TO LEARN MORE ABOUT
GETCHECKED CONTACT:

enquiries@getcheckedclinic.com

getchecked

NUTRIGENE - HEALTH REPORT

Table of Contents

Summary of Results

Nutrient Metabolism

Dietary Component	Gene, rs Number	Risk Variant	Your Variant	Your Risk	Recommendations
Vitamin A	BCMO1, rs11645428	GG	GG	Elevated	Focus on consuming preformed sources of vitamin A.
Vitamin B_{12}	FUT2, rs601338	GG or GA	GA	Elevated	Focus on consuming bioavailable sources of vitamin B12.
Vitamin C	GSTT1, rs2266633	Del	Ins	Typical	Meet the RDA for vitamin C daily.
Vitamin D	CYP2R1, rs10741657	Algorithm	GA	Elevated	Consume 1000 IU (25 mcg) vitamin D daily.
	GC, rs2282679		GG		
Vitamin E	COMT, rs4680	GG	GA	Typical	Meet the RDA for vitamin E daily from food sources rich in vitamin E.
Folate	MTHFR, rs1801133	CT or TT	TT	Elevated	Meet the RDA for folate daily.
Choline	MTHFD1, rs2236225	Algorithm	GG	Elevated	Meet the Adequate Intake (AI) level for choline daily.
	PEMT, rs12325817		CG		
Calcium	GC, rs7041	Algorithm	TG	Elevated	Consume 1200 mg of calcium daily.
	GC, rs4588		CA		
Iron Overload	SLC17A1, rs17342717	Algorithm	CC	Low	Follow the recommendations provided in the Low Iron Status section.
	HFE, rs1800562		GG		
	HFE, rs1799945		CC		
Low Iron Status	TMPRSS6, rs4820268	Algorithm	GA	Elevated	Meet the RDA for iron and consume sources of vitamin C with iron-rich foods.
	TFR2, rs7385804		CA		
	TF, rs3811647		AA		

Food Intolerances and Sensitivities

Dietary Component	Gene, rs Number	Risk Variant	Your Variant	Your Risk	Recommendations
Lactose	MCM6, rs4988235	CC or CT	CT	Slightly Elevated	Limit dairy intake if you experience gastrointestinal symptoms.
Gluten	HLA, rs2395182	Algorithm	GT	Medium	Medium risk for gluten intolerance.
	HLA, rs7775228		TT		
	HLA, rs2187668		CT		
	HLA, rs4639334		GG		
	HLA, rs7454108		TT		
	HLA, rs4713586		AA		
Caffeine	ADORA2A, rs5751876	TT	CT	Typical	Follow the recommendations provided by the CYP1A2 gene section of this report.

Cardiometabolic Health

Dietary Component	Gene, rs Number	Risk/ Response Variant	Your Variant	Your Risk/ Response	Recommendations
Caffeine	CYP1A2, rs2472300	GA or AA	AA	Elevated	Limit caffeine intake to 200 mg/day.
Glycaemic Index	TCF7L2, rs12255372	TT or GT	GT	Elevated	Consume most grain products as whole grains.
Sodium	ACE, rs4343	GA or AA	AA	Elevated	Limit sodium intake to the Adequate Intake level.
Omega6- and Omega3- Fat	FADS1, rs174547	CC or CT	TT	Typical	Meet the RDA for omega6- LA fat and omega3- ALA fat.
Physical Activity	LIPC, rs1800588	TT or CT	CT	Enhanced	Aim for 150 to 300 min/week of cardio and at least 2 days/week of muscle-strengthening activities.

2in5

People with Risk Variant

Vitamin A (Beta-Carotene)

Vitamin A is a fat-soluble vitamin that is important for eye health and vision, a strong immune system and healthy reproduction. Beta-carotene is a precursor of active vitamin A (retinol) and is an antioxidant found in certain fruits and vegetables that are orange-red in colour. Beta-carotene can be converted to preformed vitamin A in the body to exert its biological functions. Research shows that individuals with the GG version of the BCMO1 gene are inefficient at converting beta-carotene to preformed active vitamin A.* These individuals are considered low responders to dietary beta-carotene, so consuming enough active vitamin A can help ensure circulating levels of active vitamin A are adequate to support vision, immunity and reproductive functions.

Your Results

Gene	Marker
BCMO1	rs11645428
Risk Variant	**Your Variant**
GG	GG

Elevated

only when vitamin A intake is low

Recommendation

Since you possess the GG variant of the BCMO1 gene, it is important for you to meet the RDA for vitamin A. Consuming foods that are higher in preformed active vitamin A can help you to meet your needs more easily. These foods include fish, liver, eggs, and dairy products. Meeting your recommendations for vitamin A will help to support healthy immunity, vision, and reproductive health. It will also act as an antioxidant when consumed in the form of beta-carotene (plant-sources). Women should aim for 700 mcg RAE/day and men should aim for 900 mcg RAE/day.

