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Summary of IACUC Approved Exceptions as Explained by the Principal Investigator: Because of the nature of research on biological rhythms, animals must often be maintained in carefully controlled (often constant) conditions with minimal disruption (Bittman et al., 2013). Housing animals under conditions quite different from the typical animal housing environments (such as in LL, which is continuous light) is necessary to understand critical processes related to biological timing (Bittman et al., 2013). Continuous light may cause distress in the animals. The alternative to housing animals in LL is surgical removal of the pineal gland (pinealectomy) as both processes reduce melatonin production, but pinealectomy is a major surgical procedure and likely would cause greater pain and distress (and increase mortality) than housing animals in LL. LL is being utilized to prevent melatonin production and release through the use of cool white fluorescent (CWF) light. CWF light has been repeatedly used in the scientific literature and is quite effective in suppressing pineal melatonin levels in various rodent species such as Sprague-Dawley rats (Heeke et al., 1999), rice rats (Edmonds et al., 1995b), and Syrian hamsters (Brainard et al., 1986a). In rice rats, for example, CWF light suppresses melatonin within 20 minutes when the light comes on in the morning (Edmonds et al., 1995b).

The mechanism by which CWF light acts via the retina to suppress melatonin at night, for example, is to induce neuronal signals in the retinohypothalamic (RHT) tract which increases glucose metabolism in the suprachiasmatic nuclei (SCN; the biological clock) in the hypothalamus. Signals from the SCN are transmitted to the pineal gland (PG) via a multisynaptic pathway that causes suppression of pineal enzymes and the subsequent lowering of pineal gland melatonin. The response of the RHT-SCN-PG axis to light is dependent on the intensity and wavelength of the light (Brainard et al., 1986b). However, the CWF bulbs are sufficient to perform all the necessary studies carried out in the PI's laboratory in terms of photoperiodic regulation of reproduction and the suppression of pineal melatonin levels.

Species: Rice Rats

Number of Animals Affected: The number of juvenile animals exposed to LL is 175 (both males and females). For mating purposes, approximately 18-24 adult females and 18-24 adult males will be exposed to LL in order to generate the number of pups necessary to complete those groups in which LL is required during the prenatal period. The father will be removed within two weeks of pairing. Therefore, at a minimum, 211-223 animals will be exposed to LL.