camtech health

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WELCOME TO YOUR IDEAL HEALTH DNA TEST REPORT

Introduction

Frequently Asked Questions

The material in this report is not intended for the diagnosis, treatment, prediction or prevention of diseases and is not a substitute for professional medical advice. Genetic predictions are made based on genome-wide association studies among adult populations. Such correlations may vary among children populations.

US Recommendation Dietary Allowances (where listed) are provided as a reference for baseline nutrient intake, and is based on the average daily intake required to meet the nutrient requirements of healthy individuals. You should not change health behaviors solely based on this report. Always consult with a physician or other healthcare provider before you make any significant changes to your diet or lifestyle.

What does your individual genetic information constitute?

The genome is genetic content, or hereditary information, in humans and other organisms. It is composed of DNA, which is made up of four bases - Adenine (A), Thymine (T), Guanine (G), and Cytosine (C). Although the genome of all humans is almost the same, minor differences exist among individuals. These differences, called 'genetic variations', are responsible for various unique phenotypes, (appearance, e.g. color of skin/eyes, skin elasticity, skin sensitivity, etc.) and the difference in health status among individuals. In most cases, these variations are passed on to the next generation (inheritance), which affects predisposition to certain health conditions and illnesses in offspring.

What is Single Nucleotide Polymorphism (SNP)?

Single Nucleotide Polymorphism or SNP (pronounced as ‘snip’) is a type of genetic variation, wherein a single letter difference occurs in the DNA sequence of an individual compared to others.

In the above-given example, the first sequence differs from the second sequence only by a single letter (A/G). This single letter change in the sequence is associated with or affects various phenotypic traits, genetic susceptibility to health conditions, response to drugs, vitamins, etc.

What is Population Percentile Score ("Percentile Score")?

Shows the percentage of people in the general population who have lower predisposition likelihood than you for the specific trait.

What is Predisposition Likelihood Assessment ("Assessment")?

This is the assessment of whether your trait predisposition is within the normal range of the population, or whether you have slightly elevated or elevated likelihood of having a particular predisposition.

What is Wellness Genomics and what is the science behind it?

Wellness Genomics is the science of identifying links between genetic variations present in your DNA with specific wellness traits. While everyone should follow general recommendations to maintain optimal wellbeing, it may be important to pay more attention to areas for which you have elevated genetics-based risks.

Your reports are generated by our Computational Genomics platform, which is built on the most rigorous science currently available to analyze genetics-based wellness. It is based on over a decade of highly curated global scientific research. When reading your report, do note that most wellness traits are influenced by three factors: your genetics, your nurture environment (ages 0-7), and your current lifestyle choices. As such, genetics is not the only determinant for the actual presence of a trait. Genetic predispositions can only tell you the statistical likelihood that you might develop a particular trait such as vitamin deficiency or skin youthfulness.

How accurate is this genetic test?

Your saliva sample is processed in a College of American Pathologists (CAP) and/or ISO 17025-accredited Laboratory. We use Illumina DNA microarray technology to analyse your samples. The microarray chip contains highly-informative, genome-wide markers found across diverse populations, and allows us to quickly sample your DNA for unique genetic predispositions to various wellness traits. Samples run within our lab have demonstrated a 99.5% level of concordance compared with other diagnostic accredited laboratories.

How are the genes and SNPs selected?

The genes and SNPs are selected from papers published in peer-reviewed international scientific journals, based on the significance of the statistical relationship between the genetic variations and the trait. As a pioneer of Wellness Genomics, we continuously keep up with the latest developments in the field of Wellness Genomics to provide you with the most up-to-date information.

How are the percentile scores calculated?

The algorithm behind the scores is complex and proprietary, but the basic logic is as follows. Everyone has potentially two types of genetic variations - those that contribute to the strength of a trait, and those that decrease the strength of a trait. For example, one may have genetic variations that increase the likelihood of developing obesity, while other variations decrease that likelihood. In order to arrive at our indicative score, we look at each genetic variation, determine its influence on the trait, weigh the importance given its potential role in critical metabolic pathways and enzymatic reactions, explore whether it is co-occurring with other variations that we expect to see if there is a higher risk. We then consider population data, and rank the person based on their likelihood of predisposition compared to that of the rest of the population. The population percentile score shows the percentage of people who have less likelihood than you to be genetically predisposed to a trait.

Why do traits have different assessment thresholds?