Focus on consuming preformed sources of vitamin A.

BCMO1

Beta-carotene mono-oxygenase 1 (BCMO1) is an enzyme that plays a key role in the conversion of beta-carotene into the active form of vitamin A. Beta-carotene is the plant form of vitamin A. Individuals who possess the GG version of the BCMO1 gene are inefficient at converting beta-carotene into the active form of vitamin A. These individuals need to ensure they are consuming adequate amounts of vitamin A, particularly preformed vitamin A.

Sources of Vitamin A

	High in Preformed Vitamin A	Amount (mcg RAE)
Pumpkin, tinned (2/1 cup)		1010
Carrots, cooked (2/1 cup)		650
Sweet potato, boiled without skin (2/1 medium)		600
Light tuna (75g)		530
Spinach, boiled (2/1 cup)		500
Butternut squash (2/1 cup)		410
Goat cheese, hard (50g)		240
Eggs (2 large)		220
Mackerel (75g)		190

Vitamin B_{12}

Vitamin B_{12} (cobalamin) is important for normal brain and nervous system functioning. It helps to keep blood cells healthy and prevent megaloblastic anemia, which can make you feel very weak and tired. Being deficient in vitamin B_{12} is also associated with pallor (pale skin) and irritability. Research shows that some individuals are at a greater risk than others for vitamin B_{12} deficiency based on the FUT2 gene.* Since animal products are the primary sources of vitamin B_{12}, individuals following a vegetarian diet are at an even greater risk of vitamin B_{12} deficiency.

FUT2

The fucosyltransferase 2 (FUT2) enzyme is encoded by the fucosyltransferase 2 gene and is involved in vitamin B_{12} absorption and transport between cells. Variants of this gene have been linked to low blood levels of vitamin B_{12} especially when consuming a vegetarian diet. However, for individuals with the risk variant, consuming adequate vitamin B_{12} can help reduce the risk of vitamin B_{12} deficiency.

Sources of Vitamin B_{12}

	Amount (mcg)
Clams, boiled or steamed (5 large)	59.0
Oysters, boiled or steamed (6 medium)	14.7
Atlantic herring (75g)	14.0
Fortified nutritional yeast (1 Tbsp)	3.9
Beef mince, lean (75g)	2.2
Fortified plant-based beverage (1 cup)	2.2
Atlantic salmon (75g)	2.1
Lamb (75g)	1.7
Soy 'burger' patty (1)	1.7
Eggs, hard boiled (2)	1.1

4in5

People with Risk Variant

Your Results

Gene	Marker
FUT2	rs601338
Risk Variant	**Your Variant**
GG or GA	GA

Elevated

only when vitamin B12 intake is low

Recommendation

Since you possess the GG or GA variant of the FUT2 gene, you have an elevated risk for vitamin B12 deficiency. It is, therefore, important for you to meet the RDA for vitamin B12 of 2.4 mcg daily. You should focus on eating foods with a high bioavailability of vitamin B12 (foods with a form of vitamin B12 that your body uses more effectively). Meat and fish products have a higher bioavailability than eggs or plant sources of vitamin B12, including soy products or fortified plant-based milks and meat alternatives. If you follow a vegetarian or vegan diet, you are at an even greater risk for vitamin B12 deficiency and depending on your food choices, a supplement may be warranted.

Focus on consuming bioavailable sources of vitamin B12.

1in150

People with Risk Variant(s)

Iron Overload

Hemochromatosis is a condition where the body absorbs too much iron (i.e. iron "overload") and can result in liver disease, arthritis and heart conditions. If you have a high risk for iron overload it is important to monitor your iron intake and blood markers of iron status such as ferritin, hepcidin or transferrin saturation. There are two main types of dietary iron: heme and non-heme iron. Non-heme iron is found in certain plant products and is not absorbed as effectively as heme iron, but vitamin C can substantially increase the absorption of non-heme iron. Hereditary hemochromatosis is an iron overload condition that is linked to variations in the HFE or SLC17A1 genes.*

HFE & SLC17A1

The human hemochromatosis protein is encoded by the HFE gene and variations in the gene sequence have been linked to iron overload. The SLC17A1 gene is located near the HFE gene and variations in SLC17A1 have also been linked to iron overload. The HFE protein functions to regulate iron uptake in the small intestine. Those with elevated risk variants need to be careful not to consume too much iron and should have their blood markers of iron monitored. This test detects approximately %95 of cases of iron overload.

