



# Neutrogenomics : A Direct Interaction

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## ABSTRACT

Numerous studies have been carried out on nutrients and their role on health and diseases, and the role of genes in causing the diseases. The study now follows to the higher level where the research goes on how genes and nutrients interact. It is of no doubt that nutrition and genetics both play an important role in human health as well as in the development of various chronic diseases. Nutrigenomics is the branch of science that incorporates various scientific & biological approaches which describes how nutrition interacts with gene with the application of 'omics' technology.

**Keywords :** - Nutrients, Gene, Scientific, Biological, Omics.

## INTRODUCTION

Today in 21<sup>st</sup> century the nutritional environment that we live with is very different from the environments to which we had genetically adapted. Major changes in our food supply accompanied the domestication of animals and the agricultural revolution about 10,000 years ago. Later, the Industrial Revolution and developments in food technology brought about further major changes in the composition of foods, one of the most important of which was a change in the quantity and quality of the various constituent. Modern research in the field of science analyzes the role of nutrient and gene expression. It gives answers to various questions regarding the multidisciplinary gene-based approaches and the interaction of nutrition and gene so as to get the clear concept of health and disease. The quantity of dietary intake varies among individual to individual, it is because of differences in the process of absorption, distribution, metabolism and elimination. The mechanisms responsible for the between-person differences in dietary response are very complex and have been poorly understood (Drayna, 2005).

### Principles of Nutrigenomics

Nutrigenomics is both the examination of how nutrients affect genes (i.e. influence gene expression and function) and how genes affect diet (i.e. what an individual eats and how an individual responds to nutrients). Nutrigenomics uses the new “omics” technologies at the level of molecular and cellular Processes and biological systems and can tell us how things work. It is very clear that under certain condition diet can be a serious risk factor for various diseases in some individual.

The gene is the functional and physical unit of heredity passed from parent to offspring. Genes are segments of DNA that contain the information for making a specific protein. When variations in the DNA occur the result can be changes to the structure and function of the protein. There are several different types of genetic variations, including single nucleotide polymorphisms (SNPs), which are alterations in a single nucleotide. Alleles are the variant forms of a gene at a particular location on a chromosome. The genotype is the genetic identity of an individual for a genetic site, determined from the combination of maternal and paternal alleles. Genotypes do not necessarily show as outward characteristics, and as such are different from phenotypes. A phenotype is an observable trait in an individual such as hair color, high blood sugar concentrations, or the presence of a disease. Individuals with the same genotype may have different phenotypes, in part, because of their different environments.

Nutrigenomics is the area of nutrition that uses molecular tools to search, access, and understand the several responses obtained through a certain diet applied between individuals or population groups. It seeks to find how the components of a particular diet that may affect the expression of genes, which may have increased its potential or which can be suppressed. This response will depend on how genes will show a changed activity or alter gene expression.

### Application of Nutrigenomics : Where we stand now

Nutrigenomics have direct links to various chronic diseases such as cancer, osteoporosis, diabetes, cardiovascular disease and various other inflammatory conditions. There is good evidence that nutrients and physical activity influence gene expression and have shaped the genome.

Nutrigenomics is widely used for studying diet-related disorders as well as heart-related disorders

(Sivasankaran, 2010). A cardiovascular disease is the primary diet-related chronic disease of the modern time and the inflammation is emerging as underlying many chronic disorders including CVD. CVD can be characterized as a group of multifactorial conditions associated with obesity, atherosclerosis, hypertension, and thrombosis. All of these pathologic entities are known to be closely related to both genetic factors and environmental influences. Diet is considered as one of the environmental influences and a strong relationship between diet composition and CVD risk is well established (Hooper et al., 2001; Schaefer, 2002).

Genetic differences play an important role in the development of obesity, although environmental and social factors are also very important. The relative contributions of genetic and socioeconomic factors to the development of obesity and the ways in which these interact in human societies, are largely unknown.

Cancer is a process composed of multiple stages in which gene expression, protein and metabolite function begin to operate aberrantly (Go et al, 2003). Inherited mutations in genes can increase one’s susceptibility for cancer. The risk of developing cancer can be markedly increased if there is a gene-diet interaction. Diet considered as a source of either carcinogens present in certain foods or constituents acting in a protective manner.

### Challenges and Potential of Nutrigenomics and Nutrigenetics

Apart from genetics there are various factors that influence the response to diet such as age, sex, physical activity, habits such as smoking. One of the main goal of nutrigenomics is to prevent the onset and progression of chronic disease. Research strategies currently contribute to this goal by building the body of evidence linking nutrients to metabolic pathways that affect disease outcomes. Although different humans go with different variety of foods and to adapt to them certain genetic adaptations and limitations occur in relation to the diet. Understanding the evolutionary aspects of diet make it important for which our genes were programmed to respond. Because there are genetic variations among individuals, changes in dietary patterns have a differential impact on a gene.

The incorporation of genetics into nutritional epidemiologic studies aims to improve their consistency. Research is being carried out to develop a personalized

nutrition guideline for individuals and specific populations, which could be able to decrease the risk of chronic diseases. The potential of nutrigenomic approaches is to be realized.

### **Nutrigenomics and Public Awareness**

Personalised medicine and nutrition are not completely applied into the everyday routine. Nutrigenomics being a relatively new field, there are a lot of factors to be considered before it becomes common, though it is an exciting emerging field with a lot of promise it might answer to our question how nutrition can treat and prevent disease. Addressing the genetics and nutritional genomics knowledge gap will help in eradicating the social issues, create more awareness, confidence and trust among the public. Public concerns over nutrigenomics are relevant to science and to the food industry.

Sophisticated programs are available, where it is even possible to obtain a nutritional counseling based on the client's DNA. The recent advances on Nutrition Sciences allow the application of a personal counselling, in contrary to the general use of standard nutritional diets that was being applied for many years. The personalized nutritional counseling can be used not only to change diet habits and improve life style, but also mainly will permit a better diagnostic of certain diseases, retard the evolution of chronic illnesses, and assist on the treatment of others.

### **CONCLUSION AND PERSPECTIVES**

Although the term nutrigenomics is relatively new, the concept has been around for some time. Various researches have been carried out to approach the details to know how nutrients affect gene function and how genetic variation affects nutrient response. Nutrigenomics shows a new way of working with nutrition and now, the knowledge of how food interferes with the genetic code has to be well understood. Research on nutrigenomics has to be projected on a large scale so as to know about the role of nutrients on genotype and to identify genes that cause or promote chronic disease. Identifying different regulatory patterns based on diet and genotype is of prime concern. A great deal with different research has to be applied with newer analytical tools so as to gain insights into the overall biological processes involved.

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