

# Food and nutritional metabolomics with LC-MS-based non-targeted metabolite profiling

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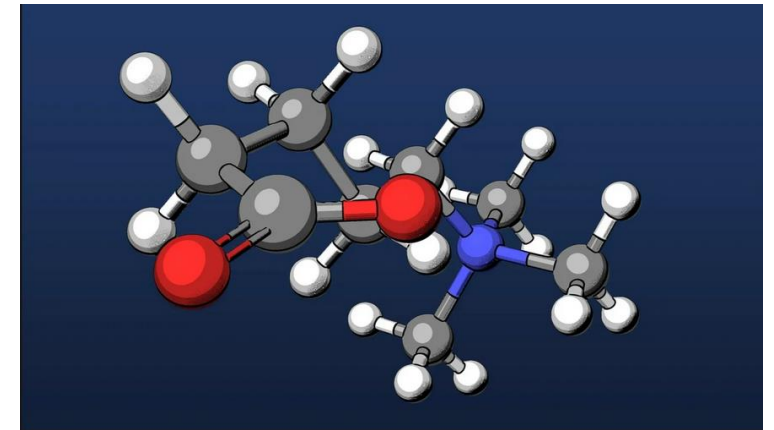
<sup>1</sup>Food Sciences Unit, University of Turku

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# Food, gut & nutritional metabolomics research group

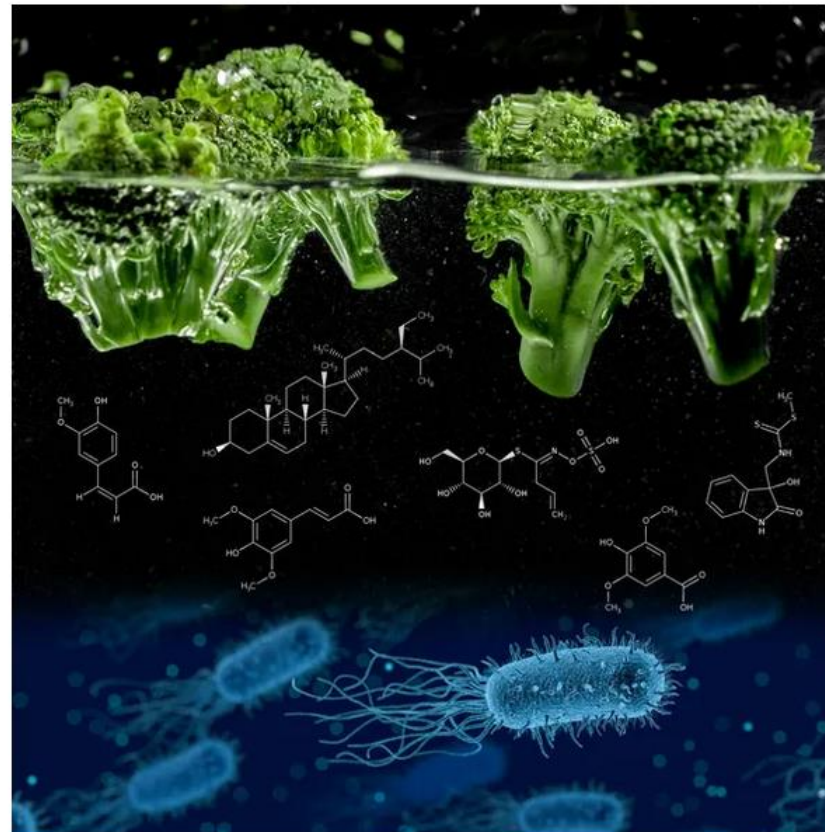
Welcome to our webpage!

Hanhinevalab.com



Team at UTU:

