



The newest wave of nutrition research, “omics” techniques provide information on biological processes to gain a deeper understanding of the interactions between nutrition and health.

Emerging Technologies

Focus On: Nutritional Metabonomics

Metabonomics addresses the comprehensive analysis of the entire metabolome under a given set of conditions. It entails the quantitative measurement of dynamic metabolic parameters of living systems in response to genetic modifications or physiological stimuli, including diet and nutrition.

The metabonomic approach is used to obtain knowledge and insights about individuals' metabolic responses to nutrients and bioactive compounds.

Using metabonomics in nutrition research is a promising method to study metabolic health, monitor nutrition status and identify biomarkers for early disease diagnosis.

Metabolic Phenotypes

Metabolic phenotypes of individuals are expressed as a result of genes, environment, lifestyle, diet and gut microflora interactions.



Metabonomics is used to understand the role of genetic, environmental and behavioural factors on metabolism and the associated effects of nutrition on specific metabolic phenotypes.

The relationship between dietary habits and metabolic phenotypes can also be studied through evaluation of metabolic interactions with gut microflora.

Gut Metabolism

The gut microbiome acts as an extended genome, representing a significant source of metabolic variability in humans. Diet can modulate the complex internal community of gut microorganisms and by doing so may drastically alter nutrient bioavailability and metabolism.

Evaluating molecular interactions between the gut microbiome and the host provide insights into health and the impact of nutrition. For example, the effects of a nutrition intervention can be examined with biomarkers of energy or gut metabolism, called a metabolic signature.

NRC Research Initiatives

NRC scientists use metabonomics to make associations between specific dietary preferences and metabolic phenotypes (metabotypes). Links between dietary preference and metabotypes can be further extrapolated to develop functional foods to meet specific nutritional needs of individuals.

The Metabolic Signature of Chocolate

Nestlé scientists investigated the link between metabolic phenotypes and the dietary preference for eating chocolate. Study results showed that the metabolites of “chocolate desiring” subjects compared to those that were “chocolate indifferent” were distinctly different.

NRC scientists concluded that the ecology and metabolic activity of the gut in healthy individuals may be modulated by the diet more than previously thought. The metabolic imprinting findings provide evidence for a link between specific dietary preferences and metabolic phenotypes.

The Microbiome and Metabolism

The human gastrointestinal system contains hundreds of strains of bacteria - collectively called the microbiome - some beneficial and others potentially harmful. NRC scientists use metabonomics to study the influence of certain bacteria in the gut on nutrient metabolism and long-term disease risk.

Abnormalities in some types of gut bacteria have recently been linked to the risk of developing diseases such as diabetes and obesity. By understanding the metabolic role of the gut microbiome and how alterations in this environment impact health, scientists can develop nutritional strategies (including probiotics and functional foods) to improve health and lower disease risk.

Definitions

Metabonomics - the quantitative measurement of the metabolic responses of living systems to pathophysiological stressors, genetic modifications, environmental stimuli and nutritional interventions.

Metabolomics - the goal of metabolomics is to understand living organisms in an integrated and coherent way rather than to look at organisms as isolated, dissected molecular parts. Maintaining health and preventing disease requires a comprehensive, integrative approach to metabolism, and metabolomics is the logical technology to bring this approach to scientific research and clinical practice.

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