape kinetics than the Gag epitope. Analysis of transcription factor expression therefore provides a valuable complement to the analysis of memory cell differentiation based on classical phenotypic markers. In Press

In Press

GRANT NUMBER: U19 AI095985 NIH/NIAID

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **HIGHLY-PARALLEL PCR ANALYSIS OF LATENTLY-INFECTED RESERVOIRS**

NPRC UNIT: Microbiology & Immunology

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST:

ABSTRACT:

Substantial evidence suggests HIV-1 can establish a latent infection of long-lived quiescent cells, which carry an integrated provirus that is largely transcriptionally silent, functionally invisible to immune surveillance and impervious to the activity of antiretroviral drugs. The long half-life of these cells and their capacity to be reactivated and produce infectious virions remains the primary obstacle to viral eradication. We propose a novel approach using a highly sensitive qPCR technique to analyze the lymphoid tissues most likely to harbor latent reservoirs, to identify the cellular compartments and subsets most enriched for latently-infected cells at higher resolution than previous analyses, and to use highly-parallel qPCR transcriptional analysis to identify novel cell surface biomarkers expressed on these subsets. The use of highly-parallel simultaneous genome/transcriptome qPCR represents a unique approach to address the fundamental challenges in characterizing latently-infected reservoirs and should provide essential information necessary for the development of strategies for viral eradication.

Progress over the past year included the optimization of high-throughput single cell PCR using the Fluidigm C1 platform, identification of a subset of molecules that are differentially expressed on the surface CD4+ T cells, development of a panel of PCR primers for these target molecules, development of a panel of PCR primers for integrated and latent forms of SIV, and preliminary analysis of the presence of full length and short SIV transcripts in different populations of memory CD4+ T cells from SIV-infected animals that have been treated with potent antiretroviral therapy.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **LIVE ATTENUATED SIV-MEDIATED PROTECTION AGAINST MUCOSAL SIV INFECTION**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS: Excluded by Requester

VISITING SCIENTIST: Excluded by Requester Harvard Medical School, NEPRC

ABSTRACT:

Vaccination of macaques with attenuated SIV strains has consistently provided the most effective protection against pathogenic SIV challenge and offers the best available experimental model to define specific mechanisms responsible for protection. Recent studies from our group have demonstrated that a significant maturation of protective immunity against vaginal challenge occurs between 5 and 20 weeks after vaccination with SIVΔnef, which is associated with evolution of both cellular and humoral immune responses. Based on these observations, we hypothesize that SIVdeltanef is able to block critical stages of SIV replication and spread in first 7 days after vaginal challenge. The goal of this proposal is to apply a panel of innovative techniques to serial necropsies of SIVdeltanef-vaccinated animals before and after challenge to elucidate the roles of adaptive and innate immune responses in mediating protection induced by SIVdeltanef and to identify the sites of containment of viral replication within the female reproductive tract.

Over the past year we have infected animals with SIVmac239deltanef, followed humoral and cellular immune responses after infection, and carried out comprehensive analyses of immune response present in lymphoid and mucosal tissues at 5 and 20 weeks after SIVdeltanef infection. These studies demonstrate robust SIV-specific CD4 and CD8 T cell responses in peripheral blood that peak approximately 5 weeks after infection and wane thereafter, whereas these responses are maintained at relatively constant levels in lymphoid and mucosal tissues. Moreover, sequence variation in SIVdeltanef results in an immunofocusing of the CD8 T cell response on more conserved epitopes. Finally, using a novel gp41 trimer reagent, we have been able to track the kinetics of SIV-specific B cells in peripheral blood and mucosal tissues. In Press In Press

GRANT NUMBER: U19 AI095985 NIH/NIAID

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **VACCINE DESIGN TO CONCENTRATE PROTECTIVE ANTIBODIES AT THE MUCOSAL BORDER**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST:

VISITING SCIENTIST: Excluded by Requester University of Minnesota, MN

ABSTRACT:

Recent collaborative experiments from the Excluded by Requester laboratories have suggested that the presence of antibodies against an oligomeric form of gp41 in the female reproductive tract may play a role in mediating protection against vaginal challenge induced by the live attenuated SIV vaccine, SIVdeltanef. The present experiments further extend these observations to determine the ability of antibodies directed against oligomeric gp41 to mediate protection against vaginal challenge. Initial studies will focus on a more detailed characterization of antibody responses induced by SIVdeltanef, as well as antibodies induced by immunization of macaques with oligomeric forms of gp41. Subsequent experiments will analyze the protective effects of passive immunization with rhesus antibodies that are specific for oligomeric gp41 and their ability to provide protection against vaginal challenge with SIV.

Studies in the past year have focused on the optimization of flow cytometric techniques to identify plasma cells and plasmablasts in macaques, as well as the development of new approaches to identify gp41-specific B cells by flow cytometry and ELISPOTs. In addition, we have analyzed the pharmacokinetics of a gp41-specific monoclonal antibody in a naïve macaque as a prelude to passive transfer experiments to examine their ability to protect against vaginal SIV infection.

GRANT NUMBER: R01 AI102625 NIH/NIAID

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **DEFINING THE RECTAL MUCOSA IN MSM AT RISK OF HIV INFECTION**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST:

ABSTRACT:

Men who have sex with men (MSM) continue to be disproportionately affected by HIV. The majority of HIV infections among MSM occur through exposure to the rectal mucosa during receptive anal intercourse. However, very little is known about the rectal mucosa of sexually active MSM. This study will examine differences in mucosal integrity, inflammation, and cell populations in the rectal mucosa between HIV negative MSM who engage in unprotected receptive anal intercourse and men who do not engage in anal intercourse. Differences seen in these mucosal parameters may identify new targets for intervention and could lead to improvements in efficacy of current and future biomedical HIV prevention interventions for MSM at risk of HIV infection. For this study, we are recruiting 45 HIV-negative MSM aged 18-45 who report being in a monogamous relationship with an HIV negative man and report engaging in unprotected receptive anal intercourse. All participants will be screened for eligibility including HIV testing of the participant and sexual partner prior to enrollment. We will also recruit 20 men between the ages of 18-45 who report never having anal sex as controls. MSM and controls will be enrolled into this longitudinal study, which will include 3 study visits over 5 months period of time. At the first study visit, eligibility will be determined and screening blood work will be performed. At the second study visit (time 0) and third study visit (time 8-16 weeks), 60 ml of peripheral blood and 8-12 rectal biopsies will be taken for immunologic assays to be performed at the Emory Vaccine Center. MSM will be asked to keep a coital diary while on study. In addition, MSM will be asked to abstain from receptive anal intercourse for 72 hours prior to the second study visit in order to examine the chronic effects of unprotected receptive anal intercourse (URAI) on the rectal mucosa. Prior to the third study visit, MSM will be asked engage in (URAI) with their HIV negative partner within 24 hours of the study visit in order to examine the acute effects of URAI. Biologic specimens from study visits 2 and 3 will be utilized to understand fluctuations in mucosal immune responses including global gene expression, epithelial cell layer integrity, and mucosal T cells populations that could influence transmission of HIV.

GRANT NUMBERS: K23AI108335
U19AI109633

SUPPORT PERCENTAGE: 0% of P51 funds support this project

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **PERSISTENT VIRUS RESERVOIRS IN SIV-INFECTED MACAQUES**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTISTS: Excluded by Requester

ABSTRACT:

Despite many advances in AIDS research, including the availability of potent anti-retroviral therapy (ART) that effectively controls virus replication in a large proportion of HIV-infected patients; a treatment that can cure the infection remains elusive. To this end, new approaches are required to eradicate the reservoirs of latently infected cells that persist during HAART and are the source of virus reactivation when therapy is interrupted. In the R21 phase of this grant application we propose to use the existing, well-established non-human primate model of SIV_{mac} infection of rhesus macaques (RMs) to validate studies of HIV eradication/functional cure by developing an experimental system in which virus replication is fully and persistently suppressed *in vivo* by a potent ART regimen (Aim #1). We will then use this validated model to investigate directly *in vivo* and in multiple organs the anatomic and phenotypical nature of the persistent reservoirs of latently infected cells, with specific focus on the relationship between expression of co-inhibitory molecules (i.e., PD-1, CTLA4, TIM-3, and LAG-3) and size of the persistent reservoirs (Aim #2). The results of the studies proposed in the R21 part of this application will pave the way for further experiments, to be conducted in the R33 phase of this proposal, in which we will test, in ART-treated SIV-infected RMs with full suppression of virus replication, immune-based interventions aimed at reducing and possibly eliminating *in vivo* the persisting reservoirs of latently infected cells. The key proposed intervention consists of a blockade of the co-inhibitory pathway most closely associated with SIV latency, which will be performed as a stand-alone therapy or in combination with a non-specific virus reactivating agent (i.e., the histone deacytelase inhibitor, SAHA).

We believe that the proposed studies will provide unprecedented insights into the biology of persistent virus reservoirs of latently infected cells, and elucidate the potential of targeting co-inhibitory pathways to reduce the reservoir during SIV infection.

GRANT NUMBER: R21AI104278

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **TH17 CELLS IN AIDS PATHOGENESIS AND HIV VACCINES**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTISTS: Excluded by Requester

ABSTRACT:

In stark contrast to HIV infection in humans, natural SIV infections of African non-human primates are typically nonpathogenic despite similarly high virus replication. While the mechanisms underlying this strikingly different outcome are still largely unknown, a consistent feature of natural SIV infections is the lack of chronic immune activation. In HIV-infected humans, loss of mucosal immunity and microbial translocation from the intestinal lumen to the systemic circulation contribute to chronic immune activation and disease progression. In a series of recent studies, we have shown that pathogenic HIV and SIV infections of humans and rhesus macaques (RMs) are associated with preferential depletion of mucosal CD4+ Th17 cells, a T helper cell population deemed critical for the maintenance of mucosal barrier integrity and the production of anti-microbial molecules. Remarkably, this depletion of mucosal Th17 cells is not observed during natural, nonpathogenic SIV infection of sooty mangabeys (SMs), a natural host species. The overarching Aim of this project is to identify the mechanism(s) responsible for the different regulation of mucosal Th17 cells in pathogenic and nonpathogenic lentiviral infections. We will test the following non- mutually exclusive hypotheses to explain why Th17 cells are preserved in SIV-infected SMs but not in HIV-infected humans or SIV-infected RMs: (i) Th17 cells are more resistant to direct virus infection [Aim 1]; (ii) Th17 cell renewal and/or differentiation are more effective in maintaining Th17 homeostasis [Aim 2]; (iii) Th17 cell homing to mucosal tissues is better preserved [Aim 3].

Elucidation of the mechanisms underlying the preservation of Th17 cells in SIV-infected SMs may provide fundamental insights on how these animals have evolved to preserve mucosal immunity upon infection and thus become AIDS resistant. We believe that this information will be relevant to the design of an AIDS vaccine that will confer protection from the HIV-associated mucosal immune dysfunction.

GRANT NUMBER: R01AI084836

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **TARGETING CYTOLYTIC CELLS TO LYMPHOID SITES OF HIV PERSISTENCE**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTISTS: Excluded by Requester

ABSTRACT:

One of the greatest therapeutic challenges in HIV research and care is the goal of viral eradication. Any strategy aimed at HIV eradication in chronic infection will need to address the persistence of virus in secondary lymphoid organs. Eradicating virus from these sites is complicated. Lymph nodes (LN) are rapidly infected in early infection, and maintain residual level of activation/inflammation during ART that may potentiate infection of susceptible cells to sustain the latent reservoir. LNs are sites at which penetration of otherwise effective antiretroviral drugs appears limited. A third critical complication is that cytolytic effector T cells are typically excluded from LN by their movement across a concentration gradient of the lysophospholipid sphingosine-1 phosphate (S1P). As a result, lymphoid tissues that constitute critical sites of HIV persistence are relatively protected from HIV-specific cytolytic cells. Based on these findings, we proposed a novel approach to retain cytolytic cells in lymphoid tissues by administration of the S1P receptor agonist FTY720. We hypothesized that sustained exposure to cytolytic cells will promote a more inflammatory LN environment, will accelerate the stochastic bursts of SIV replication that play a role in sustaining HIV reservoirs, and will allow cytolytic cells to recognize and destroy virus expressing cells directly in lymphoid tissues. We will test this model in the well-established model of SIV infection of rhesus macaques (RMs) using the S1P receptor agonist FTY720, a molecule approved by the FDA for the treatment of multiple sclerosis that blocks the interaction of S1P with its receptors and results in significant circulating lymphopenia as a consequence of lymphocyte sequestration in LN. Crucial for this proposal, we developed a fully suppressive ART regimen for SIV-infected RMs, thus validating this model for studies of HIV eradication and cure. In the R21 phase of this proposal, we are assessing the safety and activity of two different doses of FTY720 in retaining cytolytic cells in lymphoid tissues in ART-suppressed SIV-infected RMs. If successful, these studies will pave the way for the R33 phase, in which we will determine how FTY720 – at the dose showing the best activity/safety profile in the R21 studies – affects (i) antiviral cytotoxic responses and residual inflammation and (ii) HIV persistence in lymphoid tissues. The longitudinal design allows analyses of blood, LN and rectal biopsies before and during FTY720 treatment. Elective necropsy after the last dose of FTY720 will give us the unprecedented opportunity to address the effects of FTY720 in many other anatomic locations including spleen, lung and brain.

Using a well-established model of HIV infection, we are testing a novel intervention with a drug already approved by the FDA for another indication. These features make our approach very translational. If our results are successful, FTY720 would ultimately be tested in clinical trials aimed at achieving a functional cure of HIV infection in humans.

GRANT NUMBER: R21AI11617

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **CENTRAL MEMORY CD4 T CELL INFECTION: KEY ROLE IN ART RESPONSE AND HIV**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

A major obstacle to cure HIV infection is our incomplete understanding of what factors regulate the immunologic response to antiretroviral therapy (ART) and the establishment and persistence of the latent HIV reservoir. Although it is well established that HIV preferentially infects memory CD4 T cells, it is still unclear weather and to what extent the relative distribution of HIV infection within the various CD4 T cell subsets influences: (i) the magnitude of CD4 T cell reconstitution, (ii) the extent of residual immune activation/inflammation and (iii) the size of the persistent HIV reservoir during ART. These questions are highly relevant to people living with HIV (PLHIV) because targeting specific CD4 T cell subsets could be a potential priority to cure HIV infection. CD4 Central Memory T cells (TCM) are long-lived, self-renewing cells with a crucial role for CD4 T cell homeostasis and overall immune function. Recent evidence generated in nonhuman primate models of HIV infection implicates the infection of CD4 TCM as a key factor determining the outcome of infection. In the pathogenic SIV-infection of rhesus macaques, the levels of infection and depletion of CD4 TCM dictate the tempo of progression to AIDS, and the preservation of CD4 TCM in vaccinated animals associates with resistance to SIV infection. Furthermore, in nonpathogenic SIV infection of sooty mangabeys, low level of CD4 TCM infection is a key mechanism of AIDS resistance. Consistent with the importance of preserving TCM from infection and with the findings that TCM have a longer half-life than TEM, we showed that in PLHIV on ART CD4 TCM represent the largest reservoir of infected CD4 T cells. Based on these findings, we proposed a novel, paradigm-shifting model according to which the pattern of infected CD4 T cells is more important than the overall level of immune activation, virus replication, and the total number of infected cells in dictating the magnitude of CD4 T cell reconstitution and the size of the virus reservoir during ART. Here, we are testing the hypotheses that, in blood and lymph nodes, CD4 TCM infection (i) critically contributes to the extent of immunologic restoration and residual immune activation [Aim 1] and (ii) is a prognostic factor for both the size and stability of the HIV reservoir [Aim 2] following ART. In addition, we are conducting a series of mechanistic studies aimed at defining the molecular correlates of CD4 TCM infection and designing therapeutic intervention that can protect these cells from infection [Aim 3].

We believe the proposed research is highly relevant to human health. By testing a radically innovative hypothesis, these studies provide unprecedented, novel insights into the mechanism underlying the quality of the immunological response to ART and the resulting size/persistence of the HIV reservoir in PLHIV. If our hypothesis is confirmed, these studies will suggest that novel strategies aimed at protecting CD4 TCM from infection should be a critical component of interventions aimed at curing HIV infection.

GRANT NUMBER: R01AI110334

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: VIRO-IMMUNO ANALYSES OF SHIV RESERVOIRS IN MACAQUES UNDERGOING AHSCT

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

The field of HIV cure has been energized by the report of the "Berlin patient", i.e., an HIV-infected individual who received an allogeneic hematopoietic stem cell transplant (allo-HSCT) from a Δ*32ccr5* homozygous donor and has remained apparently HIV-free for several years in the absence of any antiretroviral therapy (ART). To dissect the mechanisms underlying the apparent cure of this patient, we performed auto-HSCT in simian/human immunodeficiency virus (SHIV)-infected rhesus macaques (RMs). We found that, after successful auto-HSCT, interruption of ART was followed by rapid rebound of viremia in 3/3 untransplanted control animals and 2/3 transplanted RMs. In one transplanted RM, however, plasma SHIV-RNA and SHIV-DNA in PBMCs remained undetectable after ART interruption and analyses conducted at necropsy revealed detectable SHIV-DNA in spleen and rare lymph nodes but not in the gastrointestinal tract or tonsils (for additional details please see Excluded by Requester et al., PLoS Pathogens 2014). To further investigate viral reservoirs after auto-HSCT and the immunological impact of the transplant procedure on SHIV-infected RMs, we have established a collaborative team of investigators at Emory Excluded by Requester FNLCR Excluded by Requester and NIH/VRC Excluded by Requester The proposed work is divided in three Specific Aims. In Aim 1 Excluded by Requester we propose to define the cellular origin of the virus reservoir by measuring cell-associated SHIV-DNA in naïve, memory stem cells, central-memory, and effector-memory CD4+ T cells in samples collected post-ART pre-auto-HSCT, post-ART post-auto-HSCT, and after ART interruption. At the time of this progress report, we have conducted several multi-color, multi-parametric flow cytometry staining experiments followed by sorting of the relevant memory CD4+ T cell subsets (using an Aria instrument) in cryopreserved samples that include peripheral blood, lymph nodes, and the spleen. The sorted samples were then processed for DNA extraction and the level of total, cell-associated SHIV-DNA in these cells was measured using our standard RT-PCR assay as described in Excluded by Requester et al., Journal of Immunology 2014. This complex set of staining and sorting experiment is still in progress and no interim analysis of the generated data has yet been conducted. In Aim 2 Excluded by Requester we propose to define the anatomic origin of the virus reservoir by measuring SHIV-DNA and SHIV-RNA by in situ hybridization (ISH) in conjunction with immunohistochemistry (IHC) to phenotypically identify infected cells in tissues from the same time points of Aim 1. At the time of this progress report, a large number of tissue samples have been sent to the laboratory of Excluded by Requester at the FLNCR, where the planned ISH/IHC studies are currently being conducted, although no interim analysis of the generated data has yet been performed. In Aim 3 Excluded by Requester we proposed to examine the impact of auto-HSCT on the T-cell receptor (TCR) repertoire of SHIV-infected as well as uninfected CD4+ T-cells. After several discussions with Excluded by Requester we have decided that the studies proposed in Aim #3 would be most useful if they are informed by the preliminary findings of the studies included in Aim #1 and #2. As such, at this time we have no data to report relative to this Aim.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **CD8+ T CELL EFFECTOR TRANSCRIPTIONAL PROGRAMMING IN SIV INFECTION**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

In the context of HIV and SIV infection, CD8+ T cells are intimately involved in protective immunity: loss of CD8+ T cells through depletion in rhesus macaques (RM), functional deficiency, or viral escape results in higher viremia and rapid disease progression. Accumulating evidence implicates effector function, including perforin-mediated cytotoxicity and □-chemokine expression, as the major factor for CD8+ T cell mediated control of HIV infection. Our preliminary data indicate that a profound HIV-specific CD8+ T cell effector response is mounted early during acute infection coincident with early control of viremia. However, this early CD8+ T cell effector population is rapidly depleted in most HIV infected individuals, resulting in a chronic inability to control HIV viremia and ensuing disease progression. CD8+ T cell effector function is largely regulated by the coordinated activity of two lineage-defining transcription factors, T-bet and Eomesodermin (Eomes). Determining the underlying mechanism for this failure to appropriately develop and maintain CD8+ T cell effector programming is central to our understanding of HIV disease pathogenesis, and represents a major roadblock to the development of an effective T-cell mediated HIV vaccine. In this project we directly address one major mechanism behind this failure in the SIV-rhesus macaque model of HIV-1 infection: the loss of CD4+ T cell help. A defining feature of HIV infection is the loss of T helper type 1 (Th1) responses, which are controlled by T-bet and are critical to develop T-bet/eomes-mediated CD8+ T cell memory and effector responses. During acute HIV-1 infection, we have found that the earliest detectable HIV-1-specific CD4+ T cell responses rapidly lose T-bet expression within weeks of infection. We hypothesized that this rapid loss of Th1 responses will fundamentally alter subsequent T cell help necessary for proper HIV-1-specific CD8+ T cell memory development and maintenance of effector function. Based upon these premises, the goals of this proposal are to 1) define the temporal dynamics of T-bet and Eomes expression within SIV-specific CD4+ and CD8+ T cells during acute SIV infection; 2) define the effect of CD4+ T cell help on SIV-specific CD8+ T cell programming; 3) determine whether preservation of SIV-specific CD4+ T cells during acute SIV infection improves T-bet and Eomes-mediated SIV-specific CD8+ T cell effector activity and memory formation; and 4) determine whether the absence of CD4+ T cell help during acute SIV infection abrogates T-bet and Eomes expression within SIV-specific CD8+ T cells. We will address these goals in the following Specific Aims: Aim 1. Define the temporal dynamics of T-bet and Eomes expression within SIV-specific CD4+ and CD8+ T cells during acute SIV mac251 infection of Mamu A*01^{+}B*08^{-}B*17^{-} rhesus macaques. Aim 2. Define the role of SIV-specific CD4+ T cell Th1 responses in driving T-bet/Eomes mediated SIV specific CD8+ T cell effector function and memory formation through experimental manipulation of CD4+ T cells in vivo during acute SIV infection.

GRANT NUMBER: R56AI106481

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **INACTIVATED AT-2-SIVMAC239 & LACTOBACILLUS PLANTARUM AS AIDS VACCINE**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

The search for a safe and effective vaccine for HIV infection and AIDS remains a major priority in contemporary biomedical research. A recent study performed by the group of Excluded by Requester has shown that intra-gastric immunization of rhesus macaques (RMs) with AT-2 inactivated Simian Immunodeficiency Virus and Lactobacillus plantarum (iSIV+LP) completely protected from high-dose intra-rectal SIV challenge in 15 out of 16 animals. In addition, the iSIV+LP immunized macaques showed a marked decrease in peak and set-point viremia when challenged intravenously. The goal of this project is to independently confirm the data generated by Excluded by Requester and his colleagues, thereby providing compelling evidence in favor of moving this highly innovative HIV vaccine platform into clinical trials. To this end, we are performing an independent immunization and challenge experiment in a cohort of 54 Indian origin rhesus macaques (RM) divided in four groups: (i) seventeen animals that will be immunized intra-gastrically with iSIV+LP; (ii) ten animals that will be immunized intra-gastrically with iSIV only; (iii) ten animals that will be immunized intra-gastrically with LP only; and (iv) seventeen animals that will undergo a sham intra-gastric immunization. All RMs included in this study will be challenged intra-rectally with a high-dose of SIVmac239 at 6 months post-immunization, and then followed for ~12 months after challenge with monitoring of the main virological and immunological markers of SIV disease progression. The study was funded at the end of 2013 and at this time the majority of animals have been successfully vaccinated, with the challenge phase of the experiment planned to begin in April 2015. We anticipate that this study will define the potential of LP-based candidate AIDS vaccines.

GRANT NUMBER: Private Sourc e

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **COMPARATIVE AIDS CORE (IMMUNO-VIRO SAMPLE REPOSITORY OF MANGABEYS)**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTISTS: Excluded by Requester

ABSTRACT:

This colony management projects treats the groups of SIV-infected and uninfected sooty mangabeys (SMs) housed at the Yerkes National Primate Research Center as cohorts for periodic evaluations of the immunological and virological impact of the infection. The biannual sample collections began in 2004 and between the years of 2004-2013 over 800 peripheral blood samples, as well as several dozens of lymph node and mucosal samples were collected and analyzed for numerous markers including plasma viral load, CD4+ T cell counts, and cellular and soluble markers of immune activation. In addition, multiple tissue and organ samples are collected at the time of necropsy and stored for SMs that have died of natural causes. This information, and the repository of plasma, PBMC, and tissue samples, are made available for selected research projects to both intra-mural and extra-mural scientists upon request. The samples utilized from this project have continued to be instrumental to several important studies in the field of comparative AIDS research. In addition, this project continues to enable us to generate large sets of immunological and virological data that have illuminated a number of specific aspects of SIV infection in these animals, and to relate these aspects to the main genetic features of the SM colony. Two recent intriguing aspects of this project that have been very productive are the examination of functional genomics features related to immune function; the ongoing definition of the whole SM genome; and studies of CD4+ memory stem cells, whose specific functions have been published in 2014.

GRANT NUMBER: P51OD011132

SUPPORT PERCENTAGE: 100% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **CHAVI-ID RESEARCH SUPPORT COMPONENT C. NONHUMAN PRIMATES**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

Infection of rhesus macaques with simian immunodeficiency virus (SIV) or simian-human immunodeficiency virus (SHIV) represents an important animal model for HIV-1 infection. The Nonhuman Primate (NHP) Scientific Research Support Component (SRSC) aims to support this Center for HIV/AIDS Vaccine Initiative-Immunogen Design (CHAVI-ID) consortium by consolidating and focusing the preclinical evaluation of vaccine concepts and novel immunogens in NHPs. Specifically, this SRSC provides all the expertise, infrastructure, reagents, and personnel for the conduct of complex immunogenicity and protection studies in NHPs. In the 2.5 years since the CHAVI-ID research program has been funded, the NHP-SRSC has made significant progress in supporting this CHAVI-ID by selecting and providing rhesus macaques, providing exceptional animal care, conducting experimental studies with monoclonal antibodies and vaccines, collecting samples for immunologic and virologic testing, and performing necropsy studies.

The NHP-SRSC site based at the Yerkes National Primate Research Center (YNPRC) has focused primarily on testing the in vivo immunogenicity of a series of novel HIV-1 Env immunogens that were developed in the laboratory of Excluded by Requester at the Private Source and aimed at inducing broadly neutralizing antibodies (bNAbs) to either the HIV gp120 or gp41. These immunogens were tested sequentially in healthy, SIV-uninfected rhesus macaques and include (i) engineered outer domain (eOD) 60mer-based stabilized HIV gp120 domain (adjuvanted by Iscomatrix), and (ii) 10E8 scaffold immungens (adjuvanted by Iscomatrix), for their capacity to activate VRC01-like 10E8-like B cells, respectively, drive appropriate somatic mutation, and induce cross-reactive binding VRC01-like and 10E8-like bNAbs. This study is completed and the relevant immunological data are being prepared for publication. In addition, we have conducted a titration study of the in vivo protective efficacy from SHIV challenge by a broadly neutralizing antibody PGT126.

