

Protein Engineering of a Leech-Derived Protein

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Our research group has recently discovered the function of a novel uncharacterised protein originating from a leech. This protein is able to modulate the host defense mechanism and therefore the innate immune system. Its potential to regulate the immune response makes it a promising candidate for combating diseases associated with an overactive immune system, such as Ischemia Reperfusion Injury.

In this master thesis project, we aim to unlock the secrets of this leech-derived protein through rigorous biophysical and molecular biological methods. By rational design and computational tools we will be able to modify the leech derived inhibitor to gain insights into its interaction with targets within the complement cascade and the coagulation system. To achieve this, we will employ state-of-the-art protein engineering techniques, including mutagenesis, to further elucidate the protein's binding mode and hence the structure-activity relationship (SAR).

As a student researcher, you will have the opportunity to acquire valuable skills in both molecular biology, bioinformatics and computational chemistry.

Methods

- Empirical methods:
 - Protein expression in E.coli
 - Protein purification: His-tag affinity purification
 - Site-directed mutagenesis / PCR
 - Biophysical assays
 - Enzymatic assays: Direct competitive inhibition assays
 - Enzyme-linked immunosorbent assay (ELISA)
 - SDS-PAGE / Western blot
- Computational methods
 - Scripting: R / Python
 - AlphaFold and other AI tools
 - Structural Biology: PyMol, Schrödinger Maestro

- Multiple sequence alignment, sequence similarities
- Molecular Dynamics (optional)

Availability

The master thesis is available for all motivated students of the University of Basel as well as external students with interest in protein engineering.

Contact

Please send your application to Peter Rüthemann (peter.ruethemann@unibas.ch)