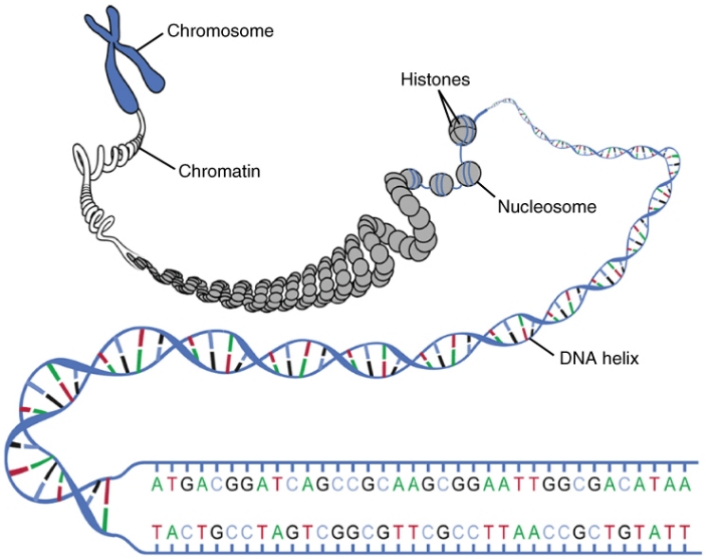
Summarised GENEWELL™ Report

Name	Female
Surname	Case Study
Gender	Female
Date of Birth	1 January, 1990
Ref Number	00001014
Referring HCP	Female Case Study
Date	2019-07-12
Preferred Name	Female

UNDERSTANDING YOUR RESULTS

On average, in terms of DNA, all humans are 99% similar to any other humans. It is the variations in the remaining 1% that makes people unique. Those differences influence a variety of traits such as appearance, behaviour, disease susceptibility or response to medications.

Your results reflect your genetic predisposition for specific characteristics, which may affect your tendencies to weight gain and risk for various diseases. Whether this genetic predisposition come to fruition ('gene expression'), often is influenced by environmental and lifestyle factors. By understanding your genetic makeup, you can identify the impact of environmental and lifestyle influences, such as what you eat and drink, what supplements you take, how you live and how active you are. Thus, knowledge of your genetic profile allows a more efficient approach to your personal health and wellness.



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DNA carries all the genetic information that forms the blueprint for making a living organism. These instructions are written in a language called the genetic code, as shown in the schematic representation above. It's an easy language to learn because it uses only four 'genetic letters': A, C, G and T. Each letter (or base) represents a chemical molecule: adenine (A), cytosine (C), guanine (G) and thymine (T). Just like other languages, the four bases forms 'genetic words' and very long 'genetic sentences' (sequences) that give the body instructions to function. What makes us unique are variations in the 'genetic letters, words and sentences'. These variations can change the function in the body. For example, changing the G to a C in the word Grate, modify the meaning of the new word, Crate, totally.

The majority of your results are reported using these four 'genetic letters'. It is reported in pairs e.g. CT or AG or CC. However, other types of genetic variations exist and are reported as Insertions / Deletions or using other scientific international abbreviations. Due to the complexities of genetics, please discuss your results with a qualified health care practitioner to interpret it for you within your unique circumstances.

Risks & Recommendations

Complex interactions among several genes as well as the environment and lifestyle factors contribute and influence many diseases (e.g. heart disease, diabetes or psychiatric disorders). It requires the input of an accredited health care professional to interpret the results, set priorities and make suitable recommendations within your unique circumstances.

Summaries of the results and key recommendations are set out in this report but necessitates further discussion with the referring health care professional, who received a comprehensive and detailed report.

Based on the online questionnaire and laboratory analysis, several scores are calculated to indicate, among others:

- Risk factors and the severity thereof that are relevant to the gene mutations detected
- Type of diet plan most likely suited for the genetic profile
- Sensitivity to dietary carbohydrates and fats
- Exercise responsiveness

Result Legend

The red circle indicates high impact

The yellow circle indicates moderate impact

The green circle indicates low impact

The blue circle indicates no impact

Current Status

Personal History

- Cognitive
- Diabetes
- Fatty Liver
- Thyroid
- Overweight
- PCOS
- Pregnancy Loss
- Sleep
- Allergy: Fish

Family History

- Cognitive
- Inflammatory
- Hypertension
- Fatty Liver
- PCOS
- Pregnancy Loss
- Sleep

Diet

- Fat Intake - High
- Folate Intake - Moderate
- Fibre Intake - Moderate

Physical Activity

Casual, 1 - 2 days a week, 45 min, Very low intensity

Lifestyle

- Alcohol Consumption - Low
- Body Mass Index
- Non-Smoker
- Prescription Supplement: Yes, currently

Pharmaceutical

- Cognitive
- Diabetes
- Vitamin B-complex
- Protein or other Shake

Summary of Genetic Results

Top Health Genes

eNOS G894T: Cardiovascular & neurological disease risk, blood pressure control & antioxidant function.	T/T
COMT Val158Met: 'Worrier' versus 'Warrior'. Metabolises dopamine & oestrogen. Affecting mood, energy level, sleep and focus.	A/G
GSTP1 I105V: Detoxification of smoke, heavy metals, herbicides, pesticides & other xenobiotics.	A/G
MAO-A R297R: Breaks down serotonin ("feel-good" chemical), dopamine (reward-motivation) & norepinephrine (stress hormone)	G/T
MTHFR A1298C: Dopamine & serotonin balance, methylation - the mechanism used by cells to control gene expression.	G/T
MTHFR C677T: Folate metabolism, homocysteine cycle, detoxification & methylation - a key process for genetic expression.	G/A
DAO (T16M): Response to histamine from food & bacteria, susceptibility to allergy symptoms & food intolerances.	C/T
PEMT G523A: Phosphatidylcholine production to maintain cell membranes, bile flow, muscle health, liver support & brain development.	T/C
IL6 -174 G>C: Pro- & anti-inflammatory properties & regulates the immune response.	G/G
GPX C599T: Detoxification of hydrogen peroxide (from stress response) & antioxidant requirements.	C/C

