YOUR GUTMAP

# DNAMap

## Your DNA Diet & Lifestyle report

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# Understanding your DNAMap

## What is DNA?

DNA is your body's instruction manual, controlling every single function from when you were only made up of a few cells, until now. It looks like a twisted ladder, made up of two halves - you inherit one half from your mother, the other from your father. This combination is what makes you, you.
Each 'rung' of the ladder contains two letters of DNA code called **nucleotides** which bond together in pairs: **A (adenine)** and **T (thymine)** bond together, as do **C (cytosine) and G (guanine).**
**Genes** are portions of the ladder which use combinations of the nucleotide code to perform specific functions.

## Results

Your results are shown by a combination of the letters ATCG along with a traffic light system to indicate if your result is good, neutral or bad.
Identical letters (e.g. GG or AA) mean you are either what is called the "wild type" with no genetic variants (SNPs) OR you have both genetic variants (from both parents). A combination of letters (e.g. AG) means you have one inherited genetic variant.

- A green result indicates either no variants or a positive genetic variant
- An amber result usually indicates one genetic variant present and a mildly negative impact
- A red result indicates a negative impact either due to both variants being present or a "wild type" result that is not as beneficial as the variant

## SNPs

Over time, due to environmental and lifestyle factors, minor changes called single nucleotide polymorphisms (SNPs) occur in the DNA code and are passed down from parent to child, from generation to generation. Remember the nucleotides? Well, a C might be replaced by a T, changing the instructions given to a gene.
Some changes are positive, making us stronger and more resilient (like being able to digest milk after infancy), some negative (like being likely to store more fat as a result of past famine or food shortage) and some make no difference at all. SNPs can be passed down on just one side of your ladder, from one parent, or from both, enhancing the effect.
SNPs are generally what we are looking for when we test your DNA.

## Example of your genetic results table:

| GENE DESCRIPTION | RESULT | IMPACT & ADVICE |
|---|---|---|
| **GENE CODE - Gene Effect**<br>Explanation of the role the gene plays and what effect genetic variants might have, symptoms etc. | GG | An explanation of your result, how you might be affected along with specific diet and lifestyle advice |
| **GENE CODE - Gene Effect**<br>Explanation of the role the gene plays and what effect genetic variants might have, symptoms etc. | AG | An explanation of your result, how you might be affected along with specific diet and lifestyle advice |
| **GENE CODE - Gene Effect**<br>Explanation of the role the gene plays and what effect genetic variants might have, symptoms etc. | AA | An explanation of your result, how you might be affected along with specific diet and lifestyle advice |

# 8 Elements of Health & Wellbeing

Welcome to your unique DNAMap. Whilst your genes play a role in your health and wellness, your genes do not have to be your destiny. Understanding your genetic predispositions can give you the vital tools to understand and manage your health. There is a two-way interaction between your DNA and your lifestyle. Many health concerns can be reversed and/or prevented by assessing risk factors and implementing appropriate nutrition and lifestyle measures. Your DNAMap explores your personal genetic profile within the context of 8 elements of health and wellbeing: digestion, metabolism, stress, immunity, nutrients, stimulants, exercise and sleep.

The insights within this report are based on your specific genotype in each of these areas. We have also supplied a separate Nutrition & Lifestyle Guide (NLG) designed to help you make the most out of the advice given. The DNAMap unlocks key health insights from your genes, allowing you to take control of your genes to improve your health and wellness.

# Your Dashboard

## 1. Digestion

- FUT2 - Gastrointestinal infections
- HLA-DQA1 - Gluten intolerance
- LCT - Lactose intolerance

## 2. Metabolism

- FTO - Obesity & T2D
- LEPR - Appetite / Satiety
- TCF7L2 - Insulin Secretion

## 3. Stress

- ACE - Blood Pressure & Electrolytes
- COMT - Anxiety, Pain, Stress
- FKBP5 - Cortisol Regulation

## 4. Immunity

- DAO - Histamine
- HNMT - Allergies
- TNF-a - Inflammation

## 5. Nutrients

- BCMO - Vitamin A
- MTHFR - Vitamin B9
- FUT2 - Vitamin B12

## 5. Nutrients

- SLC23A1 - Vitamin C
- GC - Vitamin D
- VDR - Vitamin D

## 5. Nutrients

- FTO - Protein
- TCF7L2 - Carbohhydrates
- NOS3 - Omega-3

## 6. Stimulants

- ADORA2A - Adenosine detoxification
- ADH1B - Alcohol sensitivity
- CYP1A2 - Caffeine metabolism

## 7. Excercise

- ACE- Endurance Vs Power
- COL1A1 - Tendon, ligament injury risk
- GSTM1 - Recovery

## 8. Sleep

- CLOCK - Early bird / night owl
- MTNR1B - Melatonin receptivity
- PER - Circadian rhythms

# Element 1: Digestion

Have a gut feeling? How about "trusting your gut"?

Most often we only pay attention when our digestive system acts up such as feeling queasy, bloated, 'gassy' or constipated.

Healthy digestion is one of the most crucial factors for overall health. It ensures we absorb vital nutrients from the food we eat and get rid of the waste created in the process. The gut is also one of our main sites of immunity, it's our main line of defence against the outside world, and is also where the majority of our serotonin (feel-good chemical) is made!

