NutriGENE™

OVERVIEW

Personalised diet and lifestyle
The basis for the client's new dietary and lifestyle program will be the nutrigenetic test on the DNA. This will determine the nutrient goals for many essential components such as folic acid and other vitamins and minerals. It will also determine the advised upper limits of other dietary components such as saturated fats, caffeine, salt, etc. In addition the cytotoxic test reveals foods to which the client may be intolerant and which should be removed from the diet for a specified period of time before carefully reintroducing them under the guidance of the biologist.

The nutrigenetic test analyses genetic variation in 20 genes that interact with diet and lifestyle. It is *not* a diagnostic test nor is it a risk analysis – it will not reveal any genetic diseases, all the genes tested have very common polymorphisms, it does not reveal "bad" genes, just different versions of genes. We do not test for rare genetic diseases. All of the genes included interact in some way with the environment, usually with dietary components – the body is very complex and genes do not act on their own, the produce proteins that are one part of a multi-component system that maintains the homeostasis of the organism. Genes and environment (diet, lifestyle, air quality, stress levels, type of work, etc) work together and can affect our health in both positive and negative ways. A person's genotype is fixed at conception but the environment can be modified, by a) knowing the genotype (i.e. the particular version of a gene) and b) understanding how it interacts with the environment, it is possible to modify the latter to promote optimum health and well-being.

An example is the Lactase gene and lactose intolerance. In Europe there are predominantly two very common versions of this gene, one leads to lactose tolerance, i.e. it remains possible for the individual to consume lactose rich foods (mainly dairy produce) throughout adult life since he/she continues to produce the lactase enzyme in high levels and this is the enzyme which digests lactose, the sugar found in milk. The other version of the gene leads to lactose intolerance – infants can digest lactose but as they get older, usually between 5-8 years old, the gene that produces lactase slows down, much less enzyme is produced and lactase is not digested properly. It is utilised by bacteria in the intestines, creating a type of fermentation process and gas production which causes mild to severe gastric symptoms in the affected person. The important point about lactose intolerance is that *it is only a problem when lactose containing products are consumed* – as long a no, or only small amounts, of lactose are consumed then the individual can lead a perfectly normal life, in fact lactose *intolerance* is the normal state – the vast majority of the world's population can only tolerate lactose during the early years of infancy, while feeding on the mothers milk. The variation that leads to lactose tolerance (also called lactose persistence) appeared relatively recently in human history and in is present almost entirely in people of middle European origin – in Italy lactose intolerance is very widespread, averaging about 50% but depends on the region.

Another gene tested is *MTHFR* – this is involved in pathways which metabolise folic acid and which utilise vitamins B6 and B12 and which are closely involved in homocysteine levels. There is a very common variant, 677T - present in approx. 40% of the Italian population – which produces an enzyme that works much more slowly than the other version, 677C. Many, many studies have shown that people with the T variant, especially if they are homozygous 677TT (i.e. they received the same T version from both mother and father) require higher levels of folic acid in order to keep homocysteine levels within the normal range (homocysteine is a biomarker that is assessed as a risk factor for cardiovascular diseases). The recommended daily intake of folate acid is 200 µg in Europe and 400 µg in the USA. Several intervention studies have shown that these levels are *not* adequate to maintain normal levels of homocysteine so these individuals are advised to consume at least 600 µg per day plus higher levels of vitamins B6 and B12, whereas for those with the 677C version, 300µg is recommended.

Other genes analysed in the nutrigenetic test are involved in various metabolic systems including lipid metabolism (saturated fats, MUFA, PUFA, cholesterol), removal of oxidative stress products, removal of toxins (e.g. from airborne pollution, cigarette smoke, grilled meat, etc), glucose and insulin control, inflammatory processes, utilization of vitamin D and calcium.

The SLC6A4 gene (serotonin transporter) is an important component of the test. Two common forms are the L and S versions (Long and Short) and vary by the length of a region in the gene called the promoter (this region controls the activity of the genes). This genetic variation has been associated in many studies with stress and particularly with how an individual copes with various levels and types of stress. It has been shown that those with the S version are less likely to be able to cope rapidly with stress events – for example a study in nurses (a job with many stressful events) showed that disturbed sleep was more common in those with the SS genotype compared to LL individuals. Diet has been shown to be both a contributor to stress (e.g. starting a weight loss diet can be stressful) and also be able to control responses to and coping with stress. Depending upon genotype, individuals will be given a comprehensive list of foods they should use for their nutrition and also any supplements that maybe appropriate to take. Lifestyle methods of improving ability to cope with stress and reduce the incidence of stressful events will also be discussed with the client.

*There are also several genes that have been included to assess the possibility or otherwise of the presence of celiac disease. These genes will *not* diagnose the presence of celiac disease but they are useful to *exclude* celiac disease as a possible cause of any gastro-intestinal symptoms such as irritable bowels, etc. Individuals with symptoms and for whom the genetic test reveals celiac disease as a possibility will be referred to a gastroenterologist – those for whom the genetic test excludes celiac disease may be referred as well or maybe controlled with dietary changes (e.g. foods excluded by the cytotoxic test), depending on the severity of the symptoms.

Gene Symbol	Protein name	Variant tested	Giovanna's Results	Nutrition area
5HTT (SLC6A4)	Solute carrier family 6 (Serotonin transporter)	44bp ins	**SS**	Basic diet
ACE	Angiotensin I converting enzyme	I/D	**ID**	Carbs
ADH1C	Alcohol dehydrogenase	Ile349Val	**Ile-Ile**	Alcohol
APOC3	Apolipoprotein C-III	C3175G	**CG**	Lipids

COL1A1	Collagen, type I, alpha 1	SP1	**sS**	Calcium
CYP1A2 *1F	Cytochrome P450	–163A>C	**AA**	Caffeine, meats
GSTM1	Glutathione S-transferase M1	deletion	**deleted**	Cruciferous, allium
IL6	Interleukin 6	G -174C	**GG**	Omega-3
LPL	Lipoprotein lipase	C1595G	**CC**	Lipids
MTHFR	5,10-methylenetetrahydrofolate reductase	C677T	**TT**	Folic acid, Vits B6 & B12
PPARG	Peroxisome proliferator-activated receptor gamma	ProAla (12)	**ProPro**	Carbs, fats
SOD2	Superoxide dismutase 2	C-28T	**CC**	Antioxidants
TNF	Tumour necrosis factor	G-308A	**AA**	Omega3
VDR	Vitamin D receptor	taq1	**tt**	Calcium, Vit d, caffeine
LCT	Lactase	-13910-CT	**CC**	Lactose
DQA1-201	HLA – coeliac dispostion genes	T/G	**TT**	Coeliac disposition
DQB1-202		C/T	**CC**	
DQ4		C/T	**TT**	
DQ2.5		A/G	**AG**	
DQ7		A/G	**AG**	
DQ8		C/T	**CC**	