2 Honeybee gut microbiota promotes host weight gain via bacterial metabolism and hormonal signaling.

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Recommendations:

Very Good **18 Sep 2017**

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GOOD FOR TEACHING | NEW FINDING

Bees are essential pollinators of many crops grown for human consumption. Moreover, they play an invaluable role in sustaining our planet's ecosystems by maintaining a balanced food web and biodiversity. In past decades, dramatic reductions of bee colonies caused significant economic loss throughout the world. Recently, it was found that social bees harbor highly specific gut microbiota. Thus, there is tremendous interest in understanding the role of the gut symbionts in shaping the physiology, behavior, and fitness traits of the host. However, most previous studies have been primarily descriptive, identifying the compositional variations of the microbiota under different conditions, mirroring early studies on the human gut microbiota. This work is one of the pilot investigations trying to understand mechanisms involved in host-microbe interactions in the bee system.

In this article, Moran, Zheng, and colleagues convincingly document the contributions of honeybee gut microbial metabolism to host physiology, showing that the gut microbiota promote weight gain of both whole body and gut in individual honeybees. This weight gain is likely mediated through changes in host vitellogenin, insulin signaling, and gustatory response. The authors provide evidence for several specific mechanisms by which the gut microbiota influence the host physiology, thereby generating many avenues for future research. These findings indicate that the bee gut microbiome has similar basic roles to those found in some other animals and thus provides a new model in studies of host-microbe interactions.

Disclosures
None declared

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Abstract:

ABSTRACT

Social bees harbor a simple and specialized microbiota that is spatially organized into different gut compartments. Recent results on the potential involvement of bee gut communities in pathogen protection and nutritional function have drawn attention to the impact of the microbiota on bee health. However, the contributions of gut microbiota to host physiology have yet to be investigated. Here we show that the gut microbiota promotes weight gain of both whole body and the gut in individual honey bees. This effect is likely mediated by changes... more »
in host vitellogenin, insulin signaling, and gustatory response. We found that microbial metabolism markedly reduces gut pH and redox potential through the production of short-chain fatty acids and that the bacteria adjacent to the gut wall form an oxygen gradient within the intestine. The short-chain fatty acid profile contributed by dominant gut species was confirmed in vitro. Furthermore, metabolomic analyses revealed that the gut community has striking impacts on the metabolic profiles of the gut compartments and the hemolymph, suggesting that gut bacteria degrade plant polymers from pollen and that the resulting metabolites contribute to host nutrition. Our results demonstrate how microbial metabolism affects bee growth, hormonal signaling, behavior, and gut physicochemical conditions. These findings indicate that the bee gut microbiota has basic roles similar to those found in some other animals and thus provides a model in studies of host-microbe interactions.

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