Group:	**:**	Nanotoxicology at RIKILT
Project:	**:**	**High-end analytical detection coupled to a Gut-on-a-Chip**
Supervisors	**:**	Milou Santbergen, Hans Bouwmeester, and Michel Nielen

Keywords: organ-on-a-chip, microfluidics, LAESI-MS, ICP-MS, MALDI-MS, ESI-MS, nanoparticles, alternative testing, toxicology

Summary
The lack of predictive validity of current *in vitro* models is becoming problematic for the safety assessments of chemicals (i.e. REACH, ECHA), in the development (lead finding) of beneficial ingredients (EFSA) and drugs (EMA, FDA). Conventional models, either animal models or *in vitro* models do not adequately represent human organ functioning. Recent advances in microchip- and bioengineering allowed to develop unprecedented organ-on-a-chip models that recapitulate the dynamic physical and functional features of human tissues within their biological microenvironment. Microfluidic-gastrointestinal-chip (GUT) models are the heralds of a technological revolution that will result in a complete, realistic and empiric pharmacokinetic model of the human body. To really advance the applicability of the GUT models they need to be integrated with advanced sample preparation and analytical technologies to identify and quantify the active compounds and metabolites, if formed. The small dimensions of microfluidic devices have the ability to handle mass limited analyses with low reagent consumption, and integrated multiple processing steps into a single system. On the other hand it is highly demanding for the analytical instrumentation in terms of sensitivity, and small sample volumes. The ultimate goal is to meet the demands of high throughput sample analysis such as proteomics workflows for organ-on-a-chip applications.

Aim
In this project sensitive, selective mass spectrometry detection platforms will be coupled to compartmentalized microfluidic-gastrointestinal-chips. This results in a total analysis system that is ideally positioned to replace animal trials.

Techniques
Cell culture, ICP-MS, MALDI-MS, ESI-MS, laser ablation ESI-MS, sample preparation techniques and chip development.

Student project
Available from 2017 onwards.

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