Microbial community structuration and its impact on performance-related traits the Drosophila holobiont

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Résumé

Animal's microbiota is often complex, composed of diverse microorganisms including parasites, fungi, viruses and bacteria. This structured microbial community has a major impact on host performance. Indeed, microbes trigger in the host niche complex interactions both with each other and with the host, and eventually impact host fitness. If and how multipartite interactions influence microbial community structuration and host performance remains poorly known. Here, we addressed these questions using *Drosophila* juvenile as a model. First, we described bacterial and fungal gut community structure in wild individual *Drosophila* larvae according to environmental (diet bait used for collection and collection site) and microbial (presence of *Wolbachia* bacterial endosymbiont) factors. Second, we used laboratory-designed gnotobiotic *Drosophila* to address the impact on host performance of multipartite interactions within a reduced but representative microbial community, composed of a eucaryotic virus, the endosymbiotic bacterium *Wolbachia* and two gut bacteria members. Notably, key larval performance-related traits such as size, developmental timing and survival were compared between individuals from all possible combinations of microbial partners. In parallel, microbial load was measured in individual larvae as a proxy of symbiont fitness. While environmental parameters seem to have a greater impact on microbial community structure than the presence/absence of *Wolbachia*, a better performance was measured in poly-associated hosts compared to siblings with a reduced microbial community, especially upon pathogen exposure. Our results underline that multipartite interactions, although understudied and difficult to apprehend, might be an important driver of organism ecology and evolution.

Mots-Clés: Holobiont, multipartite interactions, polymicrobial associations, performance, host, microbe interactions