Sources of Iron

Sources of Heme Iron	Sources of Non-Heme Iron
Beef	Almonds
Chicken	Chickpeas
Fish	Parsley
Organ meats	Spinach
Prawn	Tofu
Veal	White beans

Your Results

SLC17A1	rs17342717
HFE	rs1800562
HFE	rs1799945

Risk Variants	Your Variants
Algorithm	CC GG CC

Low

Recommendation

Since you do not possess any risk variants for iron overload, you have a low risk for iron overload. Follow the recommendations given in the next section for Low Iron Status.

Follow the recommendations provided in the Low Iron Status section.

Low Iron Status

Iron is an essential mineral and important component of hemoglobin, the substance in red blood cells that carries oxygen from your lungs to transport it throughout your body. Iron supports a strong immune system and is also necessary to maintain healthy cells, skin, hair, and nails. Low iron status is determined by measuring certain blood markers such as ferritin, hepcidin or transferrin. Low iron stores can lead to anemia, which is associated with fatigue, pale skin, weakness, shortness of breath and dizziness. Several genes can impact the risk of having low iron status including TMPRSS6, TFR2 and TF.*

TMPRSS6, TFR2 & TF

The TMPRSS6 gene codes for the protein matriptase2-, which affects hepcidin levels that help to regulate iron balance. The transferrin receptor 2 (TFR2) gene codes for the TFR2 protein, which helps iron to enter into cells. The transferrin (TF) gene codes for the protein transferrin, which is mainly responsible for transferring iron in the body. Together, variations in these genes can impact the risk of low iron status.

Sources of Iron

	Amount (mg)
Chicken liver (75g)	9.8
White beans, tinned (1 cup)	8.0
Pumpkin seeds (2 Tbsp)	5.2
Spinach, boiled (2/1 cup)	3.4
Tofu, firm (1/2 cup)	3.0
Tahini (2 Tbsp)	2.7
Beef mince, extra lean (100g)	2.7
Chickpeas (4/3 cup)	2.4
Almonds (4/1 cup)	1.5
Chicken mince, lean (75g)	1.2

2in5

People with Risk Variant(s)

Your Results

Genes	
TFR2	rs4820268
TF	rs7385804
	rs3811647

Risk Variants	Your Variants
Algorithm	GA CA AA

Elevated

only when iron intake is low

Recommendation

You are at an increased risk for low iron status. To minimise your risk for low iron, meet the RDA for iron and consume food sources of vitamin C with non-heme iron-containing foods to increase iron absorption. Focus on foods with a high bioavailability such as animal products (heme iron) and cooked spinach. Men aged 19 years and older and women over 50 should aim for 8 mg/day. Women 50-19 years old should aim for 18 mg/day.

Meet the RDA for iron and consume sources of vitamin C with iron-rich foods.

1in2

People with Risk Variant

Omega6- and Omega3- Fat

Higher consumption of polyunsaturated fats (PUFAs) is associated with reduced risk of cardiovascular disease. PUFAs include both omega6- fat, such as linoleic acid (LA), and omega3- fat, such as alpha-linolenic acid (ALA). Since our bodies cannot make omega6- LA and omega3- ALA, these essential fats must be obtained from our diets. However, consuming too much omega6- LA and too little omega3- ALA may have adverse health effects. Studies have shown that a gene involved in the metabolism of these PUFAs can adversely impact levels of HDL cholesterol ("good cholesterol") when dietary omega6- LA intake is high,* or when the ratio of omega6- LA to omega3- ALA is too high.**

Your Results

Gene	Marker
FADS1	

Risk Variant	Your Variant
CC or CT	TT

Your Risk

Typical

Recommendation

Since you possess the TT variant of the FADS1 gene, your HDL cholesterol levels are likely not impacted by the level of dietary omega6- LA or your balance of omega6- LA to omega3- ALA intake. Meet the guidelines for healthy adults. Individuals should aim to consume between %10-5 of energy from omega6- LA and between %1.2-0.6 of energy from omega3- ALA. Limit intakes of omega6- LA coming from baked goods, fried foods and other processed foods. For cooking, baking and salad dressings choose canola oil, which is an excellent source of omega3- ALA. Other foods rich in omega3- ALA include flax and chia seeds.

obesity-related traits. Clinical Nutrition. 1689-37:1683;2018

in FADS and LDL-C. Journal of Lipid Research. 1189–1183 :53 ;2012.

Meet the RDA for omega6- LA fat and omega3- ALA fat.

FADS1

The FADS1 gene directs the production of an enzyme called fatty acid desaturase 1. This enzyme converts omega6- LA and omega3- ALA to longer-chain PUFAs that participate in inflammatory and immune responses. Compared to those with the TT variant, individuals who have the CC or CT variant of the gene have lower levels of HDL cholesterol when consumption of omega6- LA is high. Among those with the CC or CT variant, increasing the proportion of dietary omega3- ALA to omega6- LA promotes higher levels of HDL cholesterol.

