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Letter to the editor

Dear Editor

Nutrigenomics is a specialized topic investigating the role of nutrition on gene expression, and overlapping subject between two fields of nutrition and genetics. It studies some aspects of the expression and function of genes which is affected by diet. Due to the vast and notable effect of diet on the growth, health and wellbeing of children and infants (and people with specific diseases like metabolic syndrome, diabetes, etc.), nutrigenomics has a wide range of study within this group of the human society (Dang et al., 2014). In fact, nutrigenomics is a subset of epigenomics which are the investigation of changes in gene action that are mitotically and/or meiotically heritable and that do not implicate an alternation in DNA sequence. Consequently, nutrigenomics is a field of science which studies the impacts of diet on genome. This science includes the effects of maternal nutrition on the human fetus during pregnancy; the breast-feeding phase and also the effects of the quality and composition of food on new-born and children after infancy. Regarding to the documents from Hap Map project, Personalized Medicine, and Human Genome Project, nutrigenomics follows some fundamental goals. The first is elevation of the understanding of the effects of nutritional factors on biochemical, metabolic, physiologic mechanisms, homeostasis regulations and may be their decomposition mechanism, assessing diet-related disorders and diseases (e.g. food allergies or intolerance to certain foods) and the occurrence of these diseases with respect to the sensitivity of the particular genotype to nutritional factors. The second goal is the interventional targeting of dietary protocols and nutrition to restitute normal homeostasis aimed at prohibition nutrition-associated disorders (Muller and Kersten, 2003).

Type 2 diabetes, a usually more prevalent in obese and sedentary individuals and certain minor groups, is a clear example of the interplay between genotype and diet. Its symptoms discount by elevating mobility and declining in the caloric intake, particularly through fat intake and changing the type of fat intake (Frayling, 2007), which shows the effects of metabolic stress on the metabolic syndrome (Furukawa et al., 2004).

It is well documented that the centralization of nutrigenomics on infant feeding will make a new scientific area and therefore, will lead to further achievements on the science of pregnant and lactating women's nutrition during the neonatal period and infancy. On the other hand, it will make impressive development in the field of nutrition-based interventions (not drugs) in children with nutritional and metabolic disorders, and food allergies (Dang et al., 2014).

From the molecular genetics point of view, diet affects DNA methylation, histone modification, incorporation of several histones into nucleosomes, nucleosome modification, adenosine 5-triphosphate dependent chromatin alternation, usage of non-coding RNAi/RNA pathways, chromatin bivalency via epigenetic and eventually leads to a change in gene function without altering the DNA sequence (Bird, 2002).

Changes in the expression of pluri-potency factors can control the function of certain genes which indicate the role of epigenetic factors in changing the gene arrangement and expression as are related with methylation or demethylation of lysine 4 and 27 of histone H3. The maintenance of epigenetic memory as the impact of nutritional status on the genome can be evaluated in two forms, limited and sustained response of genes and genomes to nutritional conditions (Ling et al., 2012)

Changes in gene expression due to nutritional conditions can remain in the cell memory for a long time. It is clear that those factors like 5AZac and valproic acid are inhibitors of DNA methylation, chromatin remodeling factors (ISWI and Brg1) and are involved in the planning and rearrangement of nucleus of somatic cells. Based on the above discussion, it is concluded that nutrigenomics has many relationships and overlapping fields of study with specialized branches of genetics such as lipidomics, glycomics, pharmacogenomics, toxicogenomics, metabolomics, cytomics and finally, the biological systems. Nutrigenomics emphasizes that diet ingredients are effective signals on receptors and sensitive systems of receiving these signals in the genome and also cell components which affect gene expression. Consequently,

cytokines, hormones, interleukins, antibodies, antigens, structural proteins' production and finally all cellular and metabolic processes are influenced (Corthesy-Theulaz et al., 2005). The main fundamental assumptions of nutrigenomics about relationship between genetics and nutrition, includes a) the importance of single nucleotide polymorphisms and point mutation of genes in the metabolism of nutrients, metabolic pathways bioactivity, and biochemical and metabolic mediators, b) food and particularly micronutrient importance in gene expression according to the genetic background of each individual, c) the important of diet role on health (according to the unique genetic background of each individual, d) food and particularly micronutrients can lead to a significant effect on the regulation of gene expression and on its impact on the different aspects of diseases, especially food allergies, metabolic and chronic diseases, e) the importance of nutritional intervention and regulation of nutritional conditions regarding to the each particular genotype to prohibit, mitigate or cure diseases (Muller and Kersten, 2003).

In conclusion, the possibility of changes in gene expression makes a critical debate in terms of practical use in medicine that might be the true realization of "food as medicine". In addition, using "food as medication", especially in children, infants and pregnant women as food based medical intervention and treatment protocols (not drugs) according to the elements of nutrigenomics charts, may make a very desirable prospect for the future of medical sciences and the field of nutrition. So, it seems that more detailed studies should be designed by researches for acquiring comprehensive data in this regard in the future.

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