

This report is based on in-depth interviews with research organizations completed by a scientific review.

It provides to **DECISION MAKERS** a global understanding of the sector as well as an outlook on its future.

### MARKET ANALYSIS

- New trends and perspectives brought about the “Omic” sciences
- A step ahead of dietetics?
- Main metabolic profiles
- Perspective for health management through individual regime design

### MAIN TOPICS

- Epigenetics & Gene expression
- Metabolomics is the key?
- Monogenic & Multigenic diseases
- What genomics really means?
- True nutritional needs
- Marketing & ethics?
- Nutrigenomics and communication

### EXAMPLE OF NUTRIENTS MODULATING GENOME EXPRESSION

- Vitamins
- Antioxidants
- Micronutrients –trace elements
- PUFAs

### COUNTRIES COVERED

- North America
- Western Europe
- Asia
- Australia- New Zealand

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## PRESENTATION

### OBJECTIVES

### MARKET

Consumer trends  
Perspectives for health management through nutrition  
Prospective

### MANUFACTURERS

Food industry orientations  
Applications in food segments

### RESEARCH

Nutrigenomics to develop functional food  
Nutrigenomics research  
Metabolic profiles  
Links between gene and nutrition

### ENVIRONMENT

Regulatory aspects  
Ethical aspects

The relation between alimentation and health is not a new fact; this link is part of human history. All diets ever recommended in the past have always been designed in order to achieve the best and longest life which is considered as the evidence of health.

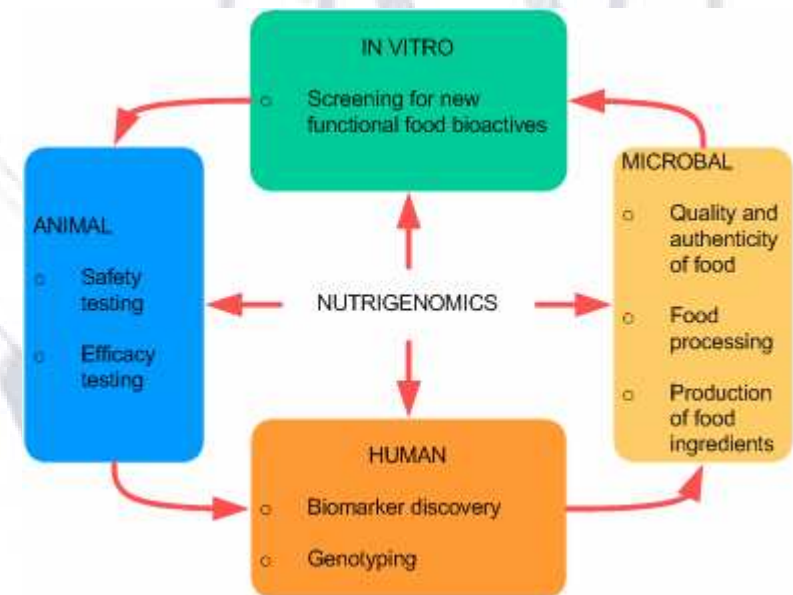
During the last century, welfare and plenty have spread all over industrial nations where great pathologies induced by deficiencies, yet unfortunately present in developing countries, disappeared. Now, the link between food and health did completely change in developed countries where odd food ratios result in the spreading of the most frequent diseases. Among these, cardiovascular diseases, cancer, diabetes, obesity, nervous diseases...have a huge impact in terms of public health.

Our present alimentation greatly influence the development of these pathologies in different ways:

- according to the composition and amounts of foods consumed,
- through eating habits which consequences are clearly perceptible with unbalanced and not varied diets,
- in association with factors like high body mass and poor physical activity it results in a reduction of the overall longevity.

Beyond its nutritional role, food brings various ingredients which, according to their potential biological activities may be risky or beneficial to health. Unravelling all these mechanisms is a tremendous challenge as our body counts about 30,000 genes, 100,000 different RNA molecules, one million different proteins and thousands metabolites interacting continuously. Deciphering the influence of the numerous nutrients we eat each day on our most intimate biological mechanisms is a big challenge entitled Nutrigenomics / Nutrigenetics.

Food is composed of complex substances which concentration may be high without toxic effects and not composed of specific, well defined molecules like chemically known drugs taken in well defined doses. Medicines are, generally, aimed at a limited number of cellular receptors, but food nutrients, characterised by variable affinities and specificities, act on a very large set of biological targets.



The understanding of the relations between nutrition and disease is all the more difficult as the influence of food relies on our genetic background and because this interaction is reciprocal as food does modify gene expression.

Geneticists used to think the origin of most common diseases was linked to changes in the DNA sequence. But the genomics revolution following the human genome project revealed a total number of human genes far less than all expectations and did not allowed the identification of numerous new defective genes corresponding to big pathologies. Yet, the sequencing of the human genome opened the door to a global approach in which genetic material, proteins and metabolites are characterized as a whole. This approach first developed for pharmacology finds now a new application in human nutrition by allowing a comprehensive understanding of the effects of food and nutrients on the metabolism and on the prevention of chronic diseases.