There is a two-way communication system between the mind and the body known as the 'gut-brain axis' which is why poor digestive health can impact your mood and mental state. As they say, you are what you eat!

See pages 3-7 of your NLG for more information & tips on gut health.

The FUT2 gene is involved in susceptibility to certain viral, bacterial and yeast (microbial) infections and balance in the digestive tract. Your digestive health can also be impacted by intolerance to components in food such as gluten and lactose, influenced by the HLA and LCT genes respectively, causing damage to the intestinal lining and knock-on digestive and immune problems. Check page 7 below to see if you have any of these genetic variants that could be disrupting your health!

| GENE DESCRIPTION | YOUR RESULT | IMPACT & ADVICE |
|---|---|---|
| **FUT2 - Gastrointestinal (GI) Infections (Non-East Asian)**<br><br>FUT2 is highly expressed in the GI tract and is involved in immune regulation via secretions. Genetic variations in FUT2 determine whether people are 'secretors' or 'non-secretors'. There are advantages and disadvantages to both in terms of susceptibility to viral, bacterial and fungal infections, as well as microbial (gut bacteria) balance. The W143X variant is the most common indicator of Secretor status in Non-East Asian populations. | **GG** | Secretor (non-East Asian populations). More resistant to candida (yeast), and to inflammatory bowel disease (IBD), specifically Crohn's Disease. Also likely to have more Bifidobacteria (the "good" bacteria). On the other hand, secretors have been shown to be more susceptible to rotavirus and norovirus infections (which cause diarrhea & vomiting), and H. pylori, a bacteria known to irritate the stomach lining, causing inflammation and stomach ulcers. See pages 3 & 7 of your NLG for more information on Gut Healing and Candida. |
| **HLA-DQA1 - Gluten Intolerance / Celiac Disease**<br><br>HLA genes help the immune system distinguish between the body's own proteins and proteins made by foreign invaders (such as viruses and bacteria). Genetic variants in HLA increase susceptibility to autoimmune conditions, particularly celiac disease - a condition where the immune system becomes abnormally sensitive to gluten (a naturally occurring protein found in wheat, barley and rye). A family history of celiac disease or other autoimmune conditions increases risk. | **CC** | You are the 'wild type' (no genetic variants) which confers low to no (genetic) risk of celiac disease and/or other autoimmune conditions. If you experience joint pain, skin problems, or migraines after eating gluten this may indicate non-celiac gluten sensitivity (IgG) which is typically a result of intestinal permeability ("leaky gut"). If so, you may do well to avoid gluten (pg. 5 NLG) for a period of time and follow a gut healing diet (pg. 3 NLG) to see if your symptoms improve. |
| **LCT/ MCM6 - Lactose Intolerance**<br><br>Controls an enzyme called lactase needed to digest lactose, the main carbohydrate found in milk and dairy products. Most people are born with the ability to digest lactose. Approximately 75% of the world's population loses this ability after infancy, however, in some populations (particularly Caucasians (50%) and some other populations (16%)), this gene has evolved to continue to produce the lactase enzyme into adulthood. | **AA** | You are likely able to produce the lactase enzyme into adulthood. You are most likely able to digest dairy products without experiencing uncomfortable symptoms such as gas and bloating. There are other reasons to avoid consuming a lot of dairy (hormones, antibiotics and pesticides) especially if you suffer from hormonal imbalances (pg. 6 NLG). |

# Element 2: Metabolism

Always craving that next piece of cake or bowl of pasta?

Fluctuating blood sugar plays havoc on your metabolism. It also disrupts hormones and causes us to store fat, put on weight and suffer from low energy, food cravings, poor concentration and irregular moods while increasing risk of obesity and developing type 2 diabetes (T2D).

High carbohydrate (sugar) diets derail blood sugar creating a 'rollercoaster': short bursts of energy followed by a crash. Insulin is a hormone that encourages cells to absorb sugar (glucose) from the blood to use as energy. Insulin also assists in breaking down fats and proteins for energy. High blood sugar means less fat metabolism, whereas, low blood sugar causes the body to release cortisol and adrenaline in response to the need to eat - you don't want either of these! Poor sleep has been linked with blood sugar imbalance, low levels of the 'satiety' hormone ***leptin*** and high levels of the 'hunger' hormone ***ghrelin*** - making you crave sugary snacks and repeating the cycle all over again!

See page 9 of your NLG for tips on balancing blood sugar.

