

Nutrigenomics

Nutrigenomics (nutritional genomics) is a scientific field studying mutual interactions between nutrients received in food and hereditary information. It investigates how biologically active substances influence the expression of genes and subsequently proteins, which ultimately lead to changes in metabolism at the cellular and organismal level.

Together with nutrigenetics (nutritional genetics) - a field dealing with the relationship between genetic variability between individuals and the predisposition to the development of specific diseases associated with nutrition - nutrigenomics is a relatively new and dynamically developing field. The integration of information from these fields will enable the **development of an individual approach to nutritional care**, which will lead to an increase in the effectiveness of intervention strategies in the prevention and treatment of diseases caused by inappropriate eating habits.

From nutrients to influencing the expression of genetic information

Human food contains a number of **essential** (macro- and micro-nutrients - vitamins, minerals) and **non-essential** (antioxidants, flavonoids, fiber, probiotics) nutrients. These biologically active substances have the ability to induce cellular changes, i.e. they can primarily influence the profile of expressed genes (transcriptome) and the organization of chromatin (epigenome) and thus have a secondary effect on **protein expression**, including their post-translational modifications (proteome) and overall metabolic profile of the cell (metabolome). These substances also often show a **pleiotropic effect**, i.e. they influence multiple cellular processes simultaneously and act tissue- and organ-specifically.

The main mechanism by which nutrients cause changes in gene expression is their interaction with transcription factors, which trigger the transcription of target genes in response to the binding of specific ligands. An extensive family of transcription factors that are often activated precisely by bioactive substances or their metabolites are nuclear receptors, which are involved in the regulation of a number of cellular processes including nutrient metabolism, cellular homeostasis, embryonic development, cell proliferation and differentiation, or apoptosis. After ligand binding, dimerization and a conformational change of the receptor occur, which leads to the coordinated dissociation of corepressors (preventing the initiation of transcription) and the binding of coactivators (activating transcription) and ultimately enabling the initiation of transcription.

Goals of Nutrigenomics

The main interest of research in the field of nutrigenomics is the preservation of **human health**, including the prevention of chronic non-infectious diseases (cardiovascular and cancer diseases, obesity, metabolic syndrome, etc.), possibly also their treatment.

Links

Related Articles

- Nutrigenetics

References

- AFMAN, Lydia – MÜLLER, Michael. Nutrigenomics: From Molecular Nutrition to Prevention of Disease. *Journal of the American Dietetic Association* [online]. 2006, vol. 106, no. 4, p. 569–576, Available from <<http://linkinghub.elsevier.com/retrieve/pii/S0002822306000022>>. ISSN 00028223.
- FENECH, Michael – EL-SOHEMY, Ahmed – CAHILL, Leah. , et al. Nutrigenetics and Nutrigenomics: Viewpoints on the Current Status and Applications in Nutrition Research and Practice. *Journal of Nutrigenetics and Nutrigenomics* [online] [online]. 2011, y. 2, vol. 4, p. 69-89, Available from <<http://www.karger.com/doi/10.1159/000327772>>. ISSN 1661-6758. DOI: 10.1159/000327772 (<http://dx.doi.org/10.1159/000327772>).