Natural Health Group

COMPREHENSIVE WELLNESS REPORT

nutcom0527 lmtest

Date of Birth	myDNA ID:	Pathology No:	Reported:
15 May 1990	33049	25279F3Q7K3	01 June 2020

ABOUT THIS REPORT

What are genetics and nutrigenomics?

- Your DNA contains information that determines the characteristics that are with you at birth. These include hair and eye color, and other characteristics such as how you process nutrients. This genetic information affects you from the inside.
- Your environment, nutritional intake, and lifestyle also play an important role. These factors affect you from the outside.
- The interaction between nutrients and genes is referred to as nutrigenomics.
- Recent research has revealed the value of nutrigenomics testing for personal use. Individuals who are guided by their genetic profile are more likely to make sustainable, long-term and healthy changes to their lifestyle, including their diet and exercise behavior.

What is the myDNA Comprehensive Wellness Report?

- The myDNA Comprehensive Wellness Report is designed for individuals looking to optimize their health and wellbeing.
- Our goal is to empower you to take more control in improving your quality of life. This report can assist you in understanding how your genes can influence:
  - Your body size and weight;
  - Your ability to lose weight;
  - Your appetite and eating behaviors;
  - How your body stores and processes dietary fats;
  - Your risk of having an abnormal cholesterol profile;
  - Your vitamin, mineral, and other nutrient needs;
  - Your sensitivity to specific tastes, foods and drinks; and
  - Your power, endurance, recovery and injury risk when you exercise.
- Understanding your genetics can help bring you one step closer to making more personalized health, wellbeing and lifestyle changes.
- You and your healthcare practitioner will be able to make better decisions about your health and you may be inspired to make lasting changes to your lifestyle.

What are we testing?

As human beings, we all have the same set of genes, but small variations within each of these genes make us different from each other. These individual variations have also been shown to predict certain aspects of your health. Analysis of such genetic variations provides the basis for your report.

How was your report created?

Your DNA was extracted from the cheek sample you provided and was analyzed at myDNA's NATA accredited laboratory in Melbourne, Australia.

Based on the available information found in the published literature, each gene has been assigned a category according to the likely clinical significance.

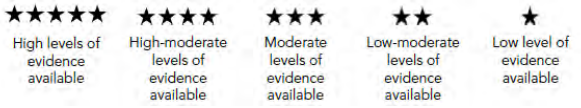
The three categories are:

● Least favorable ● Less favorable ● Normal/favorable

It is important to note that this categorization does not relate to the exact number of risk variants. For example, two risk variants may only have a moderate influence on risk and be allocated a less favorable finding (orange dot).

What are our recommendations based on?

- Our recommendations are based on a rigorous review of all the current scientific literature that relates to your genetic type.
- We have developed an Evidence Rating System that explains the quality of the relevant scientific findings.
- We believe that this Evidence Rating System also provides scientific transparency as part of our commitment to you.



For a complete description of the types of studies and the evidence rating system used, **see Section D** at the end of the report.

What are the limitations of this report?

- Each genetic marker tested is only one factor that predicts the likelihood of a particular outcome. However, your lifestyle, diet and the environment to which you are exposed have an impact on the final effect predicted by your genes. Such external factors cannot be taken into consideration in this report.
- Should you be concerned about specific parameters and levels of nutrients, you should speak with your healthcare practitioner regarding this, and discuss further testing.
- Please note we do not provide specific dietary recommendations for people with celiac disease, diabetes, allergies or other health conditions affecting diet and weight. Pregnant and/or breastfeeding women may have other dietary considerations. We encourage individuals to consult a healthcare practitioner for such advice.
- The information in this report doesn't serve to diagnose any diseases or genetic defects, as it doesn't predict the risk and likelihood of certain genetic outcomes. It is also not intended to treat, diagnose or cure any medical condition or disease.

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WEIGHT MANAGEMENT

The balance between the number of calories you consume and the calories you burn is important for your weight management. This balance is controlled by a combination of your DNA and your environment. Your DNA controls your weight from within by influencing your appetite, your food choices, how quickly you burn calories and how fat is stored around your body. For each person, the relative influence that their DNA has on their body is different and unique.

Based on the scientific literature that investigates the interaction between DNA and nutrients, we have created your personalized profile to help focus your attention on the dietary and lifestyle factors that are most relevant for you. We hope to empower you to make better decisions in your everyday life that will influence your long-term weight and health.

WHAT DO YOU NEED TO FOCUS ON TO BETTER MANAGE YOUR HEALTH?

Based on your DNA markers, the following dietary/ lifestyle factors are important for your health and weight management. This information is unique to you, so please consider these factors when making decisions about your health and wellbeing.

HIGHEST IMPACT Focus on these: most effort required

DIETARY/ LIFESTYLE FACTORS	YOUR PROFILE	PREDICTED OUTCOME	RECOMMENDATIONS
Total Calories Aerobic Exercise	● *ADIPOQ*	**Fat burning** You are likely to have reduced levels of adiponectin (a hormone that initiates fat break down and boosts metabolism).	To increase your fat burning hormone levels: • Keep your calorie intake in check. • Do moderate aerobic exercise daily.

MODERATE IMPACT Pay close attention: more effort required

DIETARY/ LIFESTYLE FACTORS	YOUR PROFILE	PREDICTED OUTCOME	RECOMMENDATIONS
Total Fat Saturated Fat	● *MTIF3*	**Body size and weight regain** You have a moderately increased chance of having an increased body size but are also more successful in maintaining weight loss over time.	• Limit total calories. • Limit total fat intake. • Limit saturated fat. • Moderate physical activity.
Energy balance (calorie intake and physical activity)	● *UCP1*	**Energy expenditure** Your gene variation indicates that you are likely to have decreased thermogenesis (the ability to burn calories to produce heat) and lower resting energy expenditure (the rate at which your body burns calories while resting). This can lead to weight loss difficulties when dieting.	• Reduce calorie intake. • Regular physical activity.

FAVORABLE IMPACT No specific action: least effort required

DIETARY/ LIFESTYLE FACTORS	YOUR PROFILE	PREDICTED OUTCOME	RECOMMENDATIONS
Protein Intake Physical Activity	● *FTO*	**Weight, appetite and obesity** Your gene variation has not been associated	• Limit total calories.

A YOUR GENETIC SUMMARY

FAVORABLE IMPACT No specific action: least effort required

DIETARY/ LIFESTYLE FACTORS	YOUR PROFILE	PREDICTED OUTCOME	RECOMMENDATIONS
		with an increased appetite or a higher chance of obesity.	• Lower protein intake (15% of total calories). • Regular moderate exercise.
Total Fat Polyunsaturated Fat	● *PPARG*	**Fat storage** Your gene variation suggests that, if you are not overweight, when you eat more food than your body needs, most of the excess calories are not converted straight into body fat.	• Limit total fat intake. • Moderate aerobic activity.
Snacking Emotional Eating	● *MC4R*	**Snacking and eating habits** Your gene variation has not been associated with increased snacking, emotional eating, food cravings or a higher chance of obesity.	• No specific dietary recommendations for this genetic result.

TASTE SENSITIVITIES AND FOOD RESPONSE

When you take the first bite of a certain food, the taste buds in your mouth signal information about its chemical composition to your brain. This is how you perceive taste. The intensity of that taste is influenced by many factors, including your DNA. This defines your taste preferences which in turn determines, to some extent, what kind of foods you eat and how much you eat, which ultimately influences your overall health. In this part of the report, we unravel how your DNA affects your preference for specific tastes.

We also look at how your DNA affects the processing of some foods or drinks and any sensitivity-related response. For example, while some people can drink milk with no issues, for others it can create some less favorable symptoms. Same goes for caffeine or other foods and drinks. The type of the food response we described is often referred to as food intolerance and does not involve the immune system or cause allergic reactions. Your DNA can affect your tolerance to some foods and your body's response to them. Although your DNA cannot be changed, your lifestyle choices can. By understanding yourself more, you can be empowered to make positive lifestyle changes that work best for you.

It is important to note that we do not test for food allergies or intolerances which can cause immune reactions in the body.

HOW DOES GENETICS AFFECT YOUR PREFERENCE AND RESPONSE TO CERTAIN NUTRIENTS?

Your DNA may affect your preference and processing of the following nutrients. Consider the implications that these results may have on your food preference and response, assess your dietary intake and where necessary, take action following the recommendations below.

LIKELY IMPACT Close attention is required

SENSITIVITIES	YOUR PROFILE	PREDICTED IMPACT	RECOMMENDATIONS
Sugar	● *TAS1R2*	**Preference to sweet foods** You are likely to have a reduced perception of sweetness. As such, you are likely to consume larger quantities of sweet foods.	• Assess your dietary intake. • Control your sugar intake. • Choose natural source of sugar such as whole fruit over added sugar. • Include protein in every meal.

POSSIBLE IMPACT Watch these in your diet

SENSITIVITIES	YOUR PROFILE	PREDICTED IMPACT	RECOMMENDATIONS
Caffeine	● *CYP1A1-CYP1A2 AHR*	**Caffeine metabolism and consumption** You have a normal ability to process caffeine. Your genetic result is associated with average to slightly more caffeine consumption.	• Consume caffeine earlier in the day. • Aim to stop drinking caffeine a few hours before bedtime. • Consider decaffeinated beverages as an alternative.
Bitter foods and drinks	● *TAS2R38*	**Preference to bitter taste** You are likely to have some sensitivity to bitterness. In some individuals, this can lead to a decreased preference for bitter vegetables that are rich in antioxidants.	• Assess your dietary intake. • Make sure you consume a variety of vegetables.

A YOUR GENETIC SUMMARY

FAVORABLE IMPACT No specific action required

SENSITIVITIES	YOUR PROFILE	PREDICTED IMPACT	RECOMMENDATIONS
Caffeine	● *ADORA2A*	**Caffeine, anxiousness and sleep disturbance** You may be moderately prone to side effects from caffeine. These include some anxiousness and sleep disturbance with larger amount of caffeine.	• Adjust your caffeine intake if necessary to reduce the chance of anxiousness and sleep disturbance.
Caffeine	● *CYP1A2*	**Caffeine booster** You can boost how quickly your body processes caffeine with inducers. Inducers include cruciferous vegetables, tobacco smoke (not recommended) and certain medications.	• **Tips:** Consume cruciferous vegetables such as broccoli, cabbage, cauliflower or brussels sprouts to to boost the speed at which your body processes caffeine.
Fats and oils	● *CD36*	**Preference for fats and oils** Your gene variation is associated with a moderately improved ability to taste fats and oils in foods. This reduces your preference for foods with added fats and oils.	• No specific dietary recommendation based on the result of this gene.
Dairy (lactose)	● *MCM6*	**Lactase persistence (dairy processing)** You are likely to produce adequate amounts of the enzyme lactase, which breaks down and digests the lactose found in dairy products. You are likely to have a normal sensitivity to milk and dairy products.	• No specific dietary restrictions or recommendations for this genetic result.

A YOUR GENETIC SUMMARY

HEART HEALTH

Cholesterol and triglyceride levels and blood pressure are two parameters that determine your hearth health. These can be influenced by many factors such as your diet, your lifestyle and your DNA. Cholesterol is an essential type of fat that is carried in the blood and helps your body to build new cells, protect nerves, and produce hormones. Your liver can produce most of the cholesterols needed for these processes, but you can also get cholesterol directly from the foods you consume.

Too much blood cholesterol can compromise your heart health. Cholesterol in the blood has two main components: high-density cholesterol (HDL-C) and low-density cholesterol (LDL-C). A higher level of HDL-C or "good cholesterol" is favorable as HDL can help to keep excess cholesterol from building up in your blood vessels. Instead, LDL-C is not as desirable as it is linked to cardiovascular health problems. Maintaining a healthy diet low in saturated and trans-fat and maintaining an active lifestyle can help manage your cholesterol levels.

Triglycerides are another form of fats in the blood that can influence your heart health. Factors that can raise triglyceride levels include being overweight, consuming excess calories from refined and sugary foods, drinking too much alcohol, and having type 2 diabetes and/or kidney disease.

Your blood pressure naturally fluctuates all the time, depending on your activities. High blood pressure is defined as such when your blood pressure is persistently higher than normal. This can lead to cardiovascular issues. Physical activity, weight and alcohol consumption are some factors that can influence your blood pressure.

This part of the report identifies some of the genetic factors that can affect your cholesterol balance, your triglyceride levels, and your blood pressure and offers suggestions on what you can do about it. Remember, your DNA is only one piece of the puzzle and does not entirely determine your destiny. You can always improve your lifestyle to achieve better health.

Keep in mind that the only way to find out your cholesterol and triglyceride blood levels is via a blood test. Blood pressure can be measured and monitored using a blood pressure monitor.

ARE CERTAIN NUTRIENTS LIKELY TO IMPACT YOUR HEART HEALTH?

Based on your genetics, these are the nutrients you need to focus on to keep your heart healthy. If you have any concerns about your cholesterol levels, triglyceride levels or your blood pressure, consult your healthcare practitioner for further advice. The recommendations below may be considered to help normalize your cholesterol profile.