GRANT NUMBER: UM1AI100663

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **CHAVI-ID RESEARCH SUPPORT COMPONENT C. NONHUMAN PRIMATES - SUPPLEMENT**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

This project represents an administrative supplement to the CHAVI-ID parental project for which Excluded by Requester serves as co-leader of the Nonhuman Primate (NHP) Scientific Research Support Component (SRSC) which aims to support this Center for HIV/AIDS Vaccine Initiative-Immunogen Design (CHAVI-ID) for the in vivo NHP studies of novel immunogens. While the proposed NHP studies have not been started yet, the relevant IUCAC protocols have been approved, the Iscomatrix adjuvant has been procured and is on site, and the in vivo immunization studies have been pre-scheduled with the animals identified and assigned. Of note, we will re-use 18 of the rhesus macaques that have been used as part of a previous round of in vivo immunizations conducted in collaborations with Excluded by Requester from Scripps and under the same CHAVI-ID umbrella.

With respect to the HIV immunogens to be used in this project, one of the most exciting aspects of the proposed 10e8 and trimer studies was to evaluate second generation, particle-based immunogens. Our collaborators at Scripps initially ran into a technical problem since a key conjugation reagent that was used for years was discontinued in September. However, a replacement reagent has now been found, and sufficient quantities of 10e8 scaffold particles were produced to begin the proposed rabbit and NHP studies. For the generation of trimers on particles and the conjugation to liposomes we experienced some difficulty in terms of conjugation efficiency. More recently, we have been pursuing a new strategy that will not require conjugation (and is also not a simple gene fusion) and we therefore have a reasonable expectation that this process will yield particles in a short time frame. For the trimer cocktail immunizations, which can be done without particles, we decided to wait long enough to include our stabilizing disulfide that greatly reduces V3 binding, as this strategy should greatly improve the design of our experiment. We are currently waiting for delivery of the vectors and, as soon as we have produced and validated our 5-member cocktail with this disulfide, we will generate a final schedule for the in vivo macaque immunization studies. Of note, if the disulfide is incompatible with some members of the cocktail, we will use the original versions of these reagents which we have frozen and ready to use at any time. However, the disulfide works great with BG505 SOSIP itself, and this disulfide involves parts of the structure that are conserved in all members of the cocktail, so it is likely that the transfer will occur without any significant problems. Finally, an additional exciting aspect of the 10e8 immunization experiment is germline-targeting of the HIV-specific B cell repertoire, and therefore we have also proposed to improve our germline-targeting construct and develop a trimeric version that should be an optimal immunogen.

GRANT NUMBER: UM1 AI100663

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **AUP512SHIV TITRATION STUDIES**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

This project has been conducted as a sub-contract with the the Centre Hospitalier-Universitaire Vaudois (CHUV) which is funded by the Private Source to conduct a series of pre-clinical and clinical studies of the Eurovacc vaccine platform which includes HIV-1 clade-C DNA and NYVAC immunogens that appear to produce very strong and broadly reactive cell mediated immune responses to the virus. The goal of the current YNPRC project was to perform an experiment of in vivo titration of a novel chimeric simian/human immunodefiicency virus (SHIV) that is mucosally transmissible, highly replication competent, CCR5-tropic, and encodes biologically relevant clade C envelope (SHIVC109F.PB4) derived from a recently infected subject in Zambia. The proposed titration experiment, which has now been completed, involved fifteen healthy rhesus macaques (RMs) that were challenged intra-rectally with an escalating does of SHIVC109F.PB4 (three challenges at each of five doses separated by a half-log virus in vitro titer starting at a TCID-50 of 3 for a total of fifteen challenges). The animals were monitored weekly for SHIV viral load and upon two consecutive positive results with VL above 1,000 copies/ml of plasma the challenge procedure were stopped and the animals monitored for an additional 60-90 days. The study was successfully completed with 13 out of 15 animals becoming SHIV-infected by the end of the study, and an appropriate robust definition of the in vivo TCID-50 dose that will be used in the next set of experiments in which RMs immunized with DNA and NYVAC will be challenged.

GRANT NUMBER: N/A CHUV, Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **ROLE OF FOLLICULAR T HELPER CELLS IN ENHANCING HUMORAL IMMUNITY**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST:

ABSTRACT:

HIV destroys the host adaptive immune response early in the course of infection by depleting CD4+ T cells and inducing a broad dysfunction of B cell responses. These two processes likely occur extensively in lymph nodes shortly and presumably involve highly evolved mechanisms of immune evasion/ immune suppression. For vaccine development efforts, it is critical to understand whether the immunopathogenesis of HIV normally precludes a protective immune response. Goal of this project is to test the hypothesis that HIV/SIV immuno-pathogenesis involves an extensive damage to follicular T helper cell (Tfh) responses. In the first set of experiments we focused on the role of a novel lymphocyte CD3+CD20+ “double positive” (DP) population in lymph nodes and spleen of healthy and SIV-infected rhesus macaques. By using a combination of flow cytometry, image stream analysis and immunohistochemistry (IHC) experiments we confirmed the presence of these two molecules on the same cell, and established that these DP cells (i) are enriched in cells showing a conventional Tfh phenotype (CD4+PD1brightCXCR5+ICOS+Bcl-6+), function (IL-21+IL-17-IL-2+/-IFN-g-) and profile of gene expression, and (ii) express other B-cell markers such as CD21, HLA-DR, CD79, and surface immunoglobulins. Based on this complex set of data, we propose that DP cells arise as a result of membrane exchange in active germinal centers after intimate contact between Tfh and GC B-cells, through a process defined as trogocytosis, and the DP phenotype may identify Tfh and GC B-cells that have recently undergone high affinity interactions during acute HIV and SIV infections. In the second set of experiments we investigated the role of suppressive follicular regulatory $CD4^+$ T cells (T_{FR}) during SIV infection of macaques. T_{FR} are natural regulatory T-cells (T_{REG}) that migrate into the follicle and, similarly to T_{FH}, up-regulate CXCR5, Bcl6, and PD1. Here we identified T_{FR} as $CD4^+Foxp3^+CXCR5^+ PD1^+Bcl6^+$ within LN of humans and rhesus macaques (RM) and confirmed their localization within the GC by immunohistochemistry. RNA sequencing showed that T_{FR} share a T_{FH} and T_{REG} transcriptional profile with intermediate expression of FoxP3, Bcl6, PRDM1, IL-10, and IL-21. In healthy, SIV-uninfected RM, we observed a negative correlation between frequencies of T_{FR} and both T_{FH} and GC B-cells as well as levels of $CD4^+$ T-cell proliferation. Following SIV infection, the T_{FR}/T_{FH} ratio was reduced with no change in the frequency of T_{REG} or in the frequency of T_{FR} within the total CD4 T-cell pool. Finally, we examined whether higher levels of direct virus infection of T_{FR} were responsible for their relative depletion post-SIV infection. We found that T_{FH}, T_{FR} and T_{REG} sorted from SIV- infected RM harbor comparable levels of cell-associated viral DNA. Our data suggests that T_{FR} may contribute to the regulation and proliferation of T_{FH} and GC B-cells *in vivo* and that a decreased T_{FR}/T_{FH} ratio in chronic SIV infection may lead to unchecked expansion of both T_{FH} and GC B-cells.

GRANT NUMBER: U19 AI096187

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **CURING HIV THROUGH ALLOGENEIC HEMATOPOIETIC STEM CELL TRANSPLANTATION**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

HIV and AIDS continue to be devastating health problems, with over 30 million people worldwide infected with the virus, and millions of deaths each year from AIDS. Combination antiretroviral therapy (cART) has greatly reduced viral loads and decreased morbidity and mortality from AIDS, but the costs of this lifelong intervention are massive, the side effects can be severe, and the emergence of drug resistance an ongoing challenge. A major obstacle to long-term control and cure of the virus has been the persistence of HIV in ART-resistant reservoirs that contain latently infected resting CD4+ T cells. This persistent reservoir of latently infected cells thus constitutes the major barrier to a cure for HIV, and the development of novel paradigm shifting approaches is likely be required for successful long-term control of viremia in absence of cART. One such approach is the use of allogeneic hematopoietic stem cell transplant (allo-HCT) to cure HIV. The promise of this approach is exemplified in the 'Berlin patient' who received an allo-HCT from a CCR5□32 homozygous donor, and is the first patient cured of HIV through transplantation. However, to date, no NHP model of allo-HCT for HIV eradication exists. The creation of this model is therefore a critical unmet need in the field. To accomplish this goal, we have assembled an investigative team with synergistic expertise in HIV immunology, gene therapy, and NHP models of allo-HCT and GVHD. This team is uniquely positioned to rapidly establish an NHP model of allo-HCT for HIV eradication and to use this model to address the critical questions surrounding transplantation and HIV. The R21 portion of this grant is focused on creating an allo-HCT model for HIV eradication. The R33 extension of this grant will focus on determining the role of GVHD on the graft-versus reservoir effect and the impact of transplantation with HIV-resistant stem cells on viral eradication after allo-HCT. They are comprised of the following two Specific Aims. The first Aim (for the R21 phase) is to create a Non-human Primate Model of Haplo-identical HCT for HIV Eradication. The second Aim (for the R33 phase) is to determine whether haplo-identical HCT using genetically-modified CCR5-disrupted stem cells can result in eradication of virus from SHIV-C infected PTMs.

GRANT NUMBER: R21AI116184

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **ANTIRETROVIRAL TREATMENT IN SIV-INFECTED SOOTY MANGABEYS**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

Over the past several decades, AIDS research has progressed in many key areas, including pathogenesis, prevention and treatment. In particular, the introduction of potent antiretroviral therapy (ART) has dramatically reduced the morbidity and mortality of HIV-infected individuals. However, several challenges remain, including the absence of a vaccine that can reliably prevent virus acquisition, and the inability of current ART regimens to eradicate the virus. One of the most consistent obstacles to address the formidable challenge of eradication of HIV infection is the presence of stable viral reservoirs of latently infected CD4+ memory T cells that persist despite ART. Our project aim is to understand the mechanisms of the complex virus-host interactions that lead to persistent infection and to achieve the ideal combination of therapies to cure HIV.

We propose to use combination antiretroviral therapy (cART) consisting of five drugs (PMPA/Tenofovir, FTC/Emtricitabine, Raltegravir and Ritonavir-boosted Darunavir) in twelve chronically SIV-infected Sooty Mangabeys (SMs) to evaluate the impact on viral reservoirs. We reasoned that, in SIV-infected SMs, the reservoir of latently infected CD4+ T cells may be particularly susceptible to cART as we have found that the subsets of memory CD4+ T cells that are most likely involved in maintaining this reservoir for long periods of tiem (central memory, T_{CM}, and T memory stem cells, T_{SCM}) are relatively resistant to SIV during natural infection. For this purpose, these twelve SIV-infected SMs have been divided into four groups, each of three animals, receiving cART for 3, 6, 9 and 12 months, followed eventually by a structured treatment interruption. During and after the period of cART, we will conduct an extensive analysis of the virological and immunological parameters of SIV replication and SIV-specific T cell dynamics in blood and mucosal tissues. While the study is still ongoing, our preliminary analyses confirmed that the used cART regimen resulted in complete suppression of plasma viremia below detectable limit in 11 out of 12 SMs, thus allowing to elucidate the cellular composition of the SIV reservoir in these animals, with particular focus on CD4+ T cell subsets, including naïve (T_N), T_{SCM}, T_{CM}, transitional memory (T_{TM}), and effector memory (T_{EM}). The analysis of the rebound of viremia (or lack thereof) after treatment interruption, is still ongoing.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **NONHUMAN PRIMATE STUDIES OF GROUP A STREPTOCOCCAL VACCINE CANDIDATES**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

Group A streptococcus (GAS; *Streptococcus pyogenes*) is among the top 10 global causes of morbidity/mortality in humans, and is responsible for diseases ranging from sore throat through to severe invasive infections (e.g. the "flesh eating" disease necrotizing fasciitis), and immune *sequelae* (rheumatic heart disease and glomerulonephritis). Despite the burden of GAS-associated diseases, no safe commercial GAS vaccine has been developed, with only two approaches currently under clinical assessment. The most advanced of these involves combining multiple peptides (26-30) derived from the cell surface M protein. Because more than 200 GAS strains have been identified, and each peptide protects against a single GAS strain, this approach is inefficient, requiring the incorporation of large numbers of peptides to provide broad protective coverage. In contrast, the use of highly conserved antigens offers a more resourceful means to generate broadly protective vaccines. Such an approach, using a single conserved M protein antigen, J8, which is found in approximately 70% of strains, is also under development. However, both approaches fail to protect against all circulating strains. Additionally, the immune *sequelae* caused by repeated GAS infection has been a critical impediment to vaccine development and testing in humans. A number of highly conserved GAS antigens with demonstrated protective efficacy in mouse models have not progressed to human trials due to the risk of triggering GAS antigen-mediated immune *sequelae*.

This project is aimed at bridging the gap between vaccine efficacy data generated in mice models and vaccine trials in humans. To this end, we proposed to combine six highly conserved GAS antigens, to produce a single vaccine capable of protecting against all GAS strains. Monitoring of immunological responses to these conserved vaccine antigens in non-human primates will generate data that circumvents the aforementioned vaccine development issues. The leading GAS vaccine components (C5a peptidase, arginine deiminase [ADI], trigger factor [TF], SpyCEP, detoxified SLO, and J8) have been selected for this work. Each of these antigens is efficacious in mouse models upon lethal GAS challenge. The combination of these antigens within a single vaccine has not been previously assessed, and if successful, may additionally generate new intellectual property. The ability to measure the immune parameters and clinical indicators of protection for these antigens in non-human primates would represent a major advance to the field of GAS vaccine development, informing future human trials. It is proposed that the production of the recombinant GAS antigens will be conducted at Private Source using the combined expertise in protein expression and GAS vaccine antigens. These antigens are now being tested in nonhuman primates at the Emory Yerkes National Primate Research Center, with assessment of post-vaccination immune response, clinical analysis and assistance in experimental design provided by Private Source collaborators.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **TRANSCRIPTOME RESOURCE FOR PRIMATE MODELS OF LENTIVIRUS INFECTION**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST:

ABSTRACT:

The goal of this project is to generate whole transcriptome reference databases for several immune cell types at baseline and during the acute and chronic phases of HIV and SIV infection, with emphasis on the comparative models of pathogenic (i.e., humans and rhesus macaques (RMs)) and non-pathogenic (i.e., sooty mangabeys (SMs) and African green monkeys (AGMs)) infections. Specific Aim 1 is to generate baseline reference transcriptomes for several key immune cell subsets in healthy individuals belonging to four primate species (humans, RMs, SMs, and AGMs). Specific Aim 2 is to generate reference transcriptomes for the key immune cell subsets in the context of acute SIV infection in the pathogenic RM and the non-pathogenic AGM models. Specific Aim 3 is to generate reference transcriptomes for the key immune cell subsets in the context of chronic HIV and SIV infection in humans, RMs, SMs, and AGMs. Resource applications include: (i) improvements to gene models for already sequenced species (humans and RMs) and assistance for genome assem¬bly/annotation for new species (i.e., SMs and AGMs); (ii) development of tools (e.g., species-specific gene probes or microarrays) for AIDS-related systems biology research; (iii) investigation of the interaction between lentiviruses and the immune system during acute and chronic infection. The project was funded in September 2013 and the work conducted so far includes: (i) the optimization of the flow cytometric assays necessary to appropriately sort the immune cell subsets whose transcriptome is analyzed, (ii) the definition of the best strategies to conduct the microarray and next-generation sequencing analysis with related bioinformatics, and (iii) the first set of staining, sorting, and analyses relative to Aims 1 and 2.

GRANT NUMBER: R24OD010445

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **STUDIES OF NATURAL SIV INFECTION OF SOOTY MANGABEYS**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTISTS: Excluded by Requester

ABSTRACT:

This project focuses on the identification and characterization of the key pathophysiological events occurring during natural SIV infection of sooty mangabeys (SMs). In the past few years of experimental work related to this research program we have made significant progress in our studies of the role of CD4+ central memory T cells (T_{CM}) and stem-cell memory T cells (T_{SCM}) during natural, non-pathogenic SIV infection of sooty mangabeys (SMs). We continue to conduct these studies in parallel with comparative studies of the pathogenic, experimental SIV_{mac} infection of rhesus macaques (RMs). In addition, we have actively explored the role played by the different pattern of infected memory CD4+ T cells observed between RMs and SMs in the establishment and persistence under antiretroviral therapy (ART) of the reservoir of latently infected cells.

In previous work we showed that CD4+ T_{CM} and T_{SCM} of SMs are less susceptible to SIV infection as compared to CD4+ T_{CM} and T_{SCM} of RMs. We next focused on the potential mechanisms by which CD4+ T_{CM} of SMs may be significantly protected from direct virus infection. These mechanisms can be briefly summarized as follows: (i) lower surface expression of the SIV entry co-receptor CCR5, as well as other corecptor used by SIV_{smm}, such as GPR-1, GPR-15, and CXCR6; (ii) higher expression of host restriction factors for SIV (i.e., TRIM5a, APOBECs, BST-2, SAMHD1, MX6, etc.) in sorted CD4+ T_{CM} and T_{SCM} of SMs as compared to RMs and humans. In addition, we investigated the presence of qualitative differences in the virus replicating in various memory CD4+ T cell subsets by analysis of virus sequences derived from sorted CD4+ T_{CM} and T_{EM}. This work is conducted in close collaboration with the laboratory of [redacted] at the University of Pennsylvania, who is a co-investigator of this proposal. As part of this work we have sequenced several hundred SGA amplicons from various CD4+ T cell subsets isolated from SIV-infected SMs and RMs; however, despite this effort, we could not identify any consistent "signature" distinguishing the *env* or *nef* genes of the viruses that integrate into T_{EM} versus T_{CM} cells. The observation that SIV-infected SMs harbor significantly less virus than SIV-infected RMs in their subsets of CD4+ T_{CM} and T_{SCM} may have very interesting implications in terms of studies of HIV latency, reservoirs, and cure strategy. Given the high priority that the AIDS research community, including the NIH/NIAID/DAIDS is giving to studies of HIV eradication, we felt that it was timely and potentially very informative to explore these implications in a study in vivo in which SIV-infected SMs are treated with antiretroviral therapy (ART). The rationale for these studies is that latently infected resting CD4+ T_{CM} and T_{SCM} may be particularly important in maintaining the reservoir under ART due to their ability to undergo multiple rounds of homeostatic proliferation in absence of active virus reactivation. We continue our research program along the lines detailed in our original grant proposal, which focuses on defining the mechanisms responsible for the lack of pathogenicity of natural SIV infection of SMs, and also continue to investigate novel aspects of the virology and immunology of this infection that may be highly relevant to the area of HIV latency, reservoirs, and cure strategies.

Excluded by Requester

GRANT NUMBER: R37AI066998

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **TARGETING SIV RESERVOIRS WITH TYPE 1 INTERFERONS**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

Despite many major advances in AIDS research, including the development of anti-retroviral drugs that suppress virus replication and greatly reduce the mortality and morbidity of HIV infection, a treatment that can cure the infection is still not available. Indeed, combination antiretroviral therapy (ART) must be taken for life, thus posing significant challenges in terms of costs and clinical safety, and interruption of therapy results in a rapid rebound of viremia in the majority of HIV-infected individuals. To this end, new approaches are required to eradicate the reservoirs of latently infected cells that persist during ART and are the source of virus reactivation when therapy is interrupted. The overarching Aim of this proposal is to explore the therapeutic potential of type I interferon (IFN-I), that activates a very potent natural antiviral molecular system, in reducing the reservoirs of virus-infected cells that persist under ART.

In the R21 phase of this project we will use the existing, well-established nonhuman primate model of SIV_{mac} infection of rhesus macaques (RMs) to evaluate, in a relatively small pilot study, the potential impact of pegylated IFN-a2a (pIFN-a2a) on the overall size, anatomic location, and cellular distribution of the reservoirs of latently infected cells in ART-treated, SIV-infected RMs. We use this very robust model to investigate directly *in vivo* and in multiple organs (i.e., blood, lymph nodes, spleen, mucosal tissues, etc) and cell types (i.e., memory CD4+ T cell subsets and macrophages) whether and to what extent pIFN-a2a administration enhances the effect of ART on the virus reservoir. The results of the studies proposed in the R21 part of this application will pave the way for further experiments, to be conducted in the R33 phase of this proposal, in which we will test, in a larger cohort of SIV-infected RMs treated with long-term ART and exhibiting full suppression of virus replication, the effect of two consecutive cycles of pIFN-a2a treatment on (i) the size of the persisting reservoirs of latently infected cells, and (ii) the time of rebound of plasma viremia after ART interruption.

We believe that the proposed studies will provide unprecedented insights into the role of type I interferon in reducing and/or altering the cellular and anatomic distribution of the persistent virus reservoirs of latently infected cells in an in vivo model of pathogenic lentiviral infection in which active virus replication is fully suppressed by ART. We believe that these results will be crucial to determine the potential of IFN-I therapy in HIV-infected individuals.

GRANT NUMBER: R21AI116200

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **ROLE OF ANTIGEN-SPECIFIC T CELL RESPONSES IN THE CONTROL OF TB, PROJ 3**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

This program aims to define signature of T cell responses associated with various clinical stages of mycobacterium tuberculosis infection, including active Tb, latent Tb, reactivation of Tb, etc.

This project started very recently and we have so far prepared and optimized assays to measure T cell response in samples from Mtb infected macaques. The goal will be to markedly expand the number of antigens to be tested, identify epitpoes and conduct detilaed analyses of overal profiles of immune responses.

GRANT NUMBER: U19 AI111211

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **DEVELOPMENT OF A RECTAL ENEMA AS A MICROBICIDE (DREAM)**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTISTS: Excluded by Requester

ABSTRACT:

This program aims to develop antiretroviral drug based mucosal protection procedure to prevent HIV transmission during anal intercourse. The proposal will develop and test the use of hypotonic enemas as well as mucus penetration nanoparticels as a strategy to force ART into the mucosal tissue and prevent infection with a SHIV challenge.

This project started very recently and we are currently testing retention of vairous volumes of enema in monkeys in order to properly model the pharmacokinetics of mucosal deliverey of tenofovir derivates to the mucosa.

GRANT NUMBER: U19 AI113127

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **PRIMATE CORE: B-CELL BIOLOGY OF MUCOSAL IMMUNE PROTECTION FROM SIV**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTISTS: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

This program project aims to delineate cellular mechanisms leading to a mucosal immune responses able to prevent transmission of SIV by the vaginal route. The primate core is central to the program project that comprises several investigators at Emory University and outside.

During this period, the virological and immunological monitoring of challenged animals was completed and all animals have been euthnaized and tissues collected extensively. Animals that resisted challenge were submitted to a single intravaginal challenge with the same dose of SIVsmE660 used before, followed by sacrifice at either day 1 or day 5 to evaluate the potential viral seeding of the female reproductive tract and the upregulation fo the innate TRIM5a mechanisms since protection afforded by immunization seemed to be associated the TRIM5a alleles from select monkeys.

GRANT NUMBER: U19 AI096187

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **ROLE OF HIV ENV GLYCOSYLATION IN MUCOSAL TRANSMISSION**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

This program aims to elucidate the role of glycosylation on the envelope of HIV in the mucosal transmission. The project will first elucidate the various levels of glycosylation present on transmitted founder viruses obtained from a cohort of discordant couple in Zambia. These envelopes will then be used to construct SHIV viruses which will be tested alone and in combination for mucosal transmission in monkeys.

This project started very recently and for now SHIV constructs are being made in parallel to evaluation for glycosydation.

GRANT NUMBER: R01 AI113883

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: IMMUNE MECHANISMS OF LONG-TERM IMMUNITY INDUCED BY IPV

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST:

ABSTRACT:

This study aims to define the potential for intradermal delivery of reduced doses of the inactivated polio vaccine to induce protective responses to the 3 strains of polio. For this project, we are comparing the administration of a full dose of IPV IM with a 20% dose of IPV delivered intradermally for the induction of polio specific responses. Groups of monkeys are given either a single or a repeated immunization with monitoring of the immune responses.

For this project we have immunized a total of 32 rhesus macaques with the Salk inactivated polio vaccine either once or twice and by either the regular intramuscular immunization route or an intradermal delivery of 20% of the vaccine only. The studies measure the magnitude and longevity of the responses generated by this vaccine. Briefly, a single immunization delivered via either route generated only a transient humoral response in vivo generally directed to 1 or 2 serotypes only. The single booster immunization induced persistent titers to at least 2 serotypes but not to the third one. Further monitoring is ongoing.

During the memory phase we also initiated immunization of monkeys with 2 experimental Dengue virus vaccines presented by virus-like particles. One vaccine consisted of the envelope of Dengue virus 2 while the other presents a fusion of all 4 serotype envelopes.

GRANT NUMBER: WHO Contract

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **MONOCLONAL ANTIBODY-BASED MULTIPURPOSE MICROBICIDES - PROJECT 5**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

This study aims to define the ability of nicotiana produced broadly neutralizing recombinant antibodies (MAbs) to HIV to prevent infection with SHIV.

During this period, we have completed the vaginal infection with HSV2 in cynomolgus monkeys and model for lactobacillus colonization prior to euthanizing these monkeys. A novel cohort of 19 have been selected and used to test the delivery and dissolution of monoclonal antibody containing biofilm. We also have evaluated a first and second generation of intravaginal rings for the delivery of MAbs and the pharmacokinetics of such delivery. Finally, we have developed and titrated a clade C tier 2 SHIV stock for the conduct of protection efficacy studies after delivery of MAbs with biofilm and intravaginal rings.

GRANT NUMBER: U19 AI096398

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **MODULATION OF EARLY HOST RESPONSE TO SIV IN PATHOGENIC INFECTION**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

This study aims to delineate differences in the initial immune responses to immunization with HSV encoded SIV proteins to compare sooty mangabeys (disease resistant model) with rhesus macaques (SIV disease susceptible model) and identify mechanistic differences potentially affecting (immunopathologic) responses to SIV infection. The grant proposal will use a replication deficient recombinant Herpes simplex based vector expressing SIV gag, env and tat-rev-nef of SIVmac239 to immunize sooty mangabeys via intra-muscular (n=3), intra-nasal (n=3) or intra-rectal (n=3) delivery.

This project was completed during this period with all blood and biopsy collections done and the animals released to the Center. The studies have outlined the potential role of TRAIL, a member of the TNF superfamily as potential marker of early pathogenesis and we have generated large amounts for a natural TRAIL inhibitor that will be utilized in the rhesus macaque that does develop disease.

