

Effects of antibiotics and gut microbiota on metabolism and behavioral development of honey bees *Apis mellifera*

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The gut microbiota, at times compared to a prokaryotic organ of eukaryotes, has been shown to be important for reproduction, growth and behavior in insects, as well as metabolism in mammals. If the gut microbiota is the equivalent of a regulatory organ, antibiotics have the effect equivalent to chemical ablation of that organ. Use of antibiotics in health and agriculture requires care, and may provide valuable information on microbiota-host relations. One place where antibiotics are used is to maintain honey bee colonies healthy, when bees face bacterial infections. We hypothesize that bee microbiota ontogeny and host development are integrated and that antibiotics can alter this interaction, with large consequences for the organism. We will study the effect of antibiotics on the honey bee gut microbiota, metabolism, and behavior throughout honey bee individual development. Bees will be treated with a beekeeping antibiotic; oxytetracycline, honey bee behavior will be monitored, physiological assays, gene expression of developmental associated genes and microbiota analysis will be performed. We expect that exposure to antibiotics will alter the developmental pattern of the bee microbiota, metabolism, and behavior. Antibiotic exposure will reduce microbiota diversity and numbers and increase bee adiposity. Also this will have distinct consequences for age at onset of behaviors such as cleaning, nursing, guarding, and foraging. This behavioral development in honey bees is typically under endocrine regulation. These results will support that microbiota has an integral role in typical endocrine regulation of metabolism and behavioral development in organisms.