

Development and validation of a quantitative method for measuring multiple food intake biomarkers

Background

- Food intake biomarkers (BFIs) are used as objective tools to estimate food intake^{1,2}. However only few BFIs are validated for this purpose and for many important foods, biomarkers are currently lacking.
- We have identified 36 potential BFIs, that have been shown in previous studies to reflect the intake of foods or food groups commonly consumed in western diets. A controlled dietary intervention in humans was performed where combination of the specific foods were provided in single and repeated doses to establish pharmacokinetic parameters including half-life and dose-response. To validate the identified candidate biomarkers as specific biomarkers of the foods tested, a rapid multi-method is needed. The aim of this project is therefore to establish a method and apply it to samples from the intervention study.

Materials and Methods



Table 1: gradient elution program

Time (min)	MPb (%)	Flow (mL/min)
0.00	0	0.4
1.00	0	0.4
1.50	5	0.4
1.51	5	0.6
4.50	90	0.6
4.51	95	0.8
5.00	95	0.8

Figure 1: Intervention study in which the current method will be employed. During the intervention weeks 1,3 and 5 the participants consume 3 meals daily for 4 days and the proportion of food changes weekly. Weeks 2 and 4 are the wash-out periods.

- UPLC-MMR method; ExionLC™ coupled with QTRAP 6500*
- Column: ACQUITY UPLC BEH C18, 1.7 μm, 2.1x 100mm
- Solvent A; water, 0.2% acet. acid and solvent B; acetonitrile, 0.2% acet. acid

Results

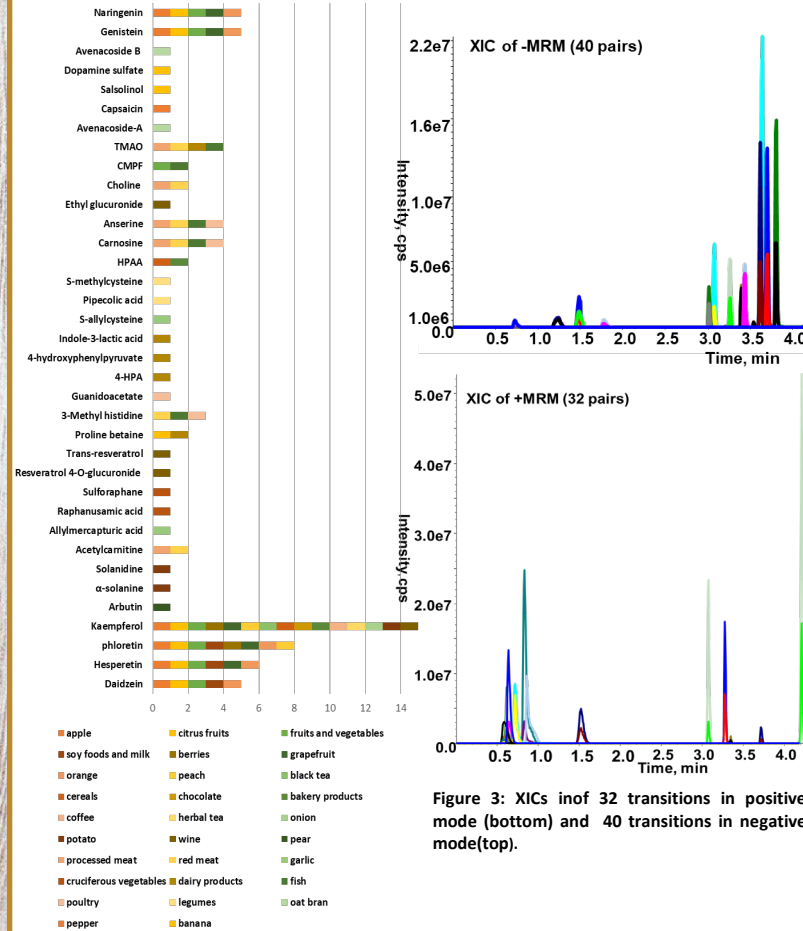


Figure 2: List of the BFIs quantified with the current method and the foods they reflect

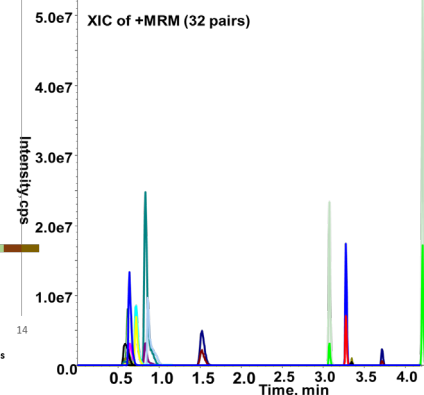
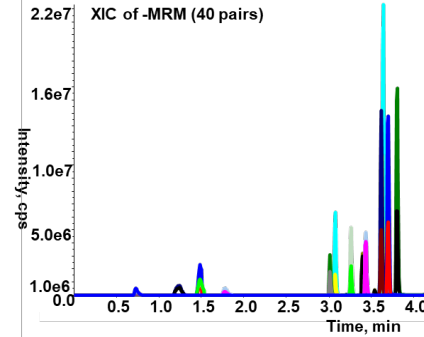


Figure 3: XICs inof 32 transitions in positive mode (bottom) and 40 transitions in negative mode(top).

Expected outcomes

- Quantification and validation of 36 BFIs in blood plasma with a single injection and a 5.0 min gradient elution program, including scheduled MRMs in positive and negative ionization mode.
- Method to be applied and validated for human blood plasma samples from intervention study.
- To fill the gap between academic research and the methodological requirements necessary for the developments of clinical and commercial applications for diet assessments.

Reference

- Landberg, R., et al., *Biomarkers of cereal food intake*. Genes & Nutrition, 2019. **14**(1): p. 28.
- Brennan, L. and F.B. Hu, *Metabolomics-Based Dietary Biomarkers in Nutritional Epidemiology-Current Status and Future Opportunities*. Mol Nutr Food Res, 2019. **63**(1): p. e1701064.

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Thérèse Hjort
Dr. Therese Karlsson



Contact

PhD student Marina Armeni; armeni@chalmers.se