



Open position for the LSM call of applications

Department/Institute: Faculty of Biology, Microbiology

Subject areas/Research fields: Microbiology, Molecular Biology, Infection Biology

Keywords: *Staphylococcus lugdunensis*, virulence, toxins, heme acquisition

Name of supervisor: Prof. Simon Heilbronner

Funding: DAAD-GSSP (LSM)

Project title:

Relevance of secreted toxins on iron-acquisition and virulence of *Staphylococcus lugdunensis*

Project description:

Staphylococcus lugdunensis is an unusually virulent coagulase-negative staphylococcal species whose infections often follow a severe and aggressive course, resembling those caused by *Staphylococcus aureus*. A key factor contributing to its pathogenicity is its ability to proliferate in the nutrient-depleted environment of the human host, particularly under conditions of iron limitation imposed by “nutritional immunity.” Previous work has shown that *S. lugdunensis* possesses specialized heme acquisition systems, including the Isd system and the LhaSTA transporter, enabling efficient iron uptake from hemoglobin. However, as the majority of host iron is located intracellularly, the bacterium also relies on hemolytic toxins to liberate heme from erythrocytes. This project aims to systematically investigate the role of several putative hemolysins—SLUSH peptides, β -toxin, hemolysin III, and a Streptolysin S-like (SLS-like) toxin—in hemoglobin release, immune cell lysis, and overall virulence. Using gene deletion mutants, expression profiling under stress conditions, functional assays with human cells, and in vivo infection models, we will define the contribution of each toxin to *S. lugdunensis* pathogenicity. Particular focus will be placed on characterizing the SLS-like toxin StsA, which is unique among staphylococci. Through structural analysis and activity assays, this study will provide new insights into the molecular basis of *S. lugdunensis* virulence and identify potential targets for antimicrobial intervention.

References:

- Heilbronner S, Foster TJ. *Staphylococcus lugdunensis*: A skin commensal with invasive pathogenic potential. *Clin Microbiol Rev.* 2021;**34** <https://doi.org/10.1128/CMR.00205-20>
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- Sekar S, Schwarzbach S, Nega M *et al.* Slush peptides of the psmbeta family enable *Staphylococcus lugdunensis* to use erythrocytes as a sole source of nutrient iron. *FASEB J.* 2024;**38**:e23881 <https://doi.org/10.1096/fj.202400335R>

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