The tendency to reach for extra helpings and be more likely to gain weight, is governed by 3 key genes: TCF7L2, LEPR & FTO. They are instrumental in determining when you feel hungry, your likelihood of overeating and your propensity for weight gain. Check page 9 below to see if any of these variants may be disrupting your metabolism!

| GENE DESCRIPTION | YOUR RESULT | IMPACT & ADVICE |
|---|---|---|
| **TCF7L2 - Insulin Secretion**<br><br>Regulates blood sugar by influencing the production of insulin, a hormone responsible for promoting the absorption of glucose (sugar) from the blood into our cells where it is needed for energy. Genetic variants on TCF7L2 may cause decreased insulin secretion leading to risk of glucose intolerance and of developing type 2 and gestational diabetes in females. | **CT** | You are among the 20% of the population associated (genetically) with decreased insulin secretion and increased risk of developing T2D. To reduce your risk aim to get between 7-9 hrs of sleep per night (pg. 20 NLG), engage in regular physical activity and swap simple for complex carbohydrates (pg. 8 NLG) which will help balance blood sugar levels (pg. 9 NLG). |
| **LEPR - Leptin Receptor**<br><br>Regulates the body's receptivity to the 'satiety' hormone, leptin, which is produced mainly by our fat cells and is responsible for controlling appetite by signalling to the body that it feels full after eating, and is also involved fat metabolism. Leptin works in opposition to the 'hunger hormone' - ghrelin. Variants are associated with lower levels of leptin leading to increased hunger, likelihood of overeating and obesity. | **AG** | You are one of over 40% of the population prone to (genetically) decreased leptin receptivity. This results in a delay of "feeling full" when eating, increased appetite, likelihood of overeating and possible risk of obesity. Poor sleep will affect your leptin levels further since sleep deprived individuals have been found to have low leptin and high ghrelin levels - making you feel more hungry! Aim to get 7-9hrs sleep each night (pg. 20 NLG), control portion size, calorie intake and eat meals more slowly to encourage leptin production. |
| **FTO - Obesity and Type 2 diabetes**<br><br>Commonly called the "fat gene" due to its connection with appetite regulation, metabolic rate and increased calorie intake. FTO is present in high levels in the brain and other areas affecting metabolism such as the heart, kidneys and fat cells. Variants increase likelihood of overeating, enjoying larger food portions, having a preference for higher calorie foods and snacking more frequently due to low satiety and resulting in risk of increased body mass, obesity and type 2 diabetes. | **TA** | You are one of the 30-50% of the population likely to feel less full after meals increasing your likelihood of overeating/ eating larger portions and risk of higher body fat mass, increased waist circumference and obesity. Being overweight and low physical activity increases your risk of insulin resistance and T2D. We recommend eating protein with every meal to help maintain fullness, swap simple for complex carbohydrates (pg. 8 NLG), and practice portion control. Physical activity has been shown to be particularly beneficial for reducing the effect of FTO variants - so get active! |

# Element 3: Stress

Are you a worrier, or a warrior? Or something in between?

We have all been negatively affected by a stressful day, event or situation, however, long term, chronic stress has an immense impact on our health and wellbeing and is one of the main contributing factors to many conditions and diseases.

**Cortisol,** one of the the body's main stress hormones, is produced naturally in moderate amounts to promote healthy daytime wakefulness and in larger amounts in response to stress (physical and emotional). Chronic stress leads to abnormally high cortisol levels which can affect immune function, reduce bone and muscle growth, fertility, sleep, increase insulin resistance and blood pressure, and makes us more sensitive to adrenaline, another stress hormone.

Unfortunately, eliminating stress completely is almost impossible. There are many techniques we can employ to improve our management of and resilience to stress in order to decrease the negative effects that long-term stress can have on our mental and physical health.

See page 10 of your NLG for stress management techniques.

Your capacity to cope with stress is influenced by your lifestyle, genes and early life factors. Key genes involved in modulating your response to stress by controlling cortisol levels, blood pressure, the break down of stress hormones are: FKBP5, ACE and COMT. Check page 11 to see if any of these variants may be impacting your ability to cope with stress and what to do about it.

| GENE DESCRIPTION | YOUR RESULT | IMPACT & ADVICE |
|---|---|---|
| **COMT - Stress and pain resilience**<br><br>Responsible for breaking down and inactivating many compounds including dopamine and adrenalin. Adrenalin is responsible for increasing our heart rate and blood pressure in response to stress. Variants in COMT lead to slower breakdown of compounds causing a prolonged stress response, irritability, anxiety, heightened pain sensitivity and mood disorders. | **AA** | 'Worrier type' (decreased genetic stress resilience). Slower breakdown of neurotransmitters and more susceptible to irritability, anxiety, pain, mood disorders and disturbed sleep. See pg. 10 of your NLG for tips on effective stress management. Check pg.18 of this report to see whether you should avoid caffeine in order to reduce anxiety, achieve better sleep and improve stress resilience. |
| **FKBP5 - Cortisol regulation**<br><br>An important stress-regulating gene responsible for modulating cortisol levels by signalling for the lowering of cortisol after a stress response. Variants in FKBP5 are associated with prolonged and increased stress response due to impaired lowering of cortisol levels after a stressful event. Carriers of the variant are more susceptible to stress-related disorders such as depression, anxiety and post traumatic stress disorder (PTSD) in adulthood particularly as a result of childhood trauma. | **CC** | More likely to recover well from stress, due to healthy cortisol regulation. Prolonged chronic stress or traumatic life events along with diet and lifestyle factors such as obesity, lack of exercise and poor diet can cause decreased stress resilience (pg. 10 NLG) regardless of genotype. Check pg. 18 below to see whether you should avoid caffeine to reduce anxiety and achieve better sleep. |
| **ACE - Blood pressure and electrolyte balance**<br><br>Found mainly in the blood vessels and lungs and plays one of the most important roles in regulating blood pressure and the balance of fluids and salts (electrolytes) in the body. ACE causes the blood vessels to constrict and blood volume to increase leading to high blood pressure (HBP). Variants in ACE are associated with increased risk of high blood pressure which, in combination with prolonged stress, can be detrimental to heart health. | **AA** | You are among the majority of the population likely to produce normal levels of ACE which plays a large role in regulating blood pressure. Healthy blood pressure means better resilience during and after a stressful situation or intense exercise. Diet and lifestyle factors, such a being obese or eating a diet high in salt and saturated fats have been shown to increase blood pressure regardless of genotype. Have your blood pressure monitored regularly. |

