Parkinson's Disease (PD) is an age-related neurodegenerative disease which causes progressive loss of dopaminergic neurons and accumulation of protein aggregates, called Lewy bodies in the brain. PD has different etiology, it may have genetic background (*pink, parkin* gene mutations) or it may be caused by noxious environmental factors (i.e. neurotoxins). One of the risk factors is oxidative stress, which may lead to degeneration of dopaminergic neurons. In addition, in *parkin* mutants innate immune genes are over-expressed. There are also evidences that alimentary tract may play an important role in pathophysiology of PD. It is possible that chronic inflammation in the intestine may cause neuroinflammation in the brain and PD development.

Drosophila melanogaster (the fruit fly) is a model organism used in many biomedical studies including human neurodegenerative diseases. Processes described in insects at the cellular level are very similar to those observed in vertebrates, including mammals. *D. melanogaster* has *pink* and *park* genes, which mutations cause symptoms similar to PD.

The aim of this study is to investigate the disruption of innate immune and circadian system regulation in PD development. The immune system seems to be regulated by both antioxidant enzyme haeme oxygenase (HO) an the circadian clock. We expect that the obtained results will explain the regulation of the innate immune system and allow to develop a potential treatment for PD by application of chemicals changing HO activity level at specific time of the day (chronotherapy), which may delay development of PD symptoms.