Sources of Omega6- and Omega3- Fats

	Omega3- ALA (g)	Omega6- LA (g)
Chia seeds (1 Tbsp)*	1.9	0.6
Flaxseeds (1 Tbsp)*	1.6	0.4
Canola oil (1 Tbsp)*	1.3	2.7
Walnuts (4/1 cup)	0.9	11
Edamame (2/1 cup)*	0.3	1.5
Salmon (75g)*	0.3	0.2
Sardines (75g)*	0.2	0.1
Corn oil (1 Tbsp)	0.2	7.3
Wheat germ cereal, toasted (1 Tbsp)*	0.1	0.4
Tahini (1 Tbsp)	0.1	3.5
Safflower Oil (1 Tbsp)	0.01	1.8
Sunflower Seeds (1/4 cup)	0.01	2.7
Sunflower Oil (1 Tbsp)	0.01	4

Physical Activity

for Cardiometabolic Health

Physical activity has important benefits for mental health, physical fitness, weight maintenance and the prevention of many chronic diseases. Indeed, exercise improves the function of your heart, lungs and blood vessels, and it also has beneficial effects on blood lipids. Scientists have demonstrated that the LIPC gene influences blood levels of HDL cholesterol (the "good" cholesterol). Research also shows that physical activity raises HDL cholesterol to a greater degree among individuals who have a particular variant of the LIPC gene, compared to those who do not.*

LIPC

The hepatic lipase gene, also known as LIPC, encodes an enzyme that plays a key role in blood lipid metabolism. LIPC helps transport HDL cholesterol to the liver, where further lipid processing takes place. Large studies conducted in both men and women show that a genetic variant in LIPC impacts the way HDL cholesterol levels increase in response to physical activity. Generally, individuals who are physically active tend to have higher HDL cholesterol concentrations than those who are sedentary. However, even among those who are physically active, individuals who carry the TT or CT variant in the LIPC gene display an enhanced HDL-raising response when engaging in physical activity, resulting in higher HDL cholesterol than individuals without this variant.

Types of Cardiovascular Activities

Moderate-Vigorous Intensity	
Swimming	Race walking, jogging, running
Briskly walking (5 km/hour or faster)	Tennis
Biking	Water Aerobics

Types of Muscle-Strengthening Activities

Lifting weights	Working with resistance bands
Heavy gardening (digging, shovelling)	Push-ups
Certain types of yoga	Sit-ups

1in3

People with Response Variant

Your Results

Gene	Marker
	rs1800588
TT or CT	CT

Your Response

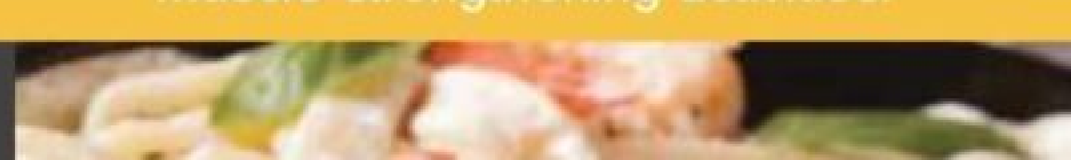
Enhanced

when physical activity is high

Recommendation

Since you possess the CT or TT variant of the LIPC gene, you have an enhanced HDL cholesterol-raising response from physical activity. Engage in 150 to 300 minutes of moderate-to-vigorous intensity exercise per week. This can be met through 30 to 60 minutes of moderate-to-vigorous intensity aerobic exercise five days per week in bouts of 10 minutes or more. This will ensure that you reap the benefits of physical activity not only for your cholesterol levels, but also body composition, weight management, mental health, blood pressure, bone health, blood sugar, and many other health-related factors. You should also include muscle strengthening activities at least 2 days per week.

Aim for 150 to 300 min/week of cardio and at least 2 days/week of muscle-strengthening activities.



1in4

People with Risk Variant

Your Results

Gene	Marker
GLUT2	rs5400
Risk Variant	**Your Variant**
CT or TT	CT

Elevated

Recommendation

Since you possess the CT or TT variant of the GLUT2 gene, you are at an increased risk of over-consuming sugar. Be mindful of this tendency to consume sweet foods and beverages and aim to keep your intake of added sugar below %5 of your total daily energy intake. A high intake of added sugar is linked to overweight & obesity, cardiometabolic disease and dental caries risk.

You have a high preference for sugar.

Sugar Preference

Sugar intake is partly determined by our sweet taste preference and cravings for certain foods and beverages. There is considerable variability in individuals' preferences and cravings for sweet foods and beverages. There are many factors that may impact your preference for sugary foods including the age that you are first introduced to sweets, and psychological associations between consuming these foods and certain life experiences or emotions. In addition to 'pleasure-generating' signals in the brain given off in response to eating or drinking something sweet, there are specialised areas in the brain that regulate both food intake and glucose (sugar) levels in the body. Research has shown that your intake of sweet foods can be determined by a genetic variant that regulates blood glucose levels in your body. People who carry the variant associated with higher sugar intake are also at higher risk of dental caries (cavities).