# Element 4: Immunity

Our incredible immune system constantly protects us from infection and harm, however, it can sometimes become overwhelmed - overreacting to perceived threats, or not responding effectively enough to get us swiftly back to optimal health. The key is balance.

**Inflammation** is an integral part of the healing process and protecting a damaged area, however, if inflammation lasts too long it becomes 'chronic' and is linked with a range of health issues such as heart disease, arthritis, asthma, diabetes and even depression.

**Histamine** is a naturally occurring compound in certain foods and is also generated internally by our bodies since it fulfils some key functions: helps protect against infection and inflammation, is vital for the release of stomach acid and acts as an excitatory neurotransmitter in the brain causing alertness and cognition. However, too much histamine in our bodies can result in unpleasant allergy-type symptoms, anxiety and insomnia due to it's neurotransmitter activity.

See page 11 of your NLG for information on anti-inflammatory foods and page 12 for more information on histamine.

Your genes affect your immune system function. High levels of TNF-alpha can result in chronic systemic inflammation. Low DAO and HNMT may result in high histamine levels causing allergy symptoms (itchiness, hives, runny/ blocked nose, asthma or chronic coughing), insomnia and anxiety. Check page 13 below to see if any of these may be impacting your immunity.

| GENE DESCRIPTION | YOUR RESULT | IMPACT & ADVICE |
|---|---|---|
| **TNF-a - Inflammation**<br><br>Helps regulate the immune reaction involved in inflammation, fever and inhibiting tumour growth but is also involved in lipid metabolism, coagulation and insulin resistance as well as being implicated in a number of autoimmune diseases. Variants in TNF-alpha are associated with overactive immune responses and susceptibility to a range of inflammatory health conditions. | **GA** | You are likely to have an increased inflammatory response. Diet and lifestyle factors such as alcohol, caffeine and sugary foods, lack of sleep, smoking and being overweight can further promote chronic inflammation which has been linked to a number of conditions from joint pain to insulin resistance and even some types of cancer. Inflammation can be reduced naturally by avoiding the above triggers and following an anti-inflammatory diet (pg. 11 NLG). |
| **HNMT - Histamine**<br><br>Controls histamine levels in the brain and airways. The stimulatory activity of histamine in the brain may benefit memory and concentration, however, it can also negatively effect sleep and cause allergy-type symptoms. Genetic variants cause up to five-fold decrease in HNMT activity resulting in symptoms such as headaches, watery, itchy eyes and nose, coughing, wheezing, shortness of breath, insomnia and anxiety. | **CC** | You are likely to have healthy breakdown of histamine in the brain and lungs due to normal functioning of the HNMT pathway. HNMT activity can be affected by other genetic variants, particularly those impacting methylation such as MTHFR (check pg. 15 below), and by your diet and lifestyle. If you experience symptoms of histamine intolerance, try avoiding histamine-containing foods (pg. 12 NLG), alcohol, and support your methylation pathways (pg. 13 NLG). |
| **DAO - Ingested histamine**<br><br>The DAO gene produces the main enzyme responsible for breaking down ingested histamine and needs vitamin B2 as a cofactor. Variants on this gene may decrease enzyme activity resulting in excess histamine and causing allergy-type symptoms including irritation to the GI tract, food allergies, gluten-sensitivity, Crohn's disease and ulcerative colitis, skin irritation, eczema and hives and even anxiety and insomnia. Those with histamine sensitivities will experience symptoms after ingesting even small amounts of histamine. | **CT** | You are among the 30-50% of the population likely to have genetically reduced DAO activity, and therefore increased risk of histamine sensitivity. If you experience symptoms you should reduce consumption of histamine foods (pg. 12 NLG), alcohol and black tea. Support DAO activity with vitamins B2, B6 and C. |

# Element 5: Nutrients

Macro and micro nutrients are your body's fuel.

Your body requires adequate amounts of vitamins and minerals (micronutrients) as well as protein, fats and carbohydrates (macro-nutrients) in order to function and regenerate properly. Whilst a diet may be healthy on paper, you may need more, or less of certain nutrients depending on your genes.

Inadequate or excessive amounts of these vital nutrients can lead to various imbalances and multiple health concerns including low energy, obesity, type 2 diabetes, cardiovascular disease, anaemia, osteoporosis, depression, infertility, poor detoxification and cancer. By eating a diet rich in good quality protein and fats, complex carbohydrates and including a wide variety of vegetables and a smaller amount of fruit, you are helping ensure that your body gets the nutrients it needs to function optimally. Very few foods naturally contain vitamin D so it is important that i you also get adequate exposure to sunlight and/ or take a good quality supplement.