Biological Systems

Gut Health & Digestion (Assimilation)

TNF a (-308 G>A): Non-Celiac Gluten Sensitivity	A/A
HMOX1 (A-413T): "Leaky Gut" & Inflammation in intestinal tract	T/T
BHMT-02 (+52C>T): “Gut brain connection”	C/T
FUT2 (G>A): Prebiotic production and vitamin B12	A/G
DAO (T16M): Histamine & gluten tolerance	C/T
MCM6 (-13910C/T): Lactose Tolerance	A/A
SHMT (C1420T): Gut inflammation	G/G
SUOX (S370S): Sulfite detoxification	T/T

Circulatory System: Blood Pressure

ADD1 (G460W): Blood pressure control	T/T
eNOS (G894T): Vasodilation & platelet aggregation	T/T
AGT (M235T): Blood flow regulation	A/G
ACE (G>C): Blood pressure control	C/C
ACE (I/D): Blood pressure control	I/I

Circulatory System: Blood Clotting & Coagulation

PAI-1 (4G/5G): Blood clotting	A/A
Factor II (G20210A): Blood clotting	G/G
Factor V (R506Q): Blood clotting	C/C

Circulatory System: Cardiovascular

CETP (I405V): HDL-cholesterol	A/A
PON1 (Q192R): Antioxidant HDL-linked gene	C/T
LIPC (250 G>A): Cholesterol metabolism	G/G
LPL (1421 C>G): Triglycerides clearance and HDL-cholesterol	C/C
APOE: Cholesterol Metabolism & Cognitive function (e.g. Dementia)	E3/E3
APOC3 (C3238G): Triglycerides	C/C

Brain Health & Neurotransmitters

COMT (Val158Met): Breakdown of the neurotransmitters: adrenaline, noradrenaline and dopamine	A/G
MAO-A (R297R): Balancing of dopamine, nor/adrenaline & serotonin	G/T
MTHFR (1298A>C): Neurotransmitter production	G/T
ANKK1 (Taq1A): Reward response & addictive tendencies	G/G
APOE: Cognitive Function	E3/E3
BDNF (Val66Met): Mood disorders & Memory	C/C
OPRM1 (A118G): Reward and stress response	A/A

Oestrogen & Testosterone Metabolism

GSTM1 (Lys173Gln): Glutathione conjugation	ABS
CYP1B1 (Val432Leu): Oestradiol & estrone metabolite degradation	G/G
SOD2 (Val16Ala): HRT use and anti-oxidant requirements	A/G
COMT (Val158Met): Oestradiol & estrone metabolites' degradation	A/G
GSTP1 (Ile105Val): Glutathione conjugation	A/G
SULT1A1*2 (638 G>A): Oestrogen inactivation	T/C
CYP17A1 (34T>C): Progesterone & DHEA synthesis	A/G
NQO1*2 (C609T): Quinone conjugation & removal	G/G
CYP1A1 (Ile462Val): Oestrogen detoxification	T/T
CYP1A1 (MspI): Oestrogen detoxification	T/T
GSTT1 (Val169Ile): Glutathione conjugation	PRS

Diabetes & Insulin Resistance

ADRB2 (A16G): Carbohydrate sensitivity	G/G
PPARG (Pro12Ala): Insulin resistance	C/C
IRS1 (T>C): Insulin resistance	C/T
SLC2A2 (Thr110Ile): Glucose 'carrier'	G/G
TCF7L2 (C>T): Type 2 diabetes risk	C/C

Inflammation & Immunity

TNF a (-308 G>A): Pro-inflammatory	A/A
HMOX1 (A-413T): Free radical defense	T/T
CRP4 (G3872A): Low grade chronic inflammation	C/T
DIO2 (Thr92Ala): Hypothyroidism	C/T
FOXE1 (A>G): Hypothyroidism	A/G
IL-1A (-889 C/T): Bone and gastric health	A/G
IL-1A (4845G>T): Active inflammatory response	A/C
IL-1B (-511A>G): Active inflammatory response e.g. joint risk	G/A
IL-1B (3954C>T): Active inflammatory response	G/A
IL-1RN (2018C>T): Active inflammatory response periodontitis	C/T
IL6 (-174 G/C): Pro- & anti-inflammatory	G/G
IL6R (481A>C): Acute inflammatory response	A/A

Structural & Cellular Integrity

GDF5 (+104T/C): Osteoarthritis	A/A
MMP1 (2G/2G): Collagen breakdown	I/I
VDR Fok1: Vitamin D requirements	A/G
DBP (Glu416Asp): Bone health and Vitamin D transport	A/C
DBP (T>G): Vitamin D transport	G/T
IL-1RN (2018 C>T): Osteoarthritis	C/T
PEMT (+5465G-A): Cell membrane integrity	T/C
VDR Taq1: Vitamin D requirements	A/A
TIMP4 (-55C/T): Osteoarthritis	C/C
VDR BsmI: Regulation of collagen formation	G/G

Cellular Systems

Energy

TCF7L2 (C>T): Benefit of restricting fat intake	C/C
FABP2 (Ala54Thr): Benefit of restricting carb intake for weight management	C/T
IRS1 (T>C): Benefit of restricting fat intake for weight loss	C/T
PPARG (Pro12Ala): Benefit of restricting certain types of fat intake for weight loss	C/C
SLC2A2 (Thr110Ile): Benefit of restricting carb intake	G/G
ACE (I/D): Benefit of restricting carb intake for weight loss	I/I

Iron Metabolism

TMPRSS6 (V736A) : Iron deficiency risk	G/G
HFE (H63D): Iron overload risk	C/C
HFE (C282Y): Iron overload risk	G/G

Circadian Rhythms

CLOCK (3111 T>C): Circadian Rhythms e.g. blood pressure, hormone secretion, diabetes & stress	A/G

