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Metabolomics in food, diet and health research (#644)

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Short Abstract

Metabolomics describes the comprehensive profiling (and/or quantification) of low molecular compounds in a biological sample and is used in almost all fields of the life sciences but also for assessment of food authenticity (origin). Advancements in NMR- or chromatography-coupled mass-analysis techniques provide constantly improved sensitivity and larger metabolite panels. In addition, new databases for annotation and identification of formerly unknown metabolites are created. With this toolbox of metabolomicsthe life, nutrition and food sciences "return to the roots" by studying again metabolic processes and pathways. Seemingly unlimited for analysing food samples, there are not yet too many examples for meat and derived products showing the reward of the technology. Some more examples can be found for plant-based foods which by nature of the plant contain usually a large number of secondary plant metabolites. Those are very characteristic and can be used in human studies for demonstration that a certain food item has been consumed. Yet, here come individual metabolic processes into play which in phase I and phase II and by the activity of the gut microbiota generate a diverse spectrum of metabolites from the plant constituents which are finally excreted in urine and/or feces. Metabolomics applications in humans are more challenging by the limited availability of bio-samples usually restricted to body fluids, blood cells or a tiny quantity of biopsy material. Most available studies in humans use metabolomics as a diagnostic tool with changes in the concentrations of individual metabolites or metabolite ratios as discriminants for health or disease. However, what is essentially not known is what determines the plasma and urinary metabolome and its dynamic changes and how this relates to individual organs and cell types which all have a distinct metabolite pattern with intracellular concentrations exceeding those in plasma frequently up to 200-fold. One of the applications in human studies is the identification of specific metabolites derived from the consumption of given food items. These new methods are considered as very helpful based on the lack of proper food intake assessment methods which currently rely mostly on food frequency questioners. If metabolite quantification would allow to assess in quantitative terms the amount of a food item consumed a new level of nutrition research for population studies would be reached. I shall demonstrate the state of art and use examples from consumption of chicken meat and beef with the identification of distinct metabolite markers and kinetic analysis thereof.

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