Nutrient levels in the body are affected by diet, stress, exercise, age, your environment as well as genetic factors. See pages 8, 13, 14, 15 & 16 of your NLG for more information on nutrients.

The need for and ability to utilise particular nutrients varies from person to person and is greatly influenced by genes. MTHFR, FUT2 and VDR may affect your levels of vitamins B9 (folate), B12 and D respectively. FTO, TCF7L2 and NOS3 play a role in determining your ideal macronutrient intake. Check pages 15 & 16 below to see whether you have any of these influential variants and, if so, what to do about it.

| GENE DESCRIPTION | YOUR RESULT | IMPACT & ADVICE |
|---|---|---|
| **BCMO1 - Vitamin A**<br><br>The BCMO1 gene is responsible for converting beta-carotene, a pigment found in plants, to active vitamin A (retinol) in the body. Vitamin A is important for eye health, a strong immune system, healthy skin and mucous membranes, reproduction and thyroid health. Here we report on a genetic variant on BCMO1 that can result in a reduced ability to convert beta-carotene from plants to retinol, and therefore lead to low levels of active vitamin A in the body. An orange or red result on either of these means reduced function and a need to increase foods high in retinol such as fish, liver and cheese; or to consider supplementing vitamin A in the form of retinol or retinoic acid. | **TT** | Less able to convert beta-carotene to active vitamin A (retinol). Increase retinol foods or consider supplementing vitamin A in the form of retinol or retinoic acid. The RDA (minimum) for vitamin A is 600 mcg for women and 700 mcg for men. |
| **MTHFR - Vitamin B9 (folate)/ Methylation**<br><br>Responsible for converting folate into the active form needed by the body to support DNA synthesis and repair, cell division, healthy pregnancy as well as the synthesis of the neurotransmitters dopamine and serotonin. Variants have been linked to cardiovascular disease, infertility, neural tube defects, low energy and mood, poor detoxification and impaired gene expression. | **GG** | "Healthy methylator" - you are likely to have healthy levels of 'active' folate (vitamin B9) in the body. A diet low in B vitamins and other vital co-factors such as zinc, magnesium, betaine and choline; and high alcohol consumption will cause low folate levels regardless of your genotype. See pg. 13 of your NLG for more information on methylation. The RDA (minimum) for folate is 200 mcg and 400 mcg for preconception, pregnant or breastfeeding women. |
| **FUT2 - Vitamin B12**<br><br>Absorption of vitamin B12 requires the secretion of intrinsic factor (IF) from the gastric cells. FUT2 'Secretors' are more susceptible to H. pylori infection which reduces IF secretion and increases risk of poor B12 absorption. Vitamin B12 is important for making red blood cells, nerves and DNA. Low B12 can lead to anaemia, fatigue, pale skin, feeling faint, heart palpitations, cardiovascular disease, swollen tongue, and nerve problems. | **GG** | Secretor (Non-East Asian populations). Possible reduced gastrointestinal absorption of vitamin B12 causing low serum B12 levels. Alcohol, certain medication and following a vegan or vegetarian diet can increase your risk of low B12 levels regardless of genetics. If you suspect low vitamin B12, consider a blood test to check your levels. Regular vitamin B12 injections will help to avoid the digestive system. The RDA for vitamin B12 is 1.5 micrograms (mcg). This is the minimum required daily to avoid deficiency. |

| GENE DESCRIPTION | YOUR RESULT | IMPACT & ADVICE |
|---|---|---|
| **SLC23A1 - Vitamin C**<br><br>This gene is responsible for transporting vitamin C and has been shown to impact the levels of circulating vitamin C in the body. Humans are unable to produce vitamin C so it is an essential part of the human diet. Vitamin C plays a role in controlling infections and healing wounds, is a powerful antioxidant, is needed to make collagen, for the absorption of iron and helps to make several hormones and chemical messengers used in the brain and nerves. The best sources of vitamin C in the diet include bell peppers, citrus fruit, strawberries, tomatoes, cruciferous veg (broccoli, Brussels sprouts, cabbage, cauliflower) and white potatoes. | **GG** | Normal ability to transport vitamin C. Make sure to include plenty of vitamin C-rich foods into your daily diet such as bell peppers, citrus fruit, strawberries, tomatoes, cruciferous veg (broccoli, Brussels sprouts, cabbage, cauliflower) and white potatoes. |
| **GC - Vitamin D Transporter**<br><br>This GC gene produces vitamin D binding protein (DBP) responsible for transporting vitamin D between the skin, liver and kidney, and on to various target cells. Vitamin D is a fat-soluble vitamin primarily produced when the skin is exposed to sunlight (UVB rays), or obtained through the diet. During winter, the sunlight doesn't contain enough UVB radiation for our skin to make vitamin D. Oily fish and mushrooms are among the few foods that naturally contain vitamin D. Vitamin D promotes the absorption of calcium and retention of phosphorus and is important for bone health and regulating the immune system. Variants on the GC gene are linked to lower levels of vitamin D. | **TG** | Reduced ability to bind and transport vitamin D. You may need to supplement vitamin D if you are unable to regularly spend time outdoors, exposing your skin to direct sunlight (without burning) for at least 20 minutes. Aim to also include vitamin D-rich foods in your diet. The RDA for vitamin D is 800 IU (20 micrograms) to avoid deficiency. |
| **VDR - Vitamin D receptor**<br><br>Regulates the body's vitamin D3 receptor and mediates the production of dopamine, one of the body's 'feel good' chemicals. This is one of the reasons why lack of sunlight is associated with low mood. Vitamin D is also crucial for bone formation, immune regulation and cell growth and differentiation. Over 30% of the population carries the variant which may lead to low vitamin D levels and low dopamine production. | **CT** | You are likely to have low receptivity to vitamin D (increased need) and therefore risk of low bone density, poor immunity, and decreased dopamine levels leading to low mood. Make sure to keep your vitamin D levels up by exposing your skin to sunlight regularly (without tanning or burning) or, if that's not possible, by taking a good quality vitamin D supplement (pg. 14 NLG) - especially during winter months. The RDA for vitamin D is 800 IU (20 micrograms) to avoid deficiency. |