GRANT NUMBER: R01 AI084810

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **MONITORING SIV RESERVOIR WITH IMMUNOPET**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

This project is an extension of the R21 award that has allowed for the definition of a total body real time evaluation of SIV replication in vivo using immunoPET/CT. In this project we plan to optimize the technology to increase signal to noise ratio and improve the resolution. Then the goal will be to delineate the dynamics of SIV infection following infection by the intravenous, intrarectal or intravaginal route. All monkeys will then be initiated on antiretroviral treatment for a period of 6 months while monitoring of the viral reservoirs using immuno-PET/CT and biopsies. Finally the functional reservoirs will be identified after ART cessation and detection of the anatomic sites from which viral replication is re-initiated in vivo.

This project started recently and we have screened a large number of monoclonal antibodies able to bind the SIV envelope expressed by the virus and the infected cells to identify a cocktail of MAbs binding various epitopes and improve signal. Additional approaches are currently being tested for background relative to signal in these SIV infected monkeys recycled form other ongoing studies.

GRANT NUMBER: R01 AI111863

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **RESOURCE FOR NONHUMAN PRIMATE IMMUNE REAGENTS**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

This project serves as a resource for the testing, optimization of use and distribution of nonhuman primate specific immune related reagents. Therefore, cDNA coding for various nonhuman primate cytokines have been and continue to be cloned and sequenced.

During the past year, the effort of the resource was focused on production of large batches of recombinant macaque proteins such as IL-21-Ig, PD-1-Ig, soluble DR5-Ig, expanding the production in pichia pastoris while maintaining S2 production system going. We have generated new clones of macaque TGF-B, IL-35 and Il-27. Additionally, we are preparing a series of CCR5-diphtheria toxin fusion proteins for the elimination of CCR5+ cells in vivo in effort to reduce SIV reservoirs. New genes were cloned for old world NHP cytokines such as TNF-sf family members, TGF-B. The Resource also has provided typing for macaque FcγR and TRIM5a for other investigators.

GRANT NUMBER: R24 OD010947

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **PET CONTRAST AGENT FOR INTERROGATING IMMUNODEFICIENCY VIRUS INFECTIONS**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST:

ABSTRACT:

Currently there is no in vivo diagnostic or contrast agent that allows the assessment of an immunodeficiency virus infection within a living subject. Such a diagnostic would identify infected cells within the body, and provide a non-invasive way of obtaining time-course information about the infection. It will be invaluable for assessing the ability of a vaccine to prevent infection or destroy infected cells within the body, as well as being useful for characterizing the efficacy and kinetics of new antiviral agents. In this grant, we propose the development of a positron emission tomography (PET) contrast agent using the simian immunodeficiency virus (SIV) infection of rhesus macaques as our model system.

In this period, we have completed the analyses on the dynamics of SIV replication in viremic monkeys before and after 5 weeks of antiretroviral therapy leading to undetectable viral loads in the plasma. Viral signals markedly decreased after ART initiation but not to a level comparable to background. Similar to long term non-progressor monkeys, ART treated monkeys showed unequal distribution of signal in the form of restricted foci within various organs such as the gut and lymphoid organs

GRANT NUMBER: R21 AI095129

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **MUCOSAL PROTECTION AGAINST HIV GENERATED BY PIV5**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

The goal of this project is explore the ability of a commonly used parainfluenza virus 5 vector expressing HIV proteins to induce mucosal immune responses in mice and primates able to protect from vaginal challenge.

This project started very recently and we are about to perform the initial immunogenicity studies using PIV5 based immunizations for SIVgag and HIV env via the intranasal and rectal route. Analysis of response will be performed in blood, mucosal fluids and bone marrow.

GRANT NUMBER: R01 AI11863

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **TARGETING MACROPHAGES AND MICROGLIA TO ERADICATE CNS HIV-1 RESERVOIRS**

NPRC UNIT: Microbiology and Immunology

CORE SCIENTISTS: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

This project explores the use of 3 classes of novel compounds to limit CNS inflammation and eliminate SIV from the CNS. The compounds to be tested are Jak3 inhibitors (Jakafi), NADPH oxydase inhibitors and rNTPs.

During the past year, we have tested Jakafi, a Jak3 inhibitor used clinically for cancer in the context of chronic SIV infection of rhesus macaques with and without antiretroviral therapy as a pilot experiment. The analysis of viral interference and immune modulation observed during this treatment is being evaluated.

GRANT NUMBER: R01 MH100999

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

DIVISION OF PATHOLOGY

Excluded by Requester **V.M.D., Division Chief**

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: EVALUATION OF ACUTE BABESIOSIS IN RHESUS MCAQUES

NPRC UNIT: Division of Pathology

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS:

VISITING SCIENTISTS:

Excludedby Requester	Private Source	USA
Excludedby Requester	[illegible]	USA
Excludedby Requester	Private Source	USA
Excluded by Requester	CDC, Atlanta, USA	
Excludedby Requester	Private Source	USA
Excludedby Requeste	CDC, Atlanta, USA	

ABSTRACT:

Babesiosis is a tick-borne disease caused by an intraerythrocytic protozoa *Babesia microti* and other species. *B. microti* is endemic in the Northeast and upper Midwest USA. Transfusion-associated babesiosis (TAB) is a growing public health concern of the safety of the US blood supply and may lead to severe morbidity and mortality. *B. microti* has been implicated in TAB in the USA, causing 159 of the 162 cases of TAB reported to the FDA, including 12 transfusion-related deaths since 2005. Although reliable Ab detection tests exist, to date, no Babesia tests have been licensed for screening blood donors in the US. Currently, blood bank organizations rely on the non-specific donor health history questionnaire to keep potentially infected donors from donating. Several challenges stand in the way of implementing blood product screening to prevent TAB such as lack of high-throughput blood donor screening tests and concerns that remain about the length of time between patent parasitemia and the appearance of detectable Ab. Detailed information regarding acute innate and adaptive immune responses during *B. microti* parasitemia, preseroconversion, seroconversion and persistence of the organism are central to developing effective strategies to prevent TAB, including an automated high-throughput assay for *B. microti* donor screening. Therefore, this study was conducted using the rhesus macaque animal model to fill these key gaps in the understanding of *B. microti* infection.

The study was conducted in 2 phases. In the first phase, an initial adaptation of *B. microti* was attempted first to avoid innate responses associated with exposure to hamster xenoantigens. Two non-splenectomized, adult rhesus macaques were inoculated intravenously with hamster-adapted *B. microti* Gray strain cells. In the second phase, four rhesus macaques were inoculated with monkey- passaged *B. microti* cells in fresh blood collected from phase 1 of the experiment. In the first phase, monkeys became infected by Day 49 post administration of hamster parasitemic blood. However, phase 2 animals became infected by Day 4 after blood transfusion from phase 1 monkeys suggesting host adaptability of *B. microti*, and possibly representing blood transmission during blood transfusion in humans. Peak IFA titer was observed in both phases during early infection followed by a decline after treatment at Day 122. Currently, we are analyzing qPCR, blood film parasitemia and immune response data from this study. In addition, Abbott is testing plasma samples for *B. microti* immunoreactive peptides triggered via the early experimental infection in rhesus macaques that might have the potential to be used as antigens in high-throughput assay(s) for screening human blood donors.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

DEVELOPMENTAL AND COGNITIVE NEUROSCIENCE DIVISION

Excl uded by Reques er

Ph.D., Division Chief

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **COGNITIVE & SOCIOEMOTIONAL DEVELOPMENT AFTER POSTNATAL ANESTHESIA**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester

AFFILIATED SCIENTIST:

VISITING SCIENTIST: Excluded by Requester Mt. Sinai School of Medicine, NY

ABSTRACT:

Anesthetics may act as neurotoxins when given early in development. A critical question in anesthesiology is whether anesthesia exposure early in life has long-term consequences on cognitive development. In this project, we evaluate the effects of acute, multiple exposures to sevoflurane (a common pediatric anesthetic) in the first month of life of infant rhesus macaques. The goal is to provide a translational model for assessing potential risks of anesthesia in pediatric populations, and for testing agents that may mitigate or eliminate this risk.

The two cohorts of subjects have completed their anesthesia exposures and are currently in their second and third year of testing respectively. Cognitive testing includes visual recognition memory tasks at over the first two years, as well as socioemotional development measured by the Human Intruder paradigm at two months (Cohort 2 only) 6, 12, & 24 months. Our early testing has revealed effects of early anesthesia both on cognition and socioemotional development. Thus we have altered our plan to end testing at three years to continue with tasks that tap into prefrontal development and executive function. This testing will take place in Excluded by Requester laboratory and we have transferred Cohort 1 to his laboratory for adolescent testing. We have presented our preliminary results at the Society for Neuroscience in 2013 and 2014 and Submitted Submitted

GRANT NUMBER: NICHD R01HD068388

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **ONTOGENY AND NEURAL BASES OF SOCIAL VISUAL ENGAGEMENT IN MONKEYS**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS

ABSTRACT:

This project (1) follows longitudinally the development of social visual engagement processes, including attention to, detection and integration of social signals in normally developing rhesus monkeys from birth to 6 months, using neuropsychological "marker" tasks similar to those employed in the typical and atypical human population (Project I) to facilitate cross-species comparisons. This will allow defining significant critical periods during which these processes emerge and refine and (2) investigates in the same animals the maturational changes in brain networks mediating these basic social processes using noninvasive neuroimaging procedures. This year we have followed visual scanning of social cues in 10 newborn monkeys and data are being analyzed. We have also obtained neuroimaging structural, DTI and RS fMRI sequences for juvenile and infant monkeys on six animals. For the behavioral data, we found interesting shifts from infancy through 6 months of age in the way infant monkeys scanned conspecific faces as compared to other species faces. While the interest in looking at conspecific faces decreases with age, interest in other species faces increase. This shift seems to occur around 3-4 months of age and corresponds to important functional remodeling of the visual cortical areas. These data increase our knowledge on the critical periods of typical development during which these early social skills emerge and mature and on the underlying neurobiological systems that underlie these skills. They are providing unprecedented opportunity to further understand the neurobiological source of the early diagnosis markers of autism.

GRANT NUMBER: P50 HD073921-01 Autism Center of Excellence -PI: Excluded by Requester

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **DEVELOPMENT OF MEDIAL TEMPORAL LOBE FUNCTIONS**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS: Excluded by Requester Psychiatry, Emory

ABSTRACT:

This project investigates (a) the development of hippocampal and perirhinal cortex functions in monkeys, (b) the long-term consequences of early insult to these brain areas on maturation of memory processes and social bonds, and (c) the anatomical reorganization of other brain systems resulting from these early lesions as compared to adult lesions. This year, theehavioral testing of animals with neonatal perirhinal lesions (Neo-PRH) and sham-operated controls (Neo-C) was continued and has shown that Neo-PRH lesions resulted in severe deficits in working memory processes . Brain changes resulting from Neo-H lesions indicated alterations of prefrontal cortex functioning with decreased metabolic activity in the lateral prefrontal cortex bilaterally in Group Neo-H relative to controls, supporting the deficit in working memory. DTI data showed significant white matter changes in the hippocampal projectional system as well as the posterior corpus callosum and parietal cortex. The primary motivation for our study of the effects of brain damage in animals is the hope that, through such research, principles of the brain's responses to damage can be established that will lead ultimately to the discovery of ways in which such effects can be alleviated or even eliminated. We have developed memory tasks appropriate to assess functionality of the medial temporal lobe during development in monkeys and that are currently used in two other NIH funded grants and that also provide important cognitive tools to study memory processes in human infants and children and its derailment in children with neurological diseases of psychopathologies.

GRANT NUMBER: R01 MH058846

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **SAFETY SIGNAL LEARNING IN MONKEYS: CORTICAL REGUALTION & DEVELOPMENT**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST:

ABSTRACT:

The AX+/BX- paradigm, which uses classically conditioned cues assessed by fear-potentiated startle, is a translational tool that has been successfully employed to explore safety-signal processing in rodents. We have developed a new version of the paradigm in which the traditional cues (tone, light, fan) were replaced by colored pictures of objects. With this manipulation, the task can now be used for repeated-design studies, such as longitudinal developmental studies and pharmacological manipulations on the same animals. During the last year of the grant, which ended in August 2014, we followed the development of safety signal learning in juvenile male monkeys during early adolescence. We found that three juvenile monkeys demonstrating increase vigilance to faces (see Aim 1, Fig. 4) at the ages of 13 and 18 months. In addition, at 13 months juvenile monkeys showed greater startle to the aversive cue (AX) than at the safety cue (BX), but did not at 18 months (compared CY vs DY). Further, conditioned inhibition, i.e. the ability to reduce fear to aversive stimuli in presence of the safety cue, was present at 13 months (AB), but suppressed at 18 months (CD). Finally, animals required less sessions at 13 months (X ± SEM: 3 ± 1.15 sessions) than at 18 months (5.6 ± 2.4 sessions) to extinguish their fear to the aversive cue A. Thus, our preliminary data indicate a lack of conditioning discrimination skills and suppression of fear when monkeys transitioned from infancy through the pre-pubertal period, possibly due to small, yet biologically active, increase in gonadal steroids during this pre-pubertal interval.

GRANT NUMBER: R21/R33 MH086947

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **CHIMPANZEE SOCIAL COGNITION**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST:

ABSTRACT:

Chimpanzees (Pan troglodytes) are known for their cooperative hunting, food sharing, and frequent mutual assistance in the wild. We explore issues of social cognition, cooperation and empathy by observations of food sharing and cooperation in an open group setting, which allows them to work together with multiple partners of their spontaneous choice. We approach the topic of primate empathy by means of a variety of measures. In some studies (bonobos, chimpanzees, elephants) we observe individuals spontaneously in distress and measure the responses of others towards them. A typical behavior is consolation or reassurance of the distressed other, which in human child studies is used as a measure of empathic concern. We also demonstrate that chimpanzees yawn when they see humans yawn. The chimpanzees at Yerkes are surrounded by human caretakers, and apparently empathize with them. The fairness studies, which were started in our capuchin lab and then taken to chimpanzees, have recently led to a breakthrough: we were the first to successfully play the Ultimatum game with chimpanzees.

GRANT NUMBER: Subcontract with the Greater Good Science Center, UC Berkeley

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **LIVING LINKS CENTER**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

The Living Links Center is a research and educational center for the study of ape and human evolution. The LLC was launched in September, 1997 with joint support from the Office of the Provost and the Executive Vice President for Health Affairs. Its focus is on noninvasive behavioral, cognitive, anatomic, and comparative genetics approaches. The LLC was formed to utilize the Yerkes chimpanzee colony in comparative research. Excluded by Requester is the current LLC Director. A more detailed mission statement can be found at our website (www.emory.edu/LIVING_LINKS/). Apart from the many studies sponsored or coordinated by the LLC, two major conferences were organized in the past few years: 1) in 2009, the LLC co-sponsored a meeting in Italy on the implications of mirror neurons for the study of primate cognition, which has this year led to a new volume, "The Primate Mind," and 2) in 2012 the LLC co-sponsored a meeting in Italy on the evolution of morality, which has this year led to a new volume, "Evolved Morality."

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **FSHR NAM ACTIVITY IN NONHUMAN PRIMATE GRANULOSA CELLS**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST:

ABSTRACT

In this pilot project, we will assess the efficacy of small molecules (negative allosteric modulators or NAM) to disrupt the action of follicle stimulating hormone (FSH) through its receptor (FSHR) in Granulosa cells in vitro as a possible non-steroidal orally active contraceptive for women. Using Granulosa cells collected from pre-ovulatory adult rhesus monkeys, we will test the hypothesis that FSHR NAM ADX68692 will block FSH action in nonhuman primate granulosa cells thereby preventing ovulation.

Six adult female rhesus monkeys are currently assigned to this protocol and the females are being monitored for spontaneous menstrual activity prior to initiation of hormonal stimulation and collection of Granulosa cells for the in vitro studies. Once we have completed collections on all six rhesus monkeys, we will begin data analysis. There are no publications yet and a request for additional funding is premature.

GRANT NUMBER: 3P51OD011132-54D1

SUPPORT PERCENTAGE: 100% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **MEMORY MONITORING & DECLARATIVE MEMORY IN MONKEYS: BEHAVIOR & BRAIN**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

The human ability to consciously monitor memory has not been accessible to study in animal models. Because humans talk about memories that are accessible to monitoring, such memories are called declarative. Nondeclarative memories cannot be subjectively monitored, but are inferred from their influence on behavior. For example, a person who may not be able to verbally report the locations of the letters on a keyboard may nonetheless type accurately and rapidly without looking at the keys. Loss of declarative memory from stroke, Alzheimer's disease, and other brain insults severely impairs higher cognitive processes including learning, planning, and adaptive decision-making. Memory monitoring is also a form of metacognition. Impaired metacognition is implicated in autism, age-related cognitive decline, and attention and impulse control disorders such as ADHD. Animal models are needed to identify the specific brain structures involved in memory monitoring to develop improved treatments for cognitive impairment in humans.

We have gathered considerable new evidence regarding both the monitoring of cognitive processes and the control of cognitive processes. Twelve monkeys have been tested in a series of experiments, using two different paradigms that measure both prospective and retrospective memory monitoring. We have found evidence that these two types of memory monitoring depend on different mechanisms. We have evaluated seven different hypotheses for these findings and the explanation that they cognitively monitor their own memory has received strong support. In experiments with six monkeys have found that monkeys can selectively maintain highly familiar but not novel images in memory. We have evaluated the effects of hippocampal lesions in a series of tasks related to cognitive control and memory monitoring. To date, we have found no negative effects of hippocampal removal in these tests, but they are ongoing.

GRANT NUMBER: R01MH082819

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **COMPARATIVE NEUROPSYCHOLOGY OF EPISODIC MEMORY IN PRIMATES**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

Episodic memory includes properties lacking in other types of memory, including the ability to access memories by recall, the ability to remember the context in which memories were formed, and the ability to remember the order in which events occurred. Episodic memory is widely thought to depend on the hippocampus. We address each of these properties of episodic memory in the current project.

We have discovered that rhesus monkeys remember simple shapes and reproduce them later on a touchscreen computer, an ability that may show that they can “bring to mind” images that are physically absent. We have developed and published new techniques for interfering with memory in monkeys that show that familiar, repeated items are held in a working memory system that is vulnerable to competing cognitive demands, while novel items are remembered well, but using a different memory system. We have followed up this result with an experiment finding that repeated items but not unfamiliar images can be actively held in mind by monkeys. We have trained monkeys to report either of two recently formed memories, depending on which context is cued, demonstrating memory for context. We have established and published a new paradigm for studying order memory in monkeys and shown that monkeys discriminate which image was viewed first. We have documented and published the finding that monkeys make different types of errors depending on how quickly they respond; indicating a dissociation of familiarity and recollection based responding. We have tested a group of monkeys with hippocampal lesions, and a group of matched control monkeys on a large battery of cognitive tests including most of the tests described above.

GRANT NUMBER: BCS-0745573 National Science Foundation Grant

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **SOCIAL COGNITION & NEUROCOGNITIVE BASES OF TRANSITIVE INFERENCE**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

Cognitive evolution in humans has likely been influenced by selection for adept social behavior. Determining the ways in which social and nonsocial cognition share common representational and brain systems is therefore critical for understanding cognition. Transitive inference (TI) is the ability to infer the relation between two items based on relations with a third (e.g. Dave is taller than Sue, Sue is taller than Jake, and therefore Dave is taller than Jake). Transitive inference, while useful in many domains, may have been selected specifically for learning social dominance relationships. The researchers have created infrastructure for remote computerized cognitive testing of monkeys in large social groups as well as in laboratory housed subjects. This infrastructure allows them to study naturally acquired social knowledge and compare it with social and non-social knowledge acquired in the laboratory. This research is important because it will advance our understanding of the brain mechanisms critical for social behavior and those critical for more abstract reasoning.

We have conducted an extensive series of tests assesses the effects of hippocampal removal on transitive inference and a variety of other cognitive tests. Surprisingly, to date we have found no negative effects of hippocampal removal. The only significant effects found so far are that monkeys respond more quickly (with no loss in accuracy. We have conducted extensive testing of apes at Zoo Atlanta and we are collecting data on transitive inference and magnitude estimation in these apes. We have also studied parallels in how monkeys and humans mentally represent ordered tasks including, simultaneous chaining, transitive inference, and memory for the order of events. We have assessed the role of spatial cognition in both human and monkey transitive inference, finding that spatial representations facilitate transitive inference.

GRANT NUMBER: IOS-1146316 National Science Foundation

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **HEMISPHERIC SPECIALIZATION AND COMMUNICATION**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

We have obtained six post-mortem brains and they have been MRI scanned. Additionally, we have completed several histological analysis of dendritic arborization in these specimens. Lastly, we have completed several analyses of our MRI scans including the first study and publication on regional and lateralized variation in cortical thickness in chimpanzees. All PET imaging and behavioral studies have stopped on this grant at the request of NIH.

GRANT NUMBER: NINDS-42867

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **NEUROANATOMICAL CORRELATES OF COGNITIVE CONTROL**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

This year we have completed several behavioral tests of inhibition and cognitive control. Eighty-four chimpanzees have reached criterion in the initial delayed gratification training and 55 of those subjects have completed testing in a modification of the original task manipulating the delay interval and their access to distractors. Twenty subjects have been tested in the Reverse Contingency paradigm. All DTI scans have now been collected in the chimpanzees.

GRANT NUMBER: NICHD-60563

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **PRIMATE GENETIC ANALYSIS AND PEDIGREE MANAGEMENT**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

Samples have and continue to be collected from all rhesus macaques and sooty mangabys within the Yerkes' breeding colony. This includes animals from both the SPF colonies dedicated to AIDS research, and the animals from the NSPF animals. Each of these samples has been genotyped for 96 polymorphic single nucleotide polymorphisms spread throughout the autosomal chromosomes. These data are used to determine parentage, pedigree, and selected genetic markers for all of our macaques and mangabeys maintained at the Field Station. The ability to characterize specific genetic components has enabled us to better meet specific investigator needs, to develop more diverse research endeavors, to selectively breed for specific genetic traits, and to undertake specific phenotypic comparisons. To manage this data set, we are establishing a full-scale database system that will be able to assimilate genetic, parentage, pedigree, and demographic variable on all the animals. This database system will be incorporated into ARMS, which will enable Yerkes' investigators and veterinarians to track, manage, and view an animal's record in a single query.

GRANT NUMBER: 2U24 OD011023-11 Excluded by Requester

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **CONTE CENTER FOR THE STUDY OF OXYTOCIN AND SOCIAL COGNITION**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

This project is part of a larger center grant (a Conte Center grant) in collaboration with Excluded by Requester Center for Translational Social Neuroscience, Emory University. It is currently in its second year. The project will examine the effects of oxytocin on social cognition, social reward, and stimulus salience in rhesus monkeys.

GRANT NUMBER: 5P50MH100023-02

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **BEHAVIORAL & NEURAL RESPONSES TO FACES & EXPRESSIONS IN NHP**

NPRC UNIT: Development and Cognitive Neuroscience Division

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

This is the end of the fifth year of this project. The goal was to examine the ability of monkeys and chimpanzees to discriminate faces based on identity and expression type. We have completed all chimpanzee studies and these subjects were released from assignment early in 2013. We are waiting for the NIH decision about a sixth year no cost extension to run some neuroimaging using a new set of subjects. The current NCE ended January 31, 2015.

GRANT NUMBER: 5R01MH068791-10REVIS

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **USING MAQFACS TO MEASURE FACIAL MOVEMENT DEFICITS IN RHESUS MONKEYS**

NPRC UNIT: Development and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester

CORE SCIENTISTS:

ABSTRACT:

This project is in its first year of no cost extension. The project applied the MaqFACS facial coding system to measure the progressive onset of facial movement deficits in monkeys treated with a dopaminergic toxin MPTP to produce Parkinsonian symptoms. We have completed the analysis for this project and asked for NCE to further analyze videos of monkeys after they were determined to be Parkinsonian and then treated with a dopamine agonist (pramipexole) to reverse the motor deficits. We presented a poster on our results at the 2014 American Society of Primatology conference and are currently writing a manuscript.

GRANT NUMBER: 5R21NS072422-02

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **EMOTIONAL & HPA AXIS FUNCTION IN TRANSGENIC HUNTINGTON DISEASE MONKEY**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

Persons with Huntington's Disease (HD) exhibit increased cortisol and inflammatory cytokines as well as emotional dysregulation, such irritability, anger/aggression, depression, and anxiety. This project aimed to characterize the emotional behavior and neuroendocrine alterations in a transgenic nonhuman primate model of HD. Subjects in our study consisted of five rhesus monkeys which were divided into two groups: transgenic HD (tHD=2) and controls (Control=3). To examine emotional behavior and neuroendocrine levels, animals underwent an acute social stressor and blood samples were collected just prior to, immediate after, and 24 hours post-stressor. The results from this pilot study have helped to further validate this animal model by demonstrating similar changes in emotional behavior and hormones to those found in patients with HD. Just as humans with HD exhibit increased irritability, aggression and anxiety, tHD monkeys expressed more hostility and coo vocalizations during a mild stressor. Additionally, tHD monkeys' exhibit increased IL-6 inflammatory cytokine levels, which has been suggested to be the most sensitive blood cytokine marker for HD. Taken together, results from the current study indicate that tHD monkeys are a unique translational animal model exhibiting several key features of the disease. Therefore, this nonhuman primate model has a great potential for helping to develop novel treatments and potential cures for the disease. I recently presenting this data at the Hereditary Disease Foundation conference 2014 in Boston, MA, with In Preparation In Preparation Lastly, we plan to use these data to apply for a grant from the National Institute of Neurological Disorders and Stroke (NINDS) to further explore the dysregulation of inflammatory cytokines by examining gene expression changes after an acute stressor.

GRANT NUMBER: Excluded by Requester Huntington's Disease Pilot Program

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **IMPACT OF EARLY LIFE ADVERSITY ON EMOTIONAL & NEUROENDOCRINE FACTORS**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

Early life adversity, such as childhood trauma or the absence of a stable caregiver, can have a devastating consequence on the development of both human and nonhuman primates. The absence of a stable caregiver can result in dysregulation of emotional behavior, oxytocin levels, and hypothalamic-pituitary-adrenal (HPA) axis activity. Additionally, there is evidence that early life adversity causes an accelerated developmental switch in the functional connectivity between the medial prefrontal cortex (mPFC) and amygdala, two brain areas essential for socio-emotional behavior. However, to date no studies have examined how this accelerated amygdala-mPFC connectivity switch could be responsible for the changes seen in emotional behavior, oxytocin and HPA axis levels. Therefore, this pilot project will use a clinically relevant primate model to examine the long-term consequences of early life adversity on brain functional connectivity, emotional behavior, and neuroendocrine function. Specifically, we will use adult rhesus macaques, which were either reared by their mother in the large species typical social groups at the Field Station or nursery reared at the Main Station. Subjects will undergo a resting state MRI scan, acute social stress task, cerebral spinal fluid and blood collection. Results from this study will help to answer the long-term consequences of altered parental care on brain development, socio-emotional behavior, and neuroendocrine systems. Data collection is currently ongoing. Lastly, this pilot will directly lead to an R01 proposal for a developmental study examining the precise timing of the alterations in hormones, brain, and behavior after early life adversity, as well as examine alterations in social behavior and perception of social cues.

