

## Master Thesis

# *Helicobacter pylori*-associated cancer signaling

## Signaling in Inflammation and Gastric Cancer

AG Microbiology - "Pathogen-induced Signaling and Cancer"

The human pathogen *Helicobacter pylori* is a class-I carcinogen that can induce clinically relevant disorders like chronic gastritis, ulceration, mucosa-associated tissue (MALT) lymphoma and gastric cancer. In fact, gastric cancer represents one of the most frequent causes of cancer-related deaths worldwide since no effective treatments are available. New knowledge about the *H. pylori*-induced signal transduction pathways is crucially important to understand how *H. pylori* reprograms gastric epithelial cells and drive them into cancer and rapid metastasis:

### Available projects:

#### 1. Analysis of the *H. pylori*-driven cell migration

- How can *H. pylori* transmit the signal from the cell surface to the actin cytoskeleton? Transmembrane receptor studies, phosphorylation studies, etc.
- Generation lentiviral CRISPR/Cas9 systems suitable for the generation of genomic knock-out and/or point mutations in the gene of interest
- Investigation of the *H. pylori*-changed epithelial cell morphology and migration: speed, force and direction
- Investigation of the functional consequences of the reorganized actin cytoskeleton using advanced live-cell imaging systems, confocal laser scanning microscopy, STED super resolution microscopy

#### 2. Characterization of novel *H. pylori* proteases

- Cloning, mutation and purification of predicted proteases and determination of proteolytic activities
- Generation of isogenic *H. pylori* deletion and complemented mutants suitable for infection experiments
- Infection experiments to identify cellular protease substrates: SDS PAGE gelelectrophoresis, biotinylation experiments, mass-spectrometry, in vitro cleavage experiments
- Investigation of the cellular and bacterial response to protease activity using gastric organoids as innovative infection models

#### 3. The *H. pylori* microenvironment as a communicator between bacterium, epithelium and immune system

- Characterization of the microenvironment after persistent *H. pylori* infections of organoids: cultivation of gastroids, preparation of outer membrane vesicles (OMVs), etc.
- Establishment of an innovative assay system to monitor the fate of OMVs and their role in the epithelium and immune cells

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