The thresholds are based on the inflection points within population distributions for each trait, which differs from trait to trait. Wherever available, the data is compared to the phenotypic data from the tested population, as well as WHO public health data on nutrient deficiency prevalence statistics.

Why might I get results that don’t seem to reflect my physical conditions?

Each trait has three influential factors: nature (genetics), nurture (upbringing), and current lifestyle (choice / behaviour). If you are predisposed to, say, exercise aversion, it means that many people with the same genetic composition as yours found it more difficult to motivate themselves to exercise. Your upbringing and personal choices can overcome such predispositions. In fact, it is the main reason we offer you this information, so you can use it to take action and manage your potential risks.

Your Report

A quick summary of your DNA test results for your easy reference

Optimal

Traits	Percentile Score	Assessment
 Baldness		HIGH RISK
 Droopy Eyelids		NORMAL
 Healthy Aging		NORMAL
 Longevity		HIGH POTENTIAL

Fitness

Traits	Percentile Score	Assessment
 Endurance Potential		HIGH POTENTIAL

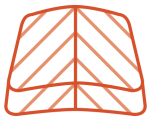
Potential for Lean Body Mass		LOW POTENTIAL
Obesity Potential		NORMAL
Difficulty in Losing Weight		NORMAL
Slow Metabolism		NORMAL

Nutrition

Traits	Percentile Score	Assessment
Vitamin A		NORMAL
Vitamin B1		SLIGHTLY HIGH RISK
Vitamin B2		NORMAL

B3	Vitamin B3	NORMAL
B5	Vitamin B5	HIGH RISK
B6	Vitamin B6	NORMAL
B7	Vitamin B7	NORMAL
B9	Vitamin B9	NORMAL
B12	Vitamin B12	NORMAL
C	Vitamin C	NORMAL
D	Vitamin D	SLIGHTLY HIGH RISK

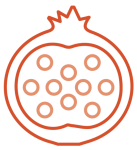
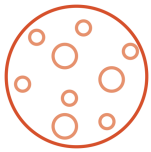
Vitamin K		NORMAL
Calcium		NORMAL
Iron		NORMAL
Magnesium		NORMAL
Selenium		NORMAL
Zinc		NORMAL
CoQ10		SLIGHTLY HIGH RISK
Glutathione		SLIGHTLY HIGH RISK

	Monounsaturated Fats	SLIGHTLY HIGH RISK
	Polyunsaturated Fats	NORMAL
	Impaired Caffeine Metabolism	NORMAL
	Sensitivity to Gluten	NORMAL
	Sensitivity to Salt	NORMAL
	Glucose Balance	HIGH RISK
	Impaired Satiety	NORMAL
	Low-Carb Diet Effectiveness	NORMAL

Low-Fat Diet Effectiveness		NORMAL
Mediterranean Diet Effectiveness		SLIGHTLY EFFECTIVE

Skin

Traits	Percentile Score	Assessment
Cellulite		SLIGHTLY HIGH RISK
Stretch Marks		NORMAL
Dry Skin		SLIGHTLY HIGH RISK
Freckles		NORMAL
Premature Collagen Breakdown		NORMAL

	Youthful Skin	NORMAL
	Crow's Feet	SLIGHTLY HIGH RISK
	Sagging Eyelids	NORMAL
	Sagging Cheeks	SLIGHTLY HIGH RISK
	Antioxidant Deficiency	NORMAL
	Skin Glycation	SLIGHTLY HIGH RISK
	UV Damage Risk	SLIGHTLY HIGH RISK
	Sun Spots	NORMAL

	Impaired Detoxification	SLIGHTLY HIGH RISK
	General Wrinkles	NORMAL
	Impaired Skin Barrier Function	SLIGHTLY HIGH RISK
	Sun Sensitivity	NORMAL

Baldness

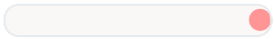
Baldness, or androgenetic alopecia (AGA), is characterized by a defined pattern of hair loss from the scalp. MPB is easily recognizable. It starts with a gradually receding hairline that forms an “M” shape. Eventually the hair becomes finer, shorter, and thinner, and creates a U-shaped (or horseshoe) pattern of hair around the sides of the head.
The condition may affect up to 70% of men and 40% of women at some point in their lifetime. The prevalence of male-pattern baldness gradually increases with age, and it is lower in Asian men compared to Caucasians.