Detoxification Phase I

CYP1B1 (Val432Leu): Detoxification	G/G
CYP1A2 *1F (-164A>C): Caffeine metabolism	C/A
CYP1A1 (MspI): Environmental carcinogens	T/T
CYP1A1 (Ile462Val): Estradiol & estrone metabolite degradation	T/T

Detoxification Phase II

GSTM1 (Lys173Gln): Glutathione conjugation	ABS
NAT2*12A: Acetylation	A/G
SULT1A1*2 (638 G>A): Sulfation	T/C
GSTP1 (Ile105Val): Glutathione conjugation	A/G
GSTT1 (Val169Ile): Glutathione conjugation	PRS
NQO1*2 (C609T): Degradation of toxins	G/G

Oxidative Stress

SOD2 (Val16Ala): Mitochondrial free radicals cleanup	A/G
EPHX1 (Tyr113His): Oxidative stress defense	T/T
CAT (C-262T): Reactive oxygen species (ROS) defense	C/C
GPX (Pro199Leu): Glutathione production & Selenium needs	C/C

DNA Damage Repair

OGG1 (Ser326Cys): Base excision repair (BER)	C/G
MLH1 (-93 A>G): Mismatch repair	A/G

Methylation

VDR Taq1: Type of Vitamin B12 for dopamine production	A/A
eNOS (G894T): Ammonia detoxification	T/T
MAO-A R297R: Neurotransmitter balance	G/T
BHMT-02 (+52C>T): Conversion of homocysteine to methionine	C/T
COMT (Val158Met): Dopamine breakdown	A/G
PEMT (+5465 G-A): Choline requirements	T/C
CBS (C699T): 1st priority treatment: Ammonia accumulation	A/G
MTHFR (A1298C): Methylated folate requirements	G/T
MTHFR (C677T): Methylated folate requirements	G/A
MTRR (A66G): Methylated vitamin B12 requirements	A/G
MTR (A2756G): Methylated vitamin B12 requirements	A/G
MAT1A (T*1297C): Conversion of methionine to SAMe	A/A
SUOX (S370S): Sulfur Metabolism	T/T
SHMT (C1420T): 1st priority treatment: Folate availability & DNA synthesis	G/G

Pharma & Hormone Therapy

CYP1B1 (Val432Leu): HT, breast & prostate health	G/G
PAI-1 (4G/5G): HT recommendation	A/A
VDR Fok1: HT and breast health	A/G
SULT1A1*2 (638 G>A): Sulfation	T/C
CYP17A1 (34 T>C): Use of oestrogen containing HTs	A/G
MAO-A (R297R): Monoamine oxidase inhibitors	G/T
NAT2*12A: Acetylation	A/G
SOD2 (Val16Ala): HT recommendation	A/G
COMT (Val158Met): Stress Hormones Breakdown, Methylation & Oestrogen Metabolism	A/G
BDNF (Val66Met): Antidepressants	C/C
ANKK1 (Taq1A): Dopamine receptor function	G/G
OPRM1 (A118G): Pain management	A/A
VDR BsmI: HT and osteoporosis prevention	G/G
Factor V (R506Q): Use of oestrogen containing HTs	C/C
APOE: HT-associated thrombosis	E3/E3
Factor II (G20210A): Use of oestrogen containing HTs	G/G
NQO1*2 (C609T): Quinones	G/G

Overall Interpretation Summary

Gut Health & Digestion (Assimilation)

Based on the selected genes tested only, you have an increased risk of impaired gut health. Gut function is inseparably linked to overall health. The gut's primary function is the digestion and absorption of nutrients. However, it has a major influence on the immune system and brain health, e.g. 90% of serotonin is produced in the gut.

Circulatory System: Blood Pressure

You have an increased genetic risk for developing hypertension (high blood pressure). Most people with high blood pressure have no signs or symptoms. Fortunately, high blood pressure can be easily detected and treated.

Circulatory System: Blood Clotting & Coagulation

You have a modestly increased genetic risk for excessive blood clotting. Blood clots are beneficial when they form in response to an injury which stops bleeding. The body will naturally dissolve the blood clot but genetic variations can inhibit that process increased the risk for strokes and heart attacks.

Circulatory System: Cardiovascular

Slight increased genetic risk for an abnormal lipid profile (cholesterol) and heart disease. Cardiovascular disease generally refers to conditions that involve narrowed or blocked blood vessels that can lead to a heart attack and high cholesterol levels. Cholesterol is a very important constituent of cell membranes and precursors of other hormones such as testosterone and oestrogen. Non-genetic risk factors for heart disease include lack of exercise and smoking.

Brain Health & Neurotransmitters

Brain health refers to the balancing of neurotransmitters (brain chemicals) within the neuroendocrine systems, that are involved in complex processes such as stress tolerance, ADHD, mood disorders, social functioning, addictive tendencies and cognitive wellness (e.g. memory). Based on the genetic score, you have a low genetic predisposition to neuro-imbalances. Implementing certain lifestyle measures can optimise your brain health.

Oestrogen & Testosterone Metabolism

The combination of gene variants identified in this analysis indicates you have a moderately impaired oestrogen and androgen (testosterone and DHEA) metabolism. This puts you in the medium risk category. Other non-genetic causes of hormonal imbalances that may increase the risk include obesity, liver disease. hormone therapy, certain antibiotics and some herbal remedies.

Diabetes & Insulin Resistance

Based on the genes tested in this analysis, you have a moderately increased risk for type 2 diabetes and insulin resistance. Other factors that increase this risk further include obesity, stress and chronic steroid use. Insulin resistance typically precedes the development of type 2 diabetes. Preventative lifestyle measures are recommended.

Inflammation & Immunity

Your genetic profile is associated with a moderately increased risk for chronic, low-grade inflammation. Inflammation is a vital part of the immune system's response to injury and infection. It is the body's way of signaling the immune system to heal and repair damaged tissue, as well as defend itself against viruses and bacteria. However, chronic inflammation is linked to certain diseases such as heart disease and arthritis. Additional support is recommended.