GLUT2

Glucose transporter type 2 (GLUT2) is involved in regulating glucose (sugar) in the body. The expression of this gene has been found in areas of the brain that are involved in controlling food intake. Individuals who possess the TT or TC variant of this gene seem to have a greater preference for sweet foods and beverages and are more likely to over-consume sugar.* In addition, those who have the variant associated with higher sweet food intake, have also been shown to have a higher risk of dental carries.**

*Eny KM et al. Genetic variant in the glucose transporter type 2 is associated with higher intakes of sugars in two distinct populations. Physiol Genomics. 60-355:(3)33;2008.
**Kulkarni GV et al. Association of GLUT2 and TAS1R2 genotypes with risk for dental caries. Caries Research. 25-47:219 ;2013

Sources of High Sugar Foods

	Amount (g)
Iced cappuccino (2 cups)	56
Cola (1 can)	36
Citrus juice, frozen, diluted (1 cup)	32
Caramels (40g)	26
Milk chocolate (50g)	26
Maple syrup (2 Tbsp)	24
Jellybeans (10 beans)	20
Caramel-coated popcorn (1 cup)	20
Ice lolly (75g)	10
Jam (1 Tbsp)	10

Eating between Meals

Eating between meals (i.e. snacking) can be beneficial if snacks are healthful and the extra calories are not in excess of those needed to maintain a healthy weight. Healthy snacks can assist with regulating blood sugar levels and weight control, curb food cravings and boost energy levels. However, for many people snacking is often an unhealthy habit due to snack-food choices and/or excessive calorie intake beyond one's needs. For your overall health and wellness, it is important to manage emotional eating (psychological reasons for snacking), and focus on more healthful snacking when you feel hungry. Some reasons for emotional eating may include boredom, habit (i.e. eating in front of the television, or at certain times), stress, frustration, anxiety or loneliness. Scientists have also discovered that variations in the MC4R gene are associated with the likelihood of eating between meals, driven by the desire to eat more or less frequently, depending on your genotype.*

*Stutzmann F et al. Common genetic variation near MC4R is associated with eating behaviour patterns in European populations. Int J Obes. 378-33:373;2009.

MC4R

The MC4R gene codes for the melanocortin 4 receptor, which is found in the hypothalamus region of the brain. This is an area of the brain that controls hunger and appetite. The MC4R gene plays an important role in appetite regulation and hunger cues. Research shows that individuals with the CC or CT version of the MC4R gene are more likely to eat between meals often and have a heightened appetite.

Replace these foods...	with these foods..
Crisps	Whole wheat pita with hummus
Muffin	Whole wheat English muffin with peanut butter
Ice cream with toppings	Low-fat yoghurt with fresh berries
Trail mix with added oils or sweets	Fibre-rich cereal with milk/alternative
'Veggie' crisps	Fresh vegetables with low-fat dip
Pasta salad	Mixed salad topped with chickpeas
Nachos and cheese dip	Whole wheat crackers with low-fat cheese
Potato crisps	Natural popcorn
Pizza Slice	Half a turkey sandwich with veggies

2in5

People with Risk Variant

Your Results

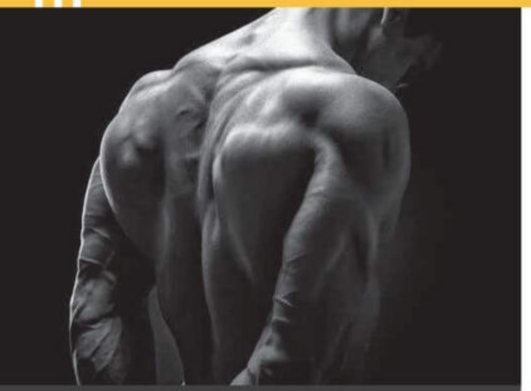
Gene	Marker
MC4R	rs17782313
Risk Variant	**Your Variant**
CC or CT	TT

Typical

Recommendation

Since you possess the TT variant of the MC4R gene, you have a typical risk for eating between meals. To maintain a healthy metabolism, avoid going longer than six hours without eating during the day. Monitor and respond to hunger cues, which may include a lack of energy, mood changes, stomach growling, weakness, dizziness, or having a headache. Choose healthy snacks that are not excessive in calories.

Your tendency to eat between meals is typical.