MODERATE IMPACT Monitor these in your diet

NUTRITIONAL FACTORS	YOUR PROFILE	PREDICTED IMPACT	RECOMMENDATIONS

Total Fat
Monounsaturated fats
	🟡 *LIPC*	**Cholesterol and triglycerides**
		Your gene variation is associated with a moderately reduced ability to process dietary fats. This increases to some extent your chance of having an abnormal lipid profile (cholesterol and triglyceride levels).
			• Monitor your lipid profile.
			• If cholesterol/ triglyceride levels are elevated:
			  ○ Limit total calories.
			  ○ Limit total fat intake.
			  ○ Favor polyunsaturated fats.
			  ○ Limit monounsaturated fats.
			  ○ Limit saturated fats.
			  ○ Regular vigorous exercise.

Omega-3	🟡 *NOS3*	**Antioxidant enzyme and blood pressure** Your gene variation predicts reduced NOS3 function (an antioxidant enzyme). This is associated with a moderately increased risk of high blood pressure and cardiovascular incidence.	• Monitor your blood pressure and lipid profile. If blood pressure, cholesterol/ triglyceride levels are elevated: • Reduce total fat intake.

A YOUR GENETIC SUMMARY

MODERATE IMPACT Monitor these in your diet

NUTRITIONAL FACTORS	YOUR PROFILE	PREDICTED IMPACT	RECOMMENDATIONS
			• Consume more omega-3 rich foods.

FAVORABLE IMPACT No specific action required

NUTRITIONAL FACTORS	YOUR PROFILE	PREDICTED IMPACT	EVIDENCE RATING
Wholegrain (Fiber)	● *APOA5*	**Triglycerides** Your gene variation does not influence your chance of having high triglyceride levels.	• No specific dietary recommendations for this genetic finding. • Maintain a balanced diet with adequate intake of wholegrain fiber. • Seek advice from a healthcare practitioner about further testing if concerned about triglyceride levels.

Salt (Sodium)	● *GRK4*	**Salt influence on blood pressure**
		Your gene variation is not likely to influence your ability to clear dietary sodium. However, other factors may still affect your body's ability to process sodium.
			• Be mindful of your sodium intake.
			• To cut down on sodium:
			  ○ Eat plenty of natural, unprocessed foods.
			  ○ Be mindful when adding sauces or condiments.
			  ○ Limit intake of packaged foods.
			  ○ Check food labels for sodium content.

VITAMINS AND MINERALS

The body requires vitamins, minerals and other nutrients to carry out its normal function and most of these are obtained from your diet. Your DNA affects how your body processes and utilizes these nutrients. Certain DNA variations can influence the levels of specific nutrients. This in turn may affect your likely requirements for those nutrients.

This part of the report will help to focus your attention on which vitamins and minerals you may need most and what to do about it.

Your genetic result is only one piece of the puzzle. Other factors such as your dietary intake and lifestyle will also affect your actual levels of these nutrients.

ARE YOU LIKELY TO NEED MORE OF CERTAIN VITAMINS OR MINERALS?

The list of vitamins and minerals below are those whose levels may be affected by your DNA. This will serve you as a guide to identify the nutrients that require your attention. For each nutrient, we recommend focusing on those "hero foods" that you should consider eating to meet your dietary intake requirements.

An assessment of likely nutrient levels can be done by evaluating your dietary intake and any symptoms that may indicate lack of specific nutrients. In some cases, a blood test may be needed to determine your actual vitamin / mineral levels and, depending on this, specific supplements may be recommended by your healthcare practitioner.

POSSIBLE NEED Monitor these: further action may be required

VITAMINS OR MINERALS	YOUR PROFILE	PREDICTED IMPACT	RECOMMENDATIONS
Vitamin B9 (Folate)	🟡 *MTHFR*	**Vitamin B9 needs** Your gene variation is associated with lower enzyme activity and possible lower folate metabolism. Studies suggest that your folate levels are likely to be slightly lower or within the normal range. However, this will be influenced by your diet.	• Monitor your vitamin B9 and homocysteine levels. • Eat vitamin B9 rich foods regularly e.g. dark leafy greens, broccoli, asparagus, and legumes. • Consider L(S)-5-MTHF or folic acid supplementation.
Vitamin B6	🟡 *NBPF3*	**Vitamin B6 needs** Your gene variation is associated with a moderate risk of low vitamin B6 levels.	• Monitor your vitamin B6 levels. • Eat vitamin B6 rich foods regularly, e.g. chickpeas, tuna, liver, salmon, chicken breast, and fortified cereals. • Consider vitamin B6 supplementation.
Vitamin B12	🟡 *FUT2*	**Vitamin B12 needs** Your gene variation is associated with a moderate risk of low vitamin B12 levels.	• Monitor your vitamin B12 levels. • Eat vitamin B12 rich foods regularly, e.g. fish, meat, poultry, eggs, milk, milk products, and fortified cereals. • Consider vitamin B12 supplementation.
Iron	🟡 *TMPRSS6* *TF*	**Iron needs** Your gene variation is associated with a moderate risk of low iron levels.	• Monitor your iron levels. • Eat iron rich foods regularly, e.g. red meat, fish, shellfish, poultry, green leafy vegetables, legumes, oysters, dried fruits and iron fortified cereals. • Consider iron supplementation.

A YOUR GENETIC SUMMARY

TYPICAL NEED No specific action required

VITAMINS OR MINERALS	YOUR PROFILE	PREDICTED IMPACT	RECOMMENDATIONS
Vitamin A	● *BCMO1*	**Vitamin A needs** Your gene variation does not influence your vitamin A levels. Other factors, such as your diet, can still affect your overall levels.	• Maintain a balanced diet with vitamin A rich foods. • Foods rich in provitamin A, e.g. leafy green vegetables, deep orange fruits and vegetables. • Foods rich in preformed vitamin A, e.g. dairy, fatty fish, and liver.
Vitamin C	● *SLC23A1*	**Vitamin C needs** Your gene variation does not influence your vitamin C levels. Other factors, such as your diet, can still affect your overall levels.	• Maintain a balanced diet with vitamin C rich foods. • Hero foods: citrus fruits, red and green peppers, kiwi fruit, broccoli, and strawberries.
Vitamin D	● *GC* *CYP2R1* *DHCR7*	**Vitamin D needs** Your gene variation does not influence your vitamin D levels. Your result is associated with lowest risk of vitamin D insufficiency.	• Spend adequate time outdoors in the sun to maintain your vitamin D levels. • Eat vitamin D rich foods regularly, e.g. fatty fish, egg yolk, liver, and vitamin D fortified foods and beverages.
Calcium Vitamin D	● *GC* *VDR*	**Calcium, bone strength and stress fracture** Your gene variation is associated with greater bone strength and a normal risk of stress fracture.	• Maintain a balanced diet with calcium rich foods. • Hero foods: milk, yoghurt, cheese, canned fish with bones, green leafy vegetables, legumes, and fortified dairy-free milks.
Omega-3	● *FADS1*	**Omega-3 and omega-6 processing** Your gene variation predicts a typical ability to process omega-3 and omega-6 fatty acids and a typical lipid profile.	• Maintain a balanced diet with omega-3 rich foods. • Hero foods: fatty fish, nuts and seeds (walnuts, flaxseeds, and chia seeds).

FITNESS AND EXERCISE

Your physical and athletic performance depends on several factors. For example, how efficiently your muscles contract and use energy, or how long and elastic your tendons are. Over the last two decades, scientific research has provided increasing evidence that these factors are controlled by your DNA in addition to your lifestyle. The combination of your DNA and the experiences that you have throughout your life makes you unique.

In this section of the report we explain what some of the most important genes reveal about your unique fitness and exercise potential. This information can empower you to choose the type of training that is likely to give you the best results, which will help you to achieve your exercise and fitness goals.

YOUR PROFILE

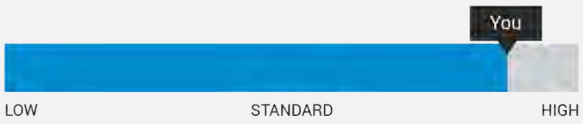
YOUR OVERALL FITNESS PROFILE IS ENDURANCE

POWER VS ENDURANCE

47% POWER / 53% ENDURANCE

With the right training, you can be suited to both power and endurance sports

STAMINA



Your aerobic fitness is naturally high and can be easily improved with training.

INJURY

You have a greater risk of soft tissue injury and should exercise with particular care.

RECOVERY

You may experience muscle soreness after intense exercise and you many need to adapt recovery time between training sessions accordingly.

LEGEND

Power vs endurance	The profile assigned for power vs endurance is based on the combination of gene results from ACTN3, AGT, AMPD1, PPARGC1A and IL6 genes. Based on a weighted average of these five results, we provide a score which indicates your Power or Endurance potential.
Stamina	The profile assigned for stamina is based on the combination of results from AGT, PPARGC1A and IL6.
Injury	The profile assigned for stamina is based on the combination of results from COL5A1 and COL1A1
Recovery	The profile assigned in this section is based on the combination of results from IL6, ACTN3 and AMPD1.

A YOUR GENETIC SUMMARY

GENETIC BARRIERS — These can be improved with training

FITNESS TRAIT	YOUR PROFILE	PREDICTED IMPACT	RECOMMENDATIONS

Injury Risk	🔴 *COL5A1*	**Injury risk and flexibility**
		Your gene variation is associated with stiffer tendons, reduced ligament strength and less flexible joints. This is likely to reduce your range of movement and increase your risk of injury. You are also more prone to muscle cramping from exercise.
			• To improve flexibility and range of movement:
			  ○ Dynamic stretches before training.
			  ○ Static stretches after training.
			  ○ Foam rolling.
			• To prevent cramping:
			  ○ Increase training volume slowly.
			  ○ Remain hydrated.
			• Treat exercise induced muscle cramps by stretching.

GENETIC WEAKNESSES — These can be easily managed with training

FITNESS TRAIT	YOUR PROFILE	PREDICTED IMPACT	RECOMMENDATIONS
Power vs Endurance Stamina	🟡 *AGT*	**Muscle strength** Your gene variation predicts normal muscle contraction and muscle strength. You are expected to have normal muscle power.	• Follow general training recommendations. • Train more frequently.

Power vs Endurance
Stamina
Recovery
	🟡 *IL6*	**Recovery time**
		Your gene variation is associated with slightly less optimal muscle fibers recovery and regeneration. You may experience some muscle soreness after intense training and may require additional time to recover.
			• Allow 1-2 recovery days between training sessions.
			• Consider food/drinks that can help your recovery. For example:
			  ○ Milk (before exercising).
			  ○ Turmeric.
			  ○ Ginger (before exercising).
			  ○ Tart cherry juice (before and after exercising).

Injury Risk	🟡 *COL1A1*	**Risk of soft tissue injury** Your gene variation is associated with normal joint support. A normal risk of soft tissue injury (e.g. tendon and ligament injuries) is expected.	• Ensure adequate warm up. • Strengthen your supporting muscles. • Stretch regularly. • Improve technique and body awareness.

A YOUR GENETIC SUMMARY

GENETIC STRENGTHS Make the most of it for optimum results

FITNESS TRAIT	YOUR PROFILE	PREDICTED IMPACT	RECOMMENDATIONS
Power vs Endurance Recovery	● *ACTN3*	**Muscle power** Your fast-twitch muscle fibers can produce maximum power and grow in size with high intensity training. Your result is favorable for sports requiring sudden bursts of activity, strength and power. You are also less prone to muscle soreness.	• High intensity training (e.g. interval training and team sports like basketball or soccer) to improve fitness. • Use heavier weights with more sets and reps to increase muscle power
Power vs Endurance Recovery	● *AMPD1*	**Muscle energy** Your muscles can produce maximum energy in short bursts. This allows you to push yourself without becoming too fatigued. With this gene variation, you are also less prone to muscle soreness after intense exercise.	• Combine high and low intensity training to improve your fitness and strength.
Power vs Endurance Stamina	● *PPARGC1A*	**Endurance** Your genetic finding indicates that your slow-twitch muscle fibers are capable of maximum growth in response to exercise. Your aerobic fitness is also naturally high. This makes you well suited for endurance training.	• Do endurance training. • Use lighter weights with more sets and reps.

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WEIGHT MANAGEMENT

KG

WEIGHT, APPETITE AND OBESITY

GENE	SNPs	YOUR RESULT
FTO	rs1558902 rs9939609	• TT Two normal alleles*

NORMAL RISK OF OBESITY

PREDICTED IMPACT
Normal regulation of hunger and feeling full;
No influence on appetite and food choices; and
No influence on risk of obesity.

DIETARY AND/OR LIFESTYLE FACTORS
Protein Intake
Physical Activity

RECOMMENDATIONS

- Limit total calories.
- Lower protein intake (15% of total calories).
- Regular moderate exercise.

ABOUT THE GENE

The *FTO* gene is linked to body size, body fat storage and obesity. This gene affects eating habits, food preferences, appetite and the feeling of being full in the brain's control center (the hypothalamus). The *FTO* gene is also linked to your chance of being overweight.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★★

Your genetic finding is:

- Not associated with obesity.
- Associated with normal regulation of appetite.

Your genetic result is only one factor that influences your risk of obesity. Other factors, such as dietary and lifestyle choices (e.g. the amount of calories you consume) are equally as important and may influence your body weight.

