Master level degree project at Comparative Physiology, Uppsala University

Title

Understanding the role of priming in innate immunity in crayfish

Background

Unlike vertebrates, invertebrates rely only on their innate immune system to fight infections. However, with only an innate immune system some of the invertebrate species have managed to live on earth for thousands of years and also some invertebrates can become several hundred years of age. This shows that the innate immune system is extremely efficient or that some additional immune processes might be at hand. Understanding the mechanism behind plasticity of the innate immune response in these animals has recently attracted special attention. More recently, the invertebrate's innate immune system was reported to show some form of adaptive features, termed innate immune memory. However, the memory characteristics of innate immune system and the mechanisms behind such phenomena remain unclear. Some scientists propose that epigenetic mechanisms such as DNA methylation may be responsible for such phenotypes. Epigenetics is the study of mechanisms that can result in phenotypic modifications in organisms without any change in their genotype. We have used the freshwater crayfish *Pacifastacus leniusculus* to test if this invertebrate does possess any immune memory, and have detected an increased tolerance to bacterial infection after a so-called priming treatment. The aim of this suggested master thesis project is to evaluate possible mechanisms behind this priming effect.

Work plan

The innate immune priming procedure in signal crayfish has already been optimized, and the student can use this method to characterize changes in immune parameters after this priming event. The student will be involved in discussing the details of the project plan, but the experiments will include characterization of the circulating hemocytes (immune cells) after priming using several different methods such as for example gene expression analysis, and hemocyte type determination. Both expression of antimicrobial peptide genes and epigenetic marker genes can be included as well as assays for antimicrobial activity. Methods that will be used includes Q-RT-PCR, antimicrobial activity assays, bacterial culture, SDS-PAGE and western blot.

Contacts

Students who would like to join us and perform their master level degree project (30 or 45 hp) can contact parisa.norouzitallab@ebc.uu.se and irene.soderhall@ebc.uu.se. The starting date of this project is on 2nd of Jan but interested students can start with hands on experience earlier.