



MASTER 2 Fundamental and Clinical Neurosciences

Internship proposal 2024-2025

(internship from January to June 2025)

Host laboratory:

INSERM U1208, Institut Cellule Souche et Cerveau,
18 avenue du Doyen Lépine, 69500, Bron

Host team:

Chronobiology and Affective Disorders

<http://www.sbri.fr/team/chronobiology-and-affective-disorders>

Internship supervisors :

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Project title :

Aberrant light exposure as compounding factors for retinal degeneration

Project summary :

Circadian rhythms are a fundamental hallmark of every cellular and physiological process throughout the body. These rhythms are programmed by molecular clocks widely distributed in mammalian tissues, including the retina.

The retinal clock plays a crucial function in adapting retinal physiology to the light/dark cycle. In mammals, the strongest synchronizing input to the circadian system is environmental light, which is received by retinal photoreceptors. In turn, circadian rhythmicity regulates major cellular functions ensuring homeostatic balance with the environment. However, chronic disturbance of the circadian system, in particular aberrant exposure to light, leads to increased morbidity, reduced lifespan, and metabolic diseases. Interestingly, retinal sensitivity to phototoxicity has been reported to be rhythmic with higher retina vulnerability at night.

This project will test the hypothesis that light exposure at inappropriate time 1) worsen cell degeneration and 2) alter the functioning and metabolism of the retinal clock in a model of photoreceptor degeneration using cellular, molecular and behavioral approaches.

3-5 recent publications :

- Kinane C, Calligaro H, Jandot A, Coutanson C, Haddjeri N, Bennis M, Dkhissi-Benyahya O. Dopamine modulates the retinal clock through melanopsin-dependent regulation of cholinergic waves during development. *BMC Biol.* 2023 Jun 26;21(1):146.
- Calligaro H, Coutanson C, Najjar RP, Mazzaro N, Cooper HM, Haddjeri N, Felder-Schmittbuhl MP, Dkhissi-Benyahya O. Rods contribute to the light-induced phase shift of the retinal clock in mammals. *PLoS Biol.* 2019;17(3):e2006211.
- Mure LS, Le HD, Benegiamo G, Chang MW, Rios L, Jillani N, Ngotho M, Kariuki T, Dkhissi-Benyahya O, Cooper HM, Panda S. Diurnal transcriptome atlas of a primate across major neural and peripheral tissues. *Science.* (2018) Feb 8. pii: eaao0318.
- Felder-Schmittbuhl MP, Buhr ED, Dkhissi-Benyahya O, Hicks D, Peirson SN, Ribelayga CP, Sandu C, Spessert R, Tosini G. Ocular Clocks: Adapting Mechanisms for Eye Functions and Health. *Invest Ophthalmol Vis Sci.* 2018;59(12):4856-4870.
- Dkhissi-Benyahya O, Coutanson C, Knoblauch K, Lahouaoui H, Levieil V, Rey C, Bennis M, Cooper HM. The absence of melanopsin alters retinal clock function and dopamine regulation by light. (2013) *Cell Mol Life Sci.* April 19