

RNA transmission between honeybees and their microbiome

Supervisor: Dr Eyal Maori (em514@cam.ac.uk)

Department/Institute: Biochemistry

Research area: RNA biology and host-microbiome interactions

Project outline:

The importance of the honeybee is much greater than honey production. These insects are responsible for pollinating more than 80 commercial crops, hence, supporting our food security and sustainability. The mutualistic interactions between bees and other species within their ecological niche have given rise to phenotypic adaptations and co-phylogenetic patterns, such as the co-evolution between bees and plants. Similar patterns have been observed between bees and their gut microbiomes. Bees depend on their microbiomes to break down carbohydrates and produce metabolites, while the microbiome depends on bees for resources. These bidirectional interactions have influenced bee physiology, immunity, and behaviour. Yet, the mechanisms that underlie signalling ('communication') between the bee host and its microbiome and the molecular effects on the individual and colony level are largely unknown. Honeybees are a unique system to study these questions due to their well-defined microbiome and social structure.

Host-microbiome studies from other species have pointed to the importance of RNA in mediating immunological and virulence responses. We previously showed that honeybees possess mechanisms for RNA transmission between individuals and generations. A honeybee gut symbiont was recently engineered to suppress parasitic mites through systemic RNA spread within the bee and transfer to the ectoparasite. This project aims to establish whether natural functional RNA transfer occurs between honeybees and their microbiomes, and will provide insights that could be potentially translated into versatile RNA-based solutions to enhance sustainable agriculture, health, and disease control.

BBSRC DTP main strategic theme: Understanding the rules of life

BBSRC DTP secondary strategic theme: Bioscience for sustainable agriculture and food