This evolution made popular the nutrigenomics concept which can be defined as the conception of food products adapted to the specific needs of everyone. After a complete metabolic check-up everybody would have the opportunity to choose, among a large set of recommended products, the foods and dietary supplements best adapted to his/her personal genetic and metabolic make up.

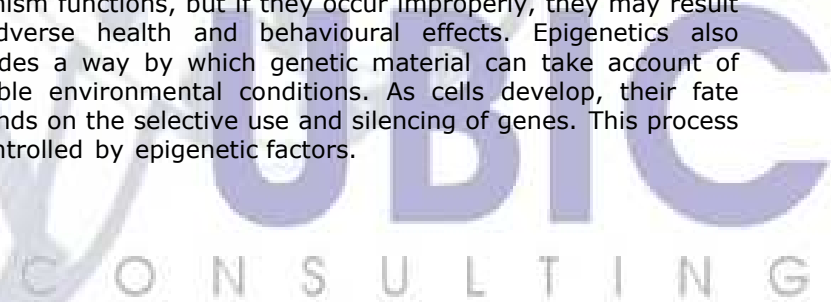
Anyway, The vast quantity of genetic and metabolic data produced by profiling diseased and healthy individuals is impossible to interpret by a human and the databases constituted must empower supervised bio-mathematical algorithms to compare a given profile with those referenced in the database.

High throughput technologies in the field of nutritional research, collaborative actions and networks are an absolute necessity and in order to accelerate and coordinate successful application of these, various institutions in developed countries have developed programs and organizations to address the impact of nutrition on biological systems in a coordinated effort.

So, in the past ten years, and especially in the past three or five, several new researches have focused fresh attention on epigenetics. Interest has grown and it became clear that understanding epigenetics and epigenomics (the genome-wide distribution of epigenetic changes) will be essential in work related to nutrigenomics and nutrigenetics as well as many other topics like stem cells, cloning, aging, agriculture, etc.

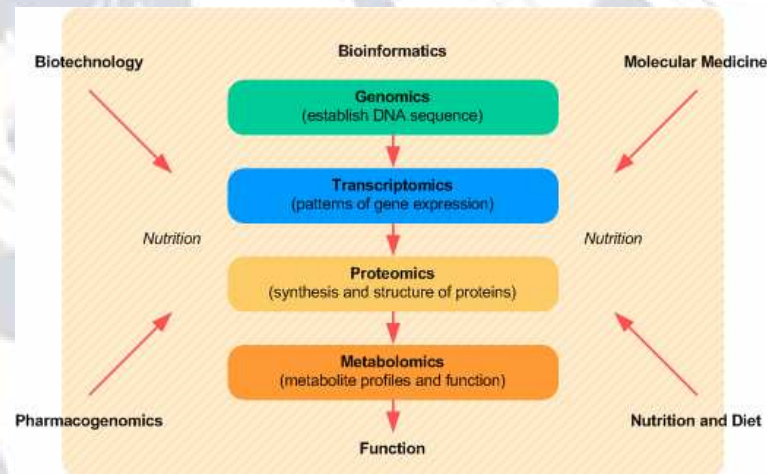
Every human cell contains all genes (information) necessary to the set up of all the parts of the whole body, but only few of them are expressed. Epigenetic modifications act as switches controlling gene expression so that only genes useful to a given kind of cell are really activated. The record of this activity is then transmitted to daughter cells at each new generation, ensuring, for example, that liver cells will divide into new liver cells and so on.

Epigenetic processes are natural and essential to many, if not all, organism functions, but if they occur improperly, they may result in adverse health and behavioural effects. Epigenetics also provides a way by which genetic material can take account of variable environmental conditions. As cells develop, their fate depends on the selective use and silencing of genes. This process is controlled by epigenetic factors.



For example, DNA methylation or acetylation of histones (structural proteins of the chromosome) play a role in phenomena where genes are switched on or off. Moreover, recent laboratory studies on inbred mice demonstrated how changes to their diet might influence their offspring.

All recent epigenetics findings require further assessment but in the next future this field of science could provide new models for disease etiology and basic mechanisms in toxicology. Yet, researchers are actively conducting follow-up studies assessing many genes and looking at links with breast and skin tumors, kidney degeneration, blood defects, etc.



So, as the conductor directs the players of a symphonic orchestra or as the software with the hardware of a computer, epigenetic factors govern the use of DNA information within each living cell. Understanding these factors could revolutionize developmental biology, and thus affect our most common practices from medicine to agriculture and, in the present case, to our feeding habits .

## OBJECTIVES OF THE STUDY

- Identify the current trends and stages of research and the research labs involved in specialized nutrition/nutrigenomics.
- Interviews with research labs, food and food ingredient manufacturers in an effort to estimate the possible speed of diffusion of diets based on genotypes
- Also estimate the communications, regulatory and distribution issues that such actors will face while providing some guidelines for implementation.
- Review main factors that will drive the market
- Identify what will be the impact of nutrigenomics on new food products and food ingredients development.

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	PART OF THE STUDY	AVAILABLE IN:	PRICE	
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