Structural & Cellular Integrity

Based on your genetic profile you have a moderately increased risk for impaired bone health (e.g. osteopenia) and cell membrane integrity. Bone health is crucial for providing structure, anchoring muscles and storing calcium. The cell membrane protects each cell in the body from environmental substances (e.g. toxins) and regulates the entry of substances (e.g. nutrients) in and out of cells. Sub-optimal cell membrane integrity makes you vulnerable to many diseases. Additional nutritional support is recommended.

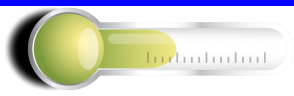
Detoxification Phase I

Genetic variants in Phase I liver detoxification were detected. Overall, your Phase I liver detoxification is considered moderately impaired. Phase I genes are triggered by specific chemicals, causing a mechanism of protection that safeguards against many different kinds of toxins. Avoidance of these toxins and nutritional support can lower the risk significantly.

Detoxification Phase II

Based on the genetic profile, Phase II detoxification in the liver is impaired. This can be managed by lifestyle interventions and nutritional support. During Phase II, toxins are made water soluble, allowing for easy excretion and removal from the body. If a sluggish Phase II is unable to keep up with the demand of Phase I, toxins will accumulate.

Oxidative Stress



Based on your gene results, you have a slightly lower 'natural' anti-oxidative protection. Additional nutritional support can overcome this. When oxygen molecules split they become unstable free radicals causing oxidative stress. Oxidative stress can damage DNA and the body's cells, leading to a range of diseases. Anti-oxidants bind to free radicals to ensure it is no longer available to cause damage. Anti-oxidants interact with free radical to ensure it is no longer available to cause damage. Some antioxidants are produced by gene enzymes and others must be consumed via the diet or supplements.

DNA Damage Repair

Impaired DNA restoration and repairability are detected. Genes control a variety of mechanisms in cells to prevent permanent changes in DNA. After DNA synthesis, any mispaired bases can be detected and replaced in a process called mismatch repair.

Methylation

Based on the genetic analysis, you have a moderately impaired methylation pathway. Methylation is essential for the optimal function of almost all the body systems. It occurs billions of times every second. It helps to repair DNA, it helps keep inflammation in check, it replenishes the compounds needed for detoxification and helps maintain a stable mood.

Energy

Humans derive food energy from carbohydrates, fats and proteins. There are many genes that control how the body converts nutrients into energy. Based on the results of some of the important genes tested, you have overall an impaired energy conversion. This increases your risk of becoming overweight but could easily be controlled with the right diet.

Nutrients and Other Compounds

Antioxidants

Antioxidants are compounds produced in the body and found in foods. Antioxidants protect cells from oxidative stress that can cause damage by harmful molecules known as free radicals formed during oxygen use. Based on your genetic results your natural antioxidative ability is slightly compromised and therefore your nutritional antioxidant requirements are a bit higher than the recommendations to the general population. While we like to think we can get all the nutrients we need from our food supply, due to modern agricultural practices this is becoming less likely. You may benefit from an antioxidant supplement especially if you are physically very active or exposed to pollution. The best dietary sources are colourful foods. Vitamins A, C and E are examples of antioxidants.

Iron

Iron deficiency is the most common nutrient deficiency in the world. It is associated with fatigue, dizziness, cold hands and feet. Iron overload, on the other hand, is equally detrimental affecting the liver. The DNA tests assessed the balance between the iron deficiency (anemia) and iron overload (haemochromatosis) genes. Your overall genetic profile is associated with normal iron homeostasis. Even so, if you follow a diet very low in iron, e.g. vegan, is a professional athlete or have a bleeding ulcer, you are still at risk for an iron deficiency. Similarly, overuse of iron supplements can cause iron overload. The best dietary source of iron is liver.

Omega-3

Omega-3's are essential nutrients (your body can not produce it). It is important for heart and brain function and has an anti-inflammatory function. There are 3 types Omega-3's: EPA (eicosapentaenoic acid), DHA (docosahexaenoic acid) and ALA (alpha -linolenic acid) and they have different roles in the body. For healthy individuals with a genetic profile like yours, 1,000mg of combined DHA and EPA are recommended daily, in a ratio of EPA:DHA of 3:1. Read labels of supplements to see how much actual EPA and DHA are in it. The total Omega -3 content does not reflect EPA and DHA content. The best food source of Omega-3 fats is fatty fish: 75g of salmon contains 1.6g DHA/EPA. Good plant food sources include flaxseed and walnuts, but you have to eat a lot to gain the same benefits as you do from fish.

Salt Sensitivty

Your genetic profile shows that you have an increased risk of hypertension if you have a high sodium consumption. Sodium is an essential mineral in the body, that plays a role in nerve signal transmission, muscle contraction and the maintenance of fluid balance. Keep your consumption of ready-made, processed and restaurant meals minimal. A good strategy for reducing sodium intake and counteracting the negative health effects that excessive intake might cause is to increase your potassium intake. Potassium in the body has the opposite effects of sodium.

Vitamin B9 (Folate)

Folate (Vitamin B9) is required for numerous processes: DNA maintenance, detoxification and hormone production to mention just a few. Your test result is associated with an increased need for folate, to overcome the genetic deficiencies. Folic Acid is the synthetic, inactive form of folate and should be avoided. Methyl folate is the active form and 400mcg is a common starting point for adults. Folinic acid is an alternative to methylfolate. Folate is found naturally in uncooked leafy green vegetables, but you may not be able to meet your folate requirements via dietary intake due to the volumes required.

Vitamin B12

Vitamin B12 (cobalamin) is important for the production of neurotransmitters, energy and blood cells. Since the human body cannot produce vitamin B12, you need to get adequate amounts of it in the correct form through the diet or via supplementation. The type and quantity of vitamin B12 required are determined primarily by genetics and based your profile, you require methylated vitamin B12 (that is already bioactive) in dosages higher than the usual recommendations. Avoid cyanocobalamin (synthetic B12). Some of the symptoms of low vitamin B12 levels include anxiety, fatigue, memory loss and tingling feet.

