universität innsbruck

Master-thesis

Master's thesis at the Institute for Breath Research at the Leopold-Franzens-University Innsbruck in cooperation with the Daniel Swarovski Research Laboratory of the Medical University of Innsbruck

Identification of new substrates for the development of a non-invasive breath test

Project description

Cytochrome P450 (CYP) enzymes play a central role in the degradation of drugs. Particularly relevant for human drug metabolism are CYP1A2, CYP2C9, CYP2C19, CYP2D6 and CYP3A4. Due to genetic variations, these enzymes can vary greatly in their activity, which can lead to over- or underdosing, treatment failure or side effects.

A non-invasive breath test could help to determine the individual CYP status of patients before administering medication. Previous studies using tolterodine as a substrate have shown that acetone is formed as a volatile metabolite (https://www.nature.com/articles/s41598-025-86450-9). In order to improve the specificity and sensitivity of such a test, new substrates should be identified that produce more characteristic volatile metabolites.

Aim of the master-thesis

The thesis aims to contribute to the development of a non-invasive breath test by identifying new substrates and characterizing their metabolic products. The focus is on:

- Screening of potential substrates using *in-vitro* models (HepG2 cells with overexpressed CYP3A4).
- Analytical detection and characterization of the resulting metabolites using LC-MS, GC-IMS and PTR-ToF-MS.

Requirements

This project addresses motivated Master students of chemistry with a focus on analytical chemistry. An independent, careful and precise way of working as well as an interest in cell culture techniques, bioanalytical research and instrumental analysis are required.

Start

The master-thesis can be started immediately.

Contact

Rebecca Hofer, MSc, rebecca.hofer@uibk.ac.at
Dr. Veronika Ruzsanyi, veronika.ruzsanyi@uibk.ac.at