Baldness is known to be substantially heritable, with approximately 80% for both early- and late- onset hair loss. Numerous genetic variants are found to be associated with hair loss. The androgen gene may be only 40% responsible for MPB. The remaining 60% can be attributed to other genes controlling the hair follicle cycle, response to metabolic states, cell division, stress and environmental factors.

Genes Tested

AR, EBF1, GRID1, HDAC9, MAPT-AS1, MBNL1, SPPL2C, SUCNR1, WNT10A, SSPN (23)...

Your percentile score



Your score falls within the 95th percentile of the population.

Assessment Summary

HIGH RISK

You have an elevated predisposition likelihood for hair loss.

Lifestyle Recommendations

Healthy hair growth requires iron, zinc, vitamin B7 (biotin), vitamin D, and omega-3. Iron deficiency is one of most common nutritional deficiency and is a well known cause of hair loss. It is a good idea to boost ferritin, a stored iron that helps the body produce hair cell protein. Some rich sources of iron include broccoli, asparagus and dark leafy greens such as spinach, collards and kale. Red meat such as beef, lamb, duck and goose also contain high levels of ferritin. You can also obtain the required nutrition via supplementation.

In addition, some of the more common herbs that help in combating hair loss include saw palmetto (Serenoa repens), black cohosh (Actaea racemosa), dong quai (Angelica sinensis), false unicorn (Chamaelirium luteum), chaste berry (Vitex agnuscastus), and red clover (Trifolium pratense) which are claimed to have anti-androgenic or estrogen promoting activity.

A study of over 700 Asian men reported that smoking cigarettes may leave Asian men at a higher risk of male pattern baldness. Smoking may destroy hair follicles, damage the papilla that circulate blood and hormones to stimulate hair growth. Quitting smoking may help in slowing down hair loss

caused by smoke-related damage.

Some topical therapies available include protein sprays that strengthen and plump the hair shaft, anti-androgenic serum, and scalp treatment shampoo that purifies the scalp from excessive sebum.

If you are concerned about hair loss, pay a visit to trichotherapy clinic to see a scalp specialist for treatment options.

Droopy Eyelids

There are various causes to droopy eyelids but this condition is more commonly seen in older adults due to the normal aging process. Due to collagen loss during the aging process, the connective tissue supporting the structure of the eyelid loses elasticity, causing the eyelids to droop. As time passes, the eyelids may begin to cover your eyes giving you a hooded appearance and may affect your vision. Anyone can get droopy eyelids; there is no difference in prevalence between men and women or between ethnicities. However, studies showed that genetics may influence your chances of developing droopy eyelids.

Genes Tested

SMYD3, LOC285638, HOXD1, ATP8A1, p12, DLGAP1, COL1A2, SFRP4, ZNF385D, SNRPCP3-SIAH2...(25)

Your percentile score

Your score falls within the 15th percentile of the population.

Assessment Summary

NORMAL

You do not seem to have known genetic predispositions for droopy eyelids.

Lifestyle Recommendations

Even if you do not have genetic predisposition for droppy eyelids, Iif you do not get sufficient sleep, your eyes will look fatigue and stressed. This may lead to sagging around the eye and give you an aged outlook. Hence, it is recommended that you have regular sleep for at least for 6 hours every night.

Another natural way to relieve droopy eyelids is through exercise. The eyelids are part of a muscle ring around the eye called the orbicularis oculi. There are several eye exercises for droopy eyelids that can tone your eyelid muscles:

Close your eyelids, stretching your upper lids down. Repeat this subtle movement five times and then squeeze your eyes shut for a count of six. Relax the contracted position of your eyelids on a count of three and then open your eyes. Perform the exercise two times daily, five days per week.

Healthy Aging

As your body ages, you can expect gradual changes that will occur at your body's own pace. How your body ages depends in part on your genetic pattern of aging. Other factors such as environmental influences and dietary regime can also contribute to healthy aging.

The genes in this trait were studied in a group of over 1,300 healthy individuals ranging from 80 to 105 years, called the Wellderly cohort. Interestingly, the study showed that the long-living group does not seem to have decreased genetics-based risk for cancer or diabetes.

This trait measures whether you share genetic variations that are associated with the Wellderly cohort.

Genes Tested

ARHGAP26, BUD13, CDKN2B-AS1, GUCY1A3, PECAM1, PHACTR1, SCARB1, SMG6, SORL1, TOMM40 (20)...

