Institute of Zoology and Biomedical Research

**Topic:** Interactions between circadian and immune systems in *Drosophila*

**Name of supervisor:** Prof dr hab. Elzbieta Pyza

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**Background information:**

Insects have innate immunity, which includes several mechanisms protecting them against various pathogens. In *Drosophila* the following eight classes of antibacterial protein have been identified: Defensin (Def), Drosocin (Dro), Cecropins (Cec), Attacin (Att), Diptericins (Dpt), MPAC (post-translationally modified pro-domain of AttC), Drosomycin (Drs), Metchnikowin (Mtk) and Andropin (Anp). Expression of the antimicrobial proteins is stimulated during various infections but also it is regulated by internal and external factors. One of them is an input from the circadian clock. The regulation of antibacterial gene and protein expression will be studied during 24 h period under various light conditions to examine effects of the circadian clock and light on immune responses. Moreover, disruption of the clock may lead to diseases and may decrease longevity. It is also possible that environmental factors (UV light, temperature) and food (anti-oxidants in food) decrease or increase the clock effect on immune responses. The aim of this project is to learn about interactions between the innate immune system, the circadian clock and environmental factors affecting the immune system or the clock. The project will test a hypothesis that the circadian clock, by rhythmic expression of antibacterial proteins at specific times during the day, delays aging and increases survival of an organism.

**The main question to be addressed in the project:**

The effect of the circadian clock on the innate immune system regulation and its possible role in the organism survival.

**Information on the methods/description of work:**

In the project transgenic lines of *Drosophila* will be used to change expression of genes encoding antibacterial proteins as well as mutants of clock genes. Antibacterial protein and their genes will be studied by Western blotting and RT-PCR, respectively. Survival and behavioral tests will be used to study aging and longevity of flies.

**Special requirements from the student**: – optional

**Place/name of potential foreign collaborator:** – optional

Dr. R. Costa, University of Padova, Italy

**At least one reference to the relevant paper:**

Damulewicz, M., Loboda, A., Jozkowicz, A., Dulak, J., Pyza E. (2017): Interactions between the circadian clock and heme oxygenase in the retina of *Drosophila melanogaster.*

Mol. Neurobiol. 54:4953-4962. DOI: 10.1007/s12035-016-0026-9.

Damulewicz, M., Loboda, A., Jozkowicz, A., Dulak, J., Pyza E. (2017): Haeme oxygenase protects against UV light DNA damages in the retina in clock-dependent manner. Sci. Rep. 7:5197. DOI:10.1038/s41598-017-05418-6.