Your Results

Gene	Marker
ACTN3	rs1815739

Response Variant	Your Variant
CC or TC	CC

Ultra

Implications

Since you possess the CC variant of the ACTN3 gene, you have a genetic advantage to excel in strength and power-based activities. These activities are important for building and maintaining muscle mass. Aim to participate in strengthening activities at least two days per week.

You have a genetic advantage to excel in power sports.

Power and Strength

Strengthening activities, as the name implies, are activities that strengthen your muscles and bones. Research shows that muscle-building exercises can also benefit your brain, help with regulating blood sugars, improve posture and help achieve and maintain a healthy body weight. Examples of these activities include body weight exercises such as push-ups, sit-ups, and lunges as well as lifting weights, using gym machines and working with resistance bands. Some activities of daily living or household chores are also considered strengthening activities such as strenuous gardening, carrying heavy groceries or running up stairs. Research shows that the ACTN3 gene plays a major role in your genetic predisposition to excelling in strength and power-based activities.*

*Ma F et al. The association of sport performance with ACE and ACTN3 genetic polymorphisms: a systematic review and meta-analysis. PLoS One. 8;2013:e54685.

ACTN3

There are two types of muscle fibres: slow twitch and fast twitch. Fast twitch muscle fibres contract with greater speed and force, which are needed for short bursts of intense activities including sprinting or lifting heavy objects. Slow twitch fibres contract for longer periods and at lower intensities and are used in activities such as walking, slow running or easy cycling. The ACTN3 gene encodes the alpha-actinin3- protein, which is only expressed in fast twitch muscle fibres. Therefore, certain variations in this gene can be beneficial for exercises or activities requiring strength and power. In particular, individuals with the CC variant of ACTN3 are more likely to excel at strength-based activities. Those with the TC variant have a slightly enhanced power and strength potential.*

*Garton and North. The effect of heterozygosity for the ACTN3 null allele on human muscle performance. Med Sci Sports Exerc. 2015 [Epub ahead of print].

Endurance

Endurance activities refer to aerobic, or "cardio" exercises that cause your heart rate to increase, such as brisk walking, jogging, biking, swimming, or dancing. Your VO2 max, or maximal aerobic capacity, measures the maximum amount of oxygen that your body can process during 1 minute of exercise, and it is a marker of physical fitness. A higher VO2 max generally results in a performance advantage when it comes to endurance activities, although many factors play a role. Research shows that multiple genes impact your genetic predisposition to excelling in endurance activities.* In some of these genes, certain versions of the gene have also been shown to improve your endurance capacity in response to endurance training more effectively.**

*Ahmetov I et al. Genome-wide association study identifies three novel genetic markers associated with elite endurance performance. Biol Sport. 9-3:(1)32;2015. doi:20831862.1124568/10.5604.
Santiago C et al. Trp64Arg polymorphism in ADRB3 gene is associated with elite endurance performance. British Journal of Sports Medicine. 9-45:147;2011.
**Zarebska A et al. The GSTP1 c.313A>G polymorphism modulates the cardiorespiratory response to aerobic training. Biol Sport. 266-31:261;2014.
He et al. NRF2 genotype improves endurance capacity in response to training. Int J Sport Med. 2007; 721-28:717.
Stefan et al. Genetic Variations in PPARD and PPARGC1A Determine Mitochondrial Function and Change in Aerobic Lifestyle Intervention. J Clin Endocrinol Metab. 1833-1827 :92 ;2007.

NFIA-AS2, ADRB3, NRF2, GSTP1 & PGC1a

NFIA-AS2, ADRB3, NRF2, GSTP1 and PGC1a are all involved in physiological processes that impact your endurance abilities. Individuals with the CC variant in the NFIA-AS2 gene tend to have greater VO2 max, which is advantageous for endurance exercise. Variations in the ADRB3 gene are more common among world-class endurance athletes compared to non-athlete controls. The NRF2 gene plays an important role in the production of mitochondria, the power houses of the cell, and those with the AA variant improve their endurance in response to exercise training. Variation in the GSTP1 gene is also associated with differences in VO2 max responses to aerobic training and individuals with the GG and GA variants have greater improvements. Finally, the GG variant of the PGC1a gene is associated with improved aerobic fitness in response to endurance training. Together, these genes can predict your genetic advantage for excelling in endurance activities and sports.

Your Results

Genes	Markers
NFIA-AS2 ADRB3 NRF2 GSTP1 PGC1a	rs1572312 rs4994 rs12594956 rs1695 rs8192678

Response Variants	Your Variants
Algorithm	CC TT CA AG AA

Typical

Implications

Based on your DNA, your endurance potential is typical. You may need to increase your training to a greater extent than an individual with a genetic advantage to achieve the same level of cardiovascular fitness. Aim to get at least 150 to 300 minutes of moderate-intensity exercise per week. This can be met through 30 to 60 minutes of moderate-intensity aerobic exercise five days per week, such as brisk walking or moderate intensity cycling.