Your percentile score

Your score falls within the 5th percentile of the population.

Assessment Summary

NORMAL

You share a number of genetic variations with the Wellderly cohort, and have a good genetic predisposition to live a healthy life.

Lifestyle Recommendations

Eating right and keeping a physically active lifestyle are keys to maintain health throughout life. As we age, the need for nutritent changes. Body composition studies found that in older individuals, a diet consisting of high amount of vegetables, fruits, whole grains, fish and low-fat dairy products may be associated with superior nutritional status and better quality of life and survival.

Calcium and vitamin D play crucial roles in the prevention and delay of osteoporosis. Recently, the role of calcium and vitamin D play in other health-related conditions such as heart disease, diabetes and immunity has received much attention. Other nutrients such as proteins, vitamins A and K, magnesium and phytoestrogens have also shown to contribute to bone health.

To keep your muscles strong and maintain youthful balance and gait, perform more muscle strengthening exercises to build and maintain bone density. This helps lower the risk of fall, fractures and disability.

Longevity

Having the right genes can help increase your chances of reaching 100 years old, since longevity runs in families. At least 50% of centenarians have first-degree relatives or grandparents who reach a ripe age, according to Boston University's New England Centenarian Study (NECS), the most comprehensive study of seniors in the world.

While you cannot control genetics, there are plenty of things you can do to increase the probability of living to a ripe old age. Studies have shown that lifestyle, diet, mental attitude and spiritual disposition play the biggest roles in longevity.

Genes Tested

ACTR3B, CADM2, IL6, IMPG2, LINC01376, MSRB2, PRKCA, TENM4, TOMM40, APOE (27)...

Your percentile score

Your score falls within the 80th percentile of the population.

Assessment Summary

HIGH POTENTIAL

Congratulations! You have an advantageous predisposition likelihood for longevity. This means you have a genetic advantage that may allow you to leverage healthy eating habits and regular exercise to achieve longevity.

Lifestyle Recommendations

Research has found that what we eat can affect our telomeres. Certain foods encourage our telomeres to lengthen while other foods can have the opposite effect. Instead of a diet high in sugar, aim to have diet rich in fiber, protein and healthy fat to avoid insulin spike which can lead to diabetes and damages our telomeres.

Keeping a careful watch on our weight and shape of our body is also important. Studies have shown that those with bigger waistline to hip ratio can lead to a more faster aging process, as the fat stored in the belly and liver can contribute to many chronic diseases.

Keep your brain active by learning a new language, take up a new hobby, attend lectures or do crossword puzzles to keep our mind engaged and alert.

Free radicals produced by normal body functions such as during liver detoxification can lead to cell damage and accelerated aging. Antioxidants play an important role to increase lifespan by scavenging inflammatory free radicals. Some rich sources of antioxidants include carotenoids like beta-carotene, lycopene and vitamin C. You can get these nutrients from rich-coloured foods such as pomegranates, goji berries, blueberries, dark chocolate, pecans and carrots.

Endurance Potential

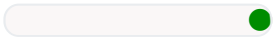
Endurance training is defined as lower intensity activity, performed for a longer period time. Your genes influence your capacity to perform endurance exercise. Endurance depends on the proportion of slow-twitch fibres in skeletal muscle. Slow twitch fibres are able to provide their own energy source, and can sustain contractions for an extended period of time, however are not as powerful as fast twitch muscles. Studies have identified a number of genetic variants associated with higher proportion of slow-twitch fibres, and higher oxygen supplies to muscle tissues. Knowing your genetic-based endurance score is important for creating your optimal fitness plan. Everyone should work on improving their endurance as it keeps heart, lungs and circulatory system healthy and improves overall fitness.

Muscle endurance shows your potential to perform well in physical activities of longer duration. If your muscle structure favours endurance you have the potential to excel in exercises that leverage on endurance. Cross-country skiing and push-ups are examples of endurance exercises.

Genes Tested

PPARGC1A, NRF2, TSHR, HFE, CNDP2, NFIA-AS2, PPAR-a, ESRRB, CDH13

Your percentile score



Your score falls within the 95th percentile of the population.

Assessment Summary

HIGH POTENTIAL

You have a higher than average endurance score. This means that you have a higher percentage of slow twitch muscles, and may be better at endurance exercises and sports. You are also likely to have efficient heart function and cellular energy production.

If your Endurance score is higher than your Power score, it is recommended that you prioritise endurance exercises in your fitness plan.

