nutrishield

Welcome to the 7th NUTRISHIELD e-Bulletin!

Issue 7 / March 2023

In this issue

Key Facts

Grant Agreement:
No 818110
Call:
H2020-SFS-2018-1
Start date:
01 November 2018
Duration:
48 months
Coordinator:
Alpes Lasers SA

Project Overview

NUTRISHIELD is an innovative solution, providing personalised nutrition advice and support that will assist people in achieving their optimal health and well-being and adopting long-term healthy and sustainable diets.

NUTRISHIELD aims to integrate laboratory techniques, methodologies, ICT devices & applications, algorithms and other components into one platform and validate it in clinical conditions.

The Challenge

To create a platform that

- promotes safe food for the population,
- enables consumers to make informed choices and
- ensures that the proposed choices will have good chances of being adopted

Assist consumers understand:

- why each food is being suggested,
- what implications each choice may have

Expected Impact

- Empowered consumers able to make healthy and sustainable dietary choices
- Personalised diets upon scientific-based dietary assessment and advice
- Increased consumer trust in personalised nutrition advice and/or support
- Prevention of diet-related and non-communicable diseases
- Quality-Of-Life, Health and Safety of the citizens

Latest Articles in Our Blog

Donated breast milk: from donation to premature new-born

Breast milk is the gold standard of new-born nutrition due to its optimal composition in terms of the nutritional elements necessary for its growth and development in the first years of life. In this framework, NUTRISHIELD has assessed the impact of the mother's diet on milk composition and growth and health status of preterm infants by designing a personalised nutrition of lactating mothers, aiming to augmenting the nutritional value of human milk (HM).

Read the full article

Are digital interventions effective for weight control in childhood?

COVID-19 pandemic has led to a rapid transition to the provision of health services through digital tools. However, none of the digital interventions appeared to lead to a significant improvement in the weight of children and adolescents. Thus, a scientific team from Harokopio University published a relevant consolidated analysis, in the framework of the NUTRISHIELD project, which included 8 studies with a total of 582 children and adolescents. The majority of technological means were used in support of conventional therapy and these complex interventions were compared with conventional therapy alone or with conditions without any intervention.

Read the full article

Digital interventions in the management of the body weight of children and adolescents

Addressing excess weight in childhood and adolescence continues to be one of the most important public health challenges. Due to the explosion in the use of technological means, new communication tools can be useful tools for the development of "smart" digital health interventions, which could help tackle childhood obesity. A scientific team from Harokopio University has recently published a systematic review and meta-analysis, in the framework of the NUTRISHIELD project, which led to individual results based on outcome parameters (body weight and fat, nutrition, physical activity, biochemical parameters and physical examination and psychological health)

Read the full post

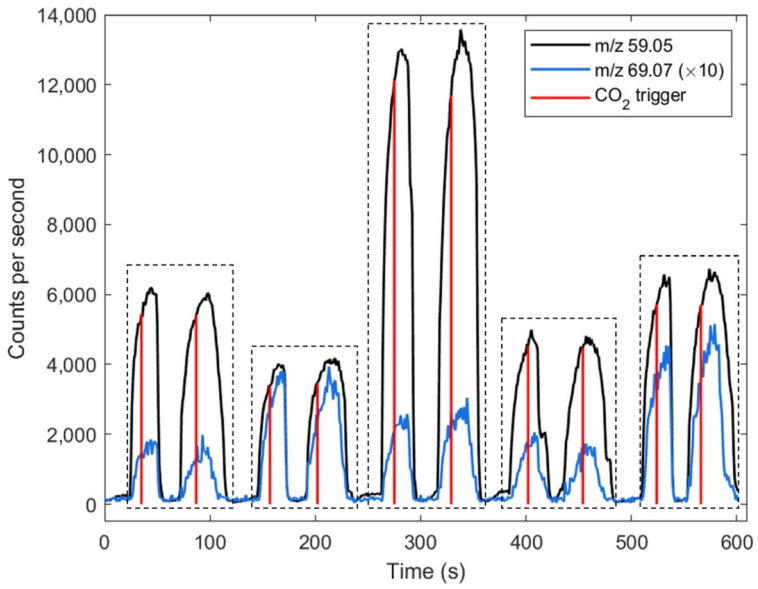
Our Publications

First Publication

Title: **Exhaled Breath Reflects Prolonged Exercise and Statin Use during a Field Campaign**
Authors: Ben Henderson, Guilherme Lopes Batista, Carlo G. Bertinetto, Joris Meurs, Dusan Materic, Coen C. W. G. Bongers, Neeltje A. E. Allard, Thijs M. H. Eijsvogels, Rupert Holzinger, Frans J. M. Harren, Jeroen J. Jansen, Maria T. E. Hopman and Simona M. Cristescu
Link: **https://www.mdpi.com/2218-1989/11/4/192/htm**