| GENE DESCRIPTION | YOUR RESULT | IMPACT & ADVICE |
|---|---|---|
| **FTO - Protein & fat need**<br><br>Commonly called the "fat gene" due to its connection with weight and body composition. FTO is present in high levels in the brain and other areas affecting metabolism such as the heart, kidneys and fat cells. Variants increase likelihood of obesity and type 2 diabetes. Current research shows that a diet higher in protein can substantially help with weight loss and maintenance in those with the FTO variant. | **TA** | You are less likely to be able to maintain a consistent weight without having to closely watch what you eat. Overweight individuals also have elevated risk of insulin resistance and type 2 diabetes. Your ideal diet to lose or maintain weight would be high in good quality protein (20-30% of your daily energy), a small amount of healthy fats (pg. 15 NLG), complex carbs - aim for no more than 1/4 of your meal (pg. 8 NLG) and a variety of non-starchy vegetables. |
| **TCF7L2 - Carbohydrate & fat consumption**<br><br>Regulates blood sugar by influencing the production of insulin, a hormone responsible for promoting the absorption of glucose (sugar) from the blood into our cells where it is needed for energy. Genetic variants on TCF7L2 may cause decreased insulin secretion leading to risk of glucose intolerance and of developing type 2 and gestational diabetes in females. | **CT** | You are likely to be sensitive to simple carbohydrates and saturated fats in terms of weight gain and increased risk of type 2 diabetes. You would benefit from eliminating simple carbs (pg. 8 NLG) and unhealthy fats (pg. 15 NLG) from your diet to lose weight, and increasing complex carbs to reduce your risk of developing type 2 diabetes. Consume less than 40% of daily energy from carbs. |
| **NOS3 - Omega-3**<br><br>Produces the enzyme nitric oxide synthase (NOS) responsible for making nitric oxide (NO), known to be protective in our blood vessels and to be involved in opening the blood vessels. Variants result in low nitric oxide production and associated with cardiovascular disease. Recent research has shown that omega-3 fat has a positive impact on cardiovascular risk in people with NOS3 variants by lowering another kind of fat called triglycerides which is also linked to lower HDL (good) cholesterol. | **GG** | You are likely to have normal NOS activity and healthy ability to produce NO which is associated with positive cardiovascular health. As a result you have normal need for omega-3 fats in your diet, however, you should ensure to consume an adequate amount of omega-3 (pg. 16 NLG) in order to keep your risk low and promote overall health. Aim for at least 140g (roughly 1-2 portions) of oily fish per week; or nuts, seeds and algae oil as plant-based sources of omega-3. |

# Element 6: Stimulants

How does your body respond to stimulants?

Some people can drink coffee all day without feeling the effects, others will feel the effects of just one cup. Whilst tolerance to stimulants can change depending on consumption, your genes play a crucial role on how your body handles caffeine and alcohol.

Alcohol prevents you from getting a refreshing night's sleep, disrupts your metabolism and alters your brain chemistry - slowing you down and potentially leading to low mood, insomnia and anxiety.

Caffeine is a controversial area in nutrition with contradictory research. The ability to metabolise caffeine is highly individual depending on genetic variants. Even moderate amounts of caffeine may have an adverse effect if you are a slow caffeine metaboliser (find out below). A big concern about caffeine is how it triggers the release of stress hormones - adrenalin and cortisol. Cortisol causes spiked blood sugar (remember the blood sugar rollercoaster?) leading to increased fat storage around the midriff. Although caffeine increases brain activity and energy in the short term, over time, it can actually drain your body's ability to produce energy naturally.