GRANT NUMBER: Seed Grant from Center for Translational Social Neuroscience

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **ADVERSE NEUROENDOCRINE & NEUROBIOLOGICAL BASES OF COMPLEX BEHAVIOR**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

AFFILIATE SCIENTISTS: Excluded by Requester Anthropology, Emory University
Excluded by Requester

ABSTRACT:

This is the doctoral dissertation improvement of research into oxytocin and vasopressin utilizing rodent models to suggest potential treatments for several human conditions, including autism spectrum disorders, social anxiety, and schizophrenia. While these studies provide essential data on the roles of hormones such as OXT and AVP, they are limited by the fact that they focus on animals with social systems characterized by less complexity and richness, relative to those of our species. With the goal of more thoroughly investigating the roles that these hormones play in mediating complex social behavior, this dissertation research by doctoral student Excluded by Requester under the supervision of Excluded by Requester Emory University) will advance the study of how oxytocin and vasopressin mediate complex social relationships by investigating the roles that these hormones play in the social lives of two types of baboons with vastly differing societies, the hamadryas and the anubis baboon. To test the hypothesis that these contrasting societies can be understood through assessing the roles of oxytocin and vasopressin, this project will first collect biological samples to measure oxytocin and vasopressin levels utilizing enzyme immunoassays, comparing these between the two subspecies. By then linking the hormonal data to observations of social behavior of the subjects within social groups of each subspecies, the project will provide a highly contextualized understanding of how OXT and AVP mold sociality. These will be complemented by a through neurobiological examination of how oxytocin and vasopressin receptors are distributed in the brain, as differences in the pattern of brain hormone receptors is a common avenue by which these hormones may affect behavior. Behavioral, hormonal and brain data have been collected. We are now beginning analysis.

GRANT NUMBER: BCS-1413395 National Science Foundation

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **THE NEUROBIOLOGY OF ADVERSE EARLY CARE IN RHESUS**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

This project studies the effects of early life stress (ELS) caused by poor maternal care on neurobehavioral development of socially-housed rhesus monkeys. The goal is to understand how stress during infancy alters normal development, with a focus on neurodevelopment of prefrontal and amygdala circuits that control emotional reactivity and stress responses, as well as cognitive functions (e.g. impulse control, executive function). These studies are critical to understand similar adverse experiences in children, because we apply a crossfostering design to rule out effects of heritable factors. We have completed collection fo all longitudinal data in our sample (n=40) and are now in the latest phase of data analysis and publication. Infants that experienced poor maternal care are more emotionally reactive/fearful, show social and cognitive deficits of functions controlled by prefrontal cortex (particularly, increased perseverative errors during reversal learning and impulsivity, and they show learned helpessness when the demands of the cognitive tasks increases). Stress physiology was also assessed through measures of the stress hormone cortisol in both hair and plasma and of CSF levels of corticotropin releasing factor (CRF). Higher levels of cortisol accumulation were detected in hair grown during infancy in infants that experienced poor maternal care than in controls, indicating that this experience was, indeed, stressful. These high hair cortisol levels during infancy were associated with reduced brain white matter tract integrity, particularly in tracts connecting prefrontal-amygdala tracts (measured by noninvasive diffusion tensor imaging (DTI) neuroimaging). Although hair cortisol accumulation normalized after infancy, we detected long-lasting neurobehavioral consequences of adverse maternal care, including altered functional connectivity of prefrontal and amygdala regions, showing similarities to similar impact reported in children exposed to ELS. Maternal sensitivity seemed one of the best predictors of proper neurobehavioral development in primates.

GRANT NUMBER: P50 MH MH078105 Translational Research Centers in Behavioral Science

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **STRESS & ADOLESCENCE COCAINE ABUSE: NEUROBIOLOGICAL VULNERABILITIES**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTISTS: Excluded by Requester

AFFILIATE SCIENTISTS: Excluded by Requester Anthropology, Emory University

Excluded by Requester **PI**

ABSTRACT:

Although it is known that adolescence is a period of high vulnerability for the development of substance abuse, including cocaine addiction, the neurobiological mechanisms are not understood. Here we examine this question in a highly translational nonhuman primate model during adolescence testing the hypothesis that exposure to early life stress (ELS) is an important risk/vulnerability factor. The premise is that ELS increases emotional/stress reactivity in primates, particularly in females, making them particularly vulnerable to cocaine addiction and relapse.

In September 2014 we started these studies on a total of n=26 subjects. Since then we have examined baseline measures of behavioral reactivity to novely and stress physiology in the animals, as well as neurobiological measures of dopaminergic (DA) and serotonergic (5HT) systems and prefrontal connectivity with the striatum and amygdala, collecting *in vivo* positron emission tomography (PET) to examine binding potential of $5HT_{1A}$, $5HT_{2A}$ and D2 receptors, as well as resting state functional connectivity MRI, respectively. Once we collect these measures we will start other studies that include baseline and fear-potentiated startle, cocaine self-administration and reinstatement, and the test of a pharmacological intervention, through the use of pharmacological blockade of the $5HT_{2A}$ receptor during cocaine abstinence to reduce the risk of relapse. Due to the recent start of the studies, we don't have any findings to report yet.

GRANT NUMBER: R01-DA038588-01

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **EFFECTS OF ESTRADIOL ON GENE EXPRESSION AND FEMALE SEX BEHAVIOR**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester **PI**

VISITING SCIENTISTS: Excluded by Requester University of Maryland School of Medicine
Excluded by Requester North Texas Health Science Center

ABSTRACT:

This study investigates the effect of a novel form of Estradiol (10β,17β-dihydroxyestra 1,4 dien-3-one; DHED) on female rhesus monkey sexual initiation. DHED is an inactive form of estradiol that serves as a free-radical scavenger. My colleagues Excluded by Requester have discovered that the brain expresses an enzyme that converts DHED to native estradiol. It appears that this critical enzyme is only expressed in brain and not in the periphery thus administration of DHED will not affect breast and uterine tissue as would administration of estradiol. We are currently testing whether an acute injection of DHED administered to ovariectomized female monkeys receiving chronic low-level estradiol will acutely increase female sexual initiation an indication of heightened female sexual desire.

GRANT NUMBER: R21 HD078077

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **AUTOMATED STUDIES OF RHESUS MONKEY COGNITION**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

We use computerized touch screens integrated with a radio frequency ID (RFID) reader to study cognition in group-living rhesus monkeys and the Field Station. During this reporting period, we developed a “cooperation console” (CC; two touch-screen computers linked in tandem) to study cognitive cooperation in rhesus monkeys. In this project monkeys will be trained to interaction with one of CC’s kiosks only when another monkey is working on the other console of the pair. Eventually the monkeys will have to jointly solve a computerized problem that neither can solve one their own. This approach avoids the issues with physical cooperation tasks as it relies solely on a cognitive understanding of cooperation. Programming for the task and the installation of the CCs were completed during this funding period.

GRANT NUMBER: N/A

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **AUTOMATED TRACKING OF MONKEYS: RECOGNITION OF SOCIAL STRUCTURE**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester **PI**

AFFILIATE SCIENTIST: Excluded by Requester

VISITING SCIENTISTS: Georgia Tech

Excluded by Requester Georgia Tech

ABSTRACT:

Delineating patterns of social affiliation and hierarchical relations in group living rhesus monkeys is very labor intensive. We are developing innovative software and hardware that automates the continuous collection of social interaction data in complex species-typical rhesus monkey social groups. The system continuously and simultaneously tracks the precise 3D locations of multiple individuals in a large social group of monkeys. Individual identification comes from comfortable collars that contain 4 active RFID tags that continuously broadcast each animal's unique code. RFID detectors within and around the compound's periphery allow triangulating each animal's precise location to within 25cm as well as their direction and velocity of movement. We track the adult males and females that make up the core of the social hierarchy (45 individuals in total). Distance between individuals is a key diagnostic for inferring social affiliation. Thus, knowing the amount of time spent at that distance allows inferring affiliative relations. The patterns of affiliation, avoidance, and time in close proximity will allow inferring the social hierarchy of the group. In combination with social network analysis, will identify patterns of group association and social instability. Three software systems will be developed under this project: 1) behavioral inference software that infers affiliative, hierarchical, aggressive, and sexual behavior from the automated tracking data; 2) social network analysis software to identify social instabilities; 3) video recognition software that will automate the coding of social behavior from the video snippets collected with the RFID-guided cameras. Together this combined hardware and software will provide an enhanced animal resource making possible easy investigation of the social impact of a variety of manipulations, from drugs to neural insult. In addition, this system can be used to monitor group health and identify individual sickness behavior.

GRANT NUMBER: None

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **STRESS & THE GENOME: THE IMPACT OF SOCIAL EFFECTS ON GENE REGULATION**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester **PI**

AFFILIATE SCIENTIST: Excluded by Requester Ph.D.

VISITING SCIENTISTS: Excluded by Requester, University of Montreal
Duke University

ABSTRACT:

The objective of this study is to determine how chronic social stressor exposure, mediated by social subordination in adult female rhesus monkeys, affects genome wide expression and whether stress related differences are due to epigenetic changes. In addition, in vitro testing of cell specific monocytes will determine whether these differences translate to altered immune function and increased susceptibility to infection. During the reporting period, nine groups of five females each were formed. Groups stabilized and samples were collected to determine expression patterns, most notably of immune function related genes. In addition, behavioral and physiological phenotypes have been determined on each female. Responsivity to an acute social separation stressor has been accomplished and samples are being analyzed for stress hormones and proinflammatory cytokines. Analyses to date show subordinate females have a dysregulated stress hormone axis regulation, characterized by reduced glucocorticoid negative feedback. Gene expression analyses are underway. Following the initial group formations and stabilization, group membership was rearranged to test the hypothesis that stress alleviation (in formally subordinate by now dominant females) would improved stress hormone axis regulation and reduces persistence of a chronic proinflammatory condition. These analyses will show how exposure to an acute stressor on a background of chronic stress affects gene expression and how these contribute to sustaining a proinflammatory condition associated with chronic stress.

GRANT NUMBER: 1R01 GM102562-02

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **SUSTAINING FACTORS FOR STRESS-INDUCED EMOTIONAL FEEDING IN FEMALES**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTISTS: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

The overriding objective of these studies is to use socially housed female rhesus monkeys as a translational model for premenopausal women to identify mechanisms that initiate and sustain emotional feeding in diverse dietary environments and to identify possible intervention strategies to reduce the health burden imposed by stress-induced excess eating. The project began in April 2013 identified adult female rhesus monkeys in breeding groups as potential subjects. Following the collection of baseline measures (PET neuroimaging of a dopamine receptor; anthropometric data), females were removed to form small groups consisting 5 to 6 animals each. A portion of these groups are maintained on a prudent, low calorie high fiber standard monkey chow diet while a second cohort has a choice between this prudent diet and a high caloric, palatable diet, mimicking the dietary choice experienced by women. Caloric intake in individual monkeys is acquired by use of innovative, automated feeding stations. In addition, PET neuroimaging, stress hormone responsivity, and proinflammatory cytokine signaling is quantified longitudinally. Females maintained in the choice dietary environment have gain significantly more body weight, particularly subordinate females. In contrast, animals fed the monkey chow diet have maintained their body weights, with subordinates have less weight and body fat than dominant monkeys. Furthermore, acute administration of a corticotropin releasing factor type 1 receptor (CRF-R1) antagonist diminishes caloric intake in subordinates fed the choice diet, normalizing levels to those observed in dominant females. These data suggest that activation of central CRF-R1 resulting from social subordination sustains emotional feeding. Together, data generated by this project, will further elucidate the relation between stressor exposure and food intake in diverse dietary environments and identify possible neurochemical circuits that sustain emotional feeding in females.

GRANT NUMBER: 1R01 DK096983-02

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **STRESS & OBESITY SYNERGIZE TO IMPAIR NEUROBEHAVIORAL DEVELOPMENT**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

This project will assess how postnatal social stress and emerging obesity affect brain structural and functional development and resulting socioemotional behavior from birth through puberty and whether stress hormones and/or proinflammatory cytokines mediate adverse effects. Female rhesus monkeys are either raised by their biological mothers or cross-fostered to other females on the day of birth and maintained in a dietary environment where either standard low fat, high fiber diet is available or a choice between this monkey and a diet high in fat and sugar is available. Food intake is quantified in individual monkeys using automated feeding stations that detect a unique RfID as a monkey acquires food. Blood biomarkers, neuroimaging (structural and functional MRI), and behavioral testing is acquires at specific ages from birth through puberty (~44 mo of age). In the current funding period, the first cohort of subjects was recruited and testing was completed through six months of age. Additional subjects will be recruited in the coming birth season. The project will identify potential biological signals that mediate the adverse effects of stress and obesity on brain health and behavior and, in doing so, will provide crucial information that will help shape clinical interventions and social policy improvement to optimize neurobehavioral development in girls.

GRANT NUMBER: R01 HD077623-02

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **SPF BREEDING COLONIES AT THE YERKES NPRC**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

The central objective of this project is to breed Indian origin rhesus monkeys that are specific pathogen free (SPF) for Herpes B, STLV, and SRV. In addition, animals are pedigreed and genetically characterized for MHC alleles. Funding from this project provides support for trained personnel and resources that are necessary to maintain and expand the SPF breeding groups and to optimize reproductive performance in support of national health related research priorities. All animals in our breeding groups at the Field Station are SPF, allowing us to optimize growth of this colony. In the 2014 birth season, the colony produced 402 live births from a population of 517 breeding age females.

The YNPRC SPF colony is virally maintained by routine blood collection for testing at specified intervals. During the current funding period, the Virology Core has made significant progress toward transitioning three diagnostic tests historically done by outside collaborators to in-house assays. The development of the in-house for Cercopithecine Herpes B (B-virus) serological screening and Western blot testing uses whole, inactivated B-virus preparations purchased from the National B-virus Laboratory. We have over one year of experience validating the highly sensitive, cytometric bead (CBA) serological screen and a highly specific, confirmatory Western blot assay. The initial CBA assay is a very cost-effective approach for an initial serological screen as we are able to multi-plex all four (and potentially more) SPF viruses into a single assay, reducing laboratory technician time, reagents, and overall costs for the SPF virus screening program. The Western blot assay has been extremely reliable for follow-up confirmation of SPF samples that had reactivity in the CBA screen above a very conservative cutoff. Finally, the Virology Core has begun development and initial validation of a real-time PCR for the confirmation of Simian betaretrovirus (SRV) infection. The Virology Core has continued to provide rapid and reliable serological and molecular testing for SIV, STLV, and SRV. Pedigree analysis is complete for all subjects born before 2012. An additional 278 subjects have been genotyped for 96 single nucleotide polymorphisms and are currently undergoing exclusionary paternity analysis. These new data will be used to further define our existing pedigree of breeding animals. Previous ancestry analysis of our SPF breeding colony revealed that only a single female among a large number of breeders had a modest (~18%) Chinese rhesus heritage and was subsequently removed from breeding. Additional analyses show that none of her offspring were full sibs and all half sibs were found to contain less than 15% Chinese heritage. Finally, all subjects except for a subset of the 2014 birth cohort have been genotyped for alleles important for HIV/AIDS studies at Yerkes, notably the Mamu-*A01, Mamu-B*08, and Mamu-B*17 MHC alleles. Furthermore, during the past year we received training from colleagues at the WNPRC to begin to implement expressed MHC allele sequencing at Yerkes that will provide a more complete characterization of the MHC. In summary, the animals derived from this SPF breeding colony are made available as subjects to NIH supported investigators for AIDS related research and contribute to national health priorities.

GRANT NUMBER: 2U24 OD011023-12

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **NEONATAL PROGRAMMING OF GROWTH & MATURATION IN RHESUS MONKEYS**

NPRC UNIT: Developmental and Cognitive Neuroscience Division

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

Gestational diabetes mellitus (GDM) is an increasingly prevalent problem with important health and societal impact, yet controversies continue in the most elementary issues related to GDM. Importantly, however, it is unclear how maternal metabolic factors in addition to frank Type II Diabetes factors during gestation impact postnatal growth and maturation. The objective of this study is to follow females from birth through sexual maturation to dtermine how maternal factors predict metabolic health. Cohorts of females have been followed from birth (2010 ans 2011). In addition maternal data was collected through preganancy and the postnatal lactational interval. The 2010 cohort has experienced puberty most have subsequently deilvered live births in the 2014 birthing season. In addition, to metabolic hormone and cytokine data, anthropometric information (weight, height, body fat, bone age) are collected at periodic intervals. The data generated thus far indicates that fat accretion during late gestation significantly predicts postnatal growth. The rhesus monkey provides a unique translatiuonal model to study prenatal programming of postnatal development.

GRANT NUMBER: 1R21 HD075264-02

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

DIVISION OF NEUROPHARMACOLOGY AND NEUROLOGIC DISEASES

Excluded by Requester **Ph.D., Division Chief**

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **MONITORING STEM CELL GRAFTS USING A NOVEL MRI REPORTER**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST: Excluded by Requester Emory Department of Radiology and Imaging Sciences

ABSTRACT:

MRI is the most versatile imaging tool for *in vivo* clinical and experimental imaging. Its application to cell tracing has been limited in the past due to the intrinsic low sensitivity of MRI compared to nuclear imaging methods. Earlier studies on cells labeled with paramagnetic iron oxide nanoparticles have shown that MRI sensitivity of detecting labeled cells can reach single digit cells per voxel, suggesting that the accumulation of metal particles in the target cells as the result of overexpression of MRI reporter genes could have practical applications in cell tracking by MRI. This concept has recently been proven with studies on an iron chelating protein, ferritin. Unlike tracking cells labeled with contrast agent such as gadolinium-based compounds or ultrasmall supermagnetic iron oxide particles (USPIO) to high-affinity antibody that only can be traced for a limited time, as the concentration of magnetic particles is gradually reduced in subsequent cell divisions, MRI reporter using MagA makes it possible to monitor gene expression in live subjects by MRI as shown in our results. Such a MRI reporter gene strategy is non-invasive and will not be affected by subsequent cell divisions or by the loss of signals due to instability of the contrast agent over time, making it very promising for long term tracing of cell transplant, which is one of the greatest barrier for the advancement of regenerative medicine.

Our results suggest that, once properly developed, MRI reporter gene systems such as MagA would have clear advantages over PET due to its non-invasiveness without repetitive injections of the contrast agent and the capacity to monitor cell grafts long term at lower cost. In 2014, we have published two publications related to this study.

GRANT NUMBER: 5R01NS064991-04

SUPPORT PERCENTAGE: 0% of P51 funds supported this project

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **A GENE AND PROGENITOR CELL THERAPY IN HUNTINGTON'S DISEASE MICE**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST:

ABSTRACT:

In the past year, our team has been focused on the characterization of Huntington's disease monkey pluripotent stem cells derived neural progenitor cells (HD-NPCs) and their derivative neurons expressing small hairpin RNA (shRNA) targeting the Huntington (HTT) gene (shHD). In addition to assessing the impact of the knock-down expression of HTT gene in HD monkey NPCs and neurons, we continue to develop and optimize our method for in vitro neural differentiation of HD-NPCs. Our first step was to focus on in vitro neural differentiation of HD-NPCs with great success. Our HD-NPCs can be maintained in culture at high homogeneity for more than 30 passages and retain neural differentiation capacity. With close to 30% Map2, 20% □III-tubulin, 20%GABA and 10% TH positive neurons derived from HD-NPCs, we were able to assess the impact of suppressed expression of the HTT gene using shHD. Besides differentiation capacity, we also aim to determine if HD-NPCs and their derivative neurons develop HD-associated cellular phenotypes such that therapeutic effect of shHD can then be determined. In order to assess therapeutic effect of shHD, we have developed various assays to evaluate cellular response to shHD. The overall objective of this study is to determine the effectiveness of NPCs replacement in rescuing the abnormal phenotype of an HD mouse model. In 2014, we have published two publications related to this study.

GRANT NUMBER: 1R21NS084163-01

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **A NOVEL TRANSLATIONAL MODEL OF AUTISUM SPECTRUM DISORDER**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

Our team has been focused on the characterization of the nonhuman primate neural progenitor cells with knock-down SHANK3 (SK3) by using small hairpin RNA targeting the SK3 gene (shSK3-NPCs). In addition to characterization of shSK3-NPCs, we are continuing to develop a neural differentiation protocol for assessing neuronal functions with reduced expression of SK3. Moreover, we have developed a gene targeting construct to target the SK3 gene by Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) technology. Instead of our earlier proposed approach using zinc finger nuclease (ZFN) to target SK3, we decided to employ CRISPR technology because of recent advancements in developing a gene targeted animal model including nonhuman primates. SK3 is a gene integral to the glutamatergic pathway and is a binding partner for the neuroligins, NLGN3 and NLGN4, which themselves bind neurexins, all of which are genetically associated with autism spectrum disorder (ASD) progression. Consequently, disruption of SK3-mediated glutamatergic transmission appears to play a pivotal role in ASD pathogenesis. Moreover, the chromosomal location of SK3 at 22q13 is linked to considerable human pathology due to genetic deletions which result in SK3 haploinsufficiency and strong phenotypes of developmental and language delays. Our ultimate goal is to develop an ASD nonhuman primate model that will allow us to assess cognitive behavioral development of ASD in higher primates longitudinally. To achieve our goal, the current study is focused on developing targeted gene knock-down or knock-out approaches that are assessed *in vitro* using NHP-NPCs and NHP embryos. We will evaluate the gene knock-down approach by using shSK3-NPCs and evaluate neuronal function *in vitro*. In our next step, we will evaluate SK3 targeting efficiency by using CRISPR in nonhuman primate embryos followed by the derivation of embryonic stem cells and neurons for functional assessment.

GRANT NUMBER: 1R21MH100670-01

SUPPORT PERCENTAGE: 0% of P51 funds supported this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **IMMUNOGENEITY OF STEM CELLS AND THEIR IMPACT IN REGENERATIVE MEDICINE**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTISTS: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

During the two years period, we have established more than forty-two iPSC lines from five monkeys, six PASCs from three monkeys and nineteen ESCs from four monkeys. A total of more than fifty PSC lines have been established. Among the established PSCs, we are not able to establish a full set of PSCs by the three derivation methods from the same monkey. From two of the monkeys, we have established both ESCs and PASCs but not iPSCs by using their skin fibroblasts. Among the eight females that we have skin fibroblast culture, only skin cells from one female was successfully used for the derivation of iPSCs and the other seven skin cell lines were not able to derive iPSCs by at least two attempts of reprogramming. On the other hand, among the primary skin culture from the six infant monkeys that we have established in the laboratory, three of them were successful in deriving iPSCs. We found that adult skin fibroblast cells were more difficult to reprogram compared to those derived from young animals, which was consistent with published reports. Additionally, stromal cells such as dental pulp stromal cells or bone marrow stromal cells may have better success rate in deriving iPSCs by using Yamanaka's factors.

GRANT NUMBER: P51OD011132

SUPPORT PERCENTAGE: 100% of P51 funds supported this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **ESTABLISHMENT OF A TRANSGENIC MONKEY MODEL OF HUNTINGTON'S DISEASE**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

One of our ongoing efforts is to produce and characterize second generation (F1) HD-NHPs. We are pleased that we have successfully generated F1 HD-NHPs, and two were confirmed germline transmitted. Among the three founders, one founder (rHD8) has a 100% transmission rate with both offspring positive with the transgenes. The other two founders have not had positive transgenic offspring, while one of them has confirmed germline transmission by the derivation of embryonic stem cells from embryos fertilized with his sperm. This is a critical step to demonstrate the feasibility in producing F1 HD monkeys that could be made available for the HD research community. Our next step is to develop a Transgenic Huntington's Disease Monkey Resource (THDMR) to facilitate the preclinical application of the HD monkey model. In 2014, we have three publications related to the HD monkey model and Under Revision

GRANT NUMBER: 8R24OD010930-08

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **BEHAVIORAL AND NEUROCHEMICAL EFFECTS OF COCAINE IN NONHUMAN PRIMATES**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST:

ABSTRACT

During the reporting period, we worked to develop a carbon-11 radiotracer that can be used to determine the behavioral and neurochemical effects of cocaine in non-human primates (NHP)s on the density and functional status of the serotonin 5-HT_{2C}R in cortical, midbrain and brainstem regions using the *in vivo* imaging technique Positron Emission Tomography (PET). Our approach has been to focus on the development of $5HT_{2c}$R ligands that are analogs of the selective inverse agonist SB 242084 (6-chloro-2,3-dihydro-5-methyl-*N*-[6-[(2-methyl-3-pyridinyl)oxy]-3-pyridinyl]-1*H*-indole-1-carboxyamide. Our choice of SB 242084 as the template for developing new $5HT_{2c}$R PET ligands stems from reported studies demonstrating that SB 242084 has the high $5HT_{2c}$R affinity (pKi = 9) and demonstrates 160 and 100 fold lower affinity, respectively, for $5HT_{2a}$R and $5HT_{2b}$ than for $5HT_{2c}$R (Excluded by Requester et al., 2000). In addition, SB 242084 has shown potent oral activity in a number of animal models of anxiety and depression demonstrating blood brain barrier penetrance (Excluded by Requester et al., 1997; Excluded by Requester et al., 1997). These data suggest that SB 242084 is a suitable lead compound for PET radiotracer development leading to a carbon-11 $5HT_{2c}$R ligand. The specific aims of this proposal are 1) The design and development of synthetic methods for the preparation of precursors for carbon-11 radiolabeling of SB 242084; 2) Carbon-11 labeling of SB 242084; 3) MicroPET studies defining time-activity curves for brain regions-of-interest in cynomolgus monkeys; and 4) MicroPET studies of binding site specificity assessed by "chase" competition in cynomolgus monkeys using SB 242084. Upon completion of this pilot project, we will have significant technological advancement in the field of *in vivo* neuroimaging by providing an NIH high priority PET radioligand for Yerkes' investigators for use in NIH applications for drug addiction, depression and anxiety.

GRANT NUMBER: 51OD011132-54S1

SUPPORT PERCENTAGE: 100% of P51 funds supported this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **COCAINE USE & MONOAMINE FUNCTION IN NON HUMAN PRIMATES**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

There is a critical need to develop effective medications to treat cocaine and psychostimulant addiction. This project continues to focus on the behavioral and in vivo neurochemical interactions between monoamines and abused stimulants, including cocaine, in the context of self-administration behavior in nonhuman primates. It is well recognized that dopamine plays a fundamental role in the behavioral pharmacology of cocaine associated with its addictive properties. However, a substantial literature has documented that serotonergic and noradrenergic function also play a significant role in the abuse-related effects of cocaine and other stimulants. Moreover, monoamines have significant therapeutic potential in a variety of psychiatric disorders.