Exercise Recommendations

Endurance is one of the four types of exercise along with strength, balance and flexibility. Ideally, all four types of exercise should be included in a balanced fitness plan. Endurance exercises are important for the heart.

Some endurance activities you would perform well in are **brisk walking, long distance running or swimming, cycling, tennis, soccer, and rowing. Climbing stairs and dancing are also good endurance exercises.**

You will benefit from using **lower weights and higher reps (12-15 reps)**. Your suggested weight is about 65% of your maximum effort lift. You can also perform exercises with less rest time between sets.

Dietary Recommendations

Magnesium is useful under heavy aerobic training, as it improves energy utilization and reduces the stress of exercise, allowing quicker recovery. Food sources include **nuts, dark leafy greens, lentils, and mackerel.**

Branch chain amino acids (BCAAs) have been shown to reduce fatigue during prolonged aerobic exercise, and are found in **meat, chicken, fish, dairy products and eggs.** These foods are also rich in beta-alanine, which helps increase the time to exhaustion during aerobic exercise.

Creatine, found in meat, especially wild game, e.g. **rabbit and venison, and wild fish, such as salmon and tuna,** increases muscle strength and endurance.

Lifestyle and Supplement Recommendations

For maximum performance, consider supplementing with creatine (5g per day), especially if you are vegetarian, or beta-alanine (2-3g for women, 4-6g for men).

Potential for Lean Body Mass

Your lean body mass is the portion of your weight that is not fat. Lean body mass (LBM) has a strong genetic component. If you have a tendency for a higher lean body mass, you have a better chance of attaining a muscular body through exercise compared to the average population. Low lean body mass is generally related to issues like higher body weight, obesity, impaired protein balance, osteoporosis and sarcopenia.

Genes Tested

DARC, FADS1, GLYAT, TRHR, APC2, CASC20, FTO, GAD2, KTN1, WNT4 (105)...

Your percentile score

Your score falls within the 60th percentile of the population.

Assessment Summary

LOW POTENTIAL

Your genetic predisposition for this trait falls below normal range which means that you are prone to lower lean body mass. To improve your lean body mass consider a high protein, low fat diet.

Exercise Recommendations

The fastest way to maximize lean muscle gain is **resistance or weight bearing training**. 3-4 sessions per week of resistance training per week should be sufficient.

For best results, most of your sets of resistance exercise should use body building style techniques. Use a weight about 75% of your best lift, performing 10-15 reps.

Sets of exercise should last between 45-70 seconds.

Focus efforts on compound exercises such as squats or chin ups.

Dietary Recommendations

Adequate protein is essential for building lean body mass. While there is wide variance depending on type of training, amount of training, and genetic requirements, current research suggests about **1.5-2.0g of protein per kg of bodyweight** as a good starting point for lean mass gain.

Animal protein, such as chicken, turkey, beef, tuna and salmon are great sources of complete protein. **Vegetarian sources** include soy (tempeh, tofu), quinoa, legumes and beans.

Creatine is also valuable for gaining lean mass. Foods rich in this nutrient include meat, especially wild game, e.g. rabbit and venison, and wild fish,

such as salmon and tuna.

Lifestyle and Supplement Recommendations

You may need more protein to achieve lean mass gains. Supplementation with a **whole protein source such as whey, eggs, or casein will help you achieve your goals** . Your suggested protein intake is around 2g per kg of bodyweight.

Spirulina powder is a great vegetarian source for complete protein. In fact, it is one of the best protein food sources, containing almost double the amount of protein per gram compared to skinless chicken. Other dairy free protein powders include brown rice and yellow pea, although they are not sources of complete protein.

Besides adequate protein intake, good sleep quality, and adequate caloric intake are other key factors that will help you effectively gain lean mass. Ensure proper recovery from your training sessions for good results.

Supplement with **creatine** to help boost lean body mass, especially if you are vegetarian, as it is only available in animal products. Suggested intake is 5g per day.

Obesity Potential

Obesity is a complex trait that is infleunced by numerous genes. Genome-wide association studies have found that people with excessive weight share some common genetic variations. Some of these variations appear more frequently in populations that have the tendency to gain weight through fat consumption, while others variations are more prominent in populations that are more prone to weight gain due to high carb intake, in particular refined carbs. Yet other genetic variants are associated with increased frequency of snacking and higher risk of diabetes. Here, we take into consideration around 400 genetic loci to determine your risk profile for obesity.