See page 18 of your NLG for tips on how to kick caffeine if you feel

Your genes significantly impact your response to caffeine and alcohol. CYP1A2 determines how effectively you break down (detoxify) caffeine while ADORA2A affects how your nervous system reacts to it - making you feel 'wired' for longer. The ADH genes control the rate at which you convert alcohol to acetaldehyde a compound more toxic than alcohol which can severely damage the body! Check page 18 to see if any of these variants impact you.

| GENE DESCRIPTION | YOUR RESULT | IMPACT & ADVICE |
|---|---|---|
| **CYP1A2 - Caffeine sensitivity**<br><br>Responsible for detoxifying multiple substances including pharmaceutical drugs (e.g. paracetamol), and most famously, caffeine. Variants are associated with increased activity and thus faster detoxification of substances. This is both good and bad depending on the substance being detoxified. With respect to caffeine, faster metabolism is generally considered positive since it reduces the time caffeine is active in body, reducing its effect. | **CA** | You are likely to be a relatively slow caffeine metaboliser. This genotype has been associated with increased anxiety and risk of hypertension when consuming more than 1-2 cups of coffee per day. Consuming caffeine after midday may affect your ability to fall asleep or cause you to wake in the night. If you suffer from anxiety, hypertension and/or insomnia we recommend limiting overall consumption of caffeinated food and drinks including coffee, tea, carbonated drinks (especially 'energy drinks'), and chocolate (pg. 18 NLG). |
| **ADORA2A - Adenosine impact**<br><br>Adenosine receptor activity increases throughout the day as the body generates adenosine, a by-product of energy (ATP) release. ADORA2A also regulates dopamine release - as adenosine levels increase, the stimulatory effect of dopamine declines - facilitating sleep. Caffeine blocks this interaction increasing the stimulatory effect of dopamine, causing alertness. Variants on ADORA2A increase the stimulatory impact of caffeine. | **TC** | You are likely to have lower ADORA2A activity and increased sensitivity to caffeine-related sleep disturbance, particularly if you are a slow metaboliser (check your CYP1A2 status above). Consuming caffeine in the evening may affect your ability to fall asleep or achieve restful sleep. If you suffer from insomnia, we recommend that you limit consumption of caffeinated food and drinks including coffee, tea, carbonated drinks (especially 'energy drinks'), and chocolate (pg. 18 NLG). Regular consumption of caffeine may, however, result in improved tolerance. |
| **ADH1B - Alcohol sensitivity/ detoxification**<br><br>Responsible for breaking down alcohol. Variants on this gene (which are more common in Asian populations than Caucasians), can result in as much as 100x faster metabolism of alcohol to more toxic acetaldehyde causing more severe symptoms of toxicity such as facial flushing, nausea and headaches, and increased oxidative damage to the body when consuming alcohol. | **CC** | You are likely to convert alcohol to acetaldehyde relatively slowly. This is considered positive since acetaldehyde is more toxic than alcohol and can cause unpleasant symptoms and oxidative (free radical) damage to the body. Alcohol metabolism is a multi-step process affected by other genes, including those involved in 'phase II' detoxification. To support the detoxification of acetaldehyde from the body increase magnesium, molybdenum, zinc and vitamins B2 and B3 which are all important co-factors. Candida overgrowth (pg. 7 NLG) will increase your levels of acetaldehyde. |

# Elements 7: Excercise

Your genes play a crucial role in what types of exercise, sports, and athletics best suit you.

Whether you have a keen interest in sports and fitness, or you are just looking to live a healthy life, exercise plays a crucial role.

Even if exercise isn't your favourite thing, it plays an important role in maintaining health. Regular exercise helps control weight, combats many health conditions including type 2 diabetes, stroke, metabolic syndrome and arthritis; improves mood, sleep and sex drive and boosts energy.

If fitness plays an important role in your life, DNAMap can unlock key insights into the type of training and activities you will excel in. Your genes play a crucial role in your VO2 max and your ratio of slow twitch / fast twitch muscle fibres. Understanding if you are better suited to be an endurance athlete, or a power athlete can help you optimise your training program.

Whilst understanding which training modalities you will excel in is important for your physical appearance and performance, the genes will look at will also give you insights on injury management.

See page 19 of your NLG for tips on injury prevention & exercise recovery

Your genes can influence the type of exercise your body is naturally more suited to. ACE impacts your aerobic efficiency, VO2max and slow twitch muscle fibre volume making you better suited to either endurance or power exercise. COL1A1 & GSTM1 influence your tendency for injury and speed of recovery after exercise. Check page 21 below to see what your specific variants say about you.