Abstract

Volatile organic compounds (VOCs) in exhaled breath provide insights into various metabolic processes and can be used to monitor physiological response to exercise and medication. We integrated and validated in situ a sampling and analysis protocol using proton transfer reaction time-of-flight mass spectrometry (PTR-ToF-MS) for exhaled breath research. The approach was demonstrated on a participant cohort comprising users of the cholesterol-lowering drug statins and non-statin users during a field campaign of three days of prolonged and repeated exercise, with no restrictions on food or drink consumption. The effect of prolonged exercise was reflected in the exhaled breath of participants, and relevant VOCs were identified. Most of the VOCs, such as acetone, showed an increase in concentration after the first day of walking and subsequent decrease towards baseline levels prior to walking on the second day. A cluster of short-chain fatty acids including acetic acid, butanoic acid, and propionic acid were identified in exhaled breath as potential indicators of gut microbiota activity relating to exercise and drug use. We have provided novel information regarding the use of breath omics for non-invasive monitoring of changes in human metabolism and especially for the gut microbiome activity in relation to exercise and the use of medication, such as statins.



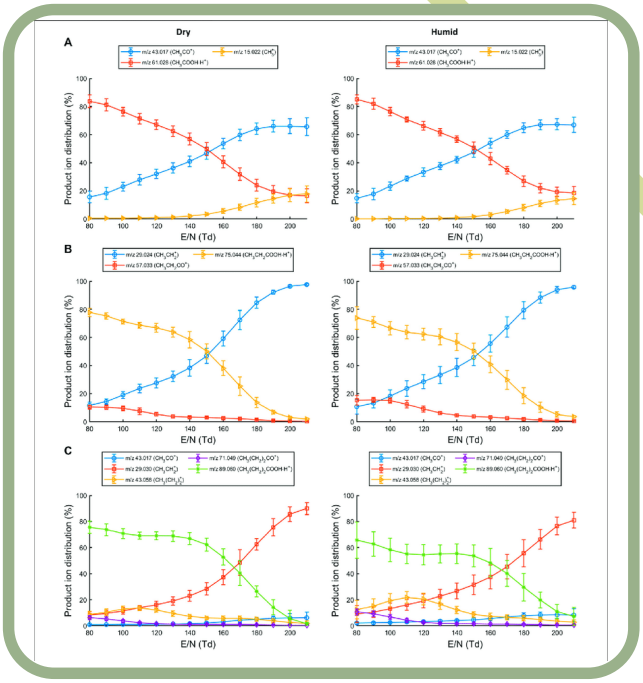
Raw signals of m/z 59.05 (acetone) and m/z 69.07 (isoprene) from five consecutive participants duplicate breath samples (each participant is separated using the dashed boxes). The red line represents the trigger that was activated when the CO2 concentration in exhaled breath reached 4%. On average, two minutes per participant are sufficient to collect the samples

Second Publication

Title: Real-Time Non-Invasive Monitoring of Short-Chain Fatty Acids in Exhaled Breath
Authors: Meurs Joris, Sakkoula Evangelia & Cristescu, S.M.
Link: https://www.researchgate.net/publication/360188474_Real-Time_Non-Invasive_Monitoring_of_Short-Chain_Fatty_Acids_in_Exhaled_Breath

Abstract

Short-chain fatty acids (SCFAs) are important metabolites produced by the gut microbiome as a result of the fermentation of non-digestible polysaccharides. The most abundant SCFAs are acetic acid, propionic acid, and butyric acid which make up 95% of this group of metabolites in the gut. Whilst conventional analysis SCFAs is done using either blood or faecal samples, SCFAs can also be detected in exhaled breath using proton transfer reaction-time-of-flight- mass spectrometry (PTR-ToF-MS) using H3O+ for ionization. However, no investigation has been performed to characterize the reactions of SCFAs with H3O+ and with other reagent ions, such as O2+ and NO+. Gas-phase samples of acetic acid, propionic acid, and butyric acid were analyzed with SRI/PTR-ToF-MS under dry and humid conditions. The ions generated and their distribution was determined for each reagent ion. It was found the humidity did not influence the product ion distribution for each SCFA. Using H3O+ as a reagent ion, SRI/PTR-ToF-MS analysis of an exhaled breath sample was performed in real-time to demonstrate the methodology. The presence of SCFAs in exhaled breath was confirmed by thermal desorption–gas chromatography–mass spectrometry (TD-GC-MS). Breath sampling repeatability was within acceptable limits (<15%) for an analytical methodology for each investigated SCFA. Nutritional intervention studies could potentially benefit from real-time monitoring of exhaled SCFAs as an alternative to measuring SCFAs invasively in blood or faecal samples since it is non-invasive, and requires minimal time investment from participants.



