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## **GENE - NUTRITION INTERACTION AND PLANT METABOLITES IN THE TREATMENT OF HUMAN HEREDITARY BASED DISORDERS**

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### **INTRODUCTION**

The primates have a long evolution as prevalently herbivorous organisms. Through the evolution there may be the impact of such a diet on the genetic system by weakening of the genetically based determination of synthesis of some metabolites. By food of plant origin, mainly fruits and young leaves, some metabolites could be regularly obtained in an excessive amount (for example ascorbic acid, folate (1) etc.), and thus there may appear and sustain some genetic variants with less efficient anabolic or acquisition mechanism for such metabolites. On the other hand, specific development of genetic information, suitable for the dietetic use of plants (metabolic dependence on dietary fibers, polyphenols and plant estrogens, development of proline-rich salivary proteins as a defense against dietary tannins, development of Se storage proteins in human plasma (2)) may appear. In early human development hunting contributed to increase in animal protein intake, and few thousand years ago, cereal grains become a staple food. The modern man uses less variable, highly refined and selected food, rich in proteins and lipids of animal origin.

### **HUMAN INDIVIDUALITY**

Genetic uniqueness of human individuals (with the exception of identical twins) is based on the mode of cross-mating reproduction and is perpetuated by the high level of heterosigosity of organisms, by migrations, by the rate of mutations and by the relatively mild selection pressure in cultural environments. There is additional post-meiotic variation in the formation of genes for immunoglobulins. Besides the genetic individuality, there are particular sets of environments, of previous dietetic, health and other life experiences, and interaction among genetic, epigenetic and environmental factors. There are some possibilities for modeling the nutritional genetic variability in man by different strains and hybrids of experimental animals (3).

### **INBORN ERRORS OF METABOLISM**

Phenilketonuria (PKU) is a case of inborn errors of metabolism, clearly genetically determined by a block in the metabolic pathway, caused by missing or ineffective enzyme. Damages for human health could be prevented by the removal of the metabolite ahead of the block, or by substitution of the metabolite behind the block. In some cases (like PKU) dietary treatment is very effective. Plant genetic engineering opened possibilities to design plant proteins and other metabolites according to the nutritional needs of patients and other consumers. By the genetic alteration of metabolites in plants it is theoretically possible to replace the present semisynthetic diets for some patients by foods of plant origin.

### **OTHER GENETICALLY BASED DISORDERS AND NUTRITIONAL INTERACTIONS**

Obesity, hyperlipidemia, diabetes, hypertension, cardio-vascular diseases, cancer, allergies and various intolerances and oversensitivities to food constituents are disorders, which are to some degree genetically determined (4, 5). Recent results in research of plant trace elements, starch digestibility, fibers and polyphenols, relevant for prevention or treatment of some of hereditary based disorders are presented in the extended version of this paper.

### **MANIPULATION OF PLANT METABOLITES**

In some plant metabolites only small changes for improving the suitability for specific patients are needed. The adverse reaction in coeliac patients is for example caused by a small section of the respective polypeptide chain. In such cases, it is possible to use plant sources without the specific metabolite, the metabolite could be controlled by the genetic adaptation of plants (6), or by post-harvest molecular adaptations.

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