Vitamin D

Your genetic profile is associated with an increased risk of inadequate Vitamin D concentrations. Vitamin D is crucial for calcium concentrations, bone health, immune function and the reduction of inflammation. Since limited foods supply Vitamin D, supplementation in the D3 form may be required. It is recommended to measure Vitamin D stores regularly (blood tests) and based on those results, supplementation of 1,000 IU vitamin D3 daily, may be the ideal therapeutic dosing.

Caffeine

Your genotype is associated with being a slow metaboliser of caffeine. You may experience side-effects such as sleep disturbances due to caffeine consumption. Caffeine tolerance level: 3-4 mg/kg body mass of caffeine daily, which is about 3 cups of coffee per day. Consumption of vegetables such as broccoli and Brussels sprouts will eliminate caffeine quicker from the body.

Choline

Based on your genetic profile, you require more choline than the general recommendation. Choline is a vitamin-like essential nutrient and needed in all cell membranes, for fat transport, DNA synthesis, acetylcholine production and muscle movement. The best dietary source is eggs, however, you might need choline and/or phosphatidylcholine supplementation. The PEMT and BHMT genes play an important role in your choline requirements.

Alcohol Sensitivity

Everyone knows alcohol is toxic but your genetic profile is associated with having overall, an increased risk of developing chronic conditions such as various cancers, heart disease, depression and dementia, compared to the general population, with regular alcohol consumption. The best available current evidence shows that regular consumption of alcohol does not improve overall health. The World Health Organisation withdrew its previously "safe" guidelines for alcohol consumption.

Nutrients Breakdown

Antioxidants

Free radicals are molecules produced by the body during the breakdown of food or as a result of exposure to radiation and environmental pollutants. They are highly reactive and cause damage to cellular components and play a role in heart disease, cancer and other diseases. Antioxidants are substances that protect your cells against the effects of free radicals

Iron

One of the main roles of iron is to help our red blood cells transport oxygen to all parts of the body. Iron is an important component of hemoglobin. Iron also plays an important role in specific processes within the cell that produce the energy for our body. It is for this reason that one of the first symptoms of low body iron stores is tiredness and fatigue.

Omega-3

Omega-3 pose strong anti-inflammatory properties, it also protects against heart disease, it is vital for brain health and development and has shown beneficial in conditions such as diabetes, obesity, depression, arthritis, ADHD (attention deficit hyperactivity disorder) and skin disorders.

Salt Sensitivty

Your genetic profile shows that you have an increased risk of hypertension if you have a high sodium consumption. Sodium is an essential mineral in the body, that plays a role in nerve signal transmission, muscle contraction and the maintenance of fluid balance. Keep your consumption of ready-made, processed and restaurant meals minimal. A good strategy for reducing sodium intake and counteracting the negative health effects that excessive intake might cause is to increase your potassium intake. Potassium in the body has the opposite effects of sodium.

Vitamin B9 (Folate)

Our bodies need folate to aid in the production of red blood cells, make DNA and other genetic material. Folate is also essential for cell division.

Vitamin B12

Vitamin B12 is a nutrient that helps keep the body's nerve and blood cells healthy and helps make DNA, the genetic material in all cells. Vitamin B12 also helps prevent a type of anemia called megaloblastic anemia that makes people tired and weak.

Vitamin D

Vitamin D plays an important role in protecting your bones, both by helping your body absorb calcium and by supporting muscles needed to avoid falls. Children need vitamin D to build strong bones, and adults need it to keep their bones strong and healthy.

Caffeine

Caffeine is a central nervous system stimulant that reduces fatigue and drowsiness. At normal doses, caffeine has variable effects on learning and memory, but it generally improves reaction time, wakefulness, concentration, and motor coordination. The amount of caffeine needed to produce these effects varies from person to person, depending on body size and degree of tolerance.