While potential for obesity and higher BMI is highly influenced by genes, it may be regulated through both diet and exercise.

Genes Tested

ADARB1, BMP2, CMYA5, FTO, LEPR, LPIN2, MAF, MC4R, PCSK1, PPARG (466)...

Your percentile score

Your score falls within the 30th percentile of the population.

Assessment Summary

NORMAL

You do not have genetic variants that predispose you to obesity.

Exercise Recommendations

Perform at least **three hours of physical activity per week**, with two hours being properly designed weight training. Split the remaining hour into three 20 min session of either cardiovascular exercise or interval training.

Dietary Recommendations

Maintain a healthy body weight by having your daily calorie intake equal about 26-28 times your bodyweight in kilograms. For example, a 70kg man with a sedentary job would eat about 1,900 calories per day. See a fitness and nutrition professional to help you adjust this for your genetics, lean body mass and activity level.

Lifestyle and Supplement Recommendations

To further reduce your obesity risk, increase 'non-exercise physical activity' such as walking more, active recreational activities, housework, washing car, gardening.

Difficulty in Losing Weight

We respond differently to exercise and diets, and lose weight at differing rates. Studies have shown that carriers of some genetic variations have more difficulty losing weight, and improving their metabolic health, compared to people without this genetic variation. Those with genetic variants associated with obesity, sensitivity to fat, type 2 diabetes, emotional eating and food addiction do not lose weight as easily as others, while on the same diet and exercise plans. It is important to remember that genetics plays a key role in weight loss and weight management. Many people feel discouraged after a few weeks of dieting when they do not see the anticipated results. Understanding your genetic predisposition may help you develop an optimal weight management plan.

Genes Tested

DEFB112, FTMT, FTO, MCTP2, NEURL1B, NRXN3, PPARG, PRR16, RGMA, TFAP2D (57)...

Your percentile score

Your score falls within the 20th percentile of the population.

Assessment Summary

NORMAL

You do not have any genetic variations for losing weight, and should not have any difficulties maintaining a healthy weight.

Exercise Recommendations

Perform at least 3 hours of physical activity per week. With 2 of those hours being properly designed strength training such as bodybuilding and circuit training. The remaining hour would be split into three 20 min session of either cardiovascular exercise, or interval training.

Swimming, cycling and rowing are good choices. Jogging is suitable only if you have no history of foot or joint pain.

Dietary Recommendations

Maintain a healthy weight by making good food choices, e.g. increasing your portion of vegetables to rice or noodles, replacing fried foods with grilled or steamed options, and ensuring that you are drinking at least 8 glasses of clean, plain water every day are good basic habits to practice towards achieving and maintaining a healthy weight.

Foods abundant in **omega-3 fatty acids, e.g. cold water fish, (preferably wild), such as sardines, mackerel, tuna, and salmon, flax seeds, and grass fed meat**, are beneficial for weight management, and also increase the feeling of satiety, meaning that you will feel more satisfied after eating, leading to less tendency to overeat, or snack between meals.

Lifestyle and Supplement Recommendations

Keep active by clocking up 'non-exercise' physical activities such as walking, joining recreational activities, housework, car washing, and gardening.

Slow Metabolism

Body weight depends on the balance between energy intake and energy expenditure. Energy intake comes from calories consumed, and energy expenditure is the energy body uses to maintain normal body temperature and essential processes such as metabolism, breathing, and brain function. Individual differences in resting metabolic rate (RMR) are substantial, and depend on age, weight, environment, and genetics. Your genes determine 40-50% of your RMR, after adjustment for age, gender, and fat-free mass. People with 'fast metabolism' can sometimes eat more food with little exercise and not gain weight. People with 'normal metabolism' tend to require average amounts of food intake and average amounts of exercise to maintain weight. Total energy expenditure is the RMR plus energy burned during physical activities.

Genes Tested

FTO

Your percentile score

Your score falls within the 5th percentile of the population.

Assessment Summary

NORMAL

Your genetic variation shows a predisposition for normal resting metabolism rate.

Exercise Recommendations

Perform at least **three hours of physical activity per week**, with two hours being properly designed weight training. Split the remaining hour into three 20 min session of either cardiovascular exercise or interval training.

Dietary Recommendations

No specific dietary recommendations apply.

