Master project in the Molecular Environments Group

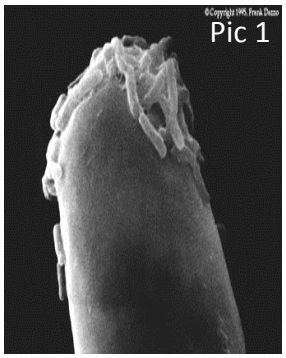
Molecular and chemical crosstalk between plants and microorganisms:

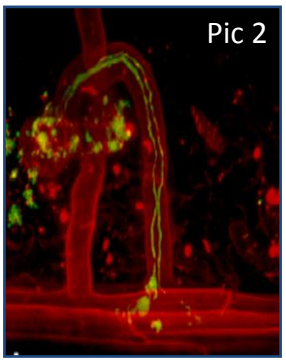
''Trehalose synthesis in *Sinorhizobium meliloti* -- and how this affects root colonization and nodulation''

Background and relevance of the project

Legume-Rhizobium symbiosis

Nitrogen deficiency is often found to be a limiting factor to plant growth and has significant ecological and agricultural implications. This may seem like a paradox based on the fact that the atmosphere around us is comprised by 80% nitrogen (N_2). However, in its pure form atmospheric nitrogen is a chemically stable gas and only organisms belonging to the group of prokaryotes are capable of reducing N_2 to a form which can be assimilated biologically. The gram-negative soil bacterium *Sinorhizobium meliloti* is able to interact with the roots of both alfalfa (*Medicago sativa*) and the model legume *Medicago truncatula* to form nodules in which atmospheric nitrogen can be converted to ammonia. From the initial contact between the bacterium and its host plant to the development of functional nodules this plant/microbe interaction is a fascinating biological phenomenon involving many finely regulated processes in both bacteria and host plants


Pic 1


Pic 2


Pic 3

Specific aims and techniques

Trehalose synthesis in *Sinorhizobium meliloti* -- and how this affects root colonization and nodulation

Trehalose is a fascinating sugar molecule known to be involved in many biological processes and in addition applied in biotechnology and medicine. Trehalose has been shown to play an important role in the root colonization, root infection – and nodulation processes during the Rhizobium-legume symbiosis. However, it is still not known whether trehalose produced during the symbiosis interaction is of bacterial or plant origin. This question is the main focus of the present master project.

To approach this question, the master student will

- Study the abilities of *Sinorhizobium* trehalose synthesis mutants to compete with wild-type for growth on alfalfa root (see picture 1).
- Screen for presence of trehalose in infection threads containing either *Sinorhizobium* trehalose synthesis mutants or wild-type *Sinorhizobium* (see picture 2)
- Compare trehalose contents in nodules induced by *Sinorhizobium* trehalose synthesis mutants and wild-type *Sinorhizobium* (see picture 3).

The project will give the student a possibility to work with bacteria and plants and to study parts of the Rhizobium-legume interaction under controlled laboratory conditions. The lab part of the work will familiarize the student with sterile technics, analytical- and molecular analysis.

For more information please contact:

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