- 4 post-docs
- 5 PhD researchers



## Who we are and what we do

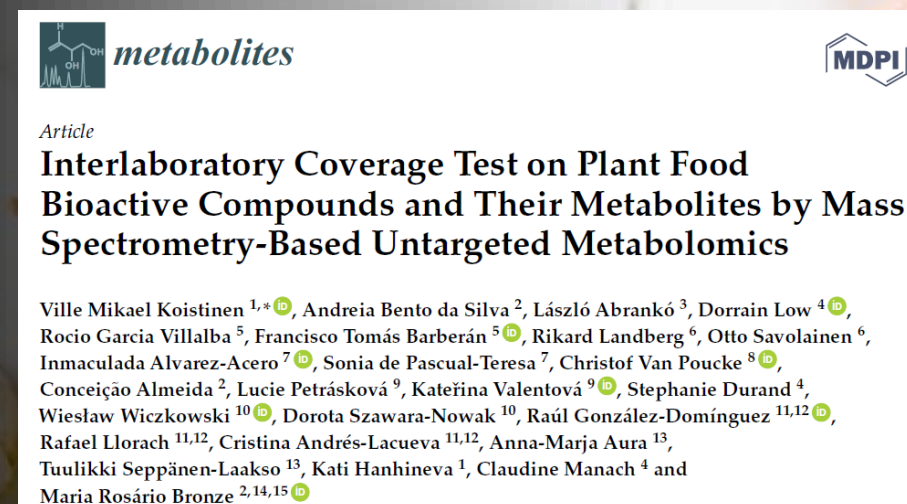
We are an academic research team based in the cities of Turku and Kuopio, Finland. We use metabolomics as our main research tool to investigate different scientific topics ranging from food science and nutrition to gut microbial metabolism and the tissue- and cellular-level effects. The key interests of our group include:

- the biochemical profiles of foods and how they are altered by food processing,
- how diet can beneficially affect health, and
- how gut microbiota is linked with the diet in affecting overall and brain health.

Our research group is based at the University of Turku, Department of Life Technologies, led by professor Kati Hanhineva. In addition, part of the group is located at the University of Eastern Finland, Institute of Public Health and Clinical Nutrition, Kuopio. We also provide metabolomics services via our spin-off company, Afekta Technologies, located in Kuopio.

# Food

- Plant based foods, especially whole grains
- Phytochemical composition
- Impact of variety
- Impact of food processing





# Microbiota

- Role of diet in modulating gut microbiota composition
- Conversion of dietary compounds by microbiota
- Biochemical impact of microbiota-borne compounds

JOURNAL OF  
AGRICULTURAL AND  
FOOD CHEMISTRY

Article

pubs.acs.org/JAFC

## Effect of Bioprocessing on the *In Vitro* Colonic Microbial Metabolism of Phenolic Acids from Rye Bran Fortified Breads

Ville M. Koistinen,<sup>†</sup> Emilia Nordlund,<sup>‡</sup> Kati Katina,<sup>‡,§</sup> Ismo Mattila,<sup>‡,||</sup> Kaisa Poutanen,<sup>‡</sup> Kati Hanhineva,<sup>†</sup> and Anna-Marja Aura<sup>\*,‡</sup>

1700019 (1 of 8)

DOI 10.1002/mnfr.201700019

Mol. Nutr. Food Res. 61, 9, 2017, 1700019

RESEARCH ARTICLE

## Fasting serum hippuric acid is elevated after bilberry (*Vaccinium myrtillus*) consumption and associates with improvement of fasting glucose levels and insulin secretion in persons at high risk of developing type 2 diabetes

Vanessa DF de Mello<sup>1</sup>, Maria A Lankinen<sup>1</sup>, Jaana Lindström<sup>2</sup>, Riitta Puupponen-Pimiä<sup>3</sup>, David E Laaksonen<sup>4</sup>, Jussi Pihlajamäki<sup>1,5</sup>, Marko Lehtonen<sup>6,7</sup>, Matti Uusitupa<sup>1,8</sup>, Jaakko Tuomilehto<sup>2,9,10</sup>, Marjukka Kolehmainen<sup>1</sup>, Riitta Törrönen<sup>1</sup> and Kati Hanhineva<sup>1,7</sup>

Koistinen et al. *Microbiome* (2019) 7:103  
<https://doi.org/10.1186/s40168-019-0718-2>

Microbiome

RESEARCH

Open Access

## Contribution of gut microbiota to metabolism of dietary glycine betaine in mice and in vitro colonic fermentation

Ville M. Koistinen<sup>1\*</sup>, Olli Kärkkäinen<sup>1</sup>, Klaudyna Borewicz<sup>2</sup>, Iman Zarei<sup>1</sup>, Jenna Jokkala<sup>1</sup>, Valérie Micard<sup>1,3</sup>, Natalia Rosa-Sibakov<sup>1,3,5</sup>, Seppo Auriola<sup>4</sup>, Anna-Marja Aura<sup>5</sup>, Hauke Smidt<sup>2</sup> and Kati Hanhineva<sup>1</sup>



SCIENTIFIC REPORTS

OPEN

## Indolepropionic acid and novel lipid metabolites are associated with a lower risk of type 2 diabetes in the Finnish Diabetes Prevention Study