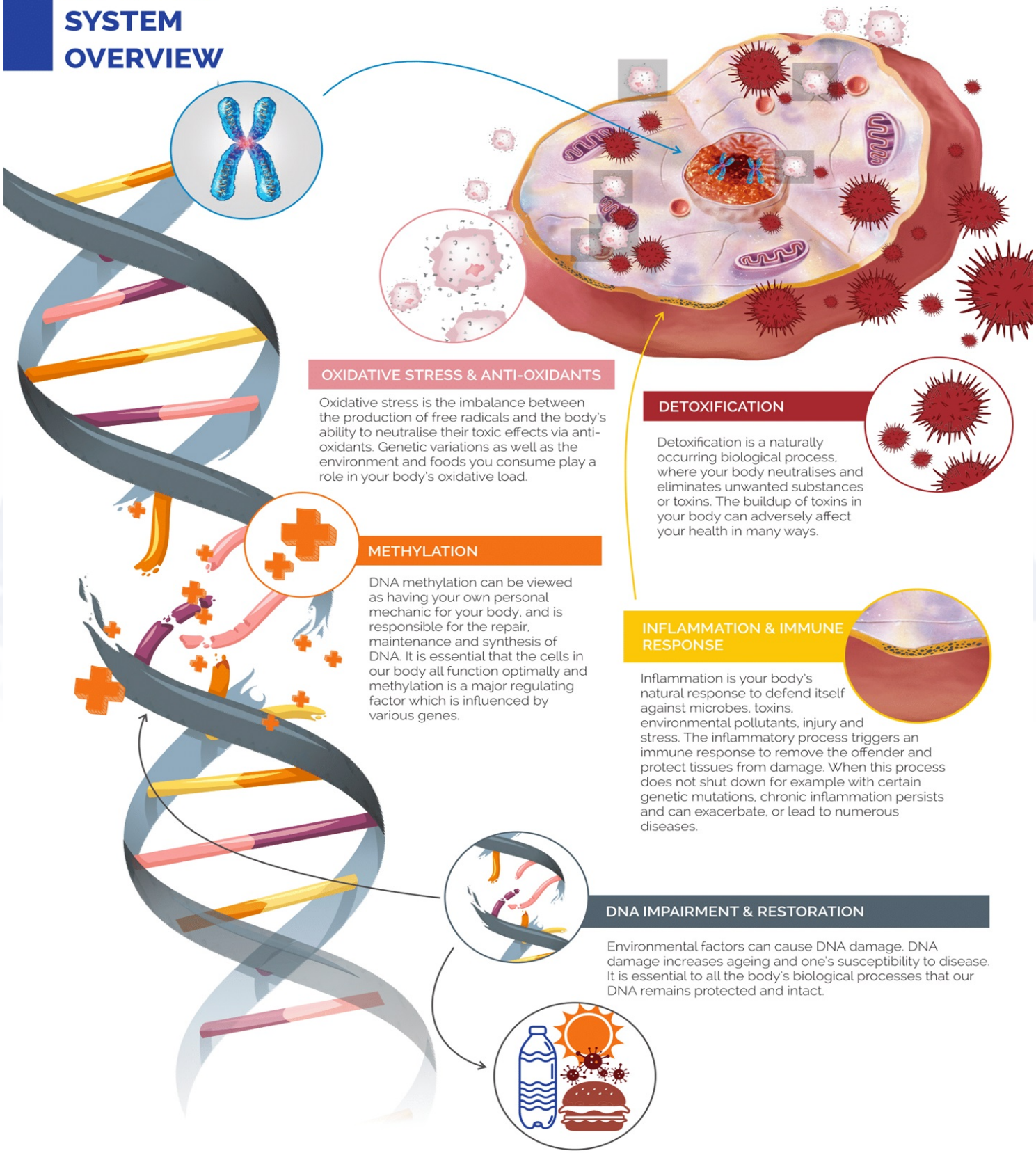
Choline

Choline is related to B vitamins and plays an essential role in the body. It is needed for neurotransmitter synthesis (acetylcholine), cell-membrane signaling (phospholipids), lipid transport (lipoproteins), methyl-group metabolism (homocysteine reduction) and DNA synthesis. Inadequate choline may result in fat and cholesterol accumulating in the liver.

Alcohol Sensitivity

One unit of alcohol (10ml/8g pure alcohol) is the equivalent to a single measure of spirits (25ml), 200ml cider, 80ml wine or 250ml beer. It is best not to "save up units" and drink them all in one go. Irrespective of your genetic profile, regular alcohol consumption depletes vitamin C, B-vitamins, magnesium and methyl groups and need replenishment. Taking the supplement N-acetyl cysteine (NAC) prior to and after alcohol consumption will help break down the toxic acetaldehyde in alcohol.

CELLULAR SYSTEM OVERVIEW



OXIDATIVE STRESS & ANTI-OXIDANTS

Oxidative stress is the imbalance between the production of free radicals and the body's ability to neutralise their toxic effects via anti-oxidants. Genetic variations as well as the environment and foods you consume play a role in your body's oxidative load.

DETOXIFICATION

Detoxification is a naturally occurring biological process, where your body neutralises and eliminates unwanted substances or toxins. The buildup of toxins in your body can adversely affect your health in many ways.

METHYLATION

DNA methylation can be viewed as having your own personal mechanic for your body, and is responsible for the repair, maintenance and synthesis of DNA. It is essential that the cells in our body all function optimally and methylation is a major regulating factor which is influenced by various genes.

INFLAMMATION & IMMUNE RESPONSE

Inflammation is your body's natural response to defend itself against microbes, toxins, environmental pollutants, injury and stress. The inflammatory process triggers an immune response to remove the offender and protect tissues from damage. When this process does not shut down for example with certain genetic mutations, chronic inflammation persists and can exacerbate, or lead to numerous diseases.

DNA IMPAIRMENT & RESTORATION

Environmental factors can cause DNA damage. DNA damage increases ageing and one's susceptibility to disease. It is essential to all the body's biological processes that our DNA remains protected and intact.

BIOLOGICAL SYSTEM OVERVIEW

BRAIN & COGNITIVE HEALTH

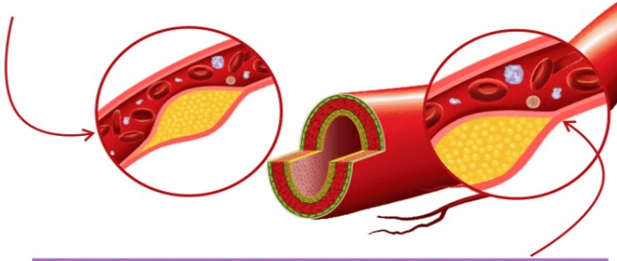
The brain is the command centre of the body and plays a role in all other systems. To ensure optimal mental and physical health, the brain needs to be in tip-top shape.

ENDOCRINOLOGY & SEX HORMONES

Everybody has oestrogen, progesterone and testosterone, as they all play an essential role within our body during various times in our lives. Keeping a healthy hormone balance is important for reproduction and cancer prevention.

CIRCULATORY SYSTEMS

The body relies on a network of blood vessels to transport oxygen, hormones and nutrients to and from cells and remove waste products. Clean arteries, a normal blood pressure and adequate blood flow are essential for a healthy circulatory system.



BLOOD CLOTTING & COAGULATION

Blood clots are a normal and necessary function to repair damaged blood vessels and prevent uncontrolled bleeding. However, if unmonitored and unchecked, blood clots could cause strokes and lead to thrombosis.

DIABETES & INSULIN RESISTANCE

Insulin is a hormone produced by the pancreas which regulates the blood glucose between ideal limits. It can remove glucose from the blood and transport it into the muscles and fat cells where it is needed for energy. In the liver, insulin controls glucose production and switches it off when the glucose level is too high.

