University of Basel

DBM Basel
Department of Biomedicine

MASTER'S THESIS PROJECT IN THE ALLERGY AND IMMUNITY LAB AT THE DBM, HEBELSTRASSE

Characterization of inflammatory pathways in a mastocytosis mouse model

We are offering a master's thesis project focused on the characterization of inflammatory pathways in a novel mouse model of mastocytosis, a rare disease characterized by the clonal expansion of mast cells.

Preliminary data indicate that mutant mice exhibit elevated baseline cytokine levels, particularly within the IL-17 and IL-22 axis, suggesting a pre-activated, Th17-like inflammatory environment that may prime mast cells and alter their responsiveness to external stimuli. IL-17 and IL-22 are well-established regulators of epithelial immunity, promoting antimicrobial defense, neutrophil recruitment, and barrier integrity. Emerging evidence indicates that mast cells actively engage in dynamic crosstalk with $CD4^+$T cells and may shape IL-22-biased T-cell responses. The precise roles of mast cells in producing and responding to IL-17 and IL-22 remain an active area of investigation. This project aims to further characterize this preconditioned inflammatory state and its functional impact on mast cell biology in the context of mastocytosis, with a particular focus on identifying the tissues and mechanisms contributing to this phenotype.

Project content

The student will work with existing and newly collected mouse samples to:

- Validate cytokine differences in serum using ELISA and OLINK
- Assess gene and protein expression in selected tissues (e.g., skin, spleen, gut) using qPCR
- Perform histological and flow cytometry analyses as well as immunoblotting, including mast cell staining and signaling and evaluation of inflammatory changes

The project will focus on establishing the robustness of the cytokine phenotype and determining its anatomical and cellular context.

Optional

Depending on interest and progress, the project may also include:

- Participation in mouse experiments (handling, sampling, tissue collection; under supervision)
- Exploratory experiments assessing systemic responses (e.g. anaphylaxis in these mice)

These components are optional and can be adapted to the student's preferences.

Learning outcomes

The student will gain experience in:

- Experimental design in a biomedical research setting
- Cytokine analysis and molecular techniques (ELISA, qPCR)
- Histology, flow cytometry, immunoblotting
- Data analysis and scientific writing
- Working with mouse models (optional)

Practical information

- Duration: 9–12 months
- Start date: July 1st, 2026 (or upon agreement)
- The scope of the project can also be adjusted depending on progress and interest

Requirements

We are looking for a motivated student with an interest in immunology or related fields and translational medicine. Previous laboratory experience is advantageous, but not required.

Contact

Please get in touch with a short description of your background and interests to discuss the project further.

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https://biomedizin.unibas.ch/en/research/research-groups/hartmann-lab/