

Group	:	Organic Chemistry
Project	:	Employing paper-microfluidics and mass spectrometry for on-site plant toxin detection
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Introduction

Providing the growing world population with safe and nutritious foods in a sustainable manner is one of the major challenges mankind faces today. The safety of our food, however, is under pressure by a range of drivers like climate change, growing world population, alternative supply chains, and dietary transformations. These drivers are expected to increase the presence of natural toxins, like plant- and mycotoxins, which are already a major food safety concern, causing a 5-10% loss of crops, annually. Traditionally used techniques for the analysis of these natural toxins, such as high-performance liquid chromatography – tandem mass spectrometry (HPLC-MS/MS) or enzyme-linked immunosorbent assays (ELISA) are expensive, time-consuming, and laboratory-bound. Therefore, there is an urgent need to develop rapid, cost-effective alternatives that farmers, food companies, and governments can use to screen their food commodities for the presence of these natural toxins.

Recently, we developed two such alternative methods for the rapid detection of tropane alkaloids in buckwheat cereals, baby food, and canola oil using an lateral flow immunoassay or paper-spray mass spectrometry for detection. Both methods use (the in-house developed) paper-immobilized liquid phase micro-extraction (PI-LPME) for the selective extraction of food contaminants from food matrices allowing for contaminant detection at extremely low levels. In this thesis project, the PI-LPME will be further developed. Examples of follow-up research projects are:

A. Expanding the range of compound classes and food matrices to which PI-LPME can be applied. For example, pesticide contamination in food and feed is a reoccurring risk in food safety. Therefore, in this thesis project the student will examine the applicability of the PI-LPME for a selective pesticide extraction.

B. Enhancing the concentration effect of the PI-LPME by combining it with paper-enhanced tip evaporation for extremely sensitive ambient mass spectrometry analysis. Some mycotoxins are strictly legislated (at PPT levels!!!) and therefore, almost impossible to measure with current ambient ionization-mass spectrometry techniques. By combining the PI-LPME with paper-enhanced tip evaporation this project aims to measure mycotoxins at these extremely low levels in baby food.

Are you an enthusiastic and motivated student with an affinity for analytical chemistry? Are you an ambitious go-getter, not afraid to be challenged? Then we are looking for you!

Techniques to be used

Developing a selective food extraction method; ambient mass spectrometry; 3D-printing to assist the paper-based extraction; LC-MS to determine extraction efficiency.

Requirements

-MSc or BSc thesis student
-Full-time available