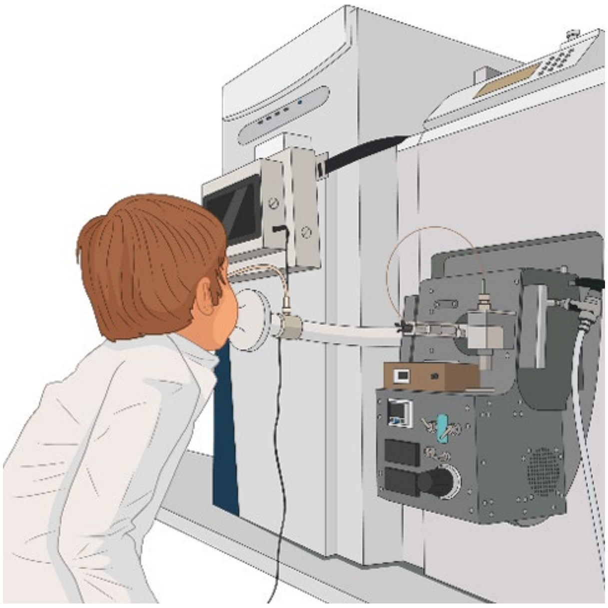
University of Basel
Department of
Biomedical Engineering

University of Basel, Department of Biomedical Engineering, Hegenheimermattweg 167c, 4123 Allschwil

Master of Science – Biomedical Engineering
Thesis Proposal

Development of deep learning models for therapeutic drug monitoring of immunosuppressants in kidney transplant patients based on exhaled breath data



Therapeutic drug monitoring (TDM) is essential in kidney transplant patients to balance the effectiveness of immunosuppressive therapy with the risk of toxicity and rejection. Traditional blood-based TDM methods are invasive and limited by sampling intervals. To address this, we are applying a noninvasive, real-time, mass spectrometric method to estimate systemic drug concentrations using exhaled breath (eg. [Singh et al., 2021; PMID: 36740603]).

In the ongoing study, we have collected high-quality breath samples from kidney transplant patients receiving standard immunosuppressive regimens, including Cyclosporine A (Neoral), Tacrolimus (Prograf), and Mycophenolate Mofetil (CellCept).
The aim of this master's thesis project is to explore this dataset using deep learning models to predict systemic concentrations and clinical effects of these immunosuppressants. This analysis-based thesis will contribute to the development of breath-based TDM in transplantation medicine and may support clinicians in optimizing individualized immunosuppressive therapy.

Nature of the Thesis
Experimental: 10
Programming: 70
Documentation: 20

Specific Requirements
Good programming skills (Python or/and MATLAB). Familiarity with deep learning models. Genuine interest in a highly interdisciplinary project.

Group Leader / Supervisor
Prof. Dr. Pablo Sinues, Translational Medicine Breath Research (TMBR), University of Basel. Dr. Kapil Dev Singh, TMBR, University of Basel

Contact
Prof. Dr. Pablo Sinues: pablo.sinues@unibas.ch | www.sinueslab.ch