Public Abstract
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Title:SIGNALS AFFECTING THE UREASE STATUS OF PLANT-ASSOCIATED BACTERIA, *METHYLOBACTERIUM* SPP.

This research focused on furthering our understanding of the interactions between Pink-Pigmented Facultative Methylotrophic bacteria (PPFMs) and plants. PPFMs (*Methylobacterium* spp.) have been found to be the most abundant microorganisms among phylloplane microflora, and have been recovered from all plants examined. I focused on the plant influence on production of active PPFM urease. *Arabidopsis thaliana* and *Glycine max* (soybean) are two dicots which provide valuable urease-negative mutants. However, while genetic and genomic analysis of each plant are advancing, little is known about the identity of the PPFMs with which they associate. I established phylogenetic relationships of various PPFM isolates recovered from plants and elsewhere. I examined the ability of resident PPFMs to mimic the urease-negative phenotype of two mutant classes of urease-negative soybean hosts. The working model is that there is a signal from the plant that either inhibits the production of the urease gene products in the associated bacteria or inhibits the function or transport of nickel from the plant to the bacteria. This signal could be a nitrogenous signal (ureides, urea, ammonia) or simply a block in nickel transport from the plant or plant cell to the associated bacteria. Examination of urease expression *in planta* or in culture requires knowledge of the urease genes and the regulation of urease in the PPFMs. Urease expression is directly related to its role in nitrogen assimilation. My studies led to the overall conclusion that urease is essential for assimilation of urea and of ureides, that urease has a constitutive basal level of expression and is "induced" by the ureide allantoin and "repressed" by the preferential nitrogen source, ammonium. However, these nitrogenous signals are not responsible for the urease-negative status of the plant-associated PPFMs. Our working model has shifted to a block in nickel uptake necessitating examination of nickel content in these bacteria, as well as interactions between PPFM and host variously mutated in urease structural and Ni-insertion (*ureG*) genes. To examine the interactions of mutated partners I attempted the recolonization of plants with PPFMs. In the course of these studies it became obvious that the interactions between PPFMs and the host plant is an intimate one because seed-reintroduced strains, though colonizing the host plant, were not seed-transmitted. In addition, PPFM interactions with *Arabidopsis* and with soybean were distinguishable, in that only in the latter were endogenous PPFMs urease-negative on mutant hosts defective in urease accessory genes.