

Group: Laboratory of Organic Chemistry, Food Quality Design

Project: Detection of macronutrients content in dried human milk spots using paper-based mid-infrared spectroscopy

Supervisors: Peiheng Wang (peiheng.wang@wur.nl) Gert Salentijn (gert.salentijn@wur.nl)

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Introduction

Human milk is the gold standard for providing optimal nutrition for infants. However, evidence also suggests substantial biological variation in human milk composition. The causes of variations and its impact on infant health is not yet well understood. Studies are often limited by sample sizes due to the conventional sampling method which is not only burdensome for the participants but also costly during transportation and storage. As an alternative sampling method, dried milk spot (DMS) is currently under development. Collection of human milk sample with DMS consists of three steps: depositing of milk drops into a piece of paper, drying of milk spot in open air and storage in plastic bag. For such a sampling method, which allows upscaling of sampling frequency and the construction of a macronutrient database, a corresponding cheap, fast and scalable method for the analysis of human macronutrients content is desired.

Mid-infrared spectroscopy (MIR) has been used to assess the macronutrient content in human milk samples¹⁻⁵. While on the analysis side, the current MIR methods are definitely fit for cheap, fast and scalable measurements of human milk, the challenge of such methods lies with scalable sample collection, transportation and storage, as explained above. Therefore, our team's developments in dried milk spot sampling with our team's developments in paper-based analysis, will be combined to obtain fast, cheap and scalable sampling and analysis of human milk macronutrients. Ultimately, being able to measure large quantities of samples over the full breast feeding period using this combined approach can contribute to more insights on infant health.



During this project the student will develop a method for the MIR detection of human milk macronutrients directly on the dried milk spot. This method will undergo validation against direct MIR measurements of liquid milk and will be benchmarked through High-Performance Liquid Chromatography (HPLC) and Gas Chromatography (GC) for detailed analysis of protein and fatty acid compositions. Additionally, the feasibility of utilizing portable Near-Infrared (NIR) devices, such as handheld scanners, for this application could also be explored.

Requirements:

- Full-time available (preferably start Sept 2024 or later)
- MSc thesis student

References:

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