

## **Description for the general public**

The honey bee *Apis mellifera* is one of the most important crop pollinators in the world. It also influences the protection of biodiversity and provides many products, such as honey, royal jelly or bee pollen with medicinal properties. In recent years, there has been a dramatic decline in the occurrence and diversity of all types of European pollinators. Honeybee losses have been attributed to climate change, exposure to pesticides, poor nutrition, increased parasite susceptibility, habitat degradation, and reduced genetic diversity. One of the major diseases of bees is nosemosis, which is caused by two species of the genus *Nosema* i.e. *Nosema apis* and *Nosema ceranae*. The infection occurs mainly through the oral route, when bees consume food containing spores of *Nosema* spp. The proliferating spores in the intestinal cells lead to digestive disorders as well as physiological and anatomical changes in the intestinal epithelial cells. Therefore, the main research objectives of the project will be to check how the nosemosis infection and keeping conditions (apiary and laboratory) will affect the selected parameters of the immune system in workers of different ages.

As part of the project, the levels of phenoloxidase and lysozyme in bees hemolymph will be tested. Additionally, identification of heat shock proteins in the hemolymph will be made after the bees are subjected to heat shock. The expression of genes related to immunity will be determined, i.e. abaecin, defensin, hymenoptaecin, peptidoglycan recognition protein S1 (PGRP-SC430) and the cytokine receptor (domeless). In addition, the level of reactive oxygen and nitrogen species, as well as the activity of catalase and glutathione-S-transferase enzymes will be checked in bee homogenates. Also, the bees will be tested for the presence of pathogens such as parasites, microsporidia and viruses.

The planned research will contribute to the development of science on the mechanisms of innate immunity in the honeybee *Apis mellifera*. The planned experiments will provide a lot of valuable information, including it will be possible to determine the time during which the immune system of worker bees is most active. The obtained results will significantly complement the existing knowledge in this field, which is extremely important due to the very important role that bees play in the ecosystem and human life.