During the previous project period, we initiated a series of studies to examine the prosocial and abuse-related effects of M.D.MA. There is a great deal of interest in the use of drugs like M.D.MA in the treatment of PTSD and other psychiatric disorders but there are obvious concerns about the abuse liability of M.D.MA itself. Moreover, M.D.MA exhibits neurotoxicity in a variety of animal models. Currently, we have established social housing in two groups of four squirrel monkeys. Social behavior is videotaped and categorized while vocal behavior is also recorded and categorized. We will determine the role of serotonin 5HT2A and 5HT2C mechanisms in the prosocial and abuse-related effects of M.D.MA and its stereoisomers. In group-housed squirrel monkeys, M.D.MA administration induced significant increases in affiliative behaviors such as time spent proximate to cage mates and the frequency of species-specific vocalizations. We also examined the effects of M.D.MA on cocaine self-administration to obtain information about the drug interactions and to gather more information that can be used to differentiate the effects of the different stereoisomers of M.D.MA. Currently, the results obtained indicate that administration of S (+) M.D.MA decreases the rate of cocaine self-administration, indicating that the S (+) stereoisomer is responsible for the abuse related effects, while the R (-) stereoisomer may elicit the prosocial effects. Ongoing studies are evaluating with microdialysis the underlying neurochemical mechanisms that mediate the reinforcing and prosocial effects of M.D.MA in order to dissociate therapeutic from abuse-related effects. The overall objective is to develop drugs with M.D.MA-like therapeutic effects without the unwanted profile of abuse liability.

GRANT NUMBER: 5R01DA012514-15

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **EVALUATION OF THE NOVEL ANTIPSYCHOTIC SEP-363856 WITH FMRI IN PRIMATES**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

Psychosis is a significant public health problem. In recent years, a large body of research has explored the effects of neurotransmission on the pathophysiology of schizophrenia and psychosis. Of particular interest is N-methyl-D-aspartate (NM.D.A)-dependent neurotransmission as a key mechanism in cognitive dysfunction. It is well known that NM.D.A-receptor antagonists, like ketamine, mimic the neurobehavioral correlates of psychosis. This has led to a well-established ketamine-induced NM.D.A receptor hypofunction model of schizophrenia-related cognitive deficits in healthy human subjects that is used to study the pathophysiology of these diseases and explore pharmacotherapeutic interventions. The general aim of this project is to first validate a ketamine-psychosis model in nonhuman primates (rhesus macaques) using functional magnetic resonance imaging (fMRI) to examine activation/deactivation profiles of ketamine against time in brain regions that are known to be associated with psychosis and schizophrenia. In particular, special attention will be given to the activation profile of ketamine in the cingulate cortex, thalamus and hippocampus.

The second aim is the use the model to examine the efficacy of the novel antipsychotic pharmacotherapeutic SEP363856.

The pattern of brain activation induced by ketamine in nonhuman primates was remarkably similar to that reported previously in human subjects, validating the animal model employed with fMRI in conscious subjects. The ketamine response was attenuated by Risperidone, a standard antipsychotic in clinical use, and by SEP 363856. The latter results support the antipsychotic profile of the novel compound SEP 363856. Moreover, SEP 363856 did not induce any overt behavioral effects as were observed with Risperidone, indicating a favorable side-effect profile for SEP 363856. Overall, the study demonstrates the utility of pharmacological imaging with fMRI in conscious nonhuman primates as a platform to evaluate the effects of novel antipsychotic drugs on brain activity. The protocols developed should have significant utility in defining drug mechanism of action at a neurochemical and brain circuit level of analysis.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **IMAGING CENTER**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTISTS: Excluded by Requester

ABSTRACT:

The Yerkes Imaging Center is part of the Yerkes National Primate Research Center at Emory University and primarily focuses on the development of in vivo magnetic resonance technologies imaging (MRI) and positron emission tomography (PET) to study anatomy, physiology and function non-invasively to address questions in neurophysiology, neuroscience and neurodegenerative diseases. Research at the Imaging Center includes high-resolution structural, perfusion and functional imaging of rhesus and chimps, diffusion-tensor imaging, awake monkey fMRI, quantitative perfusion imaging, quantitation of monoamine transporters and receptors, brain metabolic mapping, image data analysis and visualization, diffusion, perfusion and functional imaging of stroke.

The Imaging Center continues to support internal and external investigators with MRI and PET imaging as part of their individual research programs. In addition, we committed significant resources to the development of a nonhuman primate model of ischemic stroke. We have also expanded our use of diffusion tensor imaging (DTI) to characterize brain development in longitudinal studies conducted at the Yerkes Field Station.

GRANT NUMBER: N/A

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **PET IMAGING & COCAINE NEUROPHARMACOLOGY IN MONKEYS**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST:

ABSTRACT:

This research program effectively integrates behavioral pharmacology and i.v. drug self-administration, in vivo neurochemistry with microdialysis, and functional brain imaging with PET and fMRI to better understand the neuropharmacology of abused stimulants. The experimental approach is highly translational in its focus on medications development and its emphasis on brain imaging techniques that can be extended directly into human studies. We are the only research group worldwide that has the capacity to integrate these approaches in nonhuman primate models of drug addiction. While the acute effects of cocaine on brain neurochemistry have been well characterized, much less is known about the long-term changes in neurochemistry and brain function associated with chronic drug use. Clearly, a better understanding of the neurobiology underlying the progression to dependence and addiction will help direct appropriate treatment strategies.

During the previous project period, we completed an extensive series of studies evaluating resting-state functional connectivity as a biomarker for vulnerability to cocaine addiction. It is well recognized that the prefrontal cortex (PFC) subserves functions such as abstract reasoning, personality, and executive function. Recent studies have related specific regions of the PFC to outcome valuation, behavioral inhibition, drug craving, and risky decision making. Likewise, elegant studies have shown that many of the behavioral, subjective, reinforcing, and other abuse-related effects of cocaine are mediated by striatal regions that form important components of brain “reward circuits”. The specific objective of our study was to elucidate critical neural circuits involved in individual vulnerabilities to resumption of cocaine self-administration following prolonged abstinence. The subjects were three female rhesus monkeys in prolonged abstinence following a long history of cocaine self-administration. Initial experiments examined the effects of acute cocaine administration (0.3mg/kg, IV) on functional brain connectivity across the whole brain and in specific brain networks related to behavioral control using functional magnetic resonance imaging in fully conscious subjects. Subsequently, these subjects were allowed to resume cocaine self-administration to determine whether loss of basal connectivity within specific brain networks predicted the magnitude of resumption of cocaine intake following prolonged abstinence. Acute cocaine administration robustly decreased global functional connectivity and selectively impaired top-down prefrontal circuits that control behavior, while sparing connectivity of striatal areas within limbic circuits. Importantly, impaired connectivity between prefrontal and striatal areas during abstinence predicted cocaine intake when these subjects were provided renewed access to cocaine. Based on these findings, loss of prefrontal to striatal functional connectivity may be a critical mechanism underlying the negative downward spiral of cycles of abstinence and relapse that characterizes cocaine addiction.

GRANT NUMBER: NIH/DA010344

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **MOTOR EFFECTS DERMAL FIBROBLAST GRAFTS IN GLOBUS PALLIDUS**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

Dermal fibroblasts grafted in the globus pallidus have been shown to modulate the neuronal activity and improve motor behavior in rodent models of Parkinson's disease. In this project, we studied the transplantation of fibroblasts into the globus pallidus of parkinsonian monkeys to evaluate effects on parkinsonian symptoms. Results showed that after fibroblast transplantation levodopa-induced dyskinesias gradually decrease leading to an overall improvement of levodopa responses. This pilot project supports continuation studies to demonstrate efficacy in a large sample of primates.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **PHARMACOLOGICAL PROFILING OF A NOVEL PDE10A INHIBITOR IN NHP**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

This project that was focused on the role of the cyclic nucleotide phospho-diesterase 10A(PDE10A) in the striatal regulation of motor function has been completed. PDE10A is highly expressed in the striatum where it participates in signaling mechanisms related to cognitive and motor function. In this project, we studied the effects of a novel, selective PDE10A inhibitor Private Source on motor behavior and brain metabolic activity in normal macaques. Results of these tests showed that the new PDE10A inhibitor does not induce significant motor effects in the monkey at the range of doses that have shown antipsychotic efficacy in rodent models. In addition, the compound induced sedation with doses increasing beyond the therapeutic levels. The imaging studies (FDG-PET) showed that the PDE10A inhibiot increased specifically striatal activity. These studies support the development of these novel agents to treat psychotic symptoms.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **MANIPULATING GENE EXPRESSION IN THE DYSKINESIAS OF PARKINSON'S DISEASE**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

This project is focused on the role of the transcription factor deltaFosB in the striatal mechanisms asso-ciated with the development of levodopa-induced dyskinesias in Parkinson's disease (PD). The planned studies will test the effects of transgenic manipulation of □eltaFosB protein expression in non-human primates. The novel approach taken in this project may address pathophysiologic aspects and help develop new therapies. Assessment of behavioral and molecular changes following the overexpression of □eltaFosB in the striatum of parkinsonian monkeys using a viral vector-mediated gene delivery is progressing with positive results. The study of striatal activity changes in these animals using electrophysiologic recordings in correlation with the development of dyskinesias has been initiated and data analysis is in progress. Preparation for down-regulation of □FosB expression has also begun with construction of viral vectors in collaboration with our co-PI Excluded by Requester (UMDNJ, NJ). These vector are now being scaled up to produce the necessary titers for use in vivo in the whole animal. In addition, we have designed a scale for quatitative assessment of dyskinesias in monkeys. This scale was validated with its application to levodopa dose-response curves in several animals, and subjected to assessment of inter-rater reliability. The translational studies involved in the specific aims will lead to establish the mechanistic role of FosB in the development of dyskinesias. Furthermore, these studies are important to assess the clinical application of eltaFosB gene silencing as a therapeutic strategy in complicated PD.

GRANT NUMBER: 1R01NS073994

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **REGULATION OF MOTOR FUNCTION IN PARKINSON'S DISEASE**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

This project (competing renewal awarded in 2011) is focused on the striatal mechanisms involved in the development of motor abnormalities in the evolution of Parkinson's disease (PD). Current studies in this project are concerned with the role of striatal glutamatergic transmission in the pathophysiology of abnormal responses to levodopa. The goal of these studies is to identify pharmacologic targets that could serve to develop new treatments for the long-term therapy of PD. We have completed the study of selective NMDA receptor blockade in the striatum of advanced parkinsonian monkeys. We use electrophysiologic recordings of striatal neurons (MSNs) in combination with striatal injections of specific NMDA receptor antagonist. The tested NMDA blockers was assessed first for specific inhibition of receptors in slice physiology proving selective effects at the range of concentrations planned for local cerebral injections. The in vivo studies showed clear behavioral effects reducing levodopa-induced dyskinesias markedly. Behavioral data correlated with the physiology data showing normalization of firing patterns of striatal neurons in response to dopamine. These results demonstrate the link between NMDA receptor signaling mechanisms and abnormal motor responses to dopamine replacement. Studies of AMPA receptor antagonists have also been completed showing similar effects. Results demonstrate that hyperactivity of striatal projection neurons underlies the pathology of PD. We are now focused on the effects of global reduction of striatal activity in parkinsonian monkeys. Studies are in progress.

GRANT NUMBER: 2R01NS045962

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **TREATMENT OF LEVODOPA-INDUCED DYSKINESIAS TARGETING OPIOID RECEPTORS**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

This project is focused on the assessment of a drug with selective activities on opiod receptor subclasses for effects on levodopa-induced dyskinesias (LID) in non-human primates and establishing dose ranges for a phase 2 clinical study. The selective opioid receptor acting compound significantly reduced dyskinesias in a dose dependent manner in tests of acute administration to parkinsonian monkeys. The compound was also tested following chronic administration for a period of one month, and efficacy was maintained over this chronic treatment/ Behaviorla data were correlated with pharmacokinetics of the compound. The project was completed and studies of the opiod agents may now progress to clinical trials to test beneficial effects in advanced parkinsonian patients.

GRANT NUMBER: Grant from Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **PDE9 INHIBITION THERAPY FOR PARKINSON'S DISEASE**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

AFFILIATE SCIENTIST: Excluded by Requester

ABSTRACT:

The project is aimed at determining the potential use of PDE9 inhibitor for the therapy of Parkinson's disease (PD). PDE9 selectively regulates cGMP, and its inhibition may then provide differential information regarding striatal cyclic nucleotide-mediated mechanisms, and produce motor effects with therapeutic potential for PD. Studies are performed in six monkeys with advanced parkinsonism induced by MPTP with the following objectives: profiling behavioral effects of PDE9 inhibitor, determining efficacy for PD motor disability, assessing tolerability in the primate, determining pharmacokinetics in primates, and exploring the physiologic mechanisms underlying its behavioral effects. Behavioral and pharmacokinetic tests are nearly completion.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **THE PROSOCIAL BRAIN (COMPONENT 3)**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

This project is a component of a large, multi-university award from the Private Source aimed at identifying the neurobiological underpinnings of uniquely human capacities for prosocial behavior and cognition. Component 3 is focused on neuroanatomy and entails comparative studies of humans, chimpanzees, and macaques, using histological and neuroimaging approaches. Specifically, we are tasked with mapping the organization of the limbic system using histochemical markers for oxytocin, vasopressin, acetylcholine, and dopamine, and mapping systems of cortical connectivity in the three species using DTI. Progress in the reporting period for the histological components has entailed the acquisition of suitable macaque, chimpanzee, and human tissue; sectioning about half the cases that will ultimately be included; identifying appropriate antibodies and determining working dilutions. Progress in the connectivity component has entailed incorporating archived human, chimpanzee, and macaque structural and DTI scans into the Human Connectome Project platform; and conducting initial studies of temporal-lobe organization in the three species. In addition, we have developed tools to perform K-means clustering to objectively delineate cortical areas across species, which will permit identification of homologous areas and loci of evolutionary change.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **NEURODEVELOPMENTAL PROFILING OF THE EPIGENOME IN HUMAN AND RHESUS**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

This project explores the similarities and differences between humans and rhesus macaques in epigenetic modifications of DNA in brain tissue. The study compares species at multiple stages, from mid-gestation through adulthood. We developed dissection protocols for both species, and collected the first sample, dissecting representing multiple cortical and subcortical sites from juvenile macaques and refined procedures for carrying out dissections in human tissue.

We are exploring the similarities and differences between humans and rhesus macaques in epigenetic modifications of DNA in brain tissue. The study compares species at multiple stages, from mid-gestation through adulthood. We collaborated in the collection and disection of brain tissue, and will continue to collect brain tissue that may be useful for this project, and as the data analysis is being completed, we will contribute to writing up the results.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **THE ROLE OF GLIA IN HUMAN LONGEVITY AND BRAIN PLASTICITY**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

The purpose of this pilot grant has been to identify human specializations of glia and white-matter organization. We used immunocytochemistry and Western blotting to examine the gray-matter and white-matter distribution of proteins expressed by astrocytes, oligodendrocytes, and microglia, following up on results obtained in gene-expression studies. The species examined include humans, chimpanzees, and macaques. We identified two kinds of previously unknown or poorly characterized types of chemical parcellation in human white matter, one consisting of a lattice of iron-rich and iron-poor compartments, the other consisting of patches that vary in levels of expression of carbonic anhydrase 2. Both iron and CA2 are though to be essential for myelogenesis. We previously demonstrated that the iron-rich and iron-poor compartments are actually spatially elongated territories, that these two compartments are coextensive with the CA2-rich and -poor compartments, and confirmed through comparative densitometry that levels of iron and CA2 are much higher in humans than in chimpanzees or macaques.

Personal Info

Personal Info However, working with an undergraduate, we have continued to pursue the organization of iron-rich and iron-poor compartments in white matter, and are currently making 3D detailed reconstructions at very high spatial resolution of the compartments in serial sections stained with the Perls-DAB technique for labeling iron. We expect to present these results in a poster at the 2015 SFN meetings. In addition, we expect to be able to resolve these compartments in MRI, owing to the strong effect of iron on MR signal, we have begun to test different MR sequences to develop appropriate protocols. Successful scanning will be followed by sectioning, iron staining, and serial reconstruction of stained section, for correlation with MR imagery.

GRANT NUMBER: Private Source (Pilot Grant)

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **BP-ENDURE-ATLANTA: ENGAGING UNDERGRADUATES IN NEUROSCIENCE RESEARCH**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

This NIH training grant supports under-represented minority junior and senior undergraduate students from Emory, GA State, Spelman College and Agnes Scott College to join neuroscience laboratories to gain some experience in neuroscience research so that they are better prepared to apply for graduate school at the end of their undergraduate training. A total of seven Emory students are currently part of this program. The grant provides them salary support during the summer for full time work in the lab and for about 15 hours/week lab work during the academic year. In addition, they receive funds to attend the Annual Society for Neuroscience meeting. In addition to the lab work, they are required to attend series of evening workshops to discuss various issues related to Graduate school and help them develop their personal career. During the summer of their second year of training, they receive funds to join a laboratory outside of Atlanta in one of the 15 partner institutions that have summer training programs supported by NIH training grants. This unique opportunity allows them to spend time in another research environment and broaden their technical knowledge in various fields of Neuroscience research. The ultimate goal of this program is to help under-represented minority students build a solid foundation so that they can undertake graduate studies in neuroscience and participate actively in this field during their professional career.

GRANT NUMBER: SP00010548 BP-ENDURE-Atlanta: Engaging undergraduates in neuroscience research

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **THERAPEUTIC USE OF ANTI-INFLAMMATORY DRUGS IN PARKINSON'S DISEASE**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST: Excluded by Requester Emory, Physiology

ABSTRACT:

The goal of this project is to test the neuroprotective properties of the anti-inflammatory agent XPro1595 on the loss of midbrain dopaminergic neurons induced by the neurotoxin MPTP in non-human primates. During the past funding period, five adult rhesus monkeys from the Yerkes Primate Center breeding colony were assigned to this project. After a period of about 3 weeks of habituation to experimenter handling and transfer to the behavioral cages, baseline behavioral data were collected from these animals. This was achieved through routine procedures using cages equipped with infra red beams and video cameras to quantitatively assess various aspects of the monkey motor behaviors. The animal was also trained in a food picking task, which will be used to assess the severity of the slowness of movements (i.e. bradykinesia) that will be induced by the neurotoxin. We are now ready to start the treatment of these animals with MPTP and XPro1595. In brief, three animals will be treated with both compounds, while two will serve as controls and receive only injections of MPTP and vehicle. The motor behavior of the animals will be assessed longitudinally over time until some animals develop Parkinsonian motor signs, and then brain tissue will be examined for pathological signs of dopaminergic neuronal loss and striatal dopamine denervation. The hypothesis is that animals treated with MPTP and XPro1595 will not develop Parkinsonian symptoms and will harbor a significantly larger number of midbrain dopaminergic neurons than the two animals that will receive MPTP and vehicle injections. If this is the case, we will conclude that XPro1595 may be a suitable candidate to be tested as a neuroprotective drug in Parkinson's disease patients.

GRANT NUMBER: Private Source (No grant number)

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **CORE B: UDALL CENTER FOR PARKINSON'S DISEASE**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTISTS: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

This is project part of the Emory UDALL Center of Excellence for Parkinson's disease. The core B is the neuroanatomy and behavioral core of the Center which achieves experiments that contributes to the development and success of the four main projects supported in this Center. In brief, the respective contribution of Core B towards the different projects during the previous funding period was as follows: (1) Project 1 (PI: Excluded by Reques) Processing of brain tissue used by Excluded by Requester and colleagues to assess the degree of dopamine denervation in transgenic mice models of Parkinson's diseases that carry a mutated form of the human alpha- synuclein gene. TH immunopstaining in 6-OHDA-treated mice. Nissl staining of mice brains for reconstruction of tracks of recording electrodes (2) Project 2 (PI Excluded by Requester) Immunohistochemical staining and quantification of GABA innervation of motor thalamic nuclei in normal and parkinsonian monkeys. Nissl staining of thalamic sections for reconstruction of electrode recording tracks. (3) Project 3 (PI: Excluded by Requester) No significant contribution of Core B to this project during the previous funding period. (4) Project 4 (PI: Excluded by Requester) Quantitative assessment of the cellular and ultrastructural localization of M4 muscarinic receptors immunoreactivity in the striatum of normal rats. Co-author of a publication of results in collaboration with leader of project 4. These studies provide essential information towards the successful completion of the four UDALL Center projects. Core B plays a central, integrative role that enhances the scientific value of each UDALL Center project. It also facilitates the development of collaborative interactions and sharing of resources between Center investigators.

GRANT NUMBER: NINDS P50NS071669

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **PLASTICITY OF STRIATAL GLUTAMATERGIC SYNAPSES IN PARKINSON'S DISEASE**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTISTS: Excluded by Requester

ABSTRACT:

Striatal spine loss is a key neuropathological feature of Parkinson's disease (PD). In this project, we use a combination of anatomical and electrophysiological approaches to determine the plastic changes induced in the synaptic microcircuitry of the striatum by this spine and loss and its functional consequences on the physiology of the corticostriatal system. We also assess the role of dopamine in regulating glutamatergic transmisison from the cortex in normal monkeys and in animal models of Parkinson's disease. During the past funding period, our efforts have been devoted to the functional part of this project which aims at assessing changes in the electrophysiological responses of striatal neurons to cortical stimulation in normal and MPTP-treated parkinsonian monkeys. Some of the findings obtained in these studies demonstrate: (1) A decrease in the proportion of striatal output neurons and putative cholinergic interneurons that responds to corticostriatal activation in parkinsonian animals. Although the latencies of responses to cortical stimulation are not affected in the parkinsonian state, the peak responses are reduced in interneurons, but not in projection neurons. We have also studied the effects of a combination of D1- and D2-like receptor agonists on the striatal neurons responses to cortical stimulation, and found that dopamine receptor activation significantly modulates the pattern of responses cortical activation evokes in striatal neurons. Our findings suggest that the loss of dendritic spines on striatal projection neurons (shown in our previous anatomical studies) results in reduced corticostriatal transmission, and that the remaining corticostriatal synapses remain sensitive to modulation with dopamine. These findings advance our understanding of the importance of striatal neurons pathology in the transmission and integration of corticostriatal information in Parkinson's disease.

GRANT NUMBER: NINDS R01 NS037948 (NCE)

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **TRAINING IN SYSTEMS AND INTEGRATIVE BIOLOGY NEUROSCIENCE**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester

ABSTRACT:

This NIH training grant represents the main source of funding for students enrolled in the Emory Neuroscience graduate program. In 2014-2015, this training grant supported parts of the stipends, tuition fees, activity fees and other training expenses for seven second year students in the neuroscience graduate program. Trainees nominated for training grant support were chosen based on their academic performance during their first year in the program and their general participation in program activities. In addition to financial support, trainees use some of these funds to invite a guest speaker for the weekly seminar series sponsored by the graduate program (Frontiers in Neuroscience). The trainees are in charge of inviting their guest, organize their visit and host them when they come to Emory. This has proven to be an excellent opportunity for students to interact with well-known researchers in their field of interest. Last year, these funds allowed to invite seven speakers from various US research institutions to give a talk in the seminar series and interact with the trainees supported by the training grant. All trainees also received funds to cover expenses to attend the annual Society for Neuroscience meeting, which provided them a unique exposure to the field of neuroscience research.

GRANT NUMBER: T32-GM08605-20: Training in Integrative and Systems Biology: Neuroscience

SUPPORT PERCENTAGE: 5% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **EMORY ALZHEIMER'S DISEASE RESEARCH CENTER, PROJECT 3**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester **PI**

AFFILIATE SCIENTISTS: Excluded by Requester ADRC, Neurology
Excluded by Requester Emory Human Genetics

ABSTRACT:

This project has investigated the role of small noncoding RNAs in Alzheimer's disease. Our work in the past year has been directed toward phenotyping cases of AD, with a growing focus on proteomic analysis of AD cases and animal models. Tissues have been sent to the proteomics facility at Emory Excluded by Requester for this analysis, with the hypothesis that specific proteomic signatures will define the risk and progression of cognitive decline, and in particular the likelihood of developing significant tauopathy, a key histopathological marker of Alzheimer's disease that correlates strongly with cognition.

GRANT NUMBER: NIH P50AG025688

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **TRANSGENIC EXPRESSION OF TAU AND APP IN NEW RAT AND PRIMATE MODELS OF ALZHEIMER'S DISEASE**

UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester **PI**

AFFILIATE SCIENTISTS: Excluded by Requester ., University of Kentucky
Emory, Neurology

ABSTRACT:

The funds in this NCE currently support an assessment of the ability of Aβ-rich brain extracts to differentially seed PiB binding and oligothiophene spectral variation in mouse models. The basic question is whether we can induce changes in the molecular architecture of aggregated Aβ protein by a prion-like seeding mechanism. In the past year we have demonstrated differences in oligothiophene binding among Alzheimer cases, and have shown that the molecular architecture of Aβ differs among transgenic rodent models as well, even after the tissue has been in fixative. We have also initiated PiB binding analyses of seeded transgenic mice, and the results are expected within the next 6-8 weeks.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **SEEDING PATHOGENIC AB AGGREGATES *IN VITRO* AND *IN VIVO***

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTISTS: Excluded by Requester **PI**

AFFILIATE SCIENTISTS: Excluded by Requester Emory, Chemistry
Excluded by Requester Georgia Tech
Excluded by Requester Emory, Chemistry
Excluded by Requester Ph.D., Neurology, CND

ABSTRACT:

This project is investigating the cellular mechanisms of seed transport and processing, focusing in particular on neuronal transport and macrophages as potential vectors of spread. In the past year, we have shown that macrophages from a donor mouse carrying Aβ seeds can enter the brain of a host mouse, where they occur mostly around blood vessels and in the sub-arachnoid space. Additional studies indicate that neuronal transport mechanisms are unlikely to be a major source of seed transport from periphery to brain, but we have also shown that seed-induced Aβ deposition ramifies through the brain in a systematic fashion, suggestive of directed spread by neuronal transport mechanisms In Press

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this grant.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **DOES ALZHEIMER'S DISEASE PATHOLOGY BEGIN IN THE LOCUS COERULEUS?**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester

AFFILIATE SCIENTIST: Emory, Human Genetics

ABSTRACT:

This project examines the role of brainstem tauopathy in early AD-like pathogenesis in a mouse model. In the past year, we have investigated the degree of tauopathy in the brainstems of aged nonhuman primates, and found that some of them have significant hyperphosphorylated tau in the locus coeruleus and the raphe nuclei. These findings support the view that the brainstem may be an early site of tauopathy generation. In addition, in Excluded by Requester laboratory, a transgenic mouse model has been developed that expresses human-type tau only in the locus coeruleus, introducing a new murine model for studying tauopathy, and condition that is common in a number of human neurodegenerative diseases.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **THALAMIC INTERACTIONS WITH THE STRIATUM**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTISTS: Excluded by Requester **PI**

AFFILIATE SCIENTISTS:

ABSTRACT:

The 'motor' thalamus is known to receive prominent basal ganglia input. Studies have demonstrated that thalamic projections do not only reach the cerebral cortex, but also project back to the basal ganglia. The most prominent of these projections arise from the intralaminar thalamic nuclei, with additional projections from other thalamic centers, including specifically the ventral anterior and ventrolateral nuclei. These projections differ anatomically, and may also be differentially affected by neurodegenerative diseases, such as Parkinson's disease. This project utilizes optogenetic techniques to examine the functional effect of the thalamostriatal projections in normal and parkinsonian monkeys, and to examine their anatomic patterns of termination in the striatum (using light- and electron microscopic methods). We have used three animals in this project thus far. In the first, we transfected the intralaminar nuclei on one side, and the ventral motor nuclei of the thalamus on the other, and then studied the responses of striatal neurons to the optogenetic stimulation. These studies are complete, but the analysis of the results is ongoing. About half of all recorded striatal neurons showed responses to the optogenetic stimulation, with, interestingly, both excitatory and inhibitory polarity. We are currently undertaking the post-mortem anatomical analysis to determine the distribution of transfected fibers in the striatum, and the general distribution of vGluT2 positive terminals (that is, terminals of glutamatergic neurons that reside in the thalamus) within the striatum. The third monkey in this series has been trained and is scheduled to receive its recording chamber in a few weeks. This animal will be our first MPTP-treated animal in this series of studies.