Received: 03 October 2016  
Accepted: 15 March 2017  
Published: 11 April 2017

Vanessa D. de Mello<sup>1</sup>, Jussi Paananen<sup>2</sup>, Jaana Lindström<sup>1</sup>, Maria A. Lankinen<sup>1</sup>, Lin Shi<sup>4</sup>, Johanna Kuusisto<sup>4</sup>, Jussi Pihlajamäki<sup>1,6</sup>, Seppo Auriola<sup>7,8</sup>, Marko Lehtonen<sup>7,8</sup>, Olov Rolandsson<sup>9</sup>, Ingvar A. Bergdahl<sup>10</sup>, Elise Nordin<sup>4</sup>, Pirjo Ilanne-Parikka<sup>11,12</sup>, Sirkka Keinänen-Kiukkaanniemi<sup>13,14</sup>, Rikard Landberg<sup>4,15</sup>, Johan G. Eriksson<sup>1,16,17,18,19</sup>, Jaakko Tuomilehto<sup>3,10,21</sup>, Kati Hanhineva<sup>1,8</sup> & Matti Uusitupa<sup>1,22</sup>

# Metabolic impact of nutrition

- Human
  - clinical trials
  - observational cohorts
- Animal trials
- *In vitro* assays

1550

DOI 10.1002/mnfr.201500066

Mol. Nutr. Food Res. 2015, 59, 1550–1562

## RESEARCH ARTICLE

### Amino acid-derived betaines dominate as urinary markers for rye bran intake in mice fed high-fat diet—A nontargeted metabolomics study

Jenna Pekkinen<sup>1</sup>, Natalia Rosa-Sibakov<sup>1,2,3</sup>, Valerie Micard<sup>1,2</sup>, Pekka Keski-Rahkonen<sup>1</sup>, Marko Lehtonen<sup>4</sup>, Kaisa Poutanen<sup>1,3</sup>, Hannu Mykkänen<sup>1</sup> and Kati Hanhineva<sup>1</sup>

## SCIENTIFIC REPORTS

**OPEN** Whole grain intake associated molecule 5-aminovaleic acid betaine decreases  $\beta$ -oxidation of fatty acids in mouse cardiomyocytes

Received: 1 May 2018  
Accepted: 20 August 2018  
Published online: 29 August 2018

Olli Kärkkäinen<sup>1</sup>, Tomi Tuomainen<sup>1</sup>, Ville Koistinen<sup>1</sup>, Marjo Tuomainen<sup>1</sup>, Jukka Leppänen<sup>1</sup>, Jouni Laitinen<sup>1</sup>, Marko Lehtonen<sup>1</sup>, Jaisa Rytö<sup>1</sup>, Seppo Auriola<sup>2</sup>, Antti Posa<sup>3</sup>, Rauli Tsa<sup>4</sup> & Kati Hanhineva<sup>1</sup>

## RESEARCH ARTICLE

Nutritional Metabolomics

Molecular Nutrition  
Food Research  
www.mnfjournal.com

### Metabolic Profiling of High Egg Consumption and the Associated Lower Risk of Type 2 Diabetes in Middle-Aged Finnish Men

Stefania Noerman, Olli Kärkkäinen, Anton Mattsson, Jussi Paananen, Marko Lehtonen, Tarja Nurmi, Tomi-Pekka Tuomainen, Sari Voutilainen, Kati Hanhineva, and Jyrki K Virtanen\*



Contents lists available at ScienceDirect

Clinical Nutrition

journal homepage: <http://www.elsevier.com/locate/clnu>

#### Original article

Associations of the serum metabolite profile with a healthy Nordic diet and risk of coronary artery disease

Stefania Noerman<sup>a</sup>, Marietta Kokla<sup>a</sup>, Ville M. Koistinen<sup>a</sup>, Marko Lehtonen<sup>b,c</sup>, Tomi-Pekka Tuomainen<sup>a</sup>, Carl Brunius<sup>d</sup>, Jyrki K. Virtanen<sup>a,1</sup>, Kati Hanhineva<sup>a,d,e,1,\*</sup>