LIVER

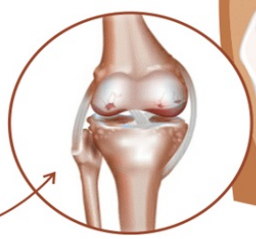
The liver is your body's 24/7 cleaning service. It has more than 500 roles in the body in which the removal of toxins and medication metabolism are crucial. It is essential to supply the liver with the support it needs to function optimally.

GUT HEALTH & DIGESTION

The gut is often referred to as the 'second brain' and has a huge role on the immune system. Digestive problems such as heartburn, bloating and constipation reflect an unhealthy gut. Gut health is strongly affected by our environment such as the food we eat, stress, anxiety, sleep and physical activity.

STRUCTURAL & CELLULAR INTEGRITY

Collagen makes up 70% of the protein in the body and is the structural building block of connective tissues, such as cartilage, blood vessels, bones, tendons, and ligaments. It also plays a vital role in providing support and elasticity to the skin.



Recommendations and Comments

Physical Activity

For weight loss, a target of at least 15 -20 METs per week, consisting of moderate to high intensity activities (3-6 METs), is recommended. The metabolic equivalent for task (MET) is a unit that estimates the amount of energy used by the body during physical activity, as compared to resting metabolism. The MET unit is standardised so it can apply to people of varying body weight and compare different activities. Resting energy expenditure (sitting) is defined as 1 MET. The MET values can be found here: https://sites.google.com/site/compendiumofphysicalactivities/com pendia

Diet

A gluten-free diet is recommended

Avoid charred food (eg the 'black bits' on grilled foods)

Avoid nitrites (food preservatives that give meat products a pink colour)

Ensure sufficient dietary folate intake or consider folate supplementation

Give preference to organic produce

Increase daily intake of cruciferous (eg broccoli) and allium (eg onions) vegetables

Increase GST (Glutathione S-transferase) activity with intake of Vit E, Cruciferous and Allium vegetables

Increased need for anti-oxidants: e.g. fruits & vegetables

Likely to tolerate lactose

Limit intake of grilled (‘braai’) or smoked meats to 1-2 servings per week (or less)

Monitor and manage sodium intake (1500-2000mg/day), and follow a diet rich in potassium

Selenium offers protection against UV ray exposure and damage

Time-restricted feeding: eat within a strict 8- to 12-hour time frame

Supplements

Antioxidant e.g. GENEWAY™ Antioxidant: 1-4 capsules/day

Curcumin: 500-1500mg/day

DIM 100mg/day e.g. GENEWAY™ DIM 1 capsule/day

Fiber: 4-6g/day, mostly soluble

Folate (methylated): 400-800µg/day

Glucose & Insulin metabolism e.g. GENEWAY™ Carb Support: 1-4 capsules/day

Glutathione: 50mg-100mg/day, but avoid with double CBS mutations

Heavy metal detoxification supplement, if needed

Magnesium Glycinate 500-1500mg/d e.g. GENEWAY™ Magnesium: 1-4 capsules/day

Myo-inositol (for high thyroid antibodies)

NAC (N-acetyl cysteine): 600-1200mg/day, but avoid in presence of double CBS mutations

Nattokinase (20,000 FU/g): 100mg/day (avoid with blood thinning agents)

Nitric Oxide (L-arginine:700-2100mg/day, or L-Citrulline, and glycine propionyl-L-carnitine (GPLC): 500-1500 mg/twice daily).

Omega-3 (DHA/EHA)

Probiotics

Thyroid support supplements (contains iodine)

Vitamin B's - as recommended by Healthcare Practitioner

Biomarkers & Clinical

Adrenal function; e.g cortisol, ACTH

Bone Mineral Density Scan

Cortisol (saliva, 5 to 6 readings: upon awakening, 30min after awakening, 60min after awakening, 12:00, 16:00, between 22:00 - 00:00 (midnight))

Fasting Insulin, Glucose, HbA1c (Carbohydrate Metabolism)

Females: Factor V Leiden mutation if miscarriages reported

Females: if PCOS is present, test adrenal function; e.g cortisol & ACTH (Adrenocorticotropic Hormone)

Folate serum and Red Blood Cell (Especially with a low dietary folate intake)

Heavy metal screening (Lancet: code Y934, Ampath: MPCB)

High sensitivity C-Reactive Protein (hs -CRP) - Ideal: <1 - 1.5mg/L

Homocysteine (especially with low folate intake) - Ideal: 4.5 - 6 umol/l

Hormones e.g. estrogen, testosterone and progesterone

Lipogram

Methylation Biochemistry: Blood histamine, Basophil count, Plasma zinc, Serum copper, Homocysteine, Heavy metals, Serotonin, Folate (Serum / Red Blood Cells), Vitamin B12

Oxidative Stress (indirect measure): Ferritin, hsCRP, Platelets, Red Blood Cells, Lymphocytes, Globulin, Uric acid & Bilirubin

Plasminogen activator inhibitor type 1 (PAI-1) - coagulation

Thyroid Profile (including antibodies)

Uric acid

Vitamin D3 - Ideal: 50 - 75ng/ml

Lifestyle

Alcohol - avoid for GST / MTHFR / MTRR / SOD / TNF genes' expression

Avoid any known carcinogens (substances and exposures that can lead to cancer)

Avoid arsenic exposure, sources of arsenic exposure: contaminated drinking water, pesticides, herbicides, fungicides, wood preservatives, ceramic enamels, paints, tobacco and fossil fuels

Avoid BPA (Bisphenol A) in plastics, pesticides, pollutants, radiation from mobile phones and genetically modified foods

Avoid cigarette smoke, including secondary smoke

Avoid environmental pollutants

Avoid using plastics (e.g. water bottles) with recycling codes 3 & 7 (may contain BPA)

Ensure sufficient amount of sleep daily (7-9 hours) for better handling oxidative stress

Stress Management

Pharmaceutical

A combo of T3/T4 is recommended if hypothyroidism is present

Bupropion (Wellbutrin) is very effective for smoking cessation in this A2/A2 genotype

Consider limiting Oral Contraceptive use to < 18 months

Low-dose diuretic treatment

May respond unfavourably to estradiol, hydrochlorothiazde, sildenafil

Requirements folate increase with commonly used medications (MTHFR C677T - see details in rest of the report)

Unlikely to respond to Ramipril

Other

First address any MTR/MTRR gene mutations, before treating MTHFR genes mutations, otherwise overmethylation may occur.

