

Highlight

Old and new symbiotic partners in lachnine aphids

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The relationship between aphids and their bacterial symbiont, *Buchnera aphidicola*, is a central model for maternally transmitted symbiosis characterized by long-term evolutionary co-diversification of partners and by genome reduction of the bacterial symbiont. In one clade of aphids, the subfamily Lachninae, genome reduction of *Buchnera* is extreme and aphid hosts often have adopted additional maternally transmitted bacterial symbionts, referred to as secondary symbionts, that have been shown previously to take over some of the nutritional functions of *B. aphidicola* (Lamelas *et al.*, 2011). Manzano-Marín and coauthors have provided a survey of the symbiont combinations that occur across the phylogenetic diversity of Lachninae. They used 16S rRNA gene amplification and sequencing to determine the symbiotic combinations of representative hosts within four tribes of lachnine aphids. All hosts surveyed contain both *B. aphidicola* and at least one secondary symbiont. These secondary symbionts varied among species and tribes of hosts, but always fall within the *Enterobacteriaceae*. *Candidatus Serratia symbiotica*, a symbiont already well documented as a common secondary symbiont in some lachnines and in other aphids, was most common. Another is *Candidatus Fukatsui*

maculolachnicola, a newly named lineage related to known aphid secondary symbionts, *Hamiltonella defensa* and *Regiella insecticola*, known as defensive symbionts in other groups of aphids. Using phylogenetics, the investigators show that some of these secondary symbionts appear to be co-diversifying with hosts, through strict maternal transmission, whereas others appear to be undergoing horizontal transfer. The authors used FISH microscopy to examine the locations and cell morphologies of several exemplars of the novel symbionts, and they document a variety of bacterial cell sizes and shapes, illustrating the common pattern that intracellular symbionts often have radical changes in morphology. Overall, this analysis indicates that the Lachninae clade of aphids parallels the cases of mealybugs and psyllids, in which the hosts harbor a constant companion as their primary symbionts and a more dynamic set of secondary symbionts drawn from the *Enterobacteriaceae*. The latter typically live in separate bacteriocytes from the primary symbionts, a pattern that also holds for Lachninae.

Reference

Lamelas, A., Gonsalbes, M.J., Manzano-Marín, A., Pereto, J., Moya, A., and Latorre, A. *Serratia symbiotica* from the aphid *Cinara cedri*: A missing link from facultative to obligate insect endosymbiont. *PLoS Genet* 7: e1002357.

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