RECOMMENDATIONS

EVIDENCE RATING ★★★★★

If you are struggling to lose weight, you should consider factors other than your genetics such as your lifestyle, meal patterns, eating habits and food choices.

If you are overweight or obese and are trying to lose weight, the following dietary and lifestyle interventions have been shown to help individuals with your genetic finding:

Limit total calories **Lower protein intake (15% of total calories)**	Consider a diet with a low protein content (15% of total daily calories from protein). Also consider reducing your total calorie intake, increasing fibre intake, limiting saturated fat and choosing low GI carbohydrates. The benefits associated with this diet include: • Improvement in body fat distribution. • Long-term weight loss as shown in one randomized controlled trial over 2 years.
Regular moderate exercise	90 minutes of moderate exercise per week is recommended (alongside the specified dietary intervention).

* This genetic finding indicates that both the *FTO* variations tested were not found to have the risk allele.

FAT STORAGE

GENE	SNPs	YOUR RESULT
PPARG	rs1801282	• CG One normal allele and one reduced functioning allele

MODERATELY REDUCED CONVERSION OF EXCESS ENERGY INTO FAT

PREDICTED IMPACT
Less accumulation of body fat if more food than needed is eaten;
Improved insulin sensitivity; and
Reduced risk of diabetes.

DIETARY AND/OR LIFESTYLE FACTORS
Total Fat
Polyunsaturated Fat

RECOMMENDATIONS

- Limit total fat intake.
- Moderate aerobic activity.

ABOUT THE GENE

The human body requires a certain amount of nutrients to sustain energy levels. However, if more food is consumed than the body needs, the excess calories are stored as body fat. The *PPARG* gene is called the 'thrifty' gene as it facilitates this fat storage process and saves fat for future energy needs.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★★

Your genetic finding is associated with:

- Reduced ability to convert excess calories into body fat for energy storage.
- Less accumulation of body fat if more food is eaten than is required.
- Lower body mass index (BMI) and protection against weight gain.
- Improved insulin sensitivity and overall reduced risk of obesity and type 2 diabetes.

This genetic finding is only favorable in individuals who do not suffer from diabetes. If the individual develops diabetes due to lifestyle or other factors, this protective mechanism is lost.

RECOMMENDATIONS

EVIDENCE RATING ★★★★★

If being overweight is a concern, consider the following dietary and lifestyle interventions to aid with weight loss:

Limit fat intake (<25% of total calories)	Limit the amount of saturated fat intake (less than 10% of total calories) and total dietary fat (less than 25% of total calories) that you consume.
Moderate aerobic activity	Regular moderate physical activity (at least 30 minutes per day, 5 days a week).

BODY SIZE AND WEIGHT REGAIN

GENE	SNPs	YOUR RESULT
MTIF3	rs1885988 rs4771122	• AG One variant allele and one normal allele*

MODERATE RISK OF HIGH BMI

PREDICTED IMPACT
Moderate risk of obesity-related diseases if combined with unhealthy diet and lifestyle; and
Less weight regain following weight loss.

DIETARY AND/OR LIFESTYLE FACTORS
Total Fat
Saturated Fat

RECOMMENDATIONS

- Limit total calories.
- Limit total fat intake.
- Limit saturated fat.
- Moderate physical activity.

ABOUT THE GENE

The *MTIF3* gene is involved in the production of energy inside mitochondria, the powerhouses of your cells. Your cells need energy-rich molecules derived from food to maintain function. Cells that need more energy, such as muscle cells, have more mitochondria to cater for their high energy requirements. The *MTIF3* gene has been linked to increased body size, as measured by Body Mass Index (BMI) and also to weight regain after dieting. However, the exact mechanism facilitating this process is yet to be discovered.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★★

Your genetic finding is associated with:

- Moderate risk of a high body mass index (BMI).
- Increased risk of cardiovascular disease and other metabolic diseases if a high BMI is combined with unhealthy dietary and lifestyle choices.
- Greater success in maintaining weight loss with less weight regain over time.

RECOMMENDATIONS

EVIDENCE RATING ★★★★★

Dietary and lifestyle interventions:

Limit total calories **Limit fat intake (<25% of total calories)** **Limit saturated fat**	Aim for a calorie restricted diet that is also low in fat (less than 25% of total calories). Two randomized controlled trials have shown that individuals with this genetic variation lost more weight compared to individuals without the genetic variation.
Moderate physical activity	Combining the dietary intervention with regular moderate physical activity (at least 30 minutes per day, 5 days a week) has been shown to result in weight loss.

* This genetic finding indicates that one or both the *MTIF3* variations tested were found to have the risk allele.

FAT BURNING

GENE	SNPs	YOUR RESULT
ADIPOQ	rs1501299	• GG Two variant alleles

LOWER LEVELS OF FAT BURNING HORMONE ADIPONECTIN

PREDICTED IMPACT
Low natural ability to burn body fat; and
Increased risk of obesity.

DIETARY AND/OR LIFESTYLE FACTORS
Total Calories
Aerobic Exercise

RECOMMENDATIONS

To increase your fat burning hormone levels:

- Keep your calorie intake in check.
- Do moderate aerobic exercise daily.

ABOUT THE GENE

The *ADIPOQ* gene contains the information needed to produce a hormone called adiponectin that is involved in boosting metabolism, breaking down fats and regulating glucose concentrations in the blood. Lower levels of adiponectin are associated with insulin resistance, an increased BMI and higher amounts of fat around the abdominal area. This may lead to obesity and other obesity-related conditions. Adiponectin levels increase with weight loss and decrease with weight gain.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★

Your genetic finding is associated with:

- Lower levels of the fat burning hormone (adiponectin).
- 50% increased risk of obesity.

If you are obese or overweight, your adiponectin levels may drop further.

Other factors that may influence adiponectin levels include:

- Ethnicity: White Europeans normally have higher adiponectin levels compared to individuals of Chinese or South Asians origin.
- Gender: Adiponectin levels are lower in males than in females; this may be attributed to the inhibitory effect of testosterone on adiponectin production.

RECOMMENDATIONS

EVIDENCE RATING ★★★★

Dietary and lifestyle interventions:

Low calorie diet	Reducing total calorie intake has been shown to result in weight loss, increased adiponectin levels and improved insulin sensitivity.
Moderate aerobic exercise	Regular exercise, particularly moderate aerobic exercise, has also been shown to increase adiponectin levels.
Avoid excess calories	Healthy individuals within the normal weight range can maintain their adiponectin levels by avoiding excess caloric intake.

ENERGY EXPENDITURE

GENE	SNPs	YOUR RESULT
UCP1	rs1800592	• AG One variant allele and one normal allele

LOWER ABILITY TO BURN CALORIES TO PRODUCE HEAT

PREDICTED IMPACT
Fewer calories needed to maintain body weight;
More storage of fat in abdomen; and
Difficulty losing weight when dieting.

DIETARY AND/OR LIFESTYLE FACTORS
Energy balance (calorie intake and physical activity)

RECOMMENDATIONS

- Reduce calorie intake.
- Regular physical activity.

ABOUT THE GENE

The amount of calories consumed (energy in) and calories burnt (energy out) make up your overall energy balance. The amount of energy required to maintain essential processes in the body is called resting energy expenditure (REE). It accounts for up to 70% of the energy burnt each day. Therefore, REE is a very important factor in weight loss. The *UCP1* gene has been shown to affect the variability in REE and thermogenesis (the process of burning calories to produce heat) between different individuals. This can influence the ability to lose weight when dieting and therefore affects the risk of weight gain.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★

Your genetic finding is associated with:

- Decreased ability to burn calories to produce heat (thermogenesis).
- Lower energy requirements to sustain essential processes in the body (resting energy expenditure).
- Lower daily energy intake to maintain body weight.
- More fat stored under the skin (subcutaneous fat) in the abdomen area.
- Difficulty losing weight when dieting. This may contribute to an increased risk of obesity.

RECOMMENDATIONS

Reduce your energy input (calorie intake)	Your genetic finding predicts that your body requires less energy (calories) to maintain proper function. Any extra calories you consume will contribute to weight gain.
Regular physical activity	• Due to your genetic finding, your ability to burn calories during rest (resting energy expenditure or REE) is naturally low. • You can boost your REE by doing regular moderate exercise. • Your REE will remain elevated as long as you exercise at least three days a week on a regular basis.
Create an energy deficit	If you are trying to lose weight, you need to create an energy deficit which means that the total calories consumed (energy in) must be lower than energy out (the sum of your resting energy expenditure and energy burnt during physical activity).

SNACKING AND EATING HABITS

GENE	SNPs	YOUR RESULT
MC4R	rs17782313	• TT Two normal alleles

NORMAL SNACKING AND EMOTIONAL EATING TENDENCY

PREDICTED IMPACT
Normal regulation of eating habits;
No influence on food choices; and
No association with obesity.

DIETARY AND/OR LIFESTYLE FACTORS
Snacking
Emotional Eating

RECOMMENDATIONS

No specific dietary recommendations for this genetic result.

ABOUT THE GENE

The *MC4R* gene is important for maintaining the energy balance in the brain's control center (the hypothalamus). It controls appetite, food preference, food enjoyment, the feeling of being full (satiety), and eating behaviors such as snacking and emotional eating. The *MC4R* gene is also linked to your chance of being overweight.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★★

Your genetic finding has not been associated with an increased BMI or obesity. It is also not associated with an increased tendency for emotional eating. Your appetite regulation and tendency to snack are also within the norm.

Other factors, like dietary and lifestyle choices (e.g. the amount of calories you consume) are equally as important and may influence your body weight.

RECOMMENDATIONS

EVIDENCE RATING ★★★

No specific diet has been recommended based on this result.

Dietary recommendations will be determined by genetic findings for other genes.

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TASTE PREFERENCE & FOOD RESPONSE

PREFERENCE TO BITTER TASTE

GENE	SNPs	YOUR RESULT
TAS2R38	rs713598	• CG One variant allele and one normal allele

SOME SENSITIVITY TO BITTERNESS

PREDICTED IMPACT
May perceive bitterness as an unpleasant taste; and
Decreased preference for bitter vegetables in some people.

FACTORS
Bitter foods and drinks

RECOMMENDATIONS

- Assess your dietary intake.
- Make sure you consume a variety of vegetables.

ABOUT THE GENE

The *TAS2R38* gene contains the information needed to produce receptor cells that are located on the tongue as well as in the stomach, colon, bladder and upper respiratory tract. These receptors play an important role in determining an individual's perception of bitter taste.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★

Your genetic finding is associated with:

- Some sensitivity to bitterness. You may perceive bitterness as an unpleasant taste.
- Decreased preference for some bitter vegetables, such as arugula and chard in some people.

Please note that other factors may also affect your sensitivity to a lesser extent. Some of these factors include:

- The density of your papillae (bumps found on the surface of the tongue). This is indicative of the how many taste receptors are present.
- Continuous use of certain medications that can diminish your sensitivity to different flavors and tastes.

RECOMMENDATIONS

Assess your daily intake of vegetables	• Due to the effect that your gene variation may have on your food preferences, assess your dietary intake of vegetables.
Consume enough vegetables	• The average recommendation is five or more servings of vegetables per day. • Vegetables that you may perceive as bitter are important sources of vitamins, antioxidants and minerals. It is also well documented that they provide protective properties against several types of diseases, including cancer. Additionally, they are rich in fiber and low in calories which makes them good food options to help you lose or maintain weight.

PREFERENCE TO SWEET FOODS

GENE	SNPs	YOUR RESULT
TAS1R2	rs35874116	• TT Two variant alleles

HIGHER PREFERENCE FOR SWEET FOODS

PREDICTED IMPACT
Greater intake of sugary foods;
Greater intake of fruit; and
Increased risk of tooth decay and cavities.

FACTORS
Sugar

RECOMMENDATIONS

- Assess your dietary intake.
- Control your sugar intake.
- Choose natural source of sugar such as whole fruit over added sugar.
- Include protein in every meal.

ABOUT THE GENE

The *TAS1R2* gene encodes for sweet taste receptor cells that are located on taste buds and in the gut. These receptors play an important role in detecting the sweetness of sugar. Genetic variations in the *TAS1R2* gene can predict your ability to perceive sweetness, which in turn can impact your sugar intake.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★

Your genetic finding is associated with:

- Decreased ability to perceive sweetness.
- Greater preference for sweet foods.
- About a 30% greater intake of added and natural sugar compared to individuals without genetic variants.
- Greater incidence of tooth decay and cavities, both in children and adults.

Individuals with your genetic variation tend to consume more sugar in order to feel satisfied or full.

RECOMMENDATIONS

Assess your daily intake	• It is advised that you evaluate your dietary intake of sugar. The WHO recommends that the daily intake of added sugar should be between 5-10% of your total daily energy allowance. • The exact amount will depend on your body weight and your goal weight. Speak to your healthcare practitioner about this.
Reduce your sugar intake	• If energy dense foods, especially sweet foods, are a big part of your diet, gradually reduce your intake of those foods. Try to restrict your intake to the lower end of your daily allowance. • Reducing your consumption can help to modify your preference for sweet foods and over time may help to decrease your overall intake.
Choose natural sources of sugar	• If you crave sweet foods, choose natural sources of sugar, such as whole fruit, instead of foods with added sugar. • The recommended daily fruit allowance is up to two servings each day.
Include protein in every meal	• One of the reasons you may crave more sugar is because sugar may not effectively turn on the signal that alerts your body that you are full. • Protein can activate the same signal that sugar does to alert your body that you are full. Include protein in every meal to help reduce sugar cravings.

