

The formation of beneficial symbiotic associations can be a form of evolutionary innovation: by establishing a symbiosis with another organism, a host rapidly gains access to unique ‘goods’ and/or ‘services’ previously unavailable to them. Fungus-growing ants, including the charismatic leaf-cutters, are a textbook example of symbiosis. These ants cultivate specialized fungi for food. In exchange, the ants provide their cultivar fungus with substrate for growth, dispersal to new colonies, and protection from competitors. This ancient and obligate ant-fungus mutualism is known to occur alongside at least one other mutualist and two specific pathogens. Specifically, fungal pathogens in the genus *Escovopsis* parasitize ant fungus gardens, thereby destroying the ant’s food source. To help overcome this garden pathogen, the ants have formed a mutualistic association with an antibiotic-producing actinobacterium that suppresses the growth of *Escovopsis*. Given that microbial pathogens likely cause virulent diseases in all plants and animals, and are an important agent of natural selection, this type of association may be widespread. I will present our recent findings related to the use of actinomycetous symbionts in fungus-growing ants and our work that indicates that associations between antibiotic-producing symbiotic bacteria and insects is more widespread. I will discuss the use of symbiotic microbes of insects as a potentially vast and yet largely untapped source for the discovery of novel natural products.