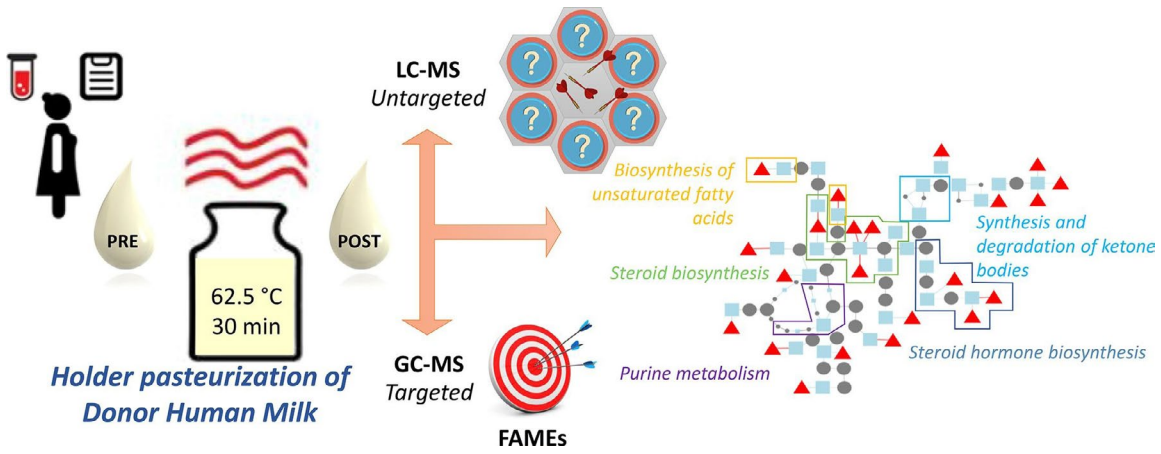
Production ion distributions for reactions of (A) acetic acid, (B) propionic acid and (C) butyric acid with H3O+ in the drift tube at different reduced electric fields. Error bars represent three standard deviations.

Third Publication

Title: **The effect of Holder pasteurization on the lipid and metabolite composition of human milk**
Authors: Isabel Ten-Doménech, Victoria Ramos-Garcia, Marta Moreno-Torres, Anna Parra-Llorca, María Gormaz, Máximo Vento, Julia Kuligowski, Guillermo Quintás
Link: **https://www.sciencedirect.com/science/article/pii/S030881462200543X?via%3Dihub**

Abstract

Human milk (HM) is the gold standard for new-born nutrition. When own mother's milk is not sufficiently available, pasteurized donor human milk becomes a valuable alternative. In this study we analyzed the impact of Holder pasteurization (HoP) on the metabolic and lipidomic composition of HM. Metabolomic and lipidomic profiles of twelve paired HM samples were analysed before and after HoP by liquid chromatography–mass spectrometry (MS) and gas chromatography-MS. Lipidomic analysis enabled the annotation of 786 features in HM out of which 289 were significantly altered upon pasteurization. Fatty acid analysis showed a significant decrease of 22 out of 29 detectable fatty acids. The observed changes were associated to five metabolic pathways. Lipid ontology enrichment analysis provided insight into the effect of pasteurization on physical and chemical properties, cellular components, and functions. Future research should focus on nutritional and/or developmental consequences of these changes.



Graphical Abstract

Fourth Publication

Title: **GC-MS analysis of short chain fatty acids and branched chain amino acids in urine and faeces samples from new-borns and lactating mothers**

Authors: Victoria Ramos-Garcia, Isabel Ten-Doménech, Alba Moreno-Giménez, Laura Campos-Berga, Anna Parra-Llorca, Álvaro Solaz-García, Inmaculada Lara-Cantón, alejandro Pinilla-Gonzalez, María Gormaz, Máximo Vento, Julia Kuligowski, Guillermo Quintás

Link: **https://www.sciencedirect.com/science/article/pii/S0009898122011391?via%3Dihub**

Abstract

Background

Short chain fatty acids (SCFAs) and branched chain amino acids (BCAAs) are frequently determined in faeces, and widely used as biomarkers of gut-microbiota activity. However, collection of faeces samples from neonates is not straightforward, and to date levels of these metabolites in new-born's faeces and urine samples have not been described.