PREFERENCE FOR FATS AND OILS

GENE	SNPs	YOUR RESULT
CD36	rs1761667	• AG One normal allele and one variant allele

MODERATELY INCREASED ABILITY TO TASTE FATS AND OILS

PREDICTED IMPACT
Moderately sensitive to the taste of oils and fats in foods; and
Decreased preference for added fats and oils in foods.

FACTORS
Fats and oils

RECOMMENDATIONS

No specific dietary recommendation based on the result of this gene.

ABOUT THE GENE

The *CD36* gene produces a receptor protein that binds and helps to facilitate fatty acid uptake and breakdown in the body. The gene is expressed in many organs, including our taste buds.

The DNA variation tested has been shown to reduce the amount of protein produced and influence our taste perception of fats and oils in foods. The exact underlying mechanism of how this happens is not fully understood. It is suggested that a reduced sensitivity to the taste of fat leads to an increased intake of fatty foods as a compensatory reaction. This is particularly important as our fat intake can affect our heart health.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★

Your DNA variation is associated with:

- Moderately increased ability to detect fats and oils in food.
- Decreased preference for added fats and oils in foods (both saturated and unsaturated fats).

RECOMMENDATIONS

No specific dietary advice

- Fats can make food more palatable and fat is high in calories. It is therefore important to be mindful of the amount of fat in your diet.
- Saturated fats (such as those found in butter, processed foods and coconut and palm oils) can increase your risk of cholesterol imbalance and heart disease. It is therefore advisable to limit your dietary intake of saturated fats.
- While foods with unsaturated fat are an important part of our diet, it is important to keep in mind that the overall intake of any type of fat should not exceed 30% of your total dietary intake in accordance with WHO recommendations. Healthy unsaturated fats can be found in seeds, nuts, legumes, avocados, beans and olives.

LACTASE PERSISTENCE (DAIRY PROCESSING)

GENE	SNPs	YOUR RESULT
MCM6	rs4988235	• TT Two normal alleles

NORMAL SENSITIVITY TO MILK AND SOME DAIRY PRODUCTS

PREDICTED IMPACT
Normal ability to digest milk and dairy products; and
Least prone to gastrointestinal discomfort from dairy.

FACTORS
Dairy (lactose)

RECOMMENDATIONS

No specific dietary restrictions or recommendations for this genetic result.

ABOUT THE GENE

The *MCM6* gene helps to regulate the production of the enzyme lactase. Lactase helps to digest lactose, a sugar found in milk and other dairy products. In most human populations, the lactase enzyme is produced in newborns, but lactase levels start to decrease during mid childhood (from the age of 5 onwards). This is called lactase non-persistence. In individuals with lactase non-persistence, higher consumption of milk and some dairy products may result in gastrointestinal discomfort. However, some individuals retain high lactase levels throughout their adult life and can produce an adequate amount of lactase in the body to digest milk and other dairy products. This ability to produce lactase in adult life is referred to as lactase persistence.

Unlike lactase deficiency, where no lactase is being produced, individuals with lactase non-persistence are still able to produce some of the lactase enzyme. This means that they can tolerate some dairy in their diet. Also, due to differences in genetic backgrounds, this test alone is not able to predict lactose sensitivity in individuals of African descent.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★

Your genetic finding is associated with:

- Normal production of the lactase enzyme.
- Normal ability to digest milk and dairy products.
- Normal sensitivity to milk and dairy products.

RECOMMENDATIONS

No dietary restriction is required based on this genetic result.

Please note that this result does not exclude lactase deficiency from other causes, such as acquired lactase deficiency or congenital lactase deficiency.

Notes:

- Lactase persistence is a relatively recent human evolutionary event which varies geographically. It coincides with the development of dairy farming. It became an advantage in times of famine to live off dairy products, so lactase persistence is more frequent in areas where dairy farming is or has been common.

CAFFEINE

GENE	SNPs	YOUR RESULT
CYP1A1-CYP1A2	rs2470893	• GG Two normal alleles
AHR	rs4410790	• CC Two high functioning alleles
ADORA2A	rs3761422	• CT One normal allele and one variant allele
CYP1A2	rs762551	• AA Two inducible alleles

NORMAL CAFFEINE PROCESSING (FASTER WITH INDUCERS) & SOME IMPACT ON SLEEP AND ANXIOUSNESS

PREDICTED IMPACT
Caffeine effect can last between 6-8 hours; Shorter effect expected with certain foods or smoking; and
Larger amount of caffeine may impact your sleep and make you feel jittery.

FACTORS
Caffeine

RECOMMENDATIONS

- Based on your combination of genetic results, it would be ideal to leave 3 hours between your last caffeine intake and your bedtime.
- Consider decaffeinated beverages.

ABOUT THE GENE

Caffeine is a stimulant naturally produced by many plants. It is mainly found in roasted coffee beans, cocoa bean, tea leaves, yerba mate and guarana berries. The *CYP1A1* and *CYP1A2* genes both produce liver enzymes that help to break down caffeine. The caffeine test looks at a region between these two genes that can be used to predict the rate of caffeine processing. The *AHR* gene enhances the activity of *CYP1A1* and *CYP1A2* gene. *AHR* is also involved in regulating inflammation and cellular processes related to immune function.

The caffeine test also looks at a genetic variation within the *CYP1A2* gene itself. This genetic variation looks at whether your CYP1A2 enzyme can work faster (i.e. be "boosted") in the presence of certain substances, called inducers. This means that if you have a genetic variation, your body can process caffeine more effectively than usual in the presence of these substances. Inducers include cruciferous vegetables (e.g. cauliflower, cabbage, broccoli and brussels sprouts), chargrilled meat, certain drugs and tobacco smoke (not recommended).

The *ADORA2A* gene controls how caffeine is received in the brain. A chemical called adenosine helps a person to feel sleepy. Caffeine can reduce the ability of adenosine to act and can therefore interfere with sleep. Caffeine affects individuals differently and studies have shown that variations in sleep quality, anxiousness and alertness caused by caffeine are linked to *ADORA2A* genetic variations.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★★

Caffeine metabolism:

Based on the *CYP1A1-CYP1A2* and *AHR* genetic findings:

- Your ability to break down and clear caffeine is normal.
- The effects of caffeine can last between 6-8 hours for you.

Boosting caffeine metabolism:

- Based on your *CYP1A2* genetic finding, you can speed up or boost how quickly your body processes caffeine with inducers. Inducers include cruciferous vegetables, tobacco smoke (not recommended) and certain medications.

Caffeine, anxiousness and sleep disturbance:

Based on the *ADORA2A* genetic finding

- You have a moderate risk of experiencing sleep disturbances when larger quantities of caffeine are consumed.
- You have a moderate risk of experiencing anxiousness after consuming caffeine. However, your risk is dependent on how much caffeine you tend to drink regularly. The feeling of anxiousness usually disappears if caffeine is consumed regularly.

RECOMMENDATIONS

Adjust your caffeine intake

- If caffeine causes anxiousness, adjust your intake accordingly.

	• The feeling of anxiousness induced by caffeine will depend on how much and how often you consume caffeine. If you are a light or infrequent caffeine consumer, you may tend to feel its effects more than someone who consumes caffeine regularly.
Sleep considerations	• Based on your combination of genetic results, it would be ideal to leave 3 hours between your last caffeine intake and your bedtime.
Decaffeinated beverages	• Consider switching to decaffeinated beverages for some hours before your intended bedtime.
Recognize your caffeine limit	• There is currently no globally recognized health-based guidance value— such as an acceptable daily intake— for caffeine. Health authorities from most countries recommend members of the healthy general adult population limit their daily intake of caffeine to 400 mg. For pregnant women, a maximum of 200 mg is recommended. • Your ability to tolerate caffeine will also depend on several other non-genetic factors, including how much caffeine you consume and how often it is consumed. Other factors include age, smoking status, exercise routine, whether you are pregnant, taking contraceptive hormones, or have liver disease.
Caffeine and calories	• When choosing a caffeinated drink, there are a couple of things you should keep in mind. Caffeine content will vary depending on factors including brewing time, size of the cup and how the beverage or food is prepared. One cup of coffee can contain anywhere from 20 mg of caffeine to more than 200 mg depending on these factors. • The amount of sugar or milk you add to your coffee and the type of milk used, will impact your total calorie intake. • Some caffeinated energy drinks are high in sugar, which will impact your total sugar intake and ultimately your calorie intake. • Remember that caffeine is found in plenty of foods and drinks other than coffee. For example, it is found in some cold beverages like sodas or pop, and chocolate.

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HEART HEALTH

CHOLESTEROL AND TRIGLYCERIDES

GENE	SNPs	YOUR RESULT
LIPC	rs1800588	• CT One normal alleles and one risk variant allele

MODERATE REDUCED ABILITY TO PROCESS DIETARY FATS

PREDICTED IMPACT
Moderate risk of blood lipid imbalance; and
Increased sensitivity to different types of fats in the diet.

NUTRITIONAL FACTORS
Total Fat
Monounsaturated fats

RECOMMENDATIONS

- Monitor your lipid profile.
- If cholesterol/ triglyceride levels are elevated:
  - Limit total calories.
  - Limit total fat intake.
  - Favor polyunsaturated fats.
  - Limit monounsaturated fats.
  - Limit saturated fats.
  - Regular vigorous exercise.

ABOUT THE GENE

The *LIPC* gene contains the information needed to produce an enzyme called hepatic lipase. This enzyme affects the way your body processes and breaks down dietary fats. There are several types of dietary fats that are found in your blood. These include triglycerides and cholesterol. For cholesterol, you can measure levels of high-density cholesterol (HDL-C), low-density cholesterol (LDL-C) or total cholesterol. While higher levels of HDL-C can be favorable, high LDL-C and triglycerides are not favorable. The *LIPC* gene can influence the overall balance of these fats in your blood, which in turn can affect your overall cardiovascular health.

GENETIC INTERPRETATION — EVIDENCE RATING ★★★

Your genetic finding is associated with:

- Moderately reduced hepatic lipase enzyme activity.
- Lowered ability to process and break down dietary fats.
- Moderate risk of blood lipid imbalance (for cholesterol and triglycerides).

Aside from genetic factors, the function of the hepatic lipase enzyme is also affected by other factors such as BMI and intra-abdominal (visceral) fat.

RECOMMENDATIONS — EVIDENCE RATING ★★★★★

As there may be changes in the overall lipid profile, seek advice from your healthcare practitioner about testing your blood lipid levels.

If cholesterol and/or triglycerides levels are elevated, consider the following dietary and lifestyle interventions:

Limit total calories **Limit fat intake (20% of total calories)**	• One randomized controlled trial has demonstrated a calorie restricted diet with low dietary fat intake (20% of total calories and low intake of saturated fat) benefited overweight and obese individuals. • This diet resulted in weight loss, increased HDL-C and decreased total cholesterol and LDL-C.
Favor polyunsaturated fats	Individuals with your genetic result tend to be more sensitive to different types of fats found in the diet. Healthy polyunsaturated fats from foods like nuts, seeds and oily fish (e.g. salmon, mackerel, trout) are favorable for your genetic finding.
Limit monounsaturated fats (from animal products) **Limit saturated fats**	Saturated fats and monounsaturated fats (particularly from animal products) have been shown to be unfavorable for your genetic result. Limit your intake of these types of fats in your diet.
Regular vigorous exercise	Doing 75 minutes of regular vigorous exercise each week in addition to dietary intervention may help increase your good cholesterol levels (HDL-C).

TRIGLYCERIDES

GENE	SNPs	YOUR RESULT
APOA5	rs662799	• TT Two normal alleles

NORMAL RISK OF ELEVATED TRIGLYCERIDES

PREDICTED IMPACT
Typical risk of cardiovascular disease; and
No influence on body weight.

NUTRITIONAL FACTORS
Wholegrain (Fiber)

RECOMMENDATIONS

- No specific dietary recommendations for this genetic finding.
- Maintain a balanced diet with adequate intake of wholegrain fiber.
- Seek advice from a healthcare practitioner about further testing if concerned about triglyceride levels.

ABOUT THE GENE

The *APOA5* gene contributes to the regulation of triglyceride levels in your blood. While genetics plays a role in how likely you are to have high triglyceride levels, other factors can also contribute. These include being overweight, consuming excess calories from refined and sugary foods, drinking too much alcohol and having Type 2 diabetes or kidney disease.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★★

Your genetic finding is associated with:

- Normal risk of high triglyceride levels.
- No increased cardiovascular risk under 45 years of age.

Your genetic result is only one factor that influences your risk of abnormal triglyceride levels. Your diet and lifestyle are equally as important and will affect your actual triglyceride levels.

RECOMMENDATIONS

EVIDENCE RATING ★★★★

No specific diet has been recommended for your result.

Although your genetic finding is not associated with an increased risk of high triglyceride levels, your diet and lifestyle can still contribute to elevated triglyceride levels. Seek advice from your healthcare practitioner if you are concerned about high triglyceride levels.