Lifestyle and Supplement Recommendations

Increase non-exercise physical activity such as walking more, doing active recreational activities, housework, washing car, gardening.

A good starting point for weight loss is eating a diet of about 26-28 times your bodyweight in kg. e.g. 70kg man with a sedentary job would eat about 1,900 calories per day. See a fitness and nutrition professional to help you adjust this for your genetics, lean body mass and activity level.

Vitamin A

Vitamin A is essential for a healthy immune and reproductive system, healthy vision, maintenance of strong bones and teeth, red blood cell production, tissue repair and skin health.

RDA for retinol is 900 micrograms (3,000IU) and 700 micrograms (2,333IU) for males and females respectively. Your need for retinol increases in pregnancy, childbirth, infancy, and childhood growth.

Genes Tested

PNPLA3, BCO1, BCMO1, TTR, CXCL8, RBP4, ABCA1

Your percentile score

Your score falls within the 5th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score falls within the normal range.

Dietary Recommendations

If you are vegetarian or vegan, ensure that you are getting sufficient retinol (active form of vitamin A) from vitamin A fortified foods, as retinol is typically found in animal food sources, such as **liver, butter, cod liver oil, tuna and eggs.**

Carotenoids, precursors to vitamin A, come from leafy green vegetables, orange and yellow vegetables such as carrots, tomatoes, orange fruits such as papaya.

Please refer to 'Nutrition Sources' at the end of this report for suggested vitamin A food sources.

Supplement Recommendations

Based on your genetic profile, you do not require supplementation.

Vitamin B1

Thiamine (vitamin B1) is essential for the metabolism of carbohydrates, fat and alcohol. It is needed for healthy nervous system and immune function. Severe thiamine deficiencies may be present in Crohn's disease and kidney dialysis patients. Thiamine imbalances result from poor dietary intake, gluten free diet, stress, excessive alcohol consumption, reduced gastrointestinal absorption and increased metabolic requirements.

Genes Tested

SLC19A3, SLC35F3

Your percentile score

Your score falls within the 55th percentile of the population.

Assessment Summary

SLIGHTLY HIGH RISK

You have a genetic predisposition for slight deficiency.

Dietary Recommendations

Boost your thiamine levels by including more of the following foods in your diet: **yeast extract, fortified breakfast cereals, enriched grain products and legumes.**

Thiamine may be destroyed by heat, and is lost in water during cooking. Avoid prolonged cooking time, and use just enough water for cooking.

Following a gluten free diet may increase your chances of thiamine deficiency. Please refer to 'Nutrition Sources' at the end of this report for suggested vitamin B1 food sources.

Supplement Recommendations

The most common forms of supplemental thiamine are thiamine mononitrate and thiamine hydrochloride.

Opt for benfotiamine, a synthetic thiamine derivative that offers better bioavailability compared to standard thiamine.

You should always consult with a physician or other healthcare provider before making any significant changes to your diet and lifestyle.

Vitamin B2

Vitamin B2 (riboflavin) is involved in vital metabolic processes in the body, including metabolism of other B vitamins and iron. It is needed for energy production, normal cell function and growth, and helps protect cells from oxidative damage. People with genetic variations in the MTHFR and MTRR genes may have a higher tendency for riboflavin deficiency.

RDA for riboflavin is 1.3mg and 1.1mg for males and females respectively. Pregnant women, and those on a low gluten, or gluten free diet may need more riboflavin.

Genes Tested

CLCN6, MTHFR, SLC52A1, FASTKD3

Your percentile score

Your score falls within the 5th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score falls within the normal range.

Dietary Recommendations

Increase your vitamin B2 levels by consuming more **dairy products (e.g. milk, cheese and yogurt), eggs, enriched or fortified cereals and grains, nuts, lean meats, liver, dark green vegetables (e.g. asparagus, broccoli, spinach and turnip greens), fish and poultry.**

Riboflavin is a water soluble nutrient, meaning that you lose about twice as much riboflavin content in cooking water when foods are boiled.

Steam, microwave or stir-fry your foods to retain as much riboflavin as possible.

Please refer to 'Nutrition Sources' at the end of this report for suggested vitamin B2 food sources.

Supplement Recommendations

Based on your genetic profile, you do not require supplementation.

Vitamin B3

Vitamin B3 (niacin or nicotinic acid) is essential for normal functioning of the digestive and nervous systems, protection from free radical damage, DNA repair, and skin health. It is important in fat, carbohydrate, and alcohol metabolism. Malnutrition, excessive alcohol consumption, and genetic variations have been associated with niacin deficiencies.