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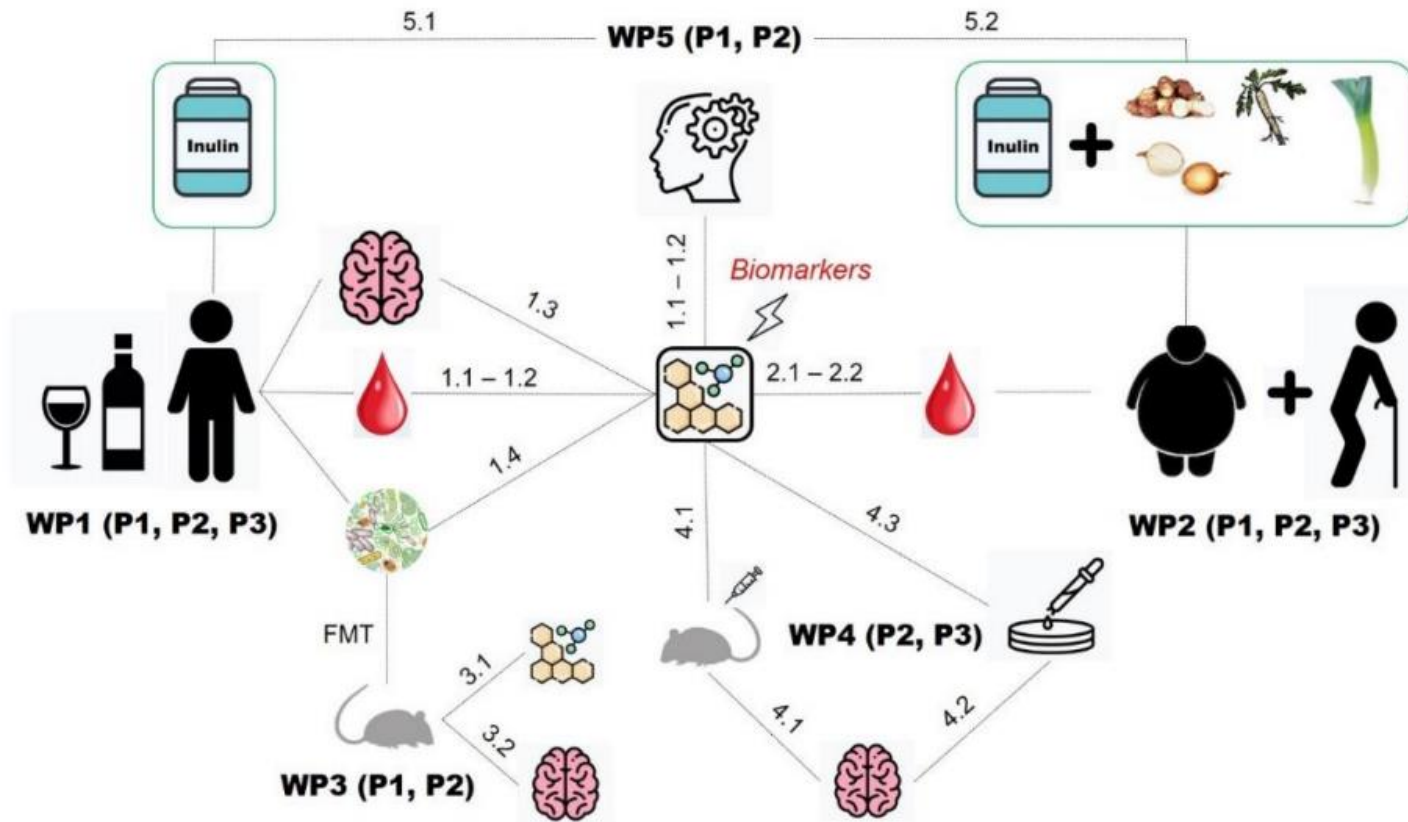
<sup>e</sup> Department of Biochemistry, Food Chemistry and Food Development Unit, University of Turku, Turku, Finland

### Quantitative assessment of betainized compounds and associations with dietary and metabolic biomarkers in the randomized study of the healthy Nordic diet (SYSDIET)

Marjo Tuomainen<sup>1</sup>, Olli Kärkkäinen<sup>1,2</sup>, Jukka Leppänen<sup>2</sup>, Seppo Auriola<sup>2,3</sup>, Marko Lehtonen<sup>2,3</sup>, Markku J Savolainen<sup>4</sup>, Kjeld Hermansen<sup>5</sup>, Ulf Risérus<sup>6</sup>, Björn Åkesson<sup>7,8</sup>, Inga Thorsdottir<sup>9</sup>, Marjukka Kolehmainen<sup>1</sup>, Matti Uusitupa<sup>1</sup>, Kaisa Poutanen<sup>10</sup>, Ursula Schwab<sup>1,11</sup> and Kati Hanhineva<sup>1</sup>

# On-going projects: Gut2Behave

Metabolic profiling of the gut-brain axis as a new stratification process to improve behavioural disorders: proof of concept in alcohol dependence