If triglycerides levels are elevated, dietary and lifestyle interventions are outlined below.

Reduce calorie intake	This can be achieved by limiting your intake of alcohol, sugar, saturated fats and refined carbohydrates.
Increase fiber intake	Include more wholegrains, legumes and leafy greens in your diet.
Increase omega-3 intake	This can be achieved by eating foods rich in omega-3 such as fatty fish (salmon, mackerel, trout and sardines) at least 2-3 times a week.
Regular moderate exercise	Moderate aerobic exercise, 30 minutes per day, 5 days per week.

ANTIOXIDANT ENZYME AND BLOOD PRESSURE

GENE	SNPs	YOUR RESULT
NOS3	rs1799983	• GT One normal allele and one risk variant allele

MODERATELY REDUCED BLOOD PRESSURE CONTROL

PREDICTED IMPACT
Moderately increased risk of hypertension & cardiovascular incidence; and
Increased risk of cholesterol imbalance.

NUTRITIONAL FACTORS
Omega-3

RECOMMENDATIONS

- Monitor your blood pressure and lipid profile.

If blood pressure, cholesterol/ triglyceride levels are elevated:

- Reduce total fat intake.
- Consume more omega-3 rich foods.

ABOUT THE GENE

The *NOS3* gene encodes for an enzyme that produces nitric oxide. Nitric oxide is an antioxidant that can neutralize free radicals. It also protects against infection and tumor growth, facilitates several biological processes including cell signaling and can dilate (widen) blood vessels. The gene variation that we test for deactivates the NOS3 enzyme, which can result in reduced nitric oxide levels. This has been strongly linked to some cardiovascular conditions such as hypertension.

GENETIC INTERPRETATION — EVIDENCE RATING ★★★

Your genetic finding is associated with:

- A moderate reduction in NOS3 enzyme activity.
- Potentially reduced levels of nitric oxide.*
- A higher risk of hypertension and cardiovascular incidence. Several studies have suggested that the association with hypertension risk might be dependent on cholesterol status, which includes high triglycerides, total cholesterol and LDL as risk factors for this genetic variation.

In pregnant women, this genetic finding is associated with increased risk of hypertension and pre-eclampsia. The pre-eclampsia risk is increased by up to 6.5 times.

**Nitric oxide is present for a few seconds before it binds to red blood cells. Therefore it has been very difficult to detect its levels in many studies.*

RECOMMENDATIONS — EVIDENCE RATING ★★★★

Monitor blood pressure and blood lipid levels	Seek advice from your healthcare practitioner about blood lipid levels and blood pressure monitoring. During pregnancy, risk assessment for pre-eclampsia is recommended.

Reduce total fat intake (<28%)
Increase intake of omega-3 polyunsaturated fatty acid
	If elevated cholesterol and/or triglycerides are detected and/or blood pressure is raised:
	• Reduce total dietary fat intake to less than 28%.
	• Supplement this dietary intervention with 1.2-1.6 g (1200-1600 mg) EPA and DHA omega-3 long chain fatty acid per day. This can be obtained by:
	  ○ Eating omega-3 rich foods such as fatty fish (salmon, mackerel and trout) and nuts and seeds (walnuts, flaxseeds, and chia seeds).
	  ○ Taking a good quality omega-3 supplement.
	A 12-week randomized controlled trial has shown that this low-fat dietary intervention, along with 1.24 g (1240 mg) EPA and DHA omega-3 long chain fatty acid per day, benefits individuals with this genetic variation.

SALT INFLUENCE ON BLOOD PRESSURE

GENE	SNPs	YOUR RESULT
GRK4	rs2960306	• GG Two normal alleles
	rs1801058	• CC Two normal alleles
	rs1024323	• CT One normal allele and one risk variant allele

LESS SENSITIVE TO DIETARY SALT INTAKE

PREDICTED IMPACT
Normal ability to clear salt (sodium); and
Typical risk of high blood pressure.

NUTRITIONAL FACTORS
Salt (Sodium)

RECOMMENDATIONS

- Be mindful of your sodium intake.
- Maintain a balanced diet with mostly natural, unprocessed foods.

ABOUT THE GENE

GRK4 encodes a G protein-coupled receptor called G Protein-Coupled Receptor Kinase 4. GRK4 is important in helping the kidneys to regulate sodium balance and blood pressure. The two most important pathways to control salt balance and blood pressure in the kidneys are the dopamine pathway and the renin-angiotensin-aldosterone system (RAAS). The dopamine and RAAS pathways regulate blood pressure by reducing sodium re-absorption and promoting sodium excretion. Both of these pathways use G protein-coupled receptors to exert their action.

The genetic change in the *GRK4* gene increases G protein-coupled receptor kinase 4 activity. This leads to impairment and desensitization of the D1R dopamine receptors in the dopamine pathway. The genetic change also leads to a higher expression of angiotensin II receptors in the RAAS pathway, which causes blood vessel constriction, thereby increasing blood pressure. The genetic variation in *GRK4* leads to a reduced ability to clear sodium, especially when dietary sodium intake is high. This increases the risk of high blood pressure.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★

Your genetic finding of *GRK4* has not been associated with salt sensitivity. This means that:

- You have a normal ability to clear dietary sodium through the kidneys.
- You are less sensitive to salt intake in the diet.
- After consumption of a meal high in sodium, the increase in mean arterial blood pressure is less than 10%.

As a result, you have a typical risk of hypertension.

RECOMMENDATIONS

Be mindful of your salt intake	• Although your genetic result is not associated with an increased risk of hypertension, it is still important for you to be mindful of your sodium intake. • The WHO recommends less than 5 g of salt (just under 1 teaspoon) or 2000 mg of sodium per day for adults. It is important to adhere to this guideline to prevent unwanted health outcomes, such as an increased risk of stroke, heart disease and high blood pressure.
Dietary tips	• Most dietary salt intake comes from salt that is added during food preparation and from salt that is found in processed foods and drinks. • About 80% of salt in the diet comes from processed foods. Therefore, it is best to try to avoid processed foods due to their high salt content. • Aim to eat plenty of natural and unprocessed foods. For example, fresh fruits and vegetables instead of canned, dehydrated or prepackaged foods. • Be mindful when adding sauces and condiments to your food. Their salt content is normally quite high. Flavor your food with herbs and spices instead of adding salt. • Check nutritional labels at the back of food packaging to find out how much salt (sodium) is in a food product and choose products that are lower in sodium.

B GENETIC RESULTS

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VITAMINS & OTHER NUTRIENTS

VITAMIN B9 NEEDS

GENE	SNPs	YOUR RESULT
MTHFR	rs1801133	• CC Two normal alleles
	rs1801131	• CC Two risk variant alleles

LOWER ENZYME ACTIVITY AND REDUCED METHYLATION

PREDICTED IMPACT
Possible lower folate levels when folate intake is low;
Chance of mildly raised homocysteine levels; and
Slightly raised need for folate.

VITAMINS OR MINERALS
Vitamin B9 (Folate)

RECOMMENDATIONS

- Monitor your vitamin B9 and homocysteine levels.
- Eat vitamin B9 rich foods regularly e.g. dark leafy greens, broccoli, asparagus, and legumes.
- Consider L(S)-5-MTHF or folic acid supplementation.

ABOUT THE GENE

Folate (vitamin B9) is an important member of the vitamin B family. Normal vitamin B9 function assists in the formation of your red blood cells, in the optimal production of DNA and in fetal development during pregnancy. One gene that assists in folate and other B vitamins metabolism is *MTHFR*.

MTHFR converts one form of folate to the most biologically active form (5-MTHF). 5-MTHF is important for a process called methylation which acts as a molecular switch that turns genes ON and OFF. Riboflavin (vitamin B2) is an important co-factor in this process that is needed for MTHFR to work at full capacity. Although rs10801133 is the most known SNP, both SNPs influence MTHFR enzyme activity and interact with each other. Evidence shows that it is important to test for both SNPs in combination rather than individually in order to get more accurate results for MTHFR enzyme activity. A compromised MTHFR activity results in the disruption in the methylation process which may lead to decreased folate levels. However, reports on folate levels are variable because they are highly influenced by the nutritional status. With low folate levels, homocysteine levels tend to raise, and this may have cardiovascular implications.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★★★

Your genetic finding is associated with:

- Mild to moderate reduction in enzyme activity.
- Lower folate levels, when folate intake is low.
- Reduced methylation.
- Chance of mildly raised homocysteine levels, when folate levels are low.

As with any vitamin, the practical importance of this result will be influenced by actual intake of dietary folate.

RECOMMENDATIONS

EVIDENCE RATING ★★★★

Monitor vitamin B9 level	• Studies have shown that folate (vitamin B9) level for your genetic finding are likely to be slightly lower or within the normal range. As your enzyme function is reduced, your actual levels will depend on your dietary folate intake. • Consult with your healthcare practitioner about taking further action if there are any concerns about low folate levels. Blood level testing of folate and homocysteine can be considered if low folate levels are suspected. • Measuring vitamin B12 levels is also recommended if supplementation is considered as folate may be neurotoxic in the presence of vitamin B12 deficiency.
Eat vitamin B9 rich foods regularly	• The recommended daily intake of folate may differ based on gender, age and life stage. Please consult with your Healthcare practitioner. • Eat plenty of foods that are rich in vitamin B9 (folate) to ensure that you meet your dietary intake requirements. This is the easiest way to obtain the biologically active form of folate. • Foods that are rich in folate and folic acid include dark leafy greens, broccoli, asparagus, lentils, beans and folic acid fortified foods.

	• The best way to preserve the vitamin B9 content in food is to consume raw (where possible) or steamed. • Ensure that you also eat plenty of foods that are rich in vitamin B2 (riboflavin). These include milk, yogurt, beef, beef liver, mushrooms, almonds, cheese and riboflavin fortified cereals and oats.
Consider supplementation with L(S)-5-MTHF or folic acid	• Folic acid and L(S)-5-Methylfolate (L(S)-5-MTHF) are the two main types of supplements routinely used for increasing folate blood levels and lowering homocysteine levels. • These supplements have been proven to effectively increase folate levels and lower homocysteine levels. However, 5-MTHF is less likely to mask some of the signs and symptoms of vitamin B12 deficiency compared to folic acid. Folic acid supplementation may lead to overlooking symptoms of vitamin B12 deficiency. • Your healthcare practitioner will be able to assess your current vitamin B9 levels and advise whether supplements are needed.

SPECIAL CONSIDERATIONS

Pregnancy planning **Pregnancy**	During pregnancy, having adequate levels of folate is very important for fetal development. To support a healthy pregnancy it is recommended to take folate supplements starting one month before pregnancy and throughout the first trimester. Speak to your healthcare practitioner for further advice.

* rs1801133 is commonly known as 677C>T while rs1801131 is commonly known as 1298 A>C

VITAMIN B6 NEEDS

GENE	SNPs	YOUR RESULT
NBPF3	rs4654748	• CT One normal allele and one risk variant allele

MODERATE RISK OF LOW VITAMIN B6

PREDICTED IMPACT
Possible moderately low vitamin B6 levels; and
Slightly raised need for vitamin B6.

VITAMINS OR MINERALS
Vitamin B6

RECOMMENDATIONS

- Monitor your vitamin B6 levels.
- Eat vitamin B6 rich foods regularly, e.g. chickpeas, tuna, liver, salmon, chicken breast, and fortified cereals.
- Consider vitamin B6 supplementation.

ABOUT THE GENE

The *NBPF3* gene helps to regulate the production of an enzyme that breaks down vitamin B6. Individuals with genetic variations in this gene have been shown to have lower levels of vitamin B6. This is most likely due to a more efficient clearance of vitamin B6. Vitamin B6 is important for immune function, neurological function and red blood cell formation. It is also required for a process called methylation, which acts as a molecular switch to turn genes on and off. Disruption in methylation could lead to raised levels of a molecule called homocysteine which has been linked to various medical conditions.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★★

Your genetic finding is associated with:

- Moderately reduced levels of vitamin B6.
- Moderately increased risk of developing low vitamin B6 levels.

As with any vitamin, the practical importance of this result will be influenced by diet and lifestyle. Additional factors, such as alcohol intake, may deplete vitamin B6 levels.

RECOMMENDATIONS

Monitor vitamin B6 levels	• As there is a moderate risk of low vitamin B6 levels, a consultation with your healthcare practitioner is advised. Further action such as blood testing of vitamin B6 may be considered if low levels are suspected.
Eat vitamin B6 rich foods regularly	• The recommended daily intake of vitamin B6 may differ based on gender, age and life stage. Please consult with your healthcare practitioner for further advice. • Eat plenty of foods that are rich in vitamin B6 to ensure that you meet your dietary intake requirements. • Sources of vitamin B6 include chickpeas, tuna, liver, salmon, chicken breast and breakfast cereals fortified with vitamin B6. • The best way to preserve vitamin B6 content in foods is to eat these foods raw (where possible) or steamed.
Consider vitamin B6 supplementation	• If vitamin B6 level falls below optimal levels, vitamin B6 supplements can be considered. Vitamin B6 is available in multivitamins with other B complex vitamins, or as a stand-alone supplement. • Your healthcare professional will be able to assess your current vitamin B6 levels and advise whether supplements are needed.