GRANT NUMBER: NIH R01NS083386

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **ADMINISTRATIVE CORE (UDALL CENTER, CORE A)**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester **M.D., PI**

AFFILIATE SCIENTIST: Emory, Neurology

ABSTRACT:

The Udall Center's administrative core supports Parkinson's disease related research activities of Udall Center investigators, and facilitates communication between Center personnel with other Emory researchers, with the Center's advisory boards, with the general public, with other Centers within the Udall network, and with the NIH. This core organizes regular monthly meetings of project leaders, quarterly meetings of the basal ganglia research community at Emory, meetings with internal and external scientific advisors, and meetings of the Center's outreach board. The core has again organized the participation of center personnel at the annual Udall Center network meeting and at the Parkinson's Action Network (PAN) meeting (both in Washington, DC). In conjunction with the administrative staff at the Yerkes center, the core keeps track of accounting and compiles progress and budgetary reports. Finally, the core has successfully administered its fourth round of reviews of high-impact pilot grant reviews. The RFA for the next pilot grant cycle has been published, with a deadline in the spring of 2015. The Center provides educational opportunities for students, postdoctoral fellows, and Neurology/Neurosurgery residents and fellows, such as lectures and hands-on training. One of the important additional functions of the core is to organize the interactions with the Udall Center component at Vanderbilt. Finally, the core has been involved in multiple public outreach events (lectures, and a very successful roundtable discussion event). Please note that the Udall Center administrator changed at the beginning of 2014. Personal Info

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GRANT NUMBER: NIH P50NS071669

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **THALAMIC ACTIVITY IN PARKINSONISM (UDALL CENTER, PROJECT #2)**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester **PI**

AFFILIATE SCIENTISTS: Excluded by Requester

ABSTRACT:

This project examines the thalamic effects of deep brain stimulation (DBS) of the internal pallidal segment (GPi) or the subthalamic nucleus (STN), or GPi lesions (pallidotomy). STN sends a glutamatergic projection to GPi, and GPi, in turn, sends its major (GABAergic) output to the thalamus. DBS and pallidotomy procedures are commonly used to treat patients with advanced Parkinson's disease, and have similar clinical effects, but likely differ substantially in terms of their effects on pallidal output. Our studies test the hypothesis that, although these local pallidal effects differ, they may lead to similar effects at the thalamic level, explaining the similar clinical results of these procedures. We have now concluded work in a total of 10 animals. Each was surgically prepared for electrophysiologic recording studies and subsequently received weekly injections with MPTP (0.4-0.6 mg/kg i.m. in weekly doses) to induce moderately severe parkinsonism. MPTP treatment had major effects on the spontaneous activity patterns of thalamic neurons. MPTP treatment resulted in a reduction of spontaneous activity, as well as an increase in the incidence of burst discharges, the intensity of bursting (as measured by the maximal frequency increase within bursts, as well as an increase in the proportion of bursts fulfilling the criteria of rebound bursting. Oscillatory fluctuations of the single cell firing rates was less affected, although an increase of frequencies up to 30 Hz was identified, while the relative proportion of oscillations in the higher frequency ranges was reduced. Interestingly, spikes of single neurons in the VLa were found to be strongly entrained to LFP signals recorded at the same location. STN stimulation in the parkinsonian state increased firing rates, and the variability of firing, and substantially reduced oscillatory power in the 1-3 Hz band, with non-significant changes in other bands (3-100 Hz). GPi stimulation also increased the firing rate of thalamic neurons and reduced oscillations in the 1-3 Hz and 13-30 Hz bands. Neither of the stimulation approaches altered the probability of firing of thalamic neurons between the stimuli. Unlike the stimulation experiments, GPi lesioning did not affect firing rates or CV values, increased 1-3 Hz power, reduced power in the theta, beta and beta bands, and increased power in the gamma band of oscillations. While the effects of stimulation on rates, variability and oscillatory activity differed between stimulation and lesioning, their effects on the entrainment of single neuron spiking to simultaneously recorded LFP activity at the same thalamic location were similar. Compared to the normal state, MPTP treatment resulted in a substantially greater entrainment of spikes to simultaneously recorded LFP signals, specifically in the 4-26 Hz range. Stimulation or lesioning of the basal ganglia substantially reduced the entrainment. With the assumption that LFPs reflect predominately afferent signals to the area of recording, while spiking obviously reflects the output of the studied cells, this finding may indicate that the different interventions had similar effects on the processing of incoming signals in the motor thalamus.

GRANT NUMBER: NIH P50NS071669

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **GLUN2D ANTAGONISM IN THE SUBTHALAMIC NUCLEUS FOR THE TREATMENT OF PARKINSONISM**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by Requester **PI**

AFFILIATE SCIENTIST:

ABSTRACT:

This project evaluates the potential antiparkinsonian properties of a new class of glutamate receptor antagonists (GluN2D ligands) that act to normalize firing abnormalities within the subthalamic nucleus (STN). The STN is one of the major nuclei whose activity is altered in the parkinsonian state, likely at least in part mediated via its glutamatergic inputs from cortex and pedunculopontine nucleus. The GluN2D receptor is highly enriched at these glutamatergic synapses, so that their blockade may provide antiparkinsonian benefits. The currently available GluN2D receptor blockers will not cross the blood brain barrier. We have therefore chosen to directly inject these agents into the STN to examine whether they are effective, and whether their further development would make sense. This project is a collaboration Excluded by Requester group in the Dept. of Pharmacology who provides us with the selective agents which are then examined in our animals. The primate studies are aimed to determine the effects and time course of GluN2D antagonism on neuronal function in parkinsonian non-human primates, using electrophysiologic recordings of STN activity. In addition, we will study the behavioral effects of these agents, using local intra-STN injections of larger volumes of GluN2D antagonist solution. The studies have started a few months ago. We have already enrolled two animals in these studies. The results of these (blinded) studies are pending.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **EXTRASTRIATAL FUNCTIONS OF DOPAMINE**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTISTS: Excluded by Requester

AFFILIATE SCIENTISTS:

ABSTRACT:

Parkinsonism arises mostly from degeneration of dopaminergic neurons in the substantia nigra pars compacta, leading to abnormal neuronal activity in the other basal ganglia. This project examines the effects of changes in the dopamine supply to the primate subthalamic nucleus (STN). Recordings of the electrophysiologic activity of STN neurons before, during and after local intra-STN administration of the dopamine D1-like receptor agonist SKF82958 showed that administration of SKF82958 significantly reduced the spontaneous firing, but increased the rate of intra-burst firing and the proportion of pause-burst sequences of firing. Quinpirole, a dopamine D2 receptor agonist, only increased the proportion of such pause-burst sequences in STN neurons of normal monkeys. In MPTP-treated monkeys, the D1-like receptor agonist also reduced the firing rate and increased the proportion of pause-burst sequences, while the D2-like receptor agonist did not any of the chosen descriptors of the firing pattern of STN neurons. Concomittant electron microscopic immunohistochemical localization of D1, D5 and D2 receptors in the STN revealed that labeling of D1 and D2 receptors is primarily found presynaptically, on pre-terminal axons and putative glutamatergic and GABAergic terminals, while D5 receptors are more significantly expressed postsynaptically, on dendritic shafts of STN neurons. The results show that, in the parkinsonian state, dopaminergic receptors in the STN show enhanced responses to their respective agonists, without significant changes in their pattern of subcellular distribution. Our data suggest that dopamine receptor activation can directly modulate the electrical activity of STN neurons by pre- and postsynaptic mechanisms in both normal and parkinsonian states, predominantly via activation of D1 receptors. Direct dopamine-mediated modulation of STN neurons may, thus, affect basal ganglia output and behavior and play a role in the therapeutic benefits or side effects of dopaminergic compounds in Parkinson's Disease.

GRANT NUMBERS: NIH R01NS071074

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **UDALL PARKINSON'S DISEASE CENTER AT EMORY UNIVERSITY**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTIST: Excluded by R equester **PI**

AFFILIATE SCIENTISTS:

ABSTRACT:

The Morris K. Udall Parkinson's Disease Center of Excellence at Emory University is a collaborative research program in which electrophysiologists, pharmacologists, and anatomists work together to study the effects of existing and new treatments for parkinsonism from a circuit perspective. The center consists of four projects and two cores. Project 1 (Excluded by Requester) examines changes imposed by altered basal ganglia input onto thalamic neurons in the parkinsonian state. Project 2 (Excluded by Requester) is a series of experiments in parkinsonian primates to compare the thalamic effects of pallidal and subthalamic nucleus inactivation and stimulation, as are commonly used to treat advanced parkinsonism in patients, with the goal of identifying changes in thalamic activity that are associated with the antiparkinsonian effects of these procedures. Project 3 (Excluded by) is a series of translational experiments that examine the use of orally active TrkB receptor agonists as symptomatic or neurorestorative treatment for Parkinson's disease in different rodent and primate models. Project 4 (Dr. Excluded by Reque / Private Source) investigates the effects of novel subtype-selective muscarinic acetylcholine receptor antagonists and activators on basal ganglia activity, and on parkinsonism in rodent models. The projects are supported by an administrative core (Core A, Excluded by Requester PI; Excluded by Requester Co-I, Excluded by R equester administrator), and by an anatomy and behavior core (Core B, Excluded by R equester) which provides immunohistochemistry and electron microscopy services to all of the center projects.

GRANT NUMBER: NIH P50NS071669

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

INDIVIDUAL PROJECT DESCRIPTION

PROJECT TITLE: **ANTIPARKINSONIAN EFFECTS OF T-TYPE CALCIUM CHANNEL INHIBITORS**

NPRC UNIT: Division of Neuropharmacology and Neurologic Diseases

CORE SCIENTISTS: Excluded by Requester **PI**

AFFILIATE SCIENTIST:

ABSTRACT:

Parkinson's disease is associated with significant changes in the electrical activities of neurons in the basal ganglia and thalamus, including the emergence of abnormal bursts of spike discharges. A common burst entity in parkinsonism is "rebound bursting". Rebound bursts are due to hyperpolarization-induced de-inactivation of T-type calcium channels. We hypothesize that rebound bursting in the basal ganglia and thalamus contributes to the development of parkinsonian motor signs, and that the blockade of T-type calcium channels may act to lessen the incidence of rebound bursts, and thereby to ameliorate parkinsonism. To test this hypothesis, we examine the utility of T-type calcium channel inhibitors as antiparkinsonian treatments in parkinsonian (MPTP-treated) Rhesus monkeys, using several highly selective T-type calcium channel antagonists. We have carried out serum and cerebrospinal fluid pharmacokinetic studies in these animals to ensure blood-brain barrier penetration and bioavailability of one voltage-independent, and one voltage-dependent T-type calcium channel inhibitor. Behavioral effects were evaluated by blinded rating of parkinsonian symptoms, and by measurement of reaction and movement times in behavioral tasks. The drugs were found to have a small antiparkinsonian effect at low dosage ranges, but were found to be sedating at higher dosages. We also studied the interaction with levodopa treatment, and found that the two drugs do not seem to be synergistic. These studies showed that the T-type calcium channel blockers tested had dose-limiting side effects which prevented their use at fully effective doses. It may be useful to continue exploration of this group of drugs, but other agents with more positive side effect profiles would have to be identified. The use of these agents remains attractive, because their effects would likely not be complicated by the limiting long-term side effects of traditional dopaminergic therapy for Parkinson's disease, such as hallucinations or dyskinesias.

GRANT NUMBER: Private Source

SUPPORT PERCENTAGE: 0% of P51 funds support this project.

Composite Application Budget Summary

Categories	Budget Period
Salary, Wages and Fringe Benefits	4,850,496
Equipment	0
Travel	10,960
Participant/Trainee Support Costs	0
Other Direct Costs (excluding Consortium)	1,926,061
Consortium Costs	0
Direct Costs	6,787,517
Indirect Costs	2,722,507
Total Direct and Indirect Costs	9,510,024

Component Budget Summary

Components	Categories	Budget Period
6199-001 (Admin Core)	Salary, Wages and Fringe Benefits	8,226
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0
	Direct Costs	8,226
	Indirect Costs	3,619
TOTALS	Total Direct and Indirect Costs	11,845
6198-002 (Admin Core)	Salary, Wages and Fringe Benefits	5,590
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0
	Direct Costs	5,590
	Indirect Costs	2,460
TOTALS	Total Direct and Indirect Costs	8,050
6197-003 (Admin Core)	Salary, Wages and Fringe Benefits	11,420
	Equipment	0
	Travel	0

	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0
	Direct Costs	11,420
	Indirect Costs	5,025
TOTALS	Total Direct and Indirect Costs	16,445
6949-004 (Admin Core)	Salary, Wages and Fringe Benefits	40,100
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0
	Direct Costs	40,100
	Indirect Costs	17,644
TOTALS	Total Direct and Indirect Costs	57,744
6951-005 (Admin Core)	Salary, Wages and Fringe Benefits	11,714
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0
	Direct Costs	11,714
	Indirect Costs	5,154
TOTALS	Total Direct and Indirect Costs	16,868

6200-006 (Admin Core)	Salary, Wages and Fringe Benefits	8,058
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0
	Direct Costs	8,058
	Indirect Costs	3,546
TOTALS	Total Direct and Indirect Costs	11,604
6983-007 (Admin Core)	Salary, Wages and Fringe Benefits	0
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	600,000
	Consortium Costs	0
	Direct Costs	600,000
	Indirect Costs	0
TOTALS	Total Direct and Indirect Costs	600,000
6224-008 (Admin Core)	Salary, Wages and Fringe Benefits	33,142
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0

	Direct Costs	33,142
	Indirect Costs	14,582
TOTALS	Total Direct and Indirect Costs	47,724
5392-009 (Admin Core)	Salary, Wages and Fringe Benefits	133,344
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0
	Direct Costs	133,344
	Indirect Costs	58,672
TOTALS	Total Direct and Indirect Costs	192,016
6972-001 (Core)	Salary, Wages and Fringe Benefits	56,300
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	439,097
	Consortium Costs	0
	Direct Costs	495,397
	Indirect Costs	217,975
TOTALS	Total Direct and Indirect Costs	713,372
6973-002 (Core)	Salary, Wages and Fringe Benefits	52,914
	Equipment	0
	Travel	0

	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	3,500
	Consortium Costs	0
	Direct Costs	56,414
	Indirect Costs	24,822
TOTALS	Total Direct and Indirect Costs	81,236
6975-003 (Core)	Salary, Wages and Fringe Benefits	18,123
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	3,500
	Consortium Costs	0
	Direct Costs	21,623
	Indirect Costs	9,514
TOTALS	Total Direct and Indirect Costs	31,137
6969-004 (Core)	Salary, Wages and Fringe Benefits	31,002
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	3,500
	Consortium Costs	0
	Direct Costs	34,502
	Indirect Costs	15,181
TOTALS	Total Direct and Indirect Costs	49,683

6974-005 (Core)	Salary, Wages and Fringe Benefits	161,133
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	10,500
	Consortium Costs	0
	Direct Costs	171,633
	Indirect Costs	75,518
TOTALS	Total Direct and Indirect Costs	247,151
6979-001 (Other)	Salary, Wages and Fringe Benefits	54,417
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0
	Direct Costs	54,417
	Indirect Costs	23,943
TOTALS	Total Direct and Indirect Costs	78,360
6959-002 (Other)	Salary, Wages and Fringe Benefits	296,412
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	39,000
	Consortium Costs	0

	Direct Costs	335,412
	Indirect Costs	147,581
TOTALS	Total Direct and Indirect Costs	482,993
6958-003 (Other)	Salary, Wages and Fringe Benefits	275,199
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	15,500
	Consortium Costs	0
	Direct Costs	290,699
	Indirect Costs	127,908
TOTALS	Total Direct and Indirect Costs	418,607
6957-004 (Other)	Salary, Wages and Fringe Benefits	882,432
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	106,084
	Consortium Costs	0
	Direct Costs	988,516
	Indirect Costs	434,947
TOTALS	Total Direct and Indirect Costs	1,423,463
6982-005 (Other)	Salary, Wages and Fringe Benefits	0
	Equipment	0
	Travel	10,960

	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	1,227
	Consortium Costs	0
	Direct Costs	12,187
	Indirect Costs	5,362
TOTALS	Total Direct and Indirect Costs	17,549
6956-006 (Other)	Salary, Wages and Fringe Benefits	1,096,695
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	152,653
	Consortium Costs	0
	Direct Costs	1,249,348
	Indirect Costs	549,714
TOTALS	Total Direct and Indirect Costs	1,799,062
6955-007 (Other)	Salary, Wages and Fringe Benefits	227,301
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	51,500
	Consortium Costs	0
	Direct Costs	278,801
	Indirect Costs	122,672
TOTALS	Total Direct and Indirect Costs	401,473

6967-008 (Other)	Salary, Wages and Fringe Benefits	78,273
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	5,000
	Consortium Costs	0
	Direct Costs	83,273
	Indirect Costs	36,640
TOTALS	Total Direct and Indirect Costs	119,913
6954-009 (Other)	Salary, Wages and Fringe Benefits	483,286
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	91,500
	Consortium Costs	0
	Direct Costs	574,786
	Indirect Costs	252,906
TOTALS	Total Direct and Indirect Costs	827,692
6968-010 (Other)	Salary, Wages and Fringe Benefits	59,355
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	2,000
	Consortium Costs	0

	Direct Costs	61,355
	Indirect Costs	26,996
TOTALS	Total Direct and Indirect Costs	88,351
6953-011 (Other)	Salary, Wages and Fringe Benefits	33,605
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0
	Direct Costs	33,605
	Indirect Costs	14,786
TOTALS	Total Direct and Indirect Costs	48,391
6966-012 (Other)	Salary, Wages and Fringe Benefits	239,057
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	51,500
	Consortium Costs	0
	Direct Costs	290,557
	Indirect Costs	127,845
TOTALS	Total Direct and Indirect Costs	418,402
6976-013 (Other)	Salary, Wages and Fringe Benefits	14,658
	Equipment	0
	Travel	0

	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0
	Direct Costs	14,658
	Indirect Costs	6,450
TOTALS	Total Direct and Indirect Costs	21,108
6965-014 (Other)	Salary, Wages and Fringe Benefits	143,911
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	10,000
	Consortium Costs	0
	Direct Costs	153,911
	Indirect Costs	67,721
TOTALS	Total Direct and Indirect Costs	221,632
6964-015 (Other)	Salary, Wages and Fringe Benefits	14,211
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0
	Direct Costs	14,211
	Indirect Costs	6,253
TOTALS	Total Direct and Indirect Costs	20,464

6963-016 (Other)	Salary, Wages and Fringe Benefits	75,025
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	130,000
	Consortium Costs	0
	Direct Costs	205,025
	Indirect Costs	90,211
TOTALS	Total Direct and Indirect Costs	295,236
6977-017 (Other)	Salary, Wages and Fringe Benefits	47,171
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0
	Direct Costs	47,171
	Indirect Costs	20,755
TOTALS	Total Direct and Indirect Costs	67,926
6962-018 (Other)	Salary, Wages and Fringe Benefits	175,394
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0

	Direct Costs	175,394
	Indirect Costs	77,173
TOTALS	Total Direct and Indirect Costs	252,567
6961-019 (Other)	Salary, Wages and Fringe Benefits	41,330
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0
	Direct Costs	41,330
	Indirect Costs	18,185
TOTALS	Total Direct and Indirect Costs	59,515
6978-020 (Other)	Salary, Wages and Fringe Benefits	41,698
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0
	Direct Costs	41,698
	Indirect Costs	18,347
TOTALS	Total Direct and Indirect Costs	60,045
6980-001 (Project)	Salary, Wages and Fringe Benefits	0
	Equipment	0
	Travel	0

	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	210,000
	Consortium Costs	0
	Direct Costs	210,000
	Indirect Costs	92,400
TOTALS	Total Direct and Indirect Costs	302,400
6991-002 (Project)	Salary, Wages and Fringe Benefits	0
	Equipment	0
	Travel	0
	Participant/Trainee Support Costs	0
	Other Direct Costs (excluding Consortium)	0
	Consortium Costs	0
	Direct Costs	0
	Indirect Costs	0
TOTALS	Total Direct and Indirect Costs	0
TOTALS		**9,510,024**

Categories Budget Summary

Categories	Components	Budget Period
R&R Budget - Senior/Key Person Funds Requested	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	125,616
	6972-001 (Core)	47,735
	6973-002 (Core)	10,055
	6975-003 (Core)	4,006
	6969-004 (Core)	5,596
	6974-005 (Core)	36,476
	6979-001 (Other)	51,511
	6959-002 (Other)	31,196
	6958-003 (Other)	27,413
	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	96,890

	6967-008 (Other)	6,676
	6954-009 (Other)	236,006
	6968-010 (Other)	6,649
	6953-011 (Other)	19,676
	6966-012 (Other)	7,402
	6976-013 (Other)	11,420
	6965-014 (Other)	55,507
	6964-015 (Other)	7,402
	6963-016 (Other)	0
	6977-017 (Other)	44,475
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	37,715
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		869,422
R&R Budget - Other Personnel Funds Requested	6199-001 (Admin Core)	8,226
	6198-002 (Admin Core)	5,590
	6197-003 (Admin Core)	11,420
	6949-004 (Admin Core)	40,100
	6951-005 (Admin Core)	11,714
	6200-006 (Admin Core)	8,058
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	33,142

	5392-009 (Admin Core)	7,728
	6972-001 (Core)	8,565
	6973-002 (Core)	42,859
	6975-003 (Core)	14,117
	6969-004 (Core)	25,406
	6974-005 (Core)	124,657
	6979-001 (Other)	2,906
	6959-002 (Other)	265,216
	6958-003 (Other)	247,786
	6957-004 (Other)	882,432
	6982-005 (Other)	0
	6956-006 (Other)	1,096,695
	6955-007 (Other)	130,411
	6967-008 (Other)	71,597
	6954-009 (Other)	247,280
	6968-010 (Other)	52,706
	6953-011 (Other)	13,929
	6966-012 (Other)	231,655
	6976-013 (Other)	3,238
	6965-014 (Other)	88,404
	6964-015 (Other)	6,809
	6963-016 (Other)	75,025
	6977-017 (Other)	2,696
	6962-018 (Other)	175,394

	6961-019 (Other)	41,330
	6978-020 (Other)	3,983
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		3,981,074
R&R Budget - Section A & B. Total Salary, Wages and Fringe Benefits (A+B)	6199-001 (Admin Core)	8,226
	6198-002 (Admin Core)	5,590
	6197-003 (Admin Core)	11,420
	6949-004 (Admin Core)	40,100
	6951-005 (Admin Core)	11,714
	6200-006 (Admin Core)	8,058
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	33,142
	5392-009 (Admin Core)	133,344
	6972-001 (Core)	56,300
	6973-002 (Core)	52,914
	6975-003 (Core)	18,123
	6969-004 (Core)	31,002
	6974-005 (Core)	161,133
	6979-001 (Other)	54,417
	6959-002 (Other)	296,412
	6958-003 (Other)	275,199
	6957-004 (Other)	882,432

	6982-005 (Other)	0
	6956-006 (Other)	1,096,695
	6955-007 (Other)	227,301
	6967-008 (Other)	78,273
	6954-009 (Other)	483,286
	6968-010 (Other)	59,355
	6953-011 (Other)	33,605
	6966-012 (Other)	239,057
	6976-013 (Other)	14,658
	6965-014 (Other)	143,911
	6964-015 (Other)	14,211
	6963-016 (Other)	75,025
	6977-017 (Other)	47,171
	6962-018 (Other)	175,394
	6961-019 (Other)	41,330
	6978-020 (Other)	41,698
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		4,850,496
R&R Budget - Section C. Total Equipment	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0

	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	0
	6973-002 (Core)	0
	6975-003 (Core)	0
	6969-004 (Core)	0
	6974-005 (Core)	0
	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0
	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0
	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0

	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		0
R&R Budget - Domestic Travel	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	0
	6973-002 (Core)	0
	6975-003 (Core)	0
	6969-004 (Core)	0
	6974-005 (Core)	0
	6979-001 (Other)	0
	6959-002 (Other)	0

	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	10,960
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0
	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0
	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		10,960
R&R Budget - Foreign Travel	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0

	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	0
	6973-002 (Core)	0
	6975-003 (Core)	0
	6969-004 (Core)	0
	6974-005 (Core)	0
	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0
	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0
	6976-013 (Other)	0

	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		0
R&R Budget - Section D. Total Travel	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	0
	6973-002 (Core)	0
	6975-003 (Core)	0
	6969-004 (Core)	0
	6974-005 (Core)	0

	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	10,960
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0
	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0
	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		10,960
R&R Budget - Tuition/Fees/Health Insurance	6199-001 (Admin Core)	0

	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	0
	6973-002 (Core)	0
	6975-003 (Core)	0
	6969-004 (Core)	0
	6974-005 (Core)	0
	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0
	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0

	6966-012 (Other)	0
	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		0
R&R Budget - Stipends	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	0
	6973-002 (Core)	0
	6975-003 (Core)	0

	6969-004 (Core)	0
	6974-005 (Core)	0
	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0
	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0
	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0

TOTALS		0
R&R Budget - Trainee Travel	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	0
	6973-002 (Core)	0
	6975-003 (Core)	0
	6969-004 (Core)	0
	6974-005 (Core)	0
	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0
	6954-009 (Other)	0

	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0
	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		0
R&R Budget - Subsistence	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	0

	6973-002 (Core)	0
	6975-003 (Core)	0
	6969-004 (Core)	0
	6974-005 (Core)	0
	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0
	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0
	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0

	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		0
R&R Budget - Other Participants/Trainee Support Costs	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	0
	6973-002 (Core)	0
	6975-003 (Core)	0
	6969-004 (Core)	0
	6974-005 (Core)	0
	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	0