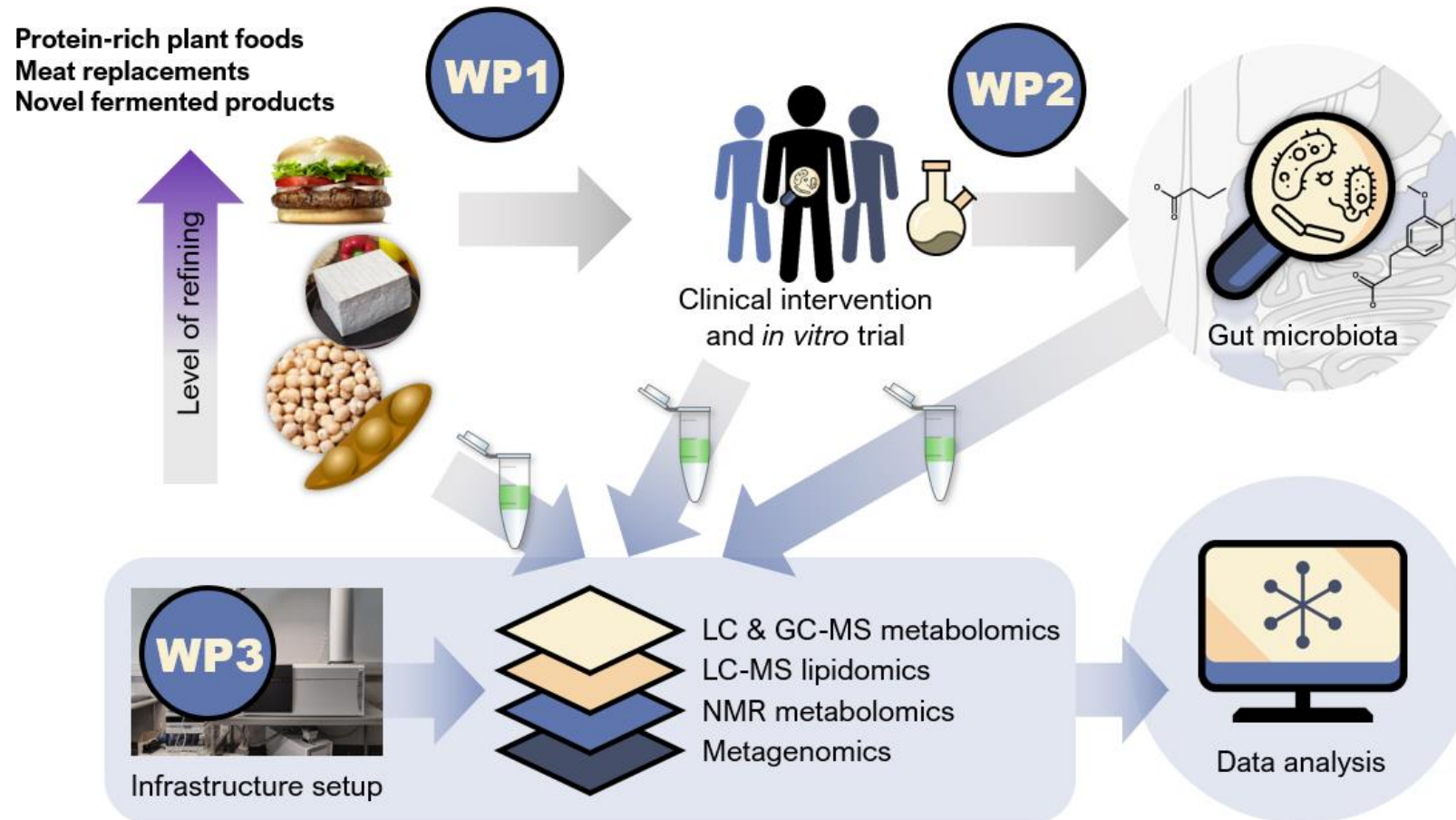


# On-going projects: NewPlant

J&AE

JANE AND AATOS  
ERKKO FOUNDATION

Novel plant-based foods: impact on health and role for fermentation



# On-going projects: HealthFerm

**Innovative pulse and cereal-based food fermentations for human health and sustainable diets**

- Societal and industrial transition from traditional to sustainable plant-based fermented foods by design for a healthy everyday diet
- How food fermentation microbiomes, fermented grain-based foods and the human gut microbiome interact and support human health
- European Union's Horizon Europe Framework Programme for Research and Innovation
- 22 partners across Europe





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Newcastle University, UK  
IARC, France



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2014–2020





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