SPECIAL CONSIDERATIONS

Poor kidney function **Autoimmune disease** **Alcohol**	• Individuals with poor kidney function, autoimmune disease and alcohol dependence are among those at the highest risk of vitamin B6 deficiency. • Please consult your healthcare practitioner if you have any of these conditions.

B GENETIC RESULTS

VITAMIN B12 NEEDS

GENE	SNPs	YOUR RESULT
FUT2	rs602662	• AG One normal allele and one risk allele

MODERATE RISK OF LOW VITAMIN B12

PREDICTED IMPACT
Moderately reduced vitamin B12 absorption;
Possible moderately low vitamin B12 levels; and
Slightly raised need for vitamin B12.

VITAMINS OR MINERALS
Vitamin B12

RECOMMENDATIONS

- Monitor your vitamin B12 levels.
- Eat vitamin B12 rich foods regularly, e.g. fish, meat, poultry, eggs, milk, milk products, and fortified cereals.
- Consider vitamin B12 supplementation.

ABOUT THE GENE

Vitamin B12 is an essential nutrient that must be obtained from your diet. Many important physiological and metabolic processes, including red blood cell formation and DNA synthesis, as well as neurological function, require vitamin B12 to function properly. The *FUT2* gene produces an enzyme that influences vitamin B12 absorption in the gut.

The *FUT2* gene facilitates the formation and secretion of histo-blood group antigens. Individuals who can produce these antigens are called "secretors", whilst those unable to produce them are called "non-secretors". The secretions allow pathogens such as Helicobacter Pylori to adhere to the gut lining. This reduces the amount of intrinsic factor, which is required for vitamin B12 absorption. As such, individuals who are secretors are at a higher risk of low vitamin B12 levels. Secretors are also more susceptible to gut infections from organisms like rotavirus and norovirus which cause diarrhea, including "cruise ship diarrhea".

GENETIC INTERPRETATION

EVIDENCE RATING ★★★★

Based on your genetic finding, your *FUT2* gene is partially active. This allows partial formation and secretion of the histo-blood group antigens which are associated with:

- Moderately decreased adhesion of pathogens to the gut lining.
- Moderately reduced amount of intrinsic factor, which is required for vitamin B12 absorption.
- Moderate reduction of vitamin B12 absorption in the gut.
- A low to moderate risk of vitamin B12 deficiency.
- Moderately reduced susceptibility to pathogen infections in the gut such as cruise ship diarrhea.

As with any vitamins, the practical importance of this result will be influenced by diet and lifestyle. For example, being a vegetarian will increase the risk of vitamin B12 deficiency because natural sources of vitamin B12 are mainly from animal products.

Please note that adhesion of pathogens may not result in increased risk of infection, inflammation, or increased risk to gut health.

RECOMMENDATIONS

Monitor vitamin B12 levels	• As there is an increased risk of vitamin B12 deficiency, a consultation with your healthcare practitioner is advised. • It is important to consider measuring vitamin B12 levels before taking certain nutritional supplements, such as folate.
Eat vitamin B12 rich foods regularly	• The recommended daily intake of vitamin B12 may differ based on gender, age and life stage. Please consult with your healthcare practitioner for further advice. • Eat plenty of foods that are rich in vitamin B12 to ensure that you meet your dietary intake requirements. • Vitamin B12 is naturally found in animal products which include fish, meat, poultry, eggs, milk and milk products. It is also found in fortified breakfast cereals and some types of nutritional yeast. • The best way to preserve most of the vitamin B12 in meat and dairy products is to cook them in the oven or on a stovetop. Do not microwave them as this will degrade vitamin B12.

Consider vitamin B12 supplementation	• If vitamin B12 level falls below optimal levels, vitamin B12 supplements can be considered. • Your healthcare practitioner will be able to assess your current vitamin B12 levels and advise whether supplements are needed.

SPECIAL CONSIDERATIONS

Vegetarian	• Vegans and vegetarians are especially at risk of low vitamin B12 levels, as explained above. • If you follow a vegetarian diet, you should eat eggs and dairy products regularly. You can also consider fortified dairy alternatives like B12-fortified milk alternatives and fortified cereals. If you are struggling to include these foods in your diet, seek advice about supplementation from a healthcare practitioner.
Vegan	• If you follow a vegan diet, you are at a higher risk of vitamin B12 deficiency. Make sure you include fortified dairy alternatives like B12-fortified grain or nut milks and fortified cereals in your diet. Seek advice about supplementation from a healthcare practitioner.
Over 50 years old	• If you are over 50-years-old, you are more likely to develop vitamin B12 deficiency. This is because the stomach cells in many people over 50 years of age may become damaged and this impairs the absorption of vitamin B12. Seek advice from a healthcare practitioner about the best supplementation plan.

VITAMIN A NEEDS

GENE	SNPs	YOUR RESULT
BCMO1	rs7501331	• CC Two normal alleles
	rs12934922	• AT One normal allele and one risk variant allele

NORMAL RISK OF LOW VITAMIN A

PREDICTED IMPACT
No influence on vitamin A processing and levels; and
Typical need for vitamin A.

VITAMINS OR MINERALS
Vitamin A

RECOMMENDATIONS

- Maintain a balanced diet with vitamin A rich foods.
- Foods rich in provitamin A, e.g. leafy green vegetables, deep orange fruits and vegetables.
- Foods rich in preformed vitamin A, e.g. dairy, fatty fish, and liver.

ABOUT THE GENE

Vitamin A is essential for normal growth and development, as well as immune system function, healthy vision and other functions in the human body. Our bodies cannot produce vitamin A. Therefore, most vitamin A is absorbed from the diet. There are two main forms of vitamin A precursors obtained from the diet: provitamin A and preformed vitamin A. Preformed vitamin A is mainly found in animal-based products such as eggs, milk and other dairy products, fatty fish and liver, while provitamin A is mainly found in plant-based foods such as fruit and vegetables. ß-carotene is the most abundant form of provitamin A in the diet. *BCMO1* converts provitamin A (ß-carotene) into the active form of vitamin A.

Vegans and vegetarians mostly obtain their vitamin A from provitamin A (found in plant-based products). They are at the highest risk of low vitamin A levels when the BCMO1 enzyme function is reduced.

GENETIC INTERPRETATION

EVIDENCE RATING ★★

Your genetic finding is associated with:

- Normal function of the BCMO1 enzyme.
- Normal conversion of ß-carotene into vitamin A.
- Typical risk of low vitamin A levels.

RECOMMENDATIONS

Maintain a balanced diet	• It is important to eat a balanced diet to maintain your vitamin A levels. • The recommended daily intake may differ based on gender, age and life stage. Please consult with your healthcare practitioner for further advice. • In general, the daily recommended amount can be obtained by consuming foods that are rich in vitamin A.
Hero foods	• You can benefit from both provitamin and preformed vitamin A. • Sources of provitamin A include: leafy green vegetables, spinach and broccoli; orange and yellow vegetables such as carrots, peppers and sweet potatoes; fruits such as mangoes, cantaloupes and apricots; and tomato products. • To boost provitamin A absorption from plant products, make sure that you have some sort of fat with your veggies, for example extra-virgin olive oil. This will aid the conversion from the precursor form of vitamin A to the active form. • Sources of preformed vitamin A include dairy products, fatty fish (salmon, herring and tuna) and liver.

SPECIAL CONSIDERATIONS

Vegan/vegetarian	• Vegans and vegetarians solely rely on provitamin A (found in plant-based products) to meet their dietary intake requirements. When the BCMO1 enzyme function is reduced, they are at the highest risk of low vitamin A. • If you are a vegan/ vegetarian, supplementation should be carefully discussed with your healthcare practitioner.
Pregnancy	• Foods like liver have many nutrients, but even half a portion (30g) of beef liver contains up to three times the recommended daily amount of vitamin A for women. Too much vitamin A can cause complications during pregnancy. If pregnant, or planning on becoming pregnant, it is recommended to limit the amount of liver and liver-derived products in your diet.

VITAMIN C NEEDS

GENE	SNPs	YOUR RESULT
SLC23A1	rs33972313	• GG Two normal alleles

NORMAL RISK OF LOW VITAMIN C

PREDICTED IMPACT
No influence on your vitamin C levels; and Typical need for vitamin C.

VITAMINS OR MINERALS
Vitamin C

RECOMMENDATIONS

- Maintain a balanced diet with vitamin C rich foods.
- Hero foods: citrus fruits, red and green peppers, kiwi fruit, broccoli, and strawberries.

ABOUT THE GENE

Vitamin C is an essential nutrient required for the formation of blood vessels, cartilage, muscle and collagen in bones. It also plays a vital role in the body's healing process. Vitamin C is also an antioxidant and helps to prevent oxidative damage, which is thought to contribute to several diseases. Our bodies are unable to produce vitamin C. Therefore, vitamin C is solely obtained from the diet and is transported across the cell membrane via transporter molecules. The *SLC23A1* gene produces a transporter protein called SLC23A1 which is the major vitamin C transporter in the gut.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★

Your genetic finding is associated with normal vitamin C transport. Low levels of vitamin C are not expected.

As with any vitamin, the practical importance of this result will be influenced by the actual intake of vitamin C from your diet.

RECOMMENDATIONS

Maintain a balanced diet	• It is important to eat a balanced diet to maintain your vitamin C levels. • The recommended daily intake may differ based on age and life stage. Please consult with your healthcare practitioner for further advice. • In general, the daily recommended amount can be obtained by consuming foods that are rich in vitamin C.
Hero foods	• Vitamin C is found in citrus fruits (for example, oranges and grapefruit), red and green peppers, kiwifruit, broccoli, strawberries and many foods and beverages that are fortified with vitamin C. • The best way to preserve most of the vitamin C found in fruit and vegetables is to eat them raw. Any food that contains vitamin C should be stored properly by sealing it in an airtight container or refrigerating where appropriate. It should also be consumed within a week of opening.

SPECIAL CONSIDERATIONS

Smokers **Passive smokers**	• Individuals who are smokers or passive smokers are amongst those at the highest risk of having low vitamin C. • Supplementation is particularly important for individuals who smoke or are exposed to second hand smoke. • If you are a smoker, you may require an additional amount of vitamin C per day to help repair cell damage caused by smoking.
Medications	• If you are taking certain medications like contraceptive pills, you may have an increased need for vitamin C.
Physical stress **Health conditions**	• Infections, burns or exposure to extreme temperatures (very high or very low) can increase your need for vitamin C. In addition, individuals with certain gastrointestinal conditions preventing vitamin C absorption may need to discuss supplementation with a healthcare practitioner.

B GENETIC RESULTS

VITAMIN D NEEDS

GENE	SNPs	YOUR RESULT
GC	rs4588	• CC Two normal alleles
CYP2R1	rs10741657	• AA Two normal alleles
DHCR7	rs12785878	• TT Two normal alleles

LOWEST RISK FOR VITAMIN D INSUFFICIENCY

PREDICTED IMPACT
No influence on your vitamin D levels; and Typical need for vitamin D.

VITAMINS OR MINERALS
Vitamin D

RECOMMENDATIONS

- Spend adequate time outdoors in the sun to maintain your vitamin D levels.
- Eat vitamin D rich foods regularly, e.g. fatty fish, egg yolk, liver, and vitamin D fortified foods and beverages.

ABOUT THE GENE

Vitamin D is an essential nutrient required for calcium absorption in the gut, for cell growth and for immune function. Your daily vitamin D requirement can be obtained from your diet and from exposure to sunlight (specifically UV rays). When UV rays strike the skin, vitamin D starts being produced. Several genes and pathways have been shown to be involved in this process. Genetic variations in the genes selected have been shown to affect the risk of vitamin D insufficiency. The overall risk increases with the presence of each additional risk allele, which is reflected in the overall risk calculated.

The *GC* gene encodes for the vitamin D-binding protein which binds vitamin D from the diet, sunlight and from supplements and transports it to target organs.

The *CYP2R1* gene encodes for an enzyme that converts the inactive form of vitamin D into the most commonly measured form of vitamin D (25(OH)D) in the blood.

The *DHCR7* gene encodes for an enzyme that converts a vitamin D precursor (7-DHC) into cholesterol and thereby diverts it away from the vitamin D pathway. This process reduces the amount of substrate available for vitamin D formation.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★★

Based on the genes tested:

- You have the lowest risk of vitamin D insufficiency (<50nmol/L)
- Your genetic combination is associated with normal vitamin D levels.

The clinical significance of this finding will depend on existing vitamin D intake and exposure to sunlight.

RECOMMENDATIONS

Maintain your vitamin D intake

- The recommended daily intake of vitamin D may differ based on age and life stage. Please consult with your healthcare practitioner for further advice.
- In general, the daily recommended amount can be obtained by spending more time outdoors during daylight hours and consuming vitamin D rich foods.
- As a general advice, to obtain 10,000 IU of vitamin D from the sun:
  - Individuals with fair skin tones – about 10 mins (arms or equivalent exposed and no sunscreen).
  - Individuals with darker skin tones (olive skin or medium skin tones) – 15-20 mins (arms or equivalent exposed and without sunscreen).
  - Individuals with deep skin tones – 60 minutes sun exposure (arms or equivalent exposed and without sunscreen).

Please note that the amount of vitamin D that can be obtained by exposure to sunlight depends on several factors including genetics, season, skin type and geographic latitude.

If concerned about vitamin D insufficiency, discuss vitamin D blood level testing with your healthcare practitioner.

Hero foods

- You can also meet your dietary intake by eating plenty of vitamin D rich foods.

	• Sources of vitamin D include fatty fish, egg yolk, liver, vitamin D fortified foods.

SPECIAL CONSIDERATIONS

Over 50 years old	• If you are over 50, and especially if you are a woman, you may need even more vitamin D. With age, your body ability to make and activate vitamin D decreases. You can discuss this with a healthcare practitioner for advice on supplementation.
Vegan	• If you are a vegan you may have an even higher risk of vitamin D deficiency without adequate sunlight or supplementation. Make sure you include vitamin D fortified milk alternatives in your diet and seek advice from a healthcare practitioner about supplementation.
Vegetarian	• If you are a vegetarian who does not include milk in your diet, you may have an even higher risk of vitamin D deficiency without adequate sunlight or supplementation. Make sure you include vitamin D fortified milk alternatives in your diet and seek advice from a healthcare practitioner about supplementation.

CALCIUM, BONE STRENGTH AND STRESS FRACTURE

GENE	SNPs	YOUR RESULT
GC	rs7041	• GG Two normal alleles
VDR	rs1544410	• CC Two normal alleles

NORMAL RISK OF STRESS FRACTURE

PREDICTED IMPACT
Typical need for calcium; and
No influence on bone mineral density, stress fractures, and osteoporosis risks.

VITAMINS OR MINERALS
Calcium
Vitamin D

RECOMMENDATIONS

- Maintain a balanced diet with calcium rich foods.
- Hero foods: milk, yoghurt, cheese, canned fish with bones, green leafy vegetables, legumes, and fortified dairy-free milks.

ABOUT THE GENE

The *GC* gene encodes for the vitamin D binding protein, which binds and transports vitamin D to target organs. The genetic variation tested has been shown to affect the abundance of vitamin D transport molecules and therefore affects vitamin D levels. Vitamin D helps with calcium absorption from the gut and into the bloodstream. Therefore, having adequate vitamin D levels is essential for maintaining calcium levels.

The *VDR* gene encodes for the vitamin D receptor (VDR). This receptor allows the body to regulate the activity of genes that are dependent on vitamin D. By turning these genes on or off, *VDR* helps to control calcium absorption and other processes.

Calcium is an essential nutrient that must be obtained from the diet. Most of your calcium supply is stored in your bones and teeth, where it supports their structure and function. Genetic changes that affect the balance of calcium and vitamin D have been shown to affect calcium absorption and bone strength. This increases the risk of osteoporosis and leads to a greater risk of stress fractures.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★★

Your genetic finding is associated with:

- Greater bone mineral density (BMD).
- Reduced risk of stress fractures.
- Lower risk of osteoporosis.
- Normal calcium and vitamin D requirements.

The clinical significance of this finding will also depend on calcium and vitamin D intake.

RECOMMENDATIONS

EVIDENCE RATING ★★★★

Maintain a balanced diet	• It is important to eat a balanced diet to maintain your calcium and vitamin D levels. • The recommended daily intake may differ based on gender, age and life stage. Please consult with your healthcare practitioner for further advice. • If necessary, calcium supplementation may also be considered. Speak with your healthcare practitioner regarding supplementation, especially if you have kidney disease.
Hero foods	• Your calcium intake could be obtained from foods that are rich natural sources of calcium, which include milk, yoghurt, cheese, canned fish with bones, green leafy vegetables, legumes, fortified dairy-free milks. • For vegetables, choose kale, broccoli and cauliflower over spinach and silverbeet / swiss chard. The latter ones have good calcium content but also contain a substance (oxalate) which inhibits calcium absorption.

SPECIAL CONSIDERATIONS

Vegan	• If you are vegan, you may be at an even higher risk of having low calcium levels as you do not eat dairy products. You might also absorb less calcium because you consume more of those plant products containing substances which may inhibit calcium absorption. Make sure you include calcium-fortified milk alternatives and plant products in your diet. Soaking nuts and legumes helps to reduce their anti-nutrient content, thus maximizing calcium absorption. Seek advice from a healthcare practitioner about supplementation if needed.
Vegetarian	• If you are vegetarian, you might absorb less calcium because you consume more plant products containing substances which may inhibit calcium absorption. Soaking nuts and legumes helps to reduce their anti-nutrient content, thus maximizing calcium absorption. Make sure you include calcium-fortified milk alternatives in your diet. Seek advice from a healthcare practitioner about supplementation if needed.
Over 50 years old	• If you are a woman over 50, you may need even more calcium. This is because, with age, bone loss increases and your body's ability to absorb calcium decreases due to a decrease in stomach acid. You can seek advice about supplementation from a healthcare practitioner.
Lactose intolerance	• If you limit or avoid dairy products, you may be at a higher risk of low calcium levels. Make sure you include calcium-fortified milk alternatives in your diet. Seek advice from a healthcare practitioner about supplementation if needed.
Kidney disease	Speak with your healthcare practitioner regarding supplementation, especially if you have kidney disease.

IRON NEEDS

GENE	SNPs	YOUR RESULT
TMPRSS6	rs4820268	• AA Two normal alleles
TF	rs3811647	• AG One normal allele and one risk variant allele

MODERATE RISK OF LOW IRON LEVELS

PREDICTED IMPACT
Reduced iron levels and iron transport; and
Slightly raised need for iron.

VITAMINS OR MINERALS
Iron

RECOMMENDATIONS

- Monitor your iron levels.
- Eat iron rich foods regularly, e.g. red meat, fish, shellfish, poultry, green leafy vegetables, legumes, oysters, dried fruits and iron fortified cereals.
- Consider iron supplementation.

ABOUT THE GENE

Iron is an essential nutrient that is obtained from the diet. It is an important component of hemoglobin, the molecule in red blood cells that carries oxygen. If adequate iron is not available, cells and tissues will not get enough oxygen. This causes signs and symptoms of iron deficiency anemia, which include tiredness (fatigue), weakness and pale skin.

The *TF* gene contains the information needed to produce a protein called transferrin. Transferrin binds and transports iron throughout the body. Transferrin controls the levels of free iron in our blood and is a good indicator of how much iron is available to our tissues.

The *TMPRSS6* gene helps to control our iron levels by controlling hepcidin, a key regulator of iron in the body. When iron levels are low, TMPRSS6 can increase iron concentrations by inhibiting the production of hepcidin. This increases the amount of iron that can be absorbed from the diet and allows more iron to be transported out of storage sites in the liver and spleen.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★★

Your genetic finding is associated with:

- Reduced iron transport to tissues, as occurs in iron deficiency anemia.
- Reduced iron levels in the blood.
- Decreased total iron binding capacity (transferrin saturation) levels.

The practical importance of this result will depend on your dietary habits, whether you are pregnant or a blood donor and other factors.

RECOMMENDATIONS

Monitor iron levels	• As there is an moderate risk of low iron levels, consult your healthcare practitioner about getting your iron levels tested. • It is important to keep your iron levels within the recommended range. Too much or too little could result in undesirable health implications.
Eat iron rich foods regularly	• The recommended daily intake may differ based on gender, age and life stage. Please consult with your healthcare practitioner for further advice. • Eat plenty of foods that are rich in iron to ensure that you meet your dietary intake requirements. • Iron-rich foods include red meats, fish, shellfish, poultry, green leafy vegetables, legumes, oysters, dried fruits and iron fortified cereals. • Heme-iron contained in animal products can be readily absorbed by your body, while iron from plant sources (non-heme) is less readily absorbed. To increase your iron absorption from plant products, make sure you combine foods that contain iron with foods that contain vitamin C. For example, add some red capsicum/peppers to a lentil stew. Also, cooking in iron pots or skillets will increase the iron content of foods.
Consider iron supplementation	• If low levels of iron are detected, iron supplementation may be considered to help increase iron levels.

	• Your healthcare practitioner will be able to assess your current iron levels and advise whether supplements are needed.

SPECIAL CONSIDERATIONS

Females	• If you are a woman of reproductive age, your body needs even more iron as menstruation increases the need for iron.
Vegan/ vegetarian	• If you are a vegan/ vegetarian, you may need almost twice as much iron as non-vegan/ vegetarians. Keep in mind that even though some vegetables like spinach are rich in iron, they also contain substances (oxalates) that decrease iron absorption.

OMEGA-3 AND OMEGA-6 PROCESSING

GENE	SNPs	YOUR RESULT
FADS1	rs174546	• CC Two normal alleles

NORMAL FATTY ACID PROCESSING

PREDICTED IMPACT
Typical proportion of different types of fatty acids in the body;
No influence on risk of blood lipid imbalance; and
Typical need for omega-3.

VITAMINS OR MINERALS
Omega-3

RECOMMENDATIONS

- Maintain a balanced diet with omega-3 rich foods.
- Hero foods: fatty fish, nuts and seeds (walnuts, flaxseeds, and chia seeds).

ABOUT THE GENE

Fats are made of fatty acids, which can come from dietary sources, but are also produced in small amounts by the body. Fatty acids come in different types, such as short or long, saturated or unsaturated and can be grouped into further subtypes, like omega-3 and omega-6. Your body processes fatty acids and rearranges them to produce all the different types. *FADS1* is specifically involved in the processing and production of unsaturated omega-3 and omega-6 types. Omega-3 and omega-6 fatty acids are essential for development, reproduction, skin and hair growth and for brain function. Additionally, they can also influence the balance of blood triglycerides and cholesterol (lipids). As such, *FADS1* also has an impact on the lipid profile.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★★

Your genetic finding is associated with:

- Normal FADS1 enzyme activity.
- Normal capacity to process omega-3 and omega-6 fatty acids.
- Typical proportion of different types of fatty acids in your blood.

Your genetic finding is not associated with an increased risk of high triglycerides or a high level of low-density cholesterol (LDL-C).

The clinical significance of this finding will depend on usual omega-3 intake and other dietary habits.

RECOMMENDATIONS

EVIDENCE RATING ★★★★

Maintain a balanced diet with omega-3 rich foods	• Please be advised that other factors, such as your dietary or lifestyle choices, may still affect your overall lipid profile. • A healthy, balanced diet is is essential to ensure adequate omega-3 intake and for maintaining a healthy lipid balance in the blood. • The recommended daily intake may differ based on age, gender and life stage. Please refer to your country's guideline. • If cholesterol and/or triglycerides levels are known to be raised, consult your healthcare practitioner about suitable treatment.
Hero foods	• In general, the daily recommended amount can be obtained from omega-3 rich foods such as fatty fish (salmon, mackerel and trout) and nuts and seeds (walnuts, flaxseeds, and chia seeds). • Eat up to 3 servings of fatty fish per week to maximize the benefits of omega-3 content and minimize the risks of mercury contamination.

SPECIAL CONSIDERATIONS

Vegan/ vegetarian	• As the most beneficial types of omega-3 are found in fatty fish, supplementation should be discussed with your healthcare practitioner.

Natural
HEALTH GROUP

FITNESS & EXERCISE

MUSCLE POWER

GENE	SNPs	YOUR RESULT
ACTN3	rs1815739	• CC Two normal alleles

ABOUT THE GENE

Your muscles contain two types of fibers: fast-twitch and slow-twitch. Fast-twitch fibers are useful for movements relying on sudden, intense bursts of activity, such as those required in power sports (e.g. weight-lifting, sprinting, high jump, long jump and pole vault). Slow-twitch fibers are useful for long-duration, low intensity activities (e.g. walking, jogging and cycling). The *ACTN3* gene builds a protein that allows fast-twitch muscle fibers to work at full force. The more ACTN3 protein your body produces, the greater your muscle power.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★★

Your genetic finding predicts full production of the ACTN3 protein. This means:

- You can generate maximum muscle power and can excel in sports that rely on sudden bursts of power, such as weight-lifting or sprinting.
- Your muscles will increase in size in response to high intensity exercise. This is an advantage in sports that require strength and power.
- You are less likely to experience muscle soreness after high intensity training, which can speed up your recovery time. Your overall Recovery ability presented on part A of this report (summary of results) is influenced also by other genes.

This result is 7-8 times more likely to be found in Olympic level sprinters. This result is also common in elite performers across a wide range of power sports including judo, cycling and ski jumping.

PEAK POWER

PREDICTED IMPACT

Fast twitch muscle fibers for optimum power;
Maximum muscle power for sudden bursts of activity;
Increase in muscle size with high intensity exercise;
Well suited for strength and power sports; and
Less prone to muscle soreness.

FITNESS PROFILE

Power vs Endurance
Recovery

RECOMMENDATIONS

- High intensity training, e.g. interval training, team sports like basketball, soccer to improve fitness.
- Heavier weights with fewer sets and reps to increase muscle power.

RECOMMENDATIONS

EVIDENCE RATING ★★★

High intensity training	Your genetic finding suggests that you are more suited to high intensity exercise, such as team sports such as basketball and soccer and High Intensity Interval Training (HIIT). High intensity training is a type of resistance exercise characterized by a high level of effort and relatively brief workouts, as opposed to low intensity training which involves low to moderate levels of effort and longer, more frequent workouts. To train and grow muscles, high intensity resistance training focuses on combining heavy weights with a low number of sets and repetitions.

