Why do hosts need their symbionts?

Nancy Moran*†[1]

[1]University of Texas at Austin – United States

Abstract

A revolution in biology in the last decade or so is the broad recognition of the importance of host-associated microbial communities in the lives of multicellular organisms. A main cause of this revolution has been new technologies that enable the study of non-cultivable organisms. For the first time, we can survey most biodiversity, including the once-hidden players living inside and on the surfaces of ourselves and other animals. These organisms are finally getting credit for their roles in ecology and evolution. What evolutionary forces drive the effects of symbionts on hosts? In some cases, hosts and their associated microbial communities, sometimes called holobionts, have shared fitness interests, and natural selection has pushed microbes towards phenotypes that benefit host fitness. In extreme cases microbe and host are essentially fused into a single entity. But, just as genes within a single genome undergo evolutionary conflict, components of an intimate symbiotic association also can be at odds. Observing that host fitness drops when associated microbes are experimentally eliminated does not imply that those microbes evolved to benefit hosts, though it may reveal ecological importance of the association. Such associations, or "holobionts", range from pairwise interactions with high fidelity over generations to complex communities that engender both competition and cooperation. The topic of levels of selection has a long history in evolutionary biology, and this work has lessons for those considering how selection acts on holobionts. These themes are illustrated with examples of insect-associated microbial communities showing different levels of complexity, different levels of conflict, and different degrees of persistence over generations.

*Speaker

†Corresponding author: nancy.moran@austin.utexas.edu