

Who is pulling the strings? The importance of nutrition in a host-parasite system

Description for general public

What and how much we are eating strongly affects our life. Eating a well-balanced diet, with adequate nutrients and appropriate calories, is a crucial requirement for good health. An appropriate diet contributes to healthy life: development, ageing and greater resilience against diseases. Similarly, a poor diet compromises the individual abilities to fight against infection, and as a consequence the organism's survival. Therefore, achieving the correct balanced diet in the face of changing requirements and imbalanced foods is a major challenge for most of the organisms. We know that different strategies to fight infections exist in insects, and ranging from physical barriers to physiological and behavioral responses. The behavioral strategies need to be coordinated by the nervous system responding to the animal immune status and this same nervous system plays an important role on coordinating feeding behaviors, and therefore what and how much animals eat.

Over the past years, researchers demonstrated that solitary animals (butterflies, cockroaches) often change their food choices following infection in order to increase their immune system. In the case of social animals, like ants, it was shown, that when ants are feeding on the diet containing extra free radicals they are able to fight against infection better. The current proposal takes advantage of all current knowledge in insect nutrition, neurobiology and immunology to present a research plan that will allow to understand better how nutrient, nervous system and innate immune response are coordinated within an individual and within a society.

My main aim is to investigate how social insects, such as ants can handle nutrient supplies at both a collective and an individual level in response to changes in the nutritional composition of available foods (protein to carbohydrate ratio) and fungal infection. For my experiments, I will use the highly organised societies of the ant species *Myrmica scabrinodis* (common red ant), and a parasitic fungus *Rickia wasmannii*, which are some of the most unusual fungi known, as they grow on the cuticle of the ants. Firstly, I will investigate whether the diet characteristics changes the lifespan of infected and uninfected ant individuals. Secondly, I will determine how fungal infection influences host longevity, fecundity, hygienic behaviour, when ants are maintained on different diets varying in their protein to carbohydrate ratio. Lastly, in order to determine whether there are changes in the nervous system of the host, due to the behavioral manipulation by the fungus I perform aggressivity assays on ants coming from infected and uninfected colonies.

The project aims at demonstrating that social animals, like ants also have an appetite for health. I expect that my results will open up new avenues for the study of host-parasite relationship and emphasize the importance of host nutrition as a key mediator of parasitic interactions.