

Microbial Development Laboratory

Research Projects for Masters Students

Project 2: **Coupling between gene expression and morphogenesis during development in a model bacterium.**

Gene expression during spore differentiation in the model organism *Bacillus subtilis*, a rod-shaped gram-positive bacterium, is controlled by a cascade of cell type-specific transcription factors. Their activation responds to morphological cues that signal the completion of key intermediate structures in the process. The Project proposed relates to the activation of the late forespore factor, called σ^G . Activation of σ^G is somehow coupled to the completion of the engulfment process, but also requires a signal emanating from the mother cell. Transmission of this signal involves a novel type of synapse-like signaling complex that spans the space between the two cells and allows for direct communication between them.

Project 3: **Identification of probiosis genes.**

Spores of several aerobic and anaerobic spore-forming bacteria of the genus *Bacillus* and *Clostridium* are found in the gastro-intestinal tract of several animals, including humans. Genome sequencing of a gut strain of *Bacillus subtilis* and its comparison to the genome of a standard laboratory strain, suggests a set of well defined adaptations to the gut ecosystem. The Project deals with testing whether certain genes or operons specifically found in the gut strain are important for colonization in animal models. The Project also involves the use of IVET (in vivo expression technology) approaches to find genes induced in vivo, that may be important for probiosis.