Your endurance potential is typical.

4in5
People with Risk Variant

Your Results

Gene	Marker
WNT16	rs2707466
Risk Variant	**Your Variant**
CC or TC	TC

Elevated

Implications

Since you possess the CC or TC variant of the WNT16 gene, you have an elevated risk for low BMD and bone fracture. Exercise protocols that produce high mechanical forces in the skeleton can increase bone density and strength. For example, sports such as basketball and volleyball, or fitness classes that include running or jumping can all help to improve bone density. In addition, resistance exercise using your own body weight, free weights or machines has been shown to strengthen bones. Daily activities such as running up stairs, carrying heavy groceries or gardening also help to maintain bone strength. Aim to engage in both weight-bearing and resistance exercises most days of the week. Be sure to seek expert guidance before trying new or more challenging exercises. It is also important to ensure adequate intakes of protein, calcium, vitamin D and antioxidants for optimal bone health.

You have an elevated risk for low bone mass.

Bone Mass

Osteoporosis and osteopenia are common bone diseases that occur more often in older adults but can develop at any age. Both involve a deterioration of tissue, resulting in low bone mineral density (BMD) and compromised bone strength. Osteoporosis can develop without any signs or symptoms and is characterised by low BMD and a high risk of bone fracture. Osteopenia is also characterised by reduced BMD and can predict later development of osteoporosis and fracture risk. Fractures are associated with hospitalisation, as well as reduced mobility and independence. Our bones support us, protect our organs, and enable us to move. We also store minerals such as calcium and phosphorous in our bones, which keep them strong, and we release them into the circulation when they are needed by other tissues. Peak bone mass is reached by early adulthood, and gradually declines with age. The rate of bone loss is influenced by factors such as nutrition and exercise, with some forms of exercise slowing the rate of loss and even increasing BMD and bone strength. Genetic variation also contributes to differences in BMD levels across individuals. Research shows that a genetic variant in the WNT16 gene is associated with a greater risk of low BMD and increased risk of fracture.*

*Zheng et al. WNT16 influences bone mineral density, cortical bone thickness, bone strength, and osteoporotic fracture risk. PLOS Genetics. 2012:8; e1002745.

WNT16

WNT16 encodes a protein belonging to the WNT family of genes, which is involved in the regulation of bone formation. WNT16 has been associated with bone mass and structure across all life stages, and it is an important determinant of BMD, bone strength, and risk of fracture. Individuals who possess the CC or TC version of the WNT16 gene are predisposed to having a lower BMD and higher risk of bone fracture, compared to those with the TT variant. It is particularly important for individuals with the CC or TC variant to engage in weight-bearing exercises and to ensure they consume adequate amounts of protein, vitamin D and calcium, which are essential nutrients for bone health.

Types of Weight Bearing Activities

Walking	Running
Hiking/trekking	Tennis
Jogging	Team Sports

Types of Resistance Activities

Lifting weights	Working with resistance bands
Using weight machines	Push-ups
Squats	Lunges

Achilles Tendon Injury

Your Achilles tendon is one of the largest and strongest tendons in the human body. It starts at the bones in your heels and continues up to your calf muscles. This tendon gives you the ability to point your toes and extend your foot. Unfortunately, injuries to the Achilles tendon are common. They typically arise from doing exercises that require a sudden surge of energy. Symptoms of an Achilles tendon injury include extreme pain, tenderness, swelling, or stiffness along the back of your foot and above your heel. Your risk of developing an Achilles tendon injury depends in part on the COL5A1 gene.*

*September AV et al. Variants within the COL5A1 gene are associated with Achilles tendinopathy in two populations. Brit J Sport Med. 365–43:357;2009.

COL5A1

The COL5A1 gene directs the body to produce a protein called collagen alpha1-(V) chain, which plays an important role in the creation of collagen. Collagen is the protein that is used to make connective tissues in the body. Given the role of the COL5A1 gene in the creation of connective tissue, scientists have studied the link between this gene and Achilles tendon injury risk. Research has shown that individuals with the CT or TT variant of COL5A1 gene have a higher risk for developing an Achilles tendon injury.

Dynamic Stretching Warm-up

Side lunges	Warrior pose
Heel raises	Tip-toe walking
Walking lunges with rear leg extension	Mountain climbers

Lower Leg Strengthening Exercises

Seated calf raises	Weighted toe raises
Standing calf raises	Anterior tibialis isometrics

Higher Risk Exercises for Achilles Tendon

Box jumping	Hill sprints
Plyometrics	Sled pushes

4in5
People with Risk Variant

Your Results

Gene	Marker
COL5A1	rs12722
Risk Variant	**Your Variant**
CT or TT	CC

Typical

Implications

Since you possess the CC variant of the COL5A1 gene, you have a typical risk of developing an Achilles tendon injury. To decrease your risk, be mindful of activities requiring a surge of energy or overextension of this tendon through certain exercises such as uphill running. Preventive measures also include additional stretching of your calf muscles and increasing the duration of your warm up and cool down during exercise sessions.