	6967-008 (Other)	0
	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0
	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		0
R&R Budget - Section E. Total Participants/Trainee Support Costs	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0

	5392-009 (Admin Core)	0
	6972-001 (Core)	0
	6973-002 (Core)	0
	6975-003 (Core)	0
	6969-004 (Core)	0
	6974-005 (Core)	0
	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0
	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0
	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0

	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		0
R&R Budget - Materials and Supplies	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	74,743
	6973-002 (Core)	2,000
	6975-003 (Core)	2,000
	6969-004 (Core)	2,000
	6974-005 (Core)	6,000
	6979-001 (Other)	0
	6959-002 (Other)	39,000
	6958-003 (Other)	14,000
	6957-004 (Other)	106,084
	6982-005 (Other)	0

	6956-006 (Other)	152,653
	6955-007 (Other)	50,000
	6967-008 (Other)	5,000
	6954-009 (Other)	90,000
	6968-010 (Other)	2,000
	6953-011 (Other)	0
	6966-012 (Other)	50,000
	6976-013 (Other)	0
	6965-014 (Other)	10,000
	6964-015 (Other)	0
	6963-016 (Other)	130,000
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		735,480
R&R Budget - Publication Costs	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0

	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	0
	6973-002 (Core)	0
	6975-003 (Core)	0
	6969-004 (Core)	0
	6974-005 (Core)	0
	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0
	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0
	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0

	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		0
R&R Budget - Consultant Services	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	0
	6973-002 (Core)	0
	6975-003 (Core)	0
	6969-004 (Core)	0
	6974-005 (Core)	0
	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	0

	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0
	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0
	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		0
R&R Budget - ADP/Computer Services	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0

	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	0
	6973-002 (Core)	0
	6975-003 (Core)	0
	6969-004 (Core)	0
	6974-005 (Core)	0
	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0
	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0
	6976-013 (Other)	0
	6965-014 (Other)	0

	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		0
R&R Budget - Subawards/Consortium/Contractual Costs	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	0
	6973-002 (Core)	0
	6975-003 (Core)	0
	6969-004 (Core)	0
	6974-005 (Core)	0
	6979-001 (Other)	0

	6959-002 (Other)	0
	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0
	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0
	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		0
R&R Budget - Equipment or Facility Rental User Fees	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0

	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	0
	6973-002 (Core)	0
	6975-003 (Core)	0
	6969-004 (Core)	0
	6974-005 (Core)	0
	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0
	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0

	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		0
R&R Budget - Alterations and Renovations	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	600,000
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	0
	6973-002 (Core)	0
	6975-003 (Core)	0
	6969-004 (Core)	0

	6974-005 (Core)	0
	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0
	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0
	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		600,000

R&R Budget - Other Direct Cost 1	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	330,158
	6973-002 (Core)	1,500
	6975-003 (Core)	1,500
	6969-004 (Core)	1,500
	6974-005 (Core)	4,500
	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	1,500
	6957-004 (Other)	0
	6982-005 (Other)	1,227
	6956-006 (Other)	0
	6955-007 (Other)	1,500
	6967-008 (Other)	0
	6954-009 (Other)	1,500
	6968-010 (Other)	0

	6953-011 (Other)	0
	6966-012 (Other)	1,500
	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	210,000
	6991-002 (Project)	0
TOTALS		556,385
R&R Budget - Other Direct Cost 2	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	34,196
	6973-002 (Core)	0

	6975-003 (Core)	0
	6969-004 (Core)	0
	6974-005 (Core)	0
	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0
	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0
	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0

	6991-002 (Project)	0
TOTALS		34,196
R&R Budget - Other Direct Cost 3	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	0
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0
	6972-001 (Core)	0
	6973-002 (Core)	0
	6975-003 (Core)	0
	6969-004 (Core)	0
	6974-005 (Core)	0
	6979-001 (Other)	0
	6959-002 (Other)	0
	6958-003 (Other)	0
	6957-004 (Other)	0
	6982-005 (Other)	0
	6956-006 (Other)	0
	6955-007 (Other)	0
	6967-008 (Other)	0

	6954-009 (Other)	0
	6968-010 (Other)	0
	6953-011 (Other)	0
	6966-012 (Other)	0
	6976-013 (Other)	0
	6965-014 (Other)	0
	6964-015 (Other)	0
	6963-016 (Other)	0
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0
	6978-020 (Other)	0
	6980-001 (Project)	0
	6991-002 (Project)	0
TOTALS		0
R&R Budget - Section F. Total Other Direct Cost	6199-001 (Admin Core)	0
	6198-002 (Admin Core)	0
	6197-003 (Admin Core)	0
	6949-004 (Admin Core)	0
	6951-005 (Admin Core)	0
	6200-006 (Admin Core)	0
	6983-007 (Admin Core)	600,000
	6224-008 (Admin Core)	0
	5392-009 (Admin Core)	0

	6972-001 (Core)	439,097
	6973-002 (Core)	3,500
	6975-003 (Core)	3,500
	6969-004 (Core)	3,500
	6974-005 (Core)	10,500
	6979-001 (Other)	0
	6959-002 (Other)	39,000
	6958-003 (Other)	15,500
	6957-004 (Other)	106,084
	6982-005 (Other)	1,227
	6956-006 (Other)	152,653
	6955-007 (Other)	51,500
	6967-008 (Other)	5,000
	6954-009 (Other)	91,500
	6968-010 (Other)	2,000
	6953-011 (Other)	0
	6966-012 (Other)	51,500
	6976-013 (Other)	0
	6965-014 (Other)	10,000
	6964-015 (Other)	0
	6963-016 (Other)	130,000
	6977-017 (Other)	0
	6962-018 (Other)	0
	6961-019 (Other)	0

	6978-020 (Other)	0
	6980-001 (Project)	210,000
	6991-002 (Project)	0
TOTALS		1,926,061
R&R Budget - Section G. Total Direct Cost (A thru F)	6199-001 (Admin Core)	8,226
	6198-002 (Admin Core)	5,590
	6197-003 (Admin Core)	11,420
	6949-004 (Admin Core)	40,100
	6951-005 (Admin Core)	11,714
	6200-006 (Admin Core)	8,058
	6983-007 (Admin Core)	600,000
	6224-008 (Admin Core)	33,142
	5392-009 (Admin Core)	133,344
	6972-001 (Core)	495,397
	6973-002 (Core)	56,414
	6975-003 (Core)	21,623
	6969-004 (Core)	34,502
	6974-005 (Core)	171,633
	6979-001 (Other)	54,417
	6959-002 (Other)	335,412
	6958-003 (Other)	290,699
	6957-004 (Other)	988,516
	6982-005 (Other)	12,187
	6956-006 (Other)	1,249,348

	6955-007 (Other)	278,801
	6967-008 (Other)	83,273
	6954-009 (Other)	574,786
	6968-010 (Other)	61,355
	6953-011 (Other)	33,605
	6966-012 (Other)	290,557
	6976-013 (Other)	14,658
	6965-014 (Other)	153,911
	6964-015 (Other)	14,211
	6963-016 (Other)	205,025
	6977-017 (Other)	47,171
	6962-018 (Other)	175,394
	6961-019 (Other)	41,330
	6978-020 (Other)	41,698
	6980-001 (Project)	210,000
	6991-002 (Project)	0
TOTALS		6,787,517
R&R Budget - Section H. Indirect Costs	6199-001 (Admin Core)	3,619
	6198-002 (Admin Core)	2,460
	6197-003 (Admin Core)	5,025
	6949-004 (Admin Core)	17,644
	6951-005 (Admin Core)	5,154
	6200-006 (Admin Core)	3,546
	6983-007 (Admin Core)	0

	6224-008 (Admin Core)	14,582
	5392-009 (Admin Core)	58,672
	6972-001 (Core)	217,975
	6973-002 (Core)	24,822
	6975-003 (Core)	9,514
	6969-004 (Core)	15,181
	6974-005 (Core)	75,518
	6979-001 (Other)	23,943
	6959-002 (Other)	147,581
	6958-003 (Other)	127,908
	6957-004 (Other)	434,947
	6982-005 (Other)	5,362
	6956-006 (Other)	549,714
	6955-007 (Other)	122,672
	6967-008 (Other)	36,640
	6954-009 (Other)	252,906
	6968-010 (Other)	26,996
	6953-011 (Other)	14,786
	6966-012 (Other)	127,845
	6976-013 (Other)	6,450
	6965-014 (Other)	67,721
	6964-015 (Other)	6,253
	6963-016 (Other)	90,211
	6977-017 (Other)	20,755

	6962-018 (Other)	77,173
	6961-019 (Other)	18,185
	6978-020 (Other)	18,347
	6980-001 (Project)	92,400
	6991-002 (Project)	0
TOTALS		2,722,507
R&R Budget - Section I. Total Direct and Indirect Costs (G +H)	6199-001 (Admin Core)	11,845
	6198-002 (Admin Core)	8,050
	6197-003 (Admin Core)	16,445
	6949-004 (Admin Core)	57,744
	6951-005 (Admin Core)	16,868
	6200-006 (Admin Core)	11,604
	6983-007 (Admin Core)	600,000
	6224-008 (Admin Core)	47,724
	5392-009 (Admin Core)	192,016
	6972-001 (Core)	713,372
	6973-002 (Core)	81,236
	6975-003 (Core)	31,137
	6969-004 (Core)	49,683
	6974-005 (Core)	247,151
	6979-001 (Other)	78,360
	6959-002 (Other)	482,993
	6958-003 (Other)	418,607
	6957-004 (Other)	1,423,463

	6982-005 (Other)	17,549
	6956-006 (Other)	1,799,062
	6955-007 (Other)	401,473
	6967-008 (Other)	119,913
	6954-009 (Other)	827,692
	6968-010 (Other)	88,351
	6953-011 (Other)	48,391
	6966-012 (Other)	418,402
	6976-013 (Other)	21,108
	6965-014 (Other)	221,632
	6964-015 (Other)	20,464
	6963-016 (Other)	295,236
	6977-017 (Other)	67,926
	6962-018 (Other)	252,567
	6961-019 (Other)	59,515
	6978-020 (Other)	60,045
	6980-001 (Project)	302,400
	6991-002 (Project)	0
TOTALS		9,510,024

A. COMPONENT COVER PAGE

Project Title: Director

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RPPR - Admin Core-5392

RESEARCH & RELATED BUDGET - SECTION A & B **FINAL**

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.	Excluded by Requester					Project Lead	Institutional Base Sallary	EFFORT			91,650.00	22,546.00	114,196.00
2.	Dr	Stewart	Wright	Caughman		Principal Investigator					0.00	0.00	0.00
3.	Excluded by Requester					Associate Director, Scientific Pgms					9,165.00	2,255.00	11,420.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **125,616.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
2	Secretarial/Clerical	1.2			6,202.00	1,526.00	7,728.00
2	**Total Number Other Personnel**					**Total Other Personnel**	**7,728.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**133,344.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**133,344.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	133,344.00	58,672.00
		Total Indirect Costs	**58,672.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**192,016.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Business Services

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	0.00	0.0			0.00	0.00	0.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **0.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Executive Administrator/CFO	0.6			9,165.00	2,255.00	11,420.00
1	**Total Number Other Personnel**					**Total Other Personnel**	**11,420.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**11,420.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**11,420.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	11,420.00	5,025.00
		Total Indirect Costs	**5,025.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number) DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**16,445.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Human Resources

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	0.00	0.0			0.00	0.00	0.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: **Total Senior/Key Person** **0.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Division Director, HR	0.6			4,486.00	1,104.00	5,590.00
1	**Total Number Other Personnel**					**Total Other Personnel**	**5,590.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**5,590.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**5,590.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	5,590.00	2,460.00
		Total Indirect Costs	**2,460.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number) DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**8,050.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Information Technology

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	0.00	0.0			0.00	0.00	0.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: **Total Senior/Key Person** **0.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	IT Director	0.6			6,602.00	1,624.00	8,226.00
1	**Total Number Other Personnel**					**Total Other Personnel**	**8,226.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**8,226.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**8,226.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	8,226.00	3,619.00
		Total Indirect Costs	**3,619.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**11,845.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Public Affairs

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	0.00	0.0			0.00	0.00	0.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **0.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Senior Director, Communications	0.6			6,467.00	1,591.00	8,058.00
1	**Total Number Other Personnel**					**Total Other Personnel**	**8,058.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**8,058.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**8,058.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	8,058.00	3,546.00
		Total Indirect Costs	**3,546.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**11,604.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Shop MS

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	0.00	0.0			0.00	0.00	0.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: **Total Senior/Key Person** **0.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
5	Fabrications Staff/Coordinator	6.0			26,599.00	6,543.00	33,142.00
5	**Total Number Other Personnel**					**Total Other Personnel**	**33,142.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**33,142.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**33,142.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	33,142.00	14,582.00
		Total Indirect Costs	**14,582.00**

Cognizant Federal Agency DHHS, Steven Zuraf, (301) 492-4855
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**47,724.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Shop FS

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	0.00	0.0			0.00	0.00	0.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **0.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
6	Fabrications Staff/Coordinator			7.2	32,183.00	7,917.00	40,100.00
6	**Total Number Other Personnel**					**Total Other Personnel**	**40,100.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**40,100.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**40,100.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	40,100.00	17,644.00
		Total Indirect Costs	**17,644.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number) DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**57,744.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Transportation

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RPPR - Admin Core-6951

RESEARCH & RELATED BUDGET - SECTION A & B **FINAL**

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	0.00	0.0			0.00	0.00	0.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **0.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
3	Materials Handlers	3.6			9,401.00	2,313.00	11,714.00
3	**Total Number Other Personnel**					**Total Other Personnel**	**11,714.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**11,714.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**11,714.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	11,714.00	5,154.00
		Total Indirect Costs	**5,154.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number) DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**16,868.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Associate Director - Animal Resources

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Associate Director, Animal Resources	Institutional Base Salary	EFFORT			9,002.00	2,214.00	11,216.00
2.						Assistant Director, Animal Resources					6,790.00	1,670.00	8,460.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **19,676.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
2	Secretarial/Clerical	1.2			4,920.00	1,210.00	6,130.00
1	Training Coordinator	1.2			6,259.00	1,540.00	7,799.00
3	**Total Number Other Personnel**					**Total Other Personnel**	**13,929.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**33,605.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	**Funds Requested ($)***
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		**Funds Requested ($)***
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**33,605.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	33,605.00	14,786.00
		Total Indirect Costs	**14,786.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number) DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**48,391.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Veterinary Medicine MS

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Associate Director, Anima Resources	Institutional Base Salary	EFFORT			27,007.00	6,644.00	33,651.00
2.						Chief Veterinarian					31,306.00	7,701.00	39,007.00
3.						Clinical Veterinarian					25,542.00	6,283.00	31,825.00
4.						Clinical Veterinarian					22,830.00	5,616.00	28,446.00
5.						Clinical Veterinarian					23,691.00	5,828.00	29,519.00
6.						Clinical Veterinarian					26,987.00	6,639.00	33,626.00
7.						Clinical Veterinarian					10,987.00	2,703.00	13,690.00
8.						Clinical Veterinarian					21,061.00	5,181.00	26,242.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **236,006.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
10	Technicians	52.8			198,459.00	48,821.00	247,280.00
10	**Total Number Other Personnel**					**Total Other Personnel**	**247,280.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**483,286.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	90,000.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
8. Maintenance/Repair Costs	1,500.00
Total Other Direct Costs	**91,500.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**574,786.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	574,786.00	252,906.00
		Total Indirect Costs	**252,906.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**827,692.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Veterinary Medicine FS

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	Institutional Base Salary	EFFORT			0.00	0.00	0.00
2.						Assistant Director, Animal Resources					27,162.00	6,682.00	33,844.00
3.						Clinical Veterinarian					11,540.00	2,839.00	14,379.00
4.						Clinical Veterinarian					19,770.00	4,863.00	24,633.00
5.						Clinical Veterinarian					19,289.00	4,745.00	24,034.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **96,890.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	0.6			2,482.00	611.00	3,093.00
5	Technicians	30.0			102,181.00	25,137.00	127,318.00
6	**Total Number Other Personnel**					**Total Other Personnel**	**130,411.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**227,301.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	50,000.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
8. Maintenance/Repair	1,500.00
Total Other Direct Costs	**51,500.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**278,801.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	278,801.00	122,672.00
		Total Indirect Costs	**122,672.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**401,473.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Animal Care MS

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	0.00	0.0			0.00	0.00	0.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **0.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	0.6			1,976.00	486.00	2,462.00
54	Animal Care Operations Personnel	51.7			878,196.00	216,037.00	1,094,233.00
55	**Total Number Other Personnel**					**Total Other Personnel**	**1,096,695.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**1,096,695.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	152,653.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**152,653.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**1,249,348.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	1,249,348.00	549,714.00
		Total Indirect Costs	**549,714.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**1,799,062.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Animal Care FS

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	0.00	0.0			0.00	0.00	0.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **0.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	0.6			2,384.00	586.00	2,970.00
42	Animal care operations personnel	244.8			705,829.00	173,633.00	879,462.00
43	**Total Number Other Personnel**					**Total Other Personnel**	**882,432.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**882,432.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	106,084.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**106,084.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**988,516.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	998,516.00	434,947.00
		Total Indirect Costs	**434,947.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**1,423,463.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Colony Management

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	Institutional Base Salary	EFFORT			0.00	0.00	0.00
2.						Colony Director					17,510.00	4,307.00	21,817.00
3.						Geneticist					4,491.00	1,105.00	5,596.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **27,413.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
11	Colony Management Technicians	58.8			198,865.00	48,921.00	247,786.00
11	**Total Number Other Personnel**					**Total Other Personnel**	**247,786.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**275,199.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	14,000.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
8. Laboratory Services	1,500.00
Total Other Direct Costs	**15,500.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**290,699.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	290,699.00	127,908.00
		Total Indirect Costs	**127,908.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**418,607.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Behavioral Management

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	Institutional Base Salary	EFFORT			0.00	0.00	0.00
2.						Behavioral Management Unit Head					25,037.00	6,159.00	31,196.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **31,196.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
10	Behavioral Management Technicians	56.4			212,854.00	52,362.00	265,216.00
10	**Total Number Other Personnel**					**Total Other Personnel**	**265,216.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**296,412.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	39,000.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**39,000.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**335,412.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	335,412.00	147,581.00
		Total Indirect Costs	**147,581.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**482,993.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Animal Records

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	0.00	0.0			0.00	0.00	0.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: **Total Senior/Key Person** **0.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
4	Animal Records Staff	9.6			33,170.00	8,160.00	41,330.00
4	**Total Number Other Personnel**					**Total Other Personnel**	**41,330.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**41,330.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**41,330.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	41,330.00	18,185.00
		Total Indirect Costs	**18,185.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number) DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**59,515.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Research Services

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	0.00	0.0			0.00	0.00	0.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **0.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
8	Research Services Technicians	37.2			140,766.00	34,628.00	175,394.00
8	**Total Number Other Personnel**					**Total Other Personnel**	**175,394.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**175,394.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**175,394.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	175,394.00	77,173.00
		Total Indirect Costs	**77,173.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**252,567.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Health and Safety
Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	0.00	0.0			0.00	0.0 0	0.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **0.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	0.6			2,744.00	675.00	3,419.00
4	Safety Office Personnel	9.6			57,468.00	14,138.00	71,606.00
5	**Total Number Other Personnel**					**Total Other Personnel**	**75,025.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**75,025.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	**Funds Requested ($)***
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		**Funds Requested ($)***
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	130,000.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**130,000.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**205,025.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	205,025.00	90,211.00
		Total Indirect Costs	**90,211.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number) DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**295,236.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Associate Director - Pathology

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Associate Director, Pathology (Interim)	Institutional Base Salary	EFFORT			5,941.00	1,461.00	7,402.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **7,402.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
2	Secretarial/Clerical	1.2			5,465.00	1,344.00	6,809.00
2	**Total Number Other Personnel**					**Total Other Personnel**	**6,809.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**14,211.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**14,211.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	14,211.00	6,253.00
		Total Indirect Costs	**6,253.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**20,464.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Anatomic Pathology

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Associate Director, Pathology (Interim)	Institutional Base Salary	EFFORT			17,824.00	4,385.00	22,209.00
2.						Pathologist					16,008.00	3,938.00	19,946.00
3.						Pathologist					10,716.00	2,636.00	13,352.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **55,507.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
3	Technicians	18.0			70,950.00	17,454.00	88,404.00
3	**Total Number Other Personnel**					**Total Other Personnel**	**88,404.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**143,911.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	10,000.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**10,000.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**153,911.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	153,911.00	67,721.00
		Total Indirect Costs	**67,721.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number) DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**221,632.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Clinical Pathology

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Associate Director, Pathology (Interim)	Institutional Base Salary	EFFORT			5,941.00	1,461.00	7,402.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **7,402.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
8	Technicians	44.4			185,919.00	45,736.00	231,655.00
8	**Total Number Other Personnel**					**Total Other Personnel**	**231,655.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**239,057.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	50,000.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
8. Maintenance/Repair	1,500.00
Total Other Direct Costs	**51,500.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**290,557.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	290,557.00	127,845.00
		Total Indirect Costs	**127,845.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**418,402.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Histology

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	Institutional Base Salary	EFFORT			0.00	0.00	0.00
2.						Pathologist					5,358.00	1,318.00	6,676.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **6,676.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
2	Technicians	12.0			57,461.00	14,136.00	71,597.00
2	**Total Number Other Personnel**					**Total Other Personnel**	**71,597.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**78,273.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	**Funds Requested ($)***
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		**Funds Requested ($)***
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	5,000.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**5,000.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**83,273.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	83,273.00	36,640.00
		Total Indirect Costs	**36,640.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**119,913.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Molecular Pathology

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	Institutional Base Salary	EFFORT			0.00	0.00	0.00
2.						Pathologist					5,336.00	1,313.00	6,649.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **6,649.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
2	Technicians	12.0			42,300.00	10,406.00	52,706.00
2	**Total Number Other Personnel**					**Total Other Personnel**	**52,706.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**59,355.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	2,000.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**2,000.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**61,355.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	61,355.00	26,996.00
		Total Indirect Costs	**26,996.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number) DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**88,351.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Biomarkers Core

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Core Director	Institutional Base Sala	EFFORT			4,491.00	1,105.00	5,596.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **5,596.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
2	Technicians	4.8			20,390.00	5,016.00	25,406.00
2	**Total Number Other Personnel**					**Total Other Personnel**	**25,406.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**31,002.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	2,000.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
8. Maintenance/Repair	1,500.00
Total Other Direct Costs	**3,500.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**34,502.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	34,502.00	15,181.00
		Total Indirect Costs	**15,181.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number) DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**49,683.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Comparative AIDS Core

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Core Co-Director	Institutional Base Salary	EFFORT			9,165.00	2,255.00	11,420.00
2.						Core Co-Director					8,863.00	2,180.00	11,043.00
3.						Core Co-Director					9,002.00	2,214.00	11,216.00
4.						Clinical Veterinarian					6,790.00	1,670.00	8,460.00
5.						Geneticist					4,491.00	1,105.00	5,596.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **47,735.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Technician	1.2			6,874.00	1,691.00	8,565.00
1	**Total Number Other Personnel**					**Total Other Personnel**	**8,565.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**56,300.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	74,743.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
8. Animal Per Diem	330,158.00
9. Laboratory Services	34,196.00
Total Other Direct Costs	**439,097.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**495,397.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	495,397.00	217,975.00
		Total Indirect Costs	**217,975.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**713,372.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Genomics Core

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Core Co-Director	Institutional Base Salary	EFFORT			4,491.00	1,105.00	5,596.00
2.						Core Co-Director					3,579.00	880.00	4,459.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **10,055.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
3	Genomics Core Staff	7.2			34,398.00	8,461.00	42,859.00
3	**Total Number Other Personnel**					**Total Other Personnel**	**42,859.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**52,914.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	2,000.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
8. Maintenance/Repair	1,500.00
Total Other Direct Costs	**3,500.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**56,414.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	56,414.00	24,822.00
		Total Indirect Costs	**24,822.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**81,236.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Imaging Core

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Core Director	Institutional Base Salary	EFFORT			5,499.00	1,353.00	6,852.00
2.						Core Assistan Director					7,292.00	1,794.00	9,086.00
3.						Clinical Veterinarian					16,482.00	4,056.00	20,538.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **36,476.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	1.8			9,801.00	2,412.00	12,213.00
9	Technicians	21.6			90,244.00	22,200.00	112,444.00
10	**Total Number Other Personnel**					**Total Other Personnel**	**124,657.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**161,133.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	6,000.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
8. Maintenance/Repair	4,500.00
Total Other Direct Costs	**10,500.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**171,633.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	171,633.00	75,518.00
		Total Indirect Costs	**75,518.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**247,151.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Virology Core

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RPPR - Core-6975

RESEARCH & RELATED BUDGET - SECTION A & B **FINAL**

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Core Director	Institutional Base Salary	EFFORT			3,215.00	791.00	4,006.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **4,006.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Technician	2.4			11,330.00	2,787.00	14,117.00
1	**Total Number Other Personnel**					**Total Other Personnel**	**14,117.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**18,123.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	2,000.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
8. Maintenance/Repair	1,500.00
Total Other Direct Costs	**3,500.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**21,623.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	21,623.00	9,514.00
		Total Indirect Costs	**9,514.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**31,137.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Division of Behavioral Neuroscience and Psychiatric Disorders

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Division Chief	Institutional Base Sallary	EFFORT			9,165.00	2,255.00	11,420.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **11,420.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	0.6			2,599.00	639.00	3,238.00
1	**Total Number Other Personnel**					**Total Other Personnel**	**3,238.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**14,658.00**

RESEARCH & RELATED Budget (A-B) (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**14,658.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	14,658.00	6,450.00
		Total Indirect Costs	**6,450.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**21,108.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Division of Developmental and Cognitive Neuroscience

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Division Chief	Institutional Base Salary	EFFORT			9,165.00	2,255.00	11,420.00
2.						Core Scientist					8,891.00	2,187.00	11,078.00
3.						Core Scientist					9,165.00	2,255.00	11,420.00
4.						Core Scientist					8,473.00	2,084.00	10,557.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **44,475.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	0.6			2,164.00	532.00	2,696.00
1	**Total Number Other Personnel**					**Total Other Personnel**	**2,696.00**

Total Salary, Wages and Fringe Benefits (A+B) **47,171.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**47,171.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	47,171.00	20,755.00
		Total Indirect Costs	**20,755.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**67,926.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Division of Microbiology and Immunology

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Division Chief	Institutional Base Salary	EFFORT			9,165.00	2,255.00	11,420.00
2.						Core Scientist					9,013.00	2,217.00	11,230.00
3.						Core Scientist					5,911.00	1,454.00	7,365.00
4.						Core Scientist					6,180.00	1,520.00	7,700.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **37,715.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	0.6			3,197.00	786.00	3,983.00
1	**Total Number Other Personnel**					**Total Other Personnel**	**3,983.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**41,698.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**41,698.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	41,698.00	18,347.00
		Total Indirect Costs	**18,347.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number) DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**60,045.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Division of Neuropharmacology and Neurologic Diseases

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Division Chief	Institutional Base Salary	EFFORT			3,666.00	902.00	4,568.00
2.						Core Scientist					6,722.00	1,654.00	8,376.00
3.						Core Scientist					5,904.00	1,452.00	7,356.00
4.						Core Scientist					8,775.00	2,159.00	10,934.00
5.						Core Scientist					7,108.00	1,749.00	8,857.00
6.						Core Scientist					9,165.00	2,255.00	11,420.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **51,511.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
1	Secretarial/Clerical	0.6			2,332.00	574.00	2,906.00
1	**Total Number Other Personnel**					**Total Other Personnel**	**2,906.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**54,417.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	**Funds Requested ($)***
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		**Funds Requested ($)***
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**54,417.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	54,417.00	23,943.00
		Total Indirect Costs	**23,943.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number) DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**78,360.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Pilot Projects

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_6980 Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

Pilot Projects—Accomplishments

Pilot Project 1: Development and Validation of a Primate Model of Selective Modulation of Neurobiological Functions using Designer Receptors Exclusively Activated by Designer Drugs (DREADDs)
Pilot Project 1 PI: Excluded by Requester

Accomplishments:
Given the departure one of the Principal Investigators Excluded by Requester from YNPRC mid-way through the pilot grant, we opted to downsize the scope of the proposed project and focused on testing the efficacy of the DREADDs on one monkey. This study is still on going. After screening a large number of adult animals currently available in our laboratory, we identified one female monkey that responded negatively to possible AAV5 antibodies. Emotional reactivity was tested in this animal using the Human Intruder task, a reliable behavioral task to assess how monkeys modulate their emotional reactivity to different levels of threats in their environment. We then infused a Gi-coupled DREADD built off of M4 muscarinic cholinergic receptors (hM4Di) using a tet-inducible Adeno-associated virus (AAV). This tet-inducible virus permanently activates the promoter for the hM4Di such that this DREADD is continuously expressed. During the surgery, the animal was infused with 1 µl of the virus was infused bilaterally into the amygdala, a neural structure known to mediate emotion regulation. After 1 month of recovery, the animal was first re-tested in the HI task to ensure that the infusion of the DREADDs by itself had no impact on emotional reactivity of this animal. The next step, planned in the next month, is to activate the viral vector and test its efficacy on the behavior of the animal.