Methods

A targeted gas chromatography – mass spectrometry (GC–MS) method for the determination of SCFAs and BCAAs in both faeces and urine samples has been validated. The analysis of 210 urine and 137 faeces samples collected from preterm (PI), term infants (TI) and their mothers was used to report faecal and urinary SCFA and BCAA levels in adult and neonatal populations.

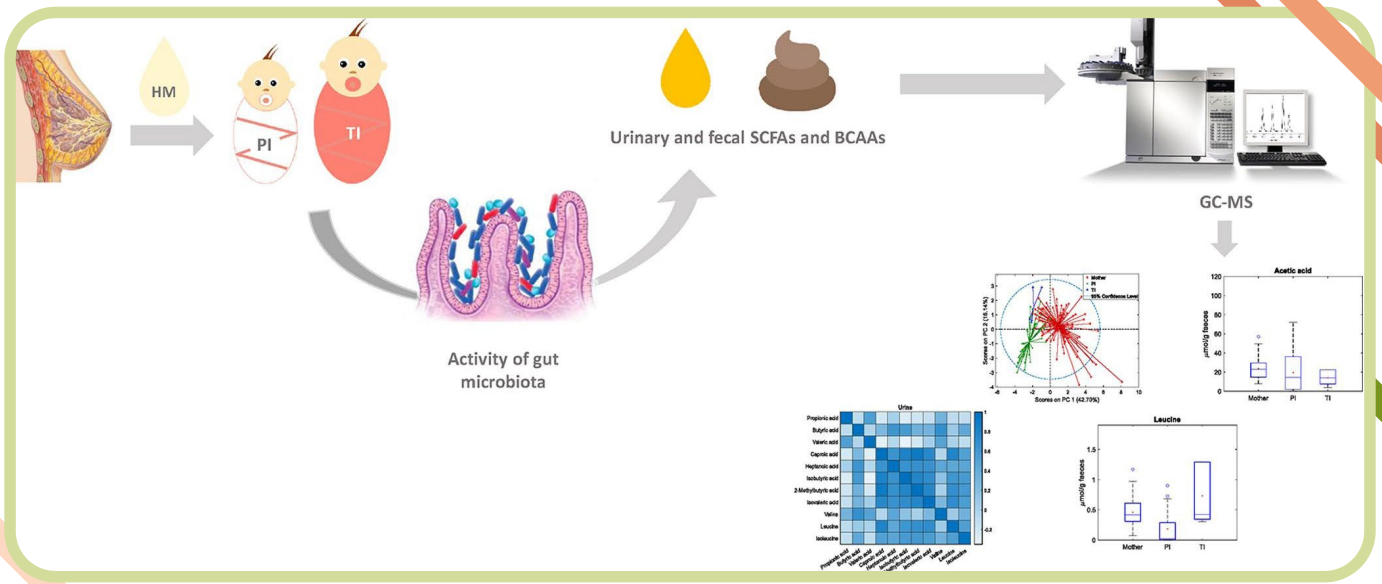
Results

A significant correlation among five SCFAs and BCAAs in faeces and urine samples was observed. Reference ranges of SCFAs and BCAAs in mothers, PI and TI were reported showing infant's lower concentrations in faeces and higher concentrations in urine.

Conclusion

This method presents a non-invasive approach for the simultaneous assessment of SCFAs and BCAAs in faecal and urine samples and the results will serve as a knowledge base for future experiments that will focus on the study of the impact of nutrition on the microbiome of lactating mothers and their infants.

Graphical abstract



nutrishield

Contact us

info@NUTRISHIELD-project.eu

Join us at :

Twitter
@NUTRISHIELD_eu

LinkedIn
NUTRISHIELDproject

Facebook
NUTRISHIELDproject

Unsubscribe information: If you wish to unsubscribe for the NUTRISHIELD e-Bulletin, please reply to info@NUTRISHIELD-project.eu, with "Unsubscribe eBulletin" in the e-mail subject.

Disclaimer: The information expressed in this e-Bulletin reflects the authors' views; the European Commission is not liable for the information contained therein.

In case you have missed our latest issue of **Press Release**, go check it **here**

www.nutrishield-project.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818110.