Maintain/achieve ideal body weight to prevent adverse gene expression.

Mutations in the methylation pathway can lead to either over- or undermethylation

Overmethylation can cause: Depression/anxiety, Food/chemical sensitivities, Hirsutism, Histamine intolerance, Low libido, No/low seasonal allergies, OCD/ADHD, Sleep disorder, Verbose & association with Artistic/musical ability. 8% of people are overmethylators.

Undermethylation can result in: obsessive compulsive disorder (OCD), perfectionism, addictive tendencies, calm demeanour with high inner tension, unhealthy competitiveness, an obsessive strive for accomplishment, social isolation, strong willed, non-compliance, difficulty with transitions, high libido, highly motivated, phobias, delusional behaviour, denial of illness, seasonal allergies, high fluidity (tears, saliva), frequent headaches, sparse hair growth. Approximately 22% of people are undermethylators.

Additional Information

Methodology

SNP (Single nucleotide polymorphism) detection takes place using a biomedical technology called polymerase chain reaction (PCR). During this process a few copies of a piece of DNA are amplified generating an exponential number of copies of a particular DNA sequence. Variations in the genes, called polymorphisms, are detected and feedback on the possible (disease) associations of these variations are provided in a report format.

Glossary

Amino acids, organic compounds that combine to form a protein.
Appetite is the desire to eat while satiety refers to the sensation of fullness after eating.
Apoptosis, cell death
Base pair (bp), pairs of nucleotides connecting the complementary strands of a molecule of DNA. The base pairs in DNA are adenine-thymine and guanine-cytosine.
Carrier (heterozygote), An individual who carries one copy of a recessive gene.
DNA (deoxyribonucleic acid), The molecule that encodes genetic information.
DNA replication, the process of producing two identical replicas of DNA from one original DNA molecule.
DNA sequence, The relative order of base pairs, whether in a fragment of DNA, a gene, a chromosome, or an entire genome.
Double helix, The shape that two linear strands of DNA assume when bonded together.
Duplication, a segment of DNA on a chromosome that is copy of another segment.
Epistasis, is the phenomenon of the effect of one gene being dependent on the presence of one or more 'modifier genes', the genetic background.
Fat mobilisation, is the increased breakdown of fats (triglycerides) with the release of fatty acids and glycerol into the blood.
Gene, The fundamental physical and functional unit of heredity.
Gene expression, The process by which a genes coded information is converted into the structures present and operating in the cell.
Gene families Groups, of closely related genes that make similar products.
Gene product, The biochemical material, either RNA or protein, resulting from expression of a gene.
Gene therapy, Insertion of normal DNA directly into cells to correct a genetic defect.
Genetic counselling, Information and support provided by a specialist doctor, usually a geneticist or medical scientist, to help people who have known conditions in their families or who are concerned about the future possibility of genetically transmitted conditions.
Genome, All the genetic material in the chromosomes of a particular organism; its size is generally given as its total number of base pairs.
Heterozygosity, The presence of two different alleles at one or more loci on chromosome pair.
HOMA-IR, Homeostasis model assessment of insulin resistance (HOMA-IR).
Homozygote, An individual with two identical alleles (versions of a single gene) at one locus (position).
Lipid oxidation Consists of three phases: (1) initiation, the formation of free radicals; (2) propagation, the free-radical chain reactions; and (3) termination, the formation of non-radical products. The lipids involved in oxidation are the unsaturated fatty acid moieties, oleic, linoleic, and linolenic acid.
Locus (pl. loci), The position of a gene on a chromosome/ chromosome marker.
Mitochondria, an organelle found in cells, where the biochemical processes of respiration and energy production occur.
Mitochondrial DNA, DNA inherited only from your mother.
Mutation, Any heritable change in DNA sequence. See also polymorphism.
Nucleotide, A subunit of DNA or RNA consisting of a nitrogenous base (adenine, guanine, thymine, or cytosine in DNA), a phosphate molecule, and a sugar molecule (deoxyribose in DNA and ribose in RNA). Thousands of nucleotides are linked to form a DNA molecule.
Nucleus, The cellular organelle in eukaryotes that contains the genetic material.
PCR, See polymerase chain reaction.
Penetrance, A "none" reference to clinical expression of a mutant gene.
Pleiotropy, occurs when one gene influences two or more seemingly unrelated phenotypic traits.
Polygenic disorders, Genetic disorders resulting from the combined action of alleles of more than one gene (e.g., heart disease, diabetes, and some cancers). Although such disorders are inherited, they depend on the simultaneous presence of several alleles; thus the hereditary patterns are usually more complex than those of single-gene disorders. Compare single-gene disorders.
Polymerase chain reaction (PCR), A method for amplifying a DNA base sequence using a heat-stable polymerase and two primers.
Polymorphism A Difference in DNA sequence among individuals. Genetic variations occurring in more than 1% of a population would be considered useful polymorphisms for genetic linkage analysis.
Protein, A large molecule composed of one or more chains of amino acids in a specific order; the order is determined by the base sequence of nucleotides in the gene coding for the protein.
Satiety refers to the sensation of fullness after eating and appetite is the desire to eat.

Single-gene disorder, Hereditary disorder caused by a mutant allele of a single gene (e.g., Duchenne muscular dystrophy, sickle cell disease). Compare polygenic disorders.
QUICKI, Quantitative insulin sensitivity check index.

Disclaimer

Approved By

Approval Signatures

Medical Scientist / Geneticist

Dietitian

Medical Laboratory Scientist