Pilot Project 2: Immune signatures of SIV-induced reactivation of tuberculosis reactivation in nonhuman primates
Pilot Project 2 PI Excluded by Requester

Accomplishments
We characterized Mtb-specific T cells in LTBI and active TB (after co-infection with SIV) to understand the immune profile of immune control and reactivation TB. Pending Support Pending Support

1. Immunophenotyping of Mtb-specific memory CD4 and CD8 T cells from latently infected NHP or NHP with active TB was carried out using PBMC stimulated with Mtb CW antigens, ESAT6/CFP10 peptide pools or SEB and using IFN-γ producing cells as markers for antigen-specific T cells. Mtb-specific CD4 and CD8 T cells in LTBI were both positive for CD28 and CD95 and were polyfunctional with respect to cytokine production. This is similar to studies in human LTBI. Interestingly Mtb-specific T cells also expressed IL-17. In contrast, Mtb specific T cells from NHP progressing to active TB (post-SIV) had reduced frequencies of polyfunctional T cells, low levels of IL-17 and IL-2 and higher levels of CD38 and HLA-DR.
2. We found that the frequencies and phenotypes of CD4 T cells in Mtb-infected NHP differ significantly between peripheral and lung mucosal compartments. We found increased frequencies of $CD69^+$ and $LAG3^+$ (Lymphocyte activating gene-3) CD4 T cells in the BAL and lung compartments of Mtb-infected NHP that are not detected in the blood. Expression of LAG3 has been implicated in negative regulation of T cell proliferation and homeostasis, suggesting that Mtb-specific T cells in the lung have compromised functions not apparent from studying blood-derived T cells alone.
3. Recent studies show that HIV and SIV induce Indoleamine 2,3 dioxygenase (IDO) in macrophages and dendritic cells, which leads to increased tryptophan catabolism, depletion of Th_{17} subsets and expansion of T_{REGS}, the loss of Th_{17}/T_{REG} balance promotes subsequent disease progression. These defects are reversed in vitro by the IDO-inhibitor 1-MT. Interestingly, we found that Mtb also induces IDO within lung granulomas in NHP with active TB (post SIV) but not LTBI. We propose to further study this and test the hypothesis that SIV triggers IDO-dependent defects in T cell functions which breaks down immune control of LTBI and leads to increased Mtb replication which in turn induced more IDO and induces further dysfunction.

Pilot Project 3: Basal Ganglia Modulation of Cortico-Thalamic Interactions
Pilot Project 3 PI: Excluded by Requester MD; Excluded by Requester PhD

Accomplishments:

In the course of these studies, two Rhesus monkeys were acquired from the Yerkes breeding colony and trained to permit handling by experimenters. During a surgical procedure under isoflurane anesthesia, they were then implanted with recording chambers to give us chronic access to motor cortices and thalamus. We then injected the M1 and SMA with 30□l of AAV5-CamKII-C1V1 (E122T/E162T)-EYFP in one hemisphere and AAV5-CamKII-hChR2 (H134R)-EYFP in the other hemisphere. Six weeks later, we began a series of experiments in which an optrode (consisting of a 0.2 mm OD optical fiber, glued to a tungsten electrodes) was repeatedly introduced into M1, SMA or the VLa to light-activate opsin-expressing neurons (in cortex) or their terminals (in thalamus), while simultaneously recording the extracellular activity of neurons in the vicinity of the stimulation site. Each animal was studied for about 4 months in this state.

We found that 90/150 (60%) of cortical neurons and 80/200 (40%) of thalamic neurons responded to the nearby optical stimulation in the ChR2 and C1V1 transfected hemispheres (in two monkeys). For both opsins, the responses of cortical neurons to 20ms light pulses were, in most cases, short-latency increases in firing rates (Fig. 1, top panel). However, the responses of thalamic neurons to light stimulation of C1V1 or ChR2-expressing cortical terminals were more variable, with many neurons showing decreases (Fig. 1, bottom panel), or combinations of increases and decreases of firing. Thalamic responses were most strongly elicited with long (500ms) light pulses.

The prolonged time to respond, and the fact that stimulation of the (excitatory) opsins lead to inhibitory effects in some thalamic neurons, suggest that at least some of the physiological effects of cortical terminals stimulation could be mediated through activation of polysynaptic circuits. These circuits may include local GABAergic interneurons in the thalamus, or (antidromically activated) GABAergic reticular thalamus inputs.

In post-mortem studies, we subsequently used immunohistochemical methods to confirm the expression of the opsins on the cortical targets, and along the cortico-thalamic targets. Large areas of M1 and SMA expressed the opsins on cell bodies and dendrites. We also found the opsin expression on cortical terminals in motor-related thalamic nuclei and in the reticular thalamus. We are currently conducting high-resolution electron microscopy studies on this material to define the postsynaptic targets of the cortico-thalamic afferents. The anatomical data will help us to interpret the results we obtained in the functional studies with the light stimulation.

Due to time constraints we were not able to bring the studies under aim 2 to completion. However, these studies will be done as a central component of the upcoming Udall Center project.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
Total Funds Requested for all Senior Key Persons in the attached file												
Additional Senior Key Persons:		File Name:								**Total Senior/Key Person**		

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
0	**Total Number Other Personnel**					**Total Other Personnel**	0.00
						Total Salary, Wages and Fringe Benefits (A+B)	0.00

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
8. Three Pilot Projects ($70,000 each) to be awarded	210,000.00
Total Other Direct Costs	**210,000.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**210,000.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	210,000.00	92,400.00
		Total Indirect Costs	**92,400.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**302,400.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Consortium

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	0.00	0.0			0.00	0.00	0.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **0.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
0	**Total Number Other Personnel**					**Total Other Personnel**	**0.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**0.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	10,960.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**10,960.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
8. Outreach Activities	1,227.00
Total Other Direct Costs	**1,227.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**12,187.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	12,187.00	5,362.00
		Total Indirect Costs	**5,362.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**17,549.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: Improvement and Modernization
Component Project Lead Information:
Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_c Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

Please see the overall component for response.

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

Accomplishments

Please see the overall component for response.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	0.00	0.0			0.00	0.00	0.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name: **Total Senior/Key Person** **0.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
0	**Total Number Other Personnel**					**Total Other Personnel**	**0.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**0.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	600,000.00
Total Other Direct Costs	**600,000.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**600,000.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	0.00	0.00
		Total Indirect Costs	**0.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number): DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**600,000.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name: Budget Justification.pdf
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)

Budget Justification

There is no significant change in budget from previously recommended levels.

A. COMPONENT COVER PAGE

Project Title: RRRP-Bloomsmith

Component Project Lead Information:

Excluded by Requester

B. COMPONENT ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

Please see the overall component for response.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

File uploaded: B2_6991 Accomplishments.pdf

B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

Not Applicable

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

File uploaded: B4_c Training.pdf

B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

Please see the overall component for response.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

During the final year of the base grant period, we will apply the findings from the RRRP to improve the care and well-being of the Yerkes mangabey colony. The findings from the study of environmental enrichment will be applied to enhancing the enrichment program for all of the run-housed mangabeys, emphasizing the use of substrate, visual barriers and climbing structures as they were found to be effective in increasing species-typical behaviors. Results from the study of housing will help to determine the number of animals per group that can live in the existing housing without eliciting aggression increases, and the results also indicate elements of the housing (visual barriers and indoor/outdoor access) that are beneficial for sooty mangabeys. The study of animal training methods will also be applied by using the training methods that are determined to be the most effective at increasing cooperation and reducing stress as mangabeys are taught to cooperate with receiving an injection of anesthesia. This training will facilitate research procedures with the mangabeys.

Accomplishments—RRRP

Assessing Behavioral Management Techniques for Sooty Mangabeys to Maximize Their Research Value

Accomplishments

Study 1 – Effects of Enrichment on Agonism: The goal of Study 1 was to increase the time mangabeys devote to noncompetitive feeding and foraging, to offer more opportunities for arboreal locomotion and for privacy and escape routes, and to reduce agonism. We predicted that when additional enrichment is offered, time devoted to feeding, foraging, and arboreal locomotion will increase, while time devoted to threats, contact aggression, and wounding will decrease compared to baseline periods.

We created an enhanced enrichment program, including the addition of hay as a substrate on the floor, additional structures on which to climb and use for visual privacy, a rotating schedule of foraging devices requiring manipulation and processing time, paper destructibles, edible forage distributed in the hay, and a diversified menu of fresh produce. We recorded the activity and behavior of 54 run-housed mangabeys in 10 groups under both the enhanced and baseline enrichment schedules (324 hours of data collected). Compared to the baseline conditions, locomotion, autogrooming, affiliative, and aggressive behavior all declined during the enhanced enrichment condition, as measured by Paired t-tests; $p \leq .006$; marginally for aggression, $p \leq 0.021$). The enrichment had a beneficial impact on aggression levels, and effectively increased species-typical behaviors, as their foraging and manipulation of items and devices doubled during the enhanced enrichment condition, changing from about 10-20 times per hour to 50-60 times per hour, and from six to 12 minutes per hour (a significant increase; $p < .001$). However, the enhanced enrichment schedule did not increase the mangabeys' locomotor activity, as expected. We found the edible forage distributed in the substrate and the rotation of challenging foraging devices occupied the largest portions of the mangabeys' time.

Application of Findings: Overall, the enhanced enrichment schedule improved the mangabeys' behavioral profile. This study led to long-term changes at the Yerkes Field Station, including the addition of privacy walls, spinning poles, toys and perches made from manzanita wood to run-housing in both mangabey and macaque enclosures. We are currently addressing the difficulties in adding hay on a regular basis to work toward widespread implementation. We are currently preparing a

In Preparation

Study 2 – Effects of Enclosure Size on Agonism: The goals of Study 2 were to determine 1) the effects of reducing available space to groups in run-housing and 2) how the physical features of the space affected behavior, with the ultimate purpose of 3) scientifically informing management staff of the holding capacity of the run-housing areas and what features of the physical space contribute to lower levels of aggression. We predicted that contact aggression and wounding would occur at greater frequencies when available space was restricted and in the older style run-housing, as it has smaller individual runs than the newer style.

We recorded mangabey behavior across housing conditions that varied in the amount of available space or in the physical features of the space. In study 2a, 26 run-housed mangabeys experienced a reduction in available space by 50% while remaining in the same run-housing area; in study 2b, 12 mangabeys experienced a move between the two housing areas, which varied in the size of individual runs, the degree of visual privacy, and the choice to move indoors or outdoors. Data were collected in seven groups (including both studies, two of which participated in both), with a total of 360 hours of data. Results of Wilcoxon signed-rank statistical tests showed that agonistic behavior was unchanged by housing condition and remained relatively low for the duration of the studies. However affiliative

behavior increased when space was restricted (p = 0.046) and when living in the newer run-housing style with less visual privacy and no outdoor access (p = 0.041), an effect driven by high- and mid-ranking males and females. This study showed that welfare was not significantly compromised by reducing the groups' space to 50% of their original area, nor was it affected when mangabeys were moved between the run-housing areas. In fact, the mangabeys adapted to possible increases in social tension created by these conditions by increasing friendly behavior, as opposed to fighting, as has been found in a variety of primate species and referred to as a tension-reduction coping strategy Excluded by Requester 1989).

Application of findings: This study demonstrated that both run-housing areas at Yerkes are adequate and that long-term reductions of available space as the colony grows in numbers are unlikely to result in an increase in aggression or social wounding. This is important information to have learned because the first generation of infants post-breeding reinstatement are currently reaching sexual maturity and management staff are moving a majority of male and female juveniles to run-housing. Also informative as the colony grows in size, it appears that visual privacy and choice to go inside or outside may be qualities of the housing environment that reduce social tension in mangabeys, and these features should be considered when new enclosures are designed or when other housing is renovated A

In Press

Study 3 – Group Structure Effects on Agonism: The goal of Study 3 was to determine whether particular group sizes and compositions are associated with lower rates of aggression and wounding upon initial introduction and in the long-term maintenance of these groups. Because captive sooty mangabeys more similar in age/sex class may be more likely to fight than mangabeys that are further apart in age Excluded by Requester 1971; 1976), we predicted that new groups formed from similarly-aged and/or same-sex individuals would engage in more aggression and wounding than groups with a more natural group composition (e.g., those with a more diverse age- and sex-composition).

We monitored all new group formations in run-housing and recorded behavior in 10 groups (1000 hours of data collected); the groups varied in size (N=3-7 subjects). We collected data during initial group formation and for six months thereafter to assess the relative success of each group formation (success measured in terms of their level of aggression and the long-term retention of all group members). All but two groups were mixed-sex; five groups were comprised of all adults and five were comprised of adults with at least one juvenile or infant. Nine groups were successful in that they remained intact through initial group formation with little aggression and all group members remained in the groups through the six-month observation period. The tenth group was successful until the last week of data collection – one adult female was removed from this group due to severe aggression directed toward her from two juvenile females. Young juvenile female mangabeys often climb the social hierarchy and direct aggression toward adults as they do so Excluded by Requester 1994).

Application of Findings: Since data collection for this study recently concluded with four of the 10 groups, we plan to assess group composition-related predictors of the frequency of aggression and wounding using multiple linear regression analysis. A manuscript detailing the results of this study will be prepared. Results will be used to inform management staff regarding the ideal group sizes and compositions for reducing aggression and promoting long-term group stability in run-housed mangabeys.

Study 4 – Breeding Strategies for Sooty Mangabeys: The initial purpose of Study 4 was: 1) to determine whether changes in social interactions across the menstrual cycle occur independently of removals and returns to the group and 2) to verify that copulation occurs during pair breeding and results in pregnancy. We predicted that females would engage in increased aggression and sexual behavior during the ovulatory phase compared to other phases of the menstrual cycle independent of pair breeding and that she would face additional aggression upon her return from pair breeding (we planned to discontinue the strategy if aggression was frequent or severe). We also predicted that

copulation would occur between the female and extra-group male during pair breeding and would result in pregnancy.

To address the first goal, we recorded affiliative, agonistic, and sexual interactions of 20 compound-housed adult female sooty mangabeys across at least one menstrual cycle, which can be visually tracked because mangabeys have external perineal swellings that vary in size and turgidity across a 28-day cycle [redacted] 1981). We collected 646 hours of behavioral data. However, over the course of the grant period, the pair breeding management strategy was rarely utilized (only once among our subjects). We documented the single pair breeding event and recorded the female's social interactions following her return to the compound. Due to the lack of implementation of the pair breeding, we reoriented Study 4's focus to evaluating female mangabey behavior across the menstrual cycle. Following data collection, we categorized each subject's observation sessions as occurring during the follicular (pre-ovulatory), ovulatory, and luteal (post-ovulatory) phases of the menstrual cycle to determine whether subjects displayed significant behavioral changes across their cycle. The compound-housed mangabeys engaged in aggression relatively infrequently and, unexpectedly, hourly rates of female aggression did not change significantly across the menstrual cycle. However, as expected, the rate of sexual behavior was significantly higher in the ovulatory phase compared to the other phases of the menstrual cycle ($p = 0.012$).

Excluded by Requester

Applications of findings: This study demonstrated that, should pair-breeding be resumed in the future, we should not expect female mangabeys living in the compound to engage in greater levels of aggression when ovulating, and any increase in aggression upon a female's return from pair-breeding should be monitored closely, as it would not be a normal feature of her behavior during that phase of her cycle. During the one case of pair breeding we evaluated, the female copulated with the extra-group male 20 times but did not become pregnant. Obviously, further research is needed to determine the safety and effectiveness of pair breeding; however, since the pair breeding strategy was not frequently implemented and there are no plans to resume it, we are instead looking into the details of female mangabey behavior across the menstrual cycle, including differences in interactions with females and males in each cycle phase and how other variables, such as individual dominance rank, interact with cycle phase to affect behavior. In Preparation

Study 5 – Applying Animal Training Techniques for Sooty Mangabeys: The purpose of Study 5 was to train mangabeys to present a limb for injection of a sedative, after which blood would be collected. Blood collection is the most common research procedure in which they are involved. We predicted that using PRT to facilitate blood sample collection from mangabeys will reduce behavioral and physiological measures of stress compared to the traditional method of accessing mangabeys and collecting blood. Study 5 is currently ongoing (we began data collection in July 2014) with 15 subjects). We plan to compare behavior and cortisol levels during a traditional access, which involves the use of NRT to coerce animals into receiving an injection of ketamine, and a trained access, in which subjects are trained using PRT to voluntarily present a limb for ketamine injection. We are recording anxiety-related behavior (e.g., fear grimace, yawning), aggression and responsiveness during training sessions, during each type of access. We will also assay serum cortisol from blood samples as an additional measure of stress in each type of access. Blood samples from the traditional (NRT) accesses are currently being analyzed in the Biomarkers Core. Positive reinforcement training with all 15 subjects is currently ongoing with promising results, thus far.

Application of findings: Study 5 has great potential for improving the management and welfare of mangabeys. The training regimen will also serve as a proof of concept, as mangabeys have never been trained to voluntarily present a limb for injection at Yerkes. Training with the PRT method is expected to be associated with reduced stress (by behavior and cortisol measures) as has been found with other species. Successfully training these monkeys to voluntarily present a limb for injection will also reduce the time required from colony management staff to obtain blood samples, making their jobs more efficient. Even if there is not a significant reduction in cortisol between the two types of accesses, reducing the handling time for the monkey will reduce the time in which he is potentially experiencing

distress. We have the opportunity to improve the efficiency of blood collection, reduce stress for the mangabeys that are routinely handled for blood collection, and provide a new training procedure so that additional mangabeys can be trained for research and medical procedures.

Additional study – Abnormal Behavior in Captive Sooty Mangabeys: Since the pair breeding management strategy that was to be studied in Study 4 was not fully implemented, we directed some of our effort to another important issue regarding abnormal behavior in mangabeys, which we observed in a small portion of the mangabeys living at the Field Station. We compiled information on the subset of the Yerkes mangabey colony that lives in indoor caging at the Main Center to better understand influences on the development and expression of abnormal behavior. Some of these mangabeys exhibit atypical behaviors, such as pacing and/or self-injury, and these behaviors are indicative of compromised welfare ([redacted] 1991). Because research shows that abnormal behaviors are very difficult to eradicate with enrichment and training ([redacted] 1998), it is important to prevent them from developing in the first place. As a first step, we sought to determine the factors that contribute to the development of abnormal behavior, including sex, the percent of lifetime spent in single-housing, rearing history, the average number of yearly sedations for research purposes, and the average number of yearly room relocations. For 46 singly-housed mangabeys, we analyzed historical records of behavioral assessments documenting self-injurious behavior (e.g., self-biting), self-directed behavior (non-injurious behaviors directed at one's own body), stereotypic locomotion (e.g., pacing), and feces- or urine-related behavior (e.g., feces-smearing). Each subject had been observed three times per week over a five-year period with an average of 96 hours per subject. We discovered that 83% of singly-housed mangabeys displayed at least one form of abnormal behavior and that stereotypic locomotion was the most common form, observed in 59% of subjects and during 3% of all observations. Self-injurious behavior was the least common form of abnormal behavior, displayed by 20% of subjects and during 0.1% of all observation sessions. Longer durations spent in single-housing and nursery-rearing both contributed to the development of abnormal behavior. Specifically, those that expressed abnormal behavior had spent, on average, 61% of their life in single-housing compared to 35% for those that never expressed abnormal behavior (Mann Whitney U test, $p = 0.008$). Furthermore, a higher proportion of subjects that were nursery-reared expressed self-injurious and self-directed behaviors (Fisher's exact tests: $p < 0.001$ and $p = 0.03$, respectively). Subjects that expressed self-injurious behavior were 9.4 times more likely to have been nursery-reared. The number of yearly sedations and room relocations did not influence the expression of abnormal behavior. In addition, female mangabeys in single-housing were more likely to display abnormal behavior than males ($p = 0.04$) and were 2.4 times more likely to display self-injurious behavior than males. When we compared the forms of abnormal behavior that were displayed by nursery-reared mangabeys living in single-housing compared with nursery-reared individuals that later lived in social-housing at the Field Station, we found that stereotypic locomotion and feces/urine-related were more commonly displayed by the singly-housed subjects, and that self-injurious and self-directed behaviors were equally likely to be displayed by both populations. These data indicate that nursery-rearing of mangabeys leads to alterations in physiology and behavior that can result in reduced welfare in the long-run, regardless of later social housing circumstance. This project was published in the journal *Animal Welfare*.

Excluded by Requester
Excluded by Requester

Application of findings: From this study, we made the recommendation that all facilities minimize nursery-rearing and the duration of single-housing for research purposes whenever feasible and avoid both, if possible. At Yerkes, colony management staff have made a concerted effort to reduce nursery-rearing by pairing abandoned infants with foster mothers and even relocating the pair, in some cases, to a social group comprised of other mother-infant pairs. In addition, any infants that cannot be fostered are placed in a peer-rearing situations. These techniques will help to prevent the development of abnormal behavior in the Yerkes mangabeys.

Training and Professional Development Opportunities

Please see the overall component for response.

C. COMPONENT PRODUCTS

C.1 PUBLICATIONS

Not Applicable

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Not Applicable

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Not Applicable

C.5 OTHER PRODUCTS AND RESOURCE SHARING

C.5.a Other products

NOTHING TO REPORT

C.5.b Resource sharing

File uploaded: C5b_c Resource Sharing.pdf

Resource Sharing

Please see the overall component for response.

D. COMPONENT PARTICIPANTS

Not Applicable

E. COMPONENT IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES?

Not Applicable

E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE?

Not Applicable

E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER?

NOTHING TO REPORT

E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)?

Not Applicable

F. COMPONENT CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. COMPONENT SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

Not Applicable

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Not Applicable

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Not Applicable

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Not Applicable

G.8 PROJECT/PERFORMANCE SITES

Not Applicable

G.9 FOREIGN COMPONENT

Not Applicable

G.10 ESTIMATED UNOBLIGATED BALANCE

Not Applicable

G.11 PROGRAM INCOME

Not Applicable

G.12 F&A COSTS

Not Applicable

RESEARCH & RELATED BUDGET - SECTION A & B FINAL

ORGANIZATIONAL DUNS*: 066469933

Budget Type*: ● Project ○ Subaward/Consortium

Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

A. Senior/Key Person

	Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary ($)	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits ($)*	Funds Requested ($)*
1.		Excluded by Requester				Project Lead	0.00	0.0			0.00	0.00	0.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons: File Name:

Total Senior/Key Person **0.00**

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary ($)*	Fringe Benefits*	Funds Requested ($)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
0	**Total Number Other Personnel**					**Total Other Personnel**	**0.00**
						Total Salary, Wages and Fringe Benefits (A+B)	**0.00**

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

C. Equipment Description	
List items and dollar amount for each item exceeding $5,000	
Equipment Item	**Funds Requested ($)***
Total funds requested for all equipment listed in the attached file	**0.00**
Total Equipment	**0.00**

Additional Equipment: File Name:

D. Travel	Funds Requested ($)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	0.00
2. Foreign Travel Costs	0.00
Total Travel Cost	**0.00**

E. Participant/Trainee Support Costs		Funds Requested ($)*
1. Tuition/Fees/Health Insurance		0.00
2. Stipends		0.00
3. Travel		0.00
4. Subsistence		0.00
5. Other:		
0 Number of Participants/Trainees	**Total Participant Trainee Support Costs**	**0.00**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K

ORGANIZATIONAL DUNS*: 066469933
Budget Type*: ● Project ● Subaward/Consortium
Enter name of Organization: EMORY UNIVERSITY

Start Date*: 05-01-2015 **End Date*:** 04-30-2016

F. Other Direct Costs	Funds Requested ($)*
1. Materials and Supplies	0.00
2. Publication Costs	0.00
3. Consultant Services	0.00
4. ADP/Computer Services	0.00
5. Subawards/Consortium/Contractual Costs	0.00
6. Equipment or Facility Rental/User Fees	0.00
7. Alterations and Renovations	0.00
Total Other Direct Costs	**0.00**

G. Direct Costs	Funds Requested ($)*
Total Direct Costs (A thru F)	**0.00**

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base ($)	Funds Requested ($)*
1. MTDC	44.0	0.00	0.00
		Total Indirect Costs	**0.00**

Cognizant Federal Agency (Agency Name, POC Name, and POC Phone Number) DHHS, Steven Zuraf, (301) 492-4855

I. Total Direct and Indirect Costs	Funds Requested ($)*
Total Direct and Indirect Institutional Costs (G + H)	**0.00**

J. Fee	Funds Requested ($)*
	0.00

K. Budget Justification* File Name:
(Only attach one file.)

RESEARCH & RELATED Budget {F-K} (Funds Requested)