Microbial interactions with eukaryotic hosts

Host specificity of the plant growth-promoting cooperation between Azospirillum and rice

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1. Introduction. Host specificity is a fundamental concept in understanding evolutionary processes leading to intimate interactions between bacteria and plants. In the case of Plant Growth-Promoting Rhizobacteria (PGPR) specificity appears to be controlled either by a strain-specific bacterial adaptation to non-specific traits of the host plant or by non-specific bacterial adaptation to genotype-specific properties of the host plant (1). Thus, we hypothesize that these adaptations result in the regulation of a large number of genes, independently of their direct involvement in phytostimulation. These regulations may depend on the bacterial strain/plant genotype combination.

2. Objectives. This work aims at identifying genes involved in reciprocal adaptation of partners and those involved in host specificity in PGPR-plant cooperation.

3. Materials & methods. To evaluate transcriptomic responses of each partner during the *Azospirillum*-rice cooperation, RNA samples obtained from *Azospirillum* root-associated cells and rice roots (cultivars Nipponbare and Cigalon) were analyzed on microarrays.

4. Results. Transcriptomic analyses evidence the regulation of 453 genes in root-associated *Azospirillum* cells and 7384 genes in rice roots. Whereas none of the *Azospirillum* properties involved in the modification of plant hormonal balance are significantly regulated under the experimental conditions, several genes of the plant partner implicated in phytohormone signaling are induced or repressed during the interaction. The induction of plant and bacterial genes involved in ROS detoxification suggest that defense response of the host plant play a key role in *Azospirillum*-rice cooperation. In addition, many genes display expression profile that depends on the strain/cultivar combination.

5. Conclusion. Combination specific responses observed at the transcriptomic level are consistent with metabolomic observations previously reported for *Azospirillum*-rice cooperation (2), suggesting that evolutionary processes have led to a preferential interaction between a strain and its original host cultivar.

References
1) Drogue et al. 2012. Research in Microbiology 163:500-510
2) Chamam et al. 2013. Phytochemistry. 87:65-77