

Postprandial changes of the serum metabolome after ingestion of probiotic yogurt and acidified milk

Ueli Bütikofer¹, Philipp A Kuert¹, Guy Vergères¹, Carola Freiburghaus¹, Nathalie Vionnet², François P Pralong², Kathryn J Burton¹, Grégory Pimentel¹, and René Badertscher¹

¹Agroscope, Bern, Switzerland

²Lausanne University Hospital, Service of Endocrinology, Diabetes and Metabolism, Lausanne, Switzerland

INTRODUCTION

Fermented foods have been produced and consumed for centuries and their ability to positively influence health and disease states is increasingly recognized. The fermentation of milk produces new metabolites and changes the proportion of existing metabolites.

OBJECTIVES

- Monitor the postprandial metabolome measured with GC-MS in serum after a single intake of 800 g dairy products (acidified milk and probiotic yogurt)
- Observe the influence of fermentation by comparing milk and yogurt
- Correlation of metabolites with gene expression

EXPERIMENTAL

Study design

Randomized double-blinded crossover study¹

- 14 healthy men, 18-40 years
- Milk acidified with 2% glucono- δ -lactone vs yogurt + *Lactobacillus rhamnosus* GG
- 2 weeks run-in/wash-out (2x 200 ml milk/day) before each test day
- A 3-day controlled diet before each test day

6 h postprandial blood sampling
Serum/whole blood
Test food sampling

Metabolomic analyses

- targeted GC-MS analysis

Transcriptomic analyses

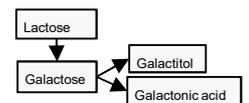
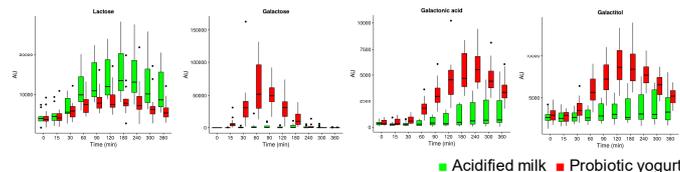
- RNAseq⁴



RESULTS

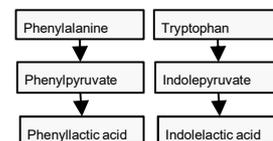
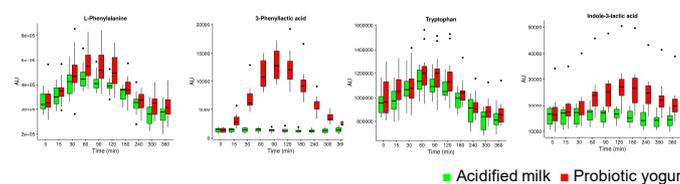
Product ²	Lactose (g/L)	Galactose (g/L)
Acidified milk	49.0	1.8
Probiotic yogurt	0.1	25.2

Lactose and its metabolites in blood serum

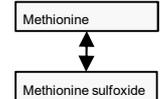
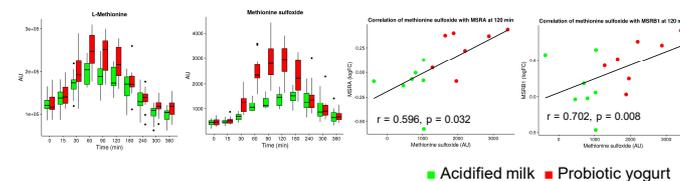


Product ²	Total amino acids (mmol/kg)	Indole-3-lactic acid (AU)
Acidified milk	1.56	0.0
Probiotic yogurt	4.86	1.8

Amino acids and metabolites in blood serum



Product ²	Methionine (AU)	Methionine sulfoxide (AU)
Acidified milk	0.2	< DL
Probiotic yogurt	6.5	< DL



< DL below detection limit

CONCLUSIONS

- Intact lactose appears in serum after dairy intake, but at lower levels after yogurt intake in accordance with products contents.
- Galactose and its metabolites galactitol and galactonic acid are elevated after yogurt intake.
- The majority of free amino acids is present at higher concentration in yogurt³. Serum concentration of several amino acids and their metabolites were also elevated after yogurt intake.
- 3-Phenylactic acid (3-PLA) is produced by lactic acid bacteria during fermentation and is present in much higher concentrations after yogurt intake. 3-PLA is a broad spectrum antimicrobial compound, active against bacteria and fungi.
- Elevated methionine sulfoxide after yogurt intake, incremental area under the curve (iAUC) is 97% higher (p < 0.001)
- Methionine sulfoxide reductase A (MSRA) is significantly upregulated in probiotic yogurt at 120 min (p = 0.016, paired Wilcoxon signed-rank test).
- Methionine sulfoxide reductase B1 (MSRB1) and MSRA show significant correlation with methionine sulfoxide at 120 min. Methionine sulfoxide reductases are implicated in protection against oxidative stress.

References:

- (1) Burton *et al.*, Brit J Nutr, 2017, 1312-1322, doi:10.1017/S0007114517000885
- (2) Pimentel *et al.*, J Nutr, 2018, 851-860, doi:10.1093/jn/nxy053
- (3) Bütikofer *et al.*, Schw Milchw Forschung; 1995, 3-6
- (4) Burton KJ. *et al.* PLoS ONE, 2018, 13(2):e0192947.