You have a typical risk for Achilles tendon injury.

Additional Genetic Insights for Health and Wellness

The table below includes genetic markers that provide additional insights for health and wellness. These insights come from research studies on genetic variation and its association with health-related outcomes, such as the association for a genetic marker with having a higher level of a nutrient circulating in the blood. This section differs from the previous sections in the report, which focus on genetic markers that modify the way we respond to diet or exercise to impact health outcomes. Therefore, currently, no personalised diet or fitness recommendations are given for the markers in the following table. Talk to your healthcare provider about general strategies you can implement to optimise your health given these additional health-related insights.

	Gene, rs Number	Gene Function	Risk/ Response Variant	Your Variant	Your Risk/ Response	Implications
Nutrients						
Magnesium	TRPM6, rs11144134	TRPM6 is a magnesium transporter	TT or CT	CT	Elevated	You have an elevated risk of low levels of magnesium.
Zinc	SLC30A3, rs11126936	SLC30A3 is a zinc transporter	CC	CC	Elevated	You have an elevated risk of low levels of zinc.
Starch	AMY1, rs4244372	AMY1 is a salivary starch enzyme	AA	AT	Typical	Your ability to metabolise starch is typical.
Vitamin E	Intergenic – rs12272004	APOA5 is a component of HDL	CC or CA	CA	Elevated	You have an elevated risk of low vitamin E levels.
Inflammation and Antioxidant Capacity						
Adiponectin	ADIPOQ, rs17366568	Adiponectin is an anti-inflammatory hormone	GA or AA	GA	Diminished	Your levels of adiponectin are likely to be diminished.
Interleukin 6	IL6, rs1800795	IL6 is an inflammation biomarker	GG or GC	GG	Elevated	Your levels of interleukin 6 are likely to be higher than normal.
Superoxide Dismutase 2	SOD2, rs4880	SOD2 is an antioxidant	TT or CT	CT	Diminished	Your SOD2 enzymatic activity, which affects antioxidant capacity, is diminished.
Nitric Oxide	NOS3, rs1799983	NOS3 is involved in producing antioxidants	GT or TT	GG	Typical	Your plasma nitric oxide levels are likely to be typical.
Eating Habits						
Hunger	NMB, rs1051168	NMB regulates eating behaviour	TT	GT	Typical	You have a typical susceptibility to hunger.

	Gene, rs Number	Gene Function	Risk/ Response Variant	Your Variant	Your Risk/ Response	Implications
Weight Management						
Maintenance of Long-Term Weight Loss	ADIPOQ, rs17300539	Adiponectin regulates fat metabolism and insulin sensitivity	AA or AG	GG	Typical	You have a typical ability to maintain weight loss in the long term.
Sleep and Lifestyle						
Short Sleep Duration	CLOCK, rs1801260	CLOCK regulates the circadian rhythm	CC or TC	TT	Typical	You have a typical risk of short sleep duration.
Alcohol Sensitivity	ALDH2, rs671	ALDH2 is involved in alcohol metabolism	AA or AG	GG	Typical	You have a typical sensitivity to the effects of drinking alcohol.
Cardiometabolic Health						
Total Cholesterol	APOA5, rs662799	APOA5 is a component of HDL	CC or TC	TT	Typical	You have a typical risk of high total cholesterol.
LDL Cholesterol	ABCG8, rs6544713	ABCG8 is involved in cholesterol transport	TT or CT	CC	Typical	You have a typical risk of high LDL cholesterol.
HDL Cholesterol	ABCA1, rs1883025	ABCA1 is involved in cholesterol transport	TT or TC	CC	Typical	You have a typical risk of low HDL cholesterol.
Triglycerides	ANGPTL3, rs10889353	ANGPTL3 is involved in regulating lipid metabolism	AA or CA	AA	Elevated	You have an increased risk of high triglycerides.
Fasting Glucose	ADCY5, rs11708067	ADCY5 is involved in insulin secretion	AA or GA	AA	Elevated	You have an increased risk for high fasting glucose.
Insulin	IRS1, rs2943641	IRS1 is involved in insulin signaling	CT or CC	CT	Elevated	You have an increased risk for high insulin concentrations.
Injury						
Rotator Cuff Injury	MMP1, rs1799750 MMP3, rs3025058	MMP1 and MMP3 are involved in tissue remodeling	Algorithm	GG DelA	Elevated	You have an elevated risk of having a rotator cuff injury.