The Science behind the NUGENE Tests

Some definitions:

1- DNA: DNA, or deoxyribonucleic acid, is the hereditary material in humans and almost all other organisms. Nearly every cell in a person's body has the same DNA. Most DNA is located in the cell nucleus (where it is called nuclear DNA), but a small amount of DNA can also be found in the mitochondria (where it is called mitochondrial DNA or mtDNA). The information in DNA is stored as a code made up of four chemical bases: adenine (A), guanine (G), cytosine (C), and thymine (T). Human DNA consists of about 3 billion bases, and more than 99 percent of those bases are the same in all people. The order, or sequence, of these bases determines the information available for building and maintaining an organism, similar to the way in which letters of the alphabet appear in a certain order to form words and sentences. An important property of DNA is that it can replicate, or make copies of itself. Each strand of DNA in the double helix (nucleotide) can serve as a pattern for duplicating the sequence of bases.

2- Gene: A gene is the basic physical and functional unit of heredity. Genes, which are made up of DNA, act as instructions to make molecules called proteins. In humans, genes vary in size from a few hundred DNA bases to more than 2 million bases. The Human Genome Project has estimated that humans have between 20,000 and 25,000 genes.
Every person has two copies of each gene, one inherited from each parent. Most genes are the same in all people, but a small number of genes (less than 1 percent of the total) are slightly different between people. Alleles are forms of the same gene with small differences in their sequence of DNA bases. These small differences contribute to each person's unique physical features.

3- Mutation: A gene mutation is a permanent alteration in the DNA sequence that makes up a gene, such that the sequence differs from what is found in most people. Mutations range in size; they can affect anywhere from a single DNA building block (base pair) to a large segment of a chromosome that includes multiple genes.

4- Single nucleotide polymorphisms, frequently called SNPs, are the most common type of genetic variation among people. Each SNP represents a difference in a single DNA building block, called a nucleotide. For example, a SNP may replace the nucleotide cytosine (C) with the nucleotide thymine (T) in a certain stretch of DNA. SNPs occur normally throughout a person's DNA. They occur once in every 300 nucleotides on average, which means there are roughly 10 million SNPs in the human genome. Most commonly, these variations are found in the DNA between genes. They can act as biological markers, helping scientists locate genes that are associated with disease. When SNPs occur within a gene or in a regulatory region near a gene, they may play a more direct role in disease by affecting the gene's function.

Nutrigenomics:

Nutrigenomics aims to seek and explain the existing reciprocal interactions between genes and nutrients at a molecular level. The discovery of these interactions (gene-nutrient) will aid the prescription of customized diets according to each individual's genotype. It seeks to elucidate how the components of a particular diet (bioactive compound) may affect the expression of genes. This response will depend on how genes will show a changed activity or alter gene expression. Example: Compounds such as resveratrol present in wine and soy genistein may indirectly influence the molecular signaling pathways, such as the factor kappa B. The involvement of these factors in the activation and regulation of key molecules is associated with diseases ranging from inflammation to cancer.

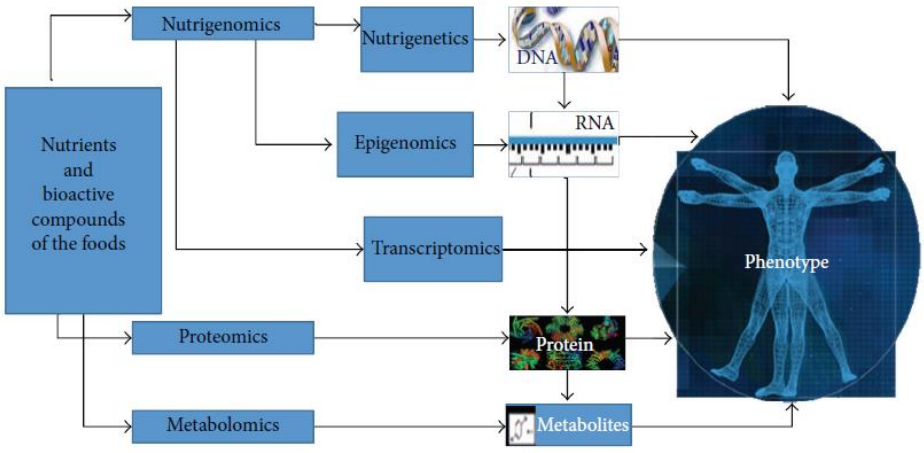

FIGURE 1: "Omics" sciences used in understanding the relationship between nutrition versus health versus disease (source: [4], with modifications; [9] with modifications).

Humans have 99.9% identity between their genomes. A distinct difference between their weight, height, eye color/hair, and other features is only 0.1% of the gene sequence and this difference, among other factors, also determines the nutritional requirements and the risk of

developing diseases. Mutations in our genetic material define every aspect of our life. They make us unique, give us special abilities and advantages, but also create barriers and cause increased susceptibility to diseases compared to general population.
Single Nucleotide Polymorphisms (SNPs) are the main reason for this genetic variation, and it can often change the encoded protein. Studies have shown that certain genes and their variants can be regulated or are influenced by nutrients/food compounds from the diet and that these molecular variations may have beneficial actions to the health of an individual.
E.g. A deficiency of the following: folic acid, vitamins B6, B12, B2, choline, and methionine can lead to changes in carbon metabolism and thus impair DNA methylation, increasing the risk of development of NTCD (Nontransmissible Chronic Diseases).

To make it simpler, the term nutrigenomics refers to both the study of how the food, beverages and supplements we consume affects our genes and how our genes can influence our body's response to what we eat.
Genetic variations in the population and between individuals affect a wide variety of responses to key components of the human diet. For instance, some individuals may benefit from limiting their consumption of caffeine or increasing their intake of omeg-3 fatty acids, while others can follow the general recommendations for either or both. The best diet for an individual depends on the specific variants he has for these nutrient-related genes. Understanding someone's genetic profile and its implications on his unique response to the food and beverages he consumes will provide the tools needed to make the best dietary choices.

Regarding Sports, our genes play a key role in biological systems like muscle formation, oxygenation of blood and tissues, and metabolism of lactic acid etc. Although we cannot change our genetic profile, we can benefit from our genetic advantages and maximize our abilities; we can overcome the "pain wall" that results from intense exercise and pressure under competition and avoid injuries and traumas, all in the most efficient and scientific way!

NUGENE Sport Test detects mutations in certain genes which affect your physical condition, your endurance capacity, and your speed and strength, but also your susceptibility to injuries. Moreover, it detects mutations in genes that control nutrient (food) metabolism and affect your performance, your physical condition and the risk of suffering from certain conditions during training and exercise.

Our performance in sports and our general physical condition is defined by our DNA, which is unique!

E.g: We all have a gene called ACTN3, but certain variants of it help our bodies make a special protein called alpha-actinin-3. This protein controls fast-twitch muscle fibers, the cells responsible for the speedy tensing and flexing of the muscles involved in sprinting or weight-lifting. Among the general population, however, some 18% of us are completely deficient in the speedy-muscle-contracting protein. Knowing our genetic profile, we would know if this kind of sports suits us best or not.

Same goes for NUGENE Weight.

References:

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