Discovery of Novel Peptide-Based Modulators Targeting the Classical and Lectin Complement Pathways

Short Project Description

Dysregulation of the classical and lectin complement pathways contributes to a broad range of inflammatory and immune-mediated diseases. A particularly attractive proximal intervention point is complement component C2, whose inhibition is expected to block downstream activation in both the classical and lectin pathways. Importantly, no C2-targeted inhibitor is currently approved, highlighting a substantial unmet medical need and strong translational relevance.

This Master's project focuses on the discovery and biochemical characterization of novel, sequence-defined peptide modulators that bind and inhibit C2. The work combines peptide engineering with functional complement assays and biophysical interaction measurements to establish structure–function relationships and validate inhibitory activity at the biochemical level.

Methods and Skills the Student Will Learn

- **Peptide chemistry**
  - Automated solid-phase peptide synthesis (liberty blue & multipep)
  - Peptide purification and analytical characterization
- **Library-based discovery**
  - Design and screening of focused peptide libraries
  - Structure–activity relationship (SAR) analysis
- **Complement biology assays**
  - Classical and lectin pathway ELISA assays
  - Haemolysis assays to assess functional complement inhibition
- **Biophysical characterization**
  - Protein–peptide interaction analysis using SPR and/or BLI
  - Interpretation of binding kinetics and mechanism of action
- **Data analysis**
  - Quantitative analysis of biochemical and biophysical datasets
  - Integration of functional and binding data to guide optimization