| GENE DESCRIPTION | YOUR RESULT | IMPACT & ADVICE |
|---|---|---|
| **ACE - Power vs endurance & VO2max**<br><br>Controls blood pressure and fluid (water/sodium) balance in the blood. This is the most researched gene in relation to sporting performance and its role in vasoconstriction and blood pressure control. | **AA** | You are likely to have greater aerobic efficiency, VO2max and increased volume of slow twitch muscle fibres making you more genetically suited to endurance sport, such as triathlons and marathons, and high repetition weight training programmes. |
| **COL1A1 - Injury**<br><br>Associated with Type 1 collagen, the main collagen found in connective tissue. It is abundant in bone, cornea, skin, tendons, ligaments and cartilage. Variants are associated with increased risk of osteoporosis, and tendon and ligament injuries in sport. | **CC** | You are likely to be genetically prone to tendon and ligament injuries particularly ACL rupture, Achilles tendon injury, shoulder dislocation and 'tennis elbow', due to lower type 1 collagen production. Pre-habilitative measures relevant to your sport such as stretching, hamstring and calf strengthening would be beneficial. Training on softer surfaces may help to prevent injury. Consider nutritional support for connective tissue such vitamin C which supports collagen production. See our tips on injury prevention and recovery on pg. 19 of your NLG. |
| **GSTM1 - Recovery**<br><br>An important detoxification enzyme which helps to neutralise free radicals in the body via glutathione, a powerful antioxidant. GSTM1 processes carcinogens, therapeutic drugs, environmental toxins and other free radicals including those generated during exercise. This gene is known to be highly polymorphic meaning variants are common. Over 50% of Caucasians have only one or no copies of the gene. This can lead to increased tiredness and decreased recovery from exercise. | **AA** | GSTM1 gene likely absent. This means you are likely to have reduced ability to neutralise free radicals in the body and therefore experience slower recovery after exercise. Excessive exercise, dietary and environmental toxins, chronic stress, inflammation and low glutathione levels will burden GSTM1 further, increasing your risk of oxidative damage. We recommend stress management (pg. 10 NLG), reducing inflammation (pg. 11 NLG) and increasing antioxidants (pg.17 NLG) to support this important detoxification pathway. |

# Element 8: Sleep

Are you a night owl, or an early bird?

Busy lifestyles often leave sleep towards the bottom of our priority list. However sleep is a fundamental factor in maintaining overall health and wellbeing.

Studies show that less than six hours of sleep per night weakens your body and increases risk of obesity, diabetes, cardiovascular disease and stroke - not to mention the effect on your mood and mental capacity! Lack of sleep also increases our likelihood of reaching for stimulants such as caffeine, sugary foods and energy drinks to keep us going during the day which negatively impact health, mood and weight and can result in feeling 'wired' in the evening and needing to resort to alcohol or sleeping pills to fall asleep.

Our internal body clocks are regulated by 24 hour cycles (circadian rhythms) which respond primarily to light or darkness in the environment. Darkness signals the body to drop in temperature and to release the 'sleep hormone' - melatonin. Exposure to light stimulates a raise in body temperature and the release of the stimulating hormone - cortisol, which promotes wakefulness.

See page 20 of your NLG for some pro sleep tips.

Your body clock is regulated by a group of 'clock genes' including CLOCK, PER and MTNR which play a major role in orchestrating your body's circadian rhythms. Improper signalling due to environmental or genetic variation can cause disrupted or altered sleep patterns. Check page 22 to see if any of these variants may be disrupting your sleep.

| GENE DESCRIPTION | YOUR RESULT | IMPACT & ADVICE |
|---|---|---|
| **CLOCK - Early bird / night owl**<br><br>The CLOCK gene plays a central role in regulating circadian rhythms in the body. Many natural processes in the body are under the control of circadian rhythms, most notably sleeping and waking. Variants in the CLOCK gene are associated with altered sleep length affecting daytime alertness and susceptibility to mood disorders. Less sleep also increases appetite and susceptibility to type 2 diabetes. The CLOCK gene determines whether you are an 'early bird' or 'night owl'. | **AA** | "Early Bird". You are likely to enjoy normal to longer sleep duration, prefer daytime activity and to rise early. This decreases your susceptibility to mood disorders as a result of insufficient sleep. In addition, your ghrelin levels are likely to be lower reducing your risk of increased body mass and type 2 diabetes. Other diet and lifestyle factors can, however, cause disruption to your body clock regardless of your genotype. Try to maintain a regular sleep routine (pg. 20 NLG), avoid stimulants and bright light/ electronics in the evening. |
| **PER3 - Circadian rhythm**<br><br>The PER family of genes work in opposition to CLOCK to regulate the timing of sleep onset by signalling appropriate circadian functions to begin in response to environmental triggers - such as the release of melatonin and lowering of body temperature in response to dim light/ onset of darkness. PER3 has been associated with differences in sleepwake preference, sensitivity to light triggers and sleep quality. | **CC** | Your response to environmental triggers that regulate the sleep / wake cycle likely to be good and therefore you are likely to prefer to sleep and wake relatively early and should be less prone to sleep disruptions. Diet and lifestyle factors such as caffeine, stress, alcohol and bright light, can play a part in disrupting your body clock regardless of your genotype. Always try to maintain a regular sleep routine (pg. 20 NLG) and avoid stimulants and bright light before bed to ensure restful, restorative sleep. |
| **MTNR1B - Melatonin receptivity**<br><br>Found mainly in the eyes and brain and involved in the body's receptivity to melatonin, the 'sleep hormone' released in response to the onset of darkness. Melatonin is involved in several processes in the body including circadian rhythms, mood regulation, anxiety, sleep appetite, immune responses and heart function. Variants are associated with disturbed sleep and increased risk of impaired blood glucose metabolism leading to type 2 diabetes. | **CC** | You are less likely to experience disturbed sleep and the associated risk factors. Always try to maintain a regular sleep routine (pg. 20 NLG), ensure adequate exercise, follow a blood sugar balancing diet (pg. 9 NLG) and avoid bright light and electronics before bed to encourage healthy melatonin release. |