

OR156

Interplay between the ant Cardiocondyla obscurior and its two bacterial endosymbionts

Antonia Klein, Lukas Schrader, Martin Kaltenpoth, Dave Wheeler, Jürgen Heinze, Jan Oettler

Intracellular endosymbiotic bacteria are vertically transmitted via maternal, cytoplasmatic inheritance. In social insects, only queens are reproductive, whereas workers are a dead end for the bacteria. Obligate endosymbionts in insects are often characterized by specialized organelles, which indicate an important role of the prokaryote in the host's metabolic system. Whole genome sequencing revealed two bacterial symbionts in the invasive ant *Cardiocondyla obscurior*, which has been distributed throughout the subtropical range with human commerce. A *Sodalis*-like endosymbiont is present exclusively in a Brazilian population, whereas *Wolbachia* was detected in the Brazilian as well as in a Japanese population. Using fluorescence in situ hybridization (FISH), we found that *Wolbachia* is distributed throughout the queen's abdomen, with focus on ovary tissue. By contrast, *Sodalis* is localized in abdominal bacteriomes, indicating an obligate relationship with the host. A genome size reduction (543 Mb) of the *Sodalis* genome furthermore points to a symbiosis formed over longer evolutionary time. Surprisingly, the Japanese *C. obscurior* population does not exhibit *Sodalis*. To unravel the interactions between the bacteria and the ant host, we analyzed *Sodalis* and *Wolbachia* density in the ant tissue in relation to sex, morph and age using real-time quantitative PCR. The results show a close association of both bacterial lineages with female fertility. *Wolbachia* as well as *Sodalis* titers increase with queen age. Whereas *Wolbachia* infection state remains constant with worker aging, surprisingly, *Sodalis* titers even decline with worker age. This points to an adaptation of *Sodalis* to their eusocial host, as the sterile *C. obscurior* workers are a dead end for the endosymbionts. Taken together, the obligate, well-adapted relationship to the ant host makes the absence of *Sodalis* in the Japanese population even more staggering.