



Influence of microbial symbionts on insects behavior and personality

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Social-economic context

Nowadays, it is commonly accepted that animals express different behavioral responses across various situations. In nature, behaviors are highly variable from one individual to another which led to the concept of individual personality. If both genetic and epigenetic factors can explain behavioral variations between individuals, recent studies suggest a microbial origin of those variations: the presence of symbiotic microorganisms would generate behavioral alterations like change in mating behavior or risk sensitivity. Until now, symbiotic microorganisms are studied for their effects on the phenotype of their hosts, like impacts on host nutrition, reproduction or survival against natural enemies. The aim of the PhD project is to demonstrate the direct link between the symbiosis and animal behaviors and individual personality. Such research is essential for understanding both the evolution of behavioral strategies in natural populations and the source of inter-individual behavioral variations.

Scientific context

To demonstrate how microbial symbionts influence animal behaviors and their personality, scientists must consider biological models with a limited number of symbionts that are manipulable. For this purpose, we will consider the pea aphid, *Acyrtosiphon pisum*, as model: this insect can harbor few bacterial symbionts that have profound effects on aphid phenotypes (nutrition, reproduction, resistance) and are manipulable (elimination by using antibiotics, infection through micro-injection). Furthermore, recent works on this aphid species have highlighted a reduction in defensive behaviors due to infection with a particular symbiont. Aphids also have a parthenogenetic reproduction which means that offspring are genetically similar to their mother. This aspect of aphids life cycle is a great advantage in the study of behavioral variations but also to understand factors influencing personality.

Objectives

By using empirical approaches, we will measure the effect of pea aphid bacterial symbionts on the major behaviors in animal life: reproduction, habitat selection and defense against adverse situations. Also, we will analyze the aphid personality (activity level, exploratory behavior, boldness toward enemies, aggressiveness toward rivals or food and sociability) depending on its symbiotic status. From all the results, we will identify how symbionts can influence biological, genetical and ecological diversification in animal species.

Perspectives

After this work, it could be interesting to search symbiotic effects on behaviors and personality in other biological models. We could also continue by highlighting the mechanisms responsible for inter-individual behavioral variations.

