PhD Fellowship

Impact of light pollution at night on female metabolism and fertility in a diurnal animal model

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team « Neuroendocrine rhythms of reproduction » (Valérie Simonneaux)
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Exposure to artificial light at night has deleterious consequences for human health. Epidemiological studies indicate that light at night associated with shift work, a socio-economic situation affecting 15-20% of workers, increases the risks of diabetes and obesity, and disrupts menstrual cyclicity (ANSES 2016 report). At present, it is still difficult to separate the part of the direct impact of light from the indirect part of the desynchronization of the circadian system. The experimental evidence for the instrument used in the health effects of light pollution is difficult to define in human subjects, and it needs relevant animal models. The nocturnal phenotype of laboratory mice and rats is unsuitable for biomedical approaches related to daily cycles, in particular sleep-wake cycle or feeding-fasting rhythm, because these rhythms are reversed compared to the diurnal phenotype of humans. In addition, most of the studies on the impact of circadian disturbances are carried out in males, thus ignoring the gender effect in the analysis. In this context, this project aims at better understanding the deleterious effects of light pollution on metabolic health and fertility. Like humans, the Grass rat (*Arvicanthis*) has a daytime phase of wakefulness and a nocturnal phase of sleep. This rodent, bred at the Chronobiotron in Strasbourg, will be used as a diurnal animal model to investigate the effects of light pollution on health from a biomedical perspective. The protocols will specifically involve female rodents, in which rhythmic reproductive activity is potentially more impacted. Two experimental protocols for light pollution will be implemented: one will reproduce the light conditions of night work (exposure to night light 5 days a week), the other will mimic the light conditions of shift work (exposure to rotating shifts, alternating phase-advance then -delay of the light-dark cycle leading to circadian desynchronization). Comparison of the results will make it possible to distinguish the direct effects of night light from its desynchronizing effects on circadian rhythms. Daily (locomotor activity), metabolic (body mass, food price, glucose tolerance), and reproductive (oestrus cycle, preovulatory LH peak) phenotypes will be followed longitudinally on the same individuals. The neuroendocrine disturbances of metabolism and reproduction will be quantified at central and peripheral levels (in particular by in situ hybridization or qPCR of target genes and by ELISA assays of hormones specific to each function).

Wished skills:
Knowledge in neurobiology and animal physiology.

Key words: Chronobiology, neuroendocrinology, circadian rhythm, reproduction, glucose metabolism

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- Letter of application
- CV
- Master's degree transcript and ranking
- Letters of reference

Deadline of application : August 15, 2021.