Note: Your overall power or endurance; and recovery profiles presented in part A of this report takes into consideration this result in combination with other gene results.

MUSCLE STRENGTH

GENE	SNPs	YOUR RESULT
AGT	rs699	• CT One variant allele and one normal allele

NORMAL MUSCLE STRENGTH

PREDICTED IMPACT
Normal muscle contraction and strength; and
Normal muscle power.

FITNESS PROFILE
Power vs Endurance
Stamina

RECOMMENDATIONS

- Follow general training recommendations.
- Train more frequently.

ABOUT THE GENE

The *AGT* gene produces a protein that helps muscles to contract properly and maintain their strength. The more protein a muscle produces, the greater its strength and power. This protein is also thought to increase the production of fast-twitch fibers, which provides an advantage in power sports.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★

Your genetic finding predicts normal production of the AGT protein. This means:

- Your muscle contraction is functioning normally.
- You are expected to have normal muscle power.

This result is not as commonly found in Olympic athletes of various disciplines.

RECOMMENDATIONS

EVIDENCE RATING ★★★

Follow general training recommendations	You can follow general training recommendations to improve your muscle power. You may need to train more frequently than others to achieve the same results.

Note: Your overall power or endurance; and stamina profile presented in part A of this report takes into consideration this result in combination with other gene results.

MUSCLE ENERGY

GENE	SNPs	YOUR RESULT
AMPD1	rs17602729	• CC Two normal alleles

IDEAL ENERGY

PREDICTED IMPACT
Maximum production of muscle energy in short bursts;
Capable of pushing yourself without getting tired too quickly; and
Less muscle soreness after intense training.

FITNESS PROFILE
Power vs Endurance
Recovery

RECOMMENDATIONS

- Mix high and low intensity training to improve your fitness and strength.

ABOUT THE GENE

Your muscle cells need energy to contract and move your body. The *AMPD1* gene produces a protein that is involved in the production of energy that is used by muscles. This energy is used during short bursts of exercise and is also important for combating muscle fatigue.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★

Your genetic finding predicts normal production of the AMPD1 protein. This means:

- Your muscles are equipped to produce maximum energy in short bursts and you can push yourself to maximum effort without getting tired too quickly.
- You are less prone to experience muscle soreness after intense exercise. This can speed up your recovery time. Your overall recovery ability presented in part A of this report (summary of results) is also influenced by other genes.

About 70-90% of elite power athletes (e.g. short distance runners, short distance swimmers, weightlifters, cyclists) have this genetic result.

RECOMMENDATIONS

EVIDENCE RATING ★★

High and low intensity training

Based on your result, both high and low intensity training will increase your fitness and strength.

- High intensity training, e.g. HIIT, which is short bursts of exercise at maximal effort followed by varied recovery times.
- Low intensity training, e.g. brisk walking, cycling, swimming, jogging.

To train your muscles, you can alternate high intensity resistance training (with heavier weights and fewer sets and repetitions) with low intensity resistance training (with lighter weights and more sets and repetitions).

Note: Your overall power or endurance; and recovery profile presented in part A of this report takes into consideration this result in combination with other gene results.

ENDURANCE

GENE	SNPs	YOUR RESULT
PPARGC1A	rs8192678	• GG Two normal alleles

PEAK ENDURANCE

PREDICTED IMPACT
Naturally high aerobic fitness;
Maximum growth of slow-twitch muscle fibers in response to exercise; and
Well suited to endurance training.

FITNESS PROFILE
Power vs Endurance
Stamina

RECOMMENDATIONS

- Endurance training.
- Lighter weights with more sets and reps.

ABOUT THE GENE

The *PPARGC1A* gene helps to regulate how energy is used in muscle cells. Increased energy levels are linked to increased aerobic fitness and the ability to exercise for longer periods of time. This gene also regulates the ability to grow slow-twitch muscle fibers which also contributes to increased endurance performance.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★

Your PPARGC1A protein is working normally. This means:

- Your muscles can grow their slow-twitch fibers with exercise. This makes you more suited to endurance training (e.g. long-distance swimming, and running).
- Your aerobic fitness is naturally high.

About half of elite endurance athletes share this genetic result.

RECOMMENDATIONS

Endurance training	You are suited to exercises that can be sustained for a longer period of time. These are low intensity activities that engage your slow-twitch muscle fibers. Examples include jogging, running, swimming and cycling. For gym work, you can focus on low intensity resistance training with lighter weights and a greater number of sets and repetitions.

Note: Your overall power or endurance; and stamina profile presented in part A of this report takes into consideration this result in combination with other gene results.

RECOVERY TIME

GENE	SNPs	YOUR RESULT
IL6	rs1800795	• CG One normal allele and one variant allele

MODERATE RECOVERY

PREDICTED IMPACT
Slightly less optimal muscle fibers regeneration;
Some muscle soreness after intense training;
May need additional recovery time after intense training; and
May be naturally suited for power sports.

FITNESS PROFILE
Power vs Endurance
Stamina
Recovery

RECOMMENDATIONS

- Allow 1-2 recovery days between training.
- Consider food/ drinks that can help muscle recovery.

ABOUT THE GENE

The *IL6* gene produces a substance called interleukin-6. It is released in the muscles in response to exercise. It promotes fiber regeneration and regulates how quickly muscles recover after exercise. It is also thought that having normal *IL6* gene function contributes to better performance in power sports.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★

Your genetic finding predicts sub-optimal levels of IL6 production. This means:

- You may experience increased muscle soreness after intense exercise.
- You may need additional time to recover after intense exercise. Therefore, you should ensure 1-2 recovery days between intense training sessions. During the recovery days, you can do low intensity exercise or train different body parts on different days. However, your overall Recovery profile presented on part A of this report (summary of results) is also influenced by other gene results.
- With appropriate training, you are likely to achieve great improvements in your stamina. However, your overall stamina profile presented in part A of this report (summary of results) is also influenced by other gene results.
- You may be naturally suited to power sports (e.g. sprinting, weight-lifting, long jump, high jump). However, your overall Power or Endurance profile presented on part A of this report (summary of results) is also influenced by other gene results.

About 20-30% of elite athletes in power sports have this genetic result.

RECOMMENDATIONS

Training on most days

There are some foods which can help you recover after intense training:

- Drinking a glass of milk within 10 minutes of exercising can help keep muscle soreness down and reduce muscle damage.
- Curcumin can help to reduce a loss in muscle strength. It can be found in turmeric. Certain drinks such as turmeric lattes, may be of benefit.
- Taking ginger before exercise can also accelerate recovery of muscle strength following intense exercise.
- Drinking tart cherry juice before and after training may reduce muscle soreness.

Note: Your overall power or endurance; stamina; and recovery profile presented in part A of this report takes into consideration this result in combination with other gene results.

RISK OF SOFT TISSUE INJURY

GENE	SNPs	YOUR RESULT
COL1A1	rs1800012	• GG Two normal alleles

NORMAL RISK OF SOFT TISSUE INJURY

PREDICTED IMPACT
Normal joints support; and
Normal risk of tendon and ligament injuries.

FITNESS PROFILE
Injury Risk

RECOMMENDATIONS

- Ensure adequate warm up.
- Strengthen your supporting muscles.
- Stretch regularly.
- Improve technique and body awareness.

ABOUT THE GENE

The *COL1A1* gene builds the main collagen chain that affects the strength of ligaments, tendons and joint capsules. This strength affects the mobility of joints such as shoulders, knees and ankles. Greater levels of this type of collagen provide better supported joints and a reduced risk of injury.

GENETIC INTERPRETATION

EVIDENCE RATING ★★★

Your genetic finding predicts:

- Normal production of COL1A1 protein.
- Normal risk of ligament and tendon injury. This may include anterior cruciate ligament (ACL) or Achilles tendon injuries, or shoulder dislocation.

RECOMMENDATIONS

EVIDENCE RATING ★★★★

Adequate warm up	A comprehensive warm up program will help prepare the body for exercise by gradually increasing the heart rate and blood flow to the muscles.
Strengthen your supporting muscles	Strengthening supporting muscles can reduce imbalances in the body and prevent injury. For example, strengthening exercises for the hamstrings, quadriceps and gluteus maximus could support the muscles around the ligament and prevent injury of the knee e.g. ACL injuries.
Regular stretching	Regular stretching can reduce muscle tightness. Tightness has been shown to increase the risk of certain injuries. For example, tight calf muscles are associated with an increased risk of Achilles tendon injuries as they place more stress on the Achilles tendon.
Improve technique and body awareness	70% of ACL injuries occur without contact to the region. For example, injuries can be caused by landing, pivoting or stopping suddenly. Research shows that Neuromuscular Training can be highly effective in reducing the risk of ACL injuries in athletes who play sports. Neuromuscular training includes exercises that improve strength, balance, agility and flexibility and is highly-specific for sports that pose a high risk of ACL injuries (e.g. soccer). This type of training focuses on training the knee to move in a correct way, especially when jumping, landing and pivoting.

Note: Your overall injury risk profile presented in part A of this report takes into consideration this result in combination with other gene results.

INJURY RISK AND FLEXIBILITY

GENE	SNPs	YOUR RESULT
COL5A1	rs12722	• CT One variant allele and one normal allele

INCREASED RISK OF TENDON INJURY AND REDUCED JOINT FLEXIBILITY

PREDICTED IMPACT

Stiffer tendons and reduced ligament strength;
Less flexible joints and decreased range of movement;
Increased muscle stiffness;
Greater injury risk; and
Increased risk of muscle cramping from exercise.

FITNESS PROFILE

Injury Risk

RECOMMENDATIONS

- To improve flexibility and range of movement:
  - Dynamic stretches before training.
  - Static stretches after training.
  - Foam rolling.
- To prevent cramping:
  - Increase training volume slowly.
  - Remain hydrated.
- Treat exercise induced muscle cramps by stretching.

ABOUT THE GENE

The *COL5A1* gene produces the protein collagen 5 which affects the structure and function of collagen in ligaments and tendons. The amount of collagen and how it is packed influences ligament strength. It also influences your range of motion and the flexibility of joints.

GENETIC INTERPRETATION — EVIDENCE RATING ★★★★

Your genetic finding indicates that your supply of collagen 5 is not ideal. This means that:

- You are likely to have stiffer tendons and reduced ligament strength.
- You are at a greater risk of injury (including tennis elbow and injuries to your Achilles tendon).
- You are likely to have less flexible joints, a reduced range of movement and increased muscle stiffness.
- You have an increased risk of muscle cramping from exercise.

RECOMMENDATIONS — EVIDENCE RATING ★★★

To increase your flexibility and range of movement, consider the following:

Dynamic stretches prior to training	This type of stretching can improve flexibility and muscle strength when performed prior to training, decreasing the risk of injury. • Examples include: arm and leg swings, hip circles, lunges etc. • Suitable for: athletes who require running or jumping, such as basketball players or sprinters.	
Static stretches post training	This should be incorporated at the end of the work-out or as part of a cool-down to improve flexibility on a more permanent or long-term basis. • Examples include: holding stretch positions for 30-60 seconds at a level of mild to moderate discomfort and repeating 2-3 times. • Suitable for: athletes that require flexibility, such as gymnasts or dancers.	
Foam rolling, prior or post training	This is a release technique that has been shown to be effective at increasing an individual's range of movement and flexibility. It can be applied to different muscle groups. • Examples include: when areas of soreness are found, the foam roller should be held there for 30-60 seconds until the muscle relaxes and there is a decreased sensitivity in that area. • Suitable for: all uninjured athletes, this can be used in conjunction with dynamic and static stretches before and after training.	
To prevent cramping after exercise:	Increase training volume slowly	Building training volume and intensity over time will help reduce exercise-induced muscle cramps.
	Remain Hydrated	Dehydration can cause muscles to fatigue prematurely during exercise. Having adequate hydration before, during, and after exercise can reduce muscle fatigue and cramps.

	Stretch	When experiencing muscle cramps induced by exercise, the most common and effective treatment is stretching.

Note: Your overall injury risk profile presented in part A of this report takes into consideration this result in combination with other gene results.

Natural
HEALTH GROUP

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FUT2

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EVIDENCE RATING SCALE

D EVIDENCE RATING SYSTEM

We have developed a ratings system so that you can see our level of confidence in the research that we have used as a basis for our recommendations. This is based on Oxford Centre for Evidence Based Medicine – Level of Evidence, March 2009* and has been modified to apply for genetic tests.

LEVEL	CAUSATION AND TREATMENT
★★★★★	Systematic review of multiple RCT (meta-analysis) Systematic review of meta-analyses Single RCT (random controlled trial) with narrow confidence intervals
★★★★	» Meta-analysis of cohort studies » Prospective cohort with 80% follow up. » Single RCT not in 5 » Good quality ecological research » Genome-wide association studies
★★★	Multiple case control studies Meta-analysis of case control Follow up cohort <80% Cross sectional studies >1000 people Case control good quality
★★	» Single case control not in 3 » Case-series » Cross sectional <1000 people
★	Single case report Expert opinion Biochemistry First principle Animal/bacteria analogy

*http://www.cebm.net/oxford-centre-evidence-based-medicine-levels-evidence-march-2009/


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