RDA for niacin for males and females are 16mg and 14mg respectively.

Genes Tested

G6PD, HAAO, KYNU

Your percentile score

Your score falls within the 5th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score falls within the normal range.

Dietary Recommendations

Maintain your niacin supply by including **brewer's yeast, beef liver, beef kidney, poultry, fish such as salmon, tuna and fortified cereals in your daily diet.** Niacin is heat stable, so is not destroyed during cooking.

You can also further boost your niacin levels by increasing your intake of foods rich in the amino acid tryptophan, which converts to niacin in the body. **Milk and eggs** contain small amounts of niacin, but are excellent sources of tryptophan.

Please refer to 'Nutrition Sources' at the end of this report for suggested niacin food sources.

Supplement Recommendations

Based on your genetic profile, you do not require supplementation.

Vitamin B5

Vitamin B5 (pantothenic acid) is needed for the breakdown of fats and carbohydrates, maintenance of healthy digestive system, production of red blood cells, and sex- and stress- related hormones. While severe vitamin B5 deficiencies are very rare, imbalances may cause fatigue, depression, irritability, nausea, and upper respiratory infections. Genetic variations could result in lower B5 conversion to CoA, an important coenzyme in the body.

RDA for vitamin B5 is 5mg per day. Other factors increasing your need for vitamin B5 include depression, fatigue, high cholesterol level, high triglyceride level, eczema and rheumatoid arthritis.

Genes Tested

PANK3, SLC5A6, PPCDC

Your percentile score

Your score falls within the 95th percentile of the population.

Assessment Summary

HIGH RISK

You have a genetic predisposition for deficiency.

Dietary Recommendations

Foods rich in vitamin B5 include **animal organs (liver and kidney), fish, shellfish, milk products, eggs, avocados, legumes, mushrooms, and sweet potatoes.**

It is unstable when exposed to heat, so avoid prolonged cooking where possible.

Please refer to 'Nutrition Sources' at the end of this report for suggested vitamin B5 food sources.

Supplement Recommendations

Look for supplements containing vitamin B5 in the form of pantethine (active form). Supplementing with pantethine helps support coenzyme A levels (low when vitamin B5 is insufficient), a vital co-cofactor for many enzymatic reactions, including fat and carbohydrate metabolism.

An additional benefit to pantethine is that it also helps maintain healthy cholesterol and triglyceride levels.Vitamin B5 should be taken with water, ideally after meals.

You should always consult with a physician or other healthcare provider

before making any significant changes to your diet and lifestyle.

Vitamin B6

Vitamin B6 (pyridoxine) is involved in many essential processes, including metabolism of fat and protein, healthy immune and nervous system function, production of hemoglobin, neurotransmitters, and maintenance of normal homocysteine levels. Symptoms of vitamin B6 imbalance include nerve inflammation, irritability, depression, lack of mental clarity, dermatitis, cracked, sore lips, inflamed tongue and mouth.

RDA for adults is 1.3 mg. It increases to 1.7mg for males and 1.5 mg for females above 50 years old. Factors increasing ones need for vitamin B6 include depression, high homocysteine levels, cardiovascular disease, ADHD, asthma, cognitive decline and Alzheimer's disease, morning sickness, premenstrual syndrome, and certain medications, such as oral contracptives and non-steroidal anti-inflammatories.

Genes Tested

ALPL, NBPF3, ADCYAP1R1

Your percentile score

Your score falls within the 10th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score falls within the normal range.

Dietary Recommendations

You should be able to get enough vitamin B6 from your diet. The best sources for vitamin B6 are **meat, whole grain products especially wheat, fortified cereals, vegetables and nuts.** Vitamin B6 from animal sources is more bioavailable.

Although vitamin B6 is a relatively heat stable vitamin, avoid prolonged cooking at high temperatures. Cooking, freezing, canning, storing or processing foods can deplete their vitamin B6 content by as much as 50%.

Please refer to 'Nutrition Sources' at the end of this report for suggested vitamin B6 food sources.

Supplement Recommendations

Based on your genetic profile, you do not require supplementation.

Vitamin B7

Humans must obtain vitamin B7 (biotin) from our diet, as it can be only made by plants, bacteria, yeast and algae. Biotin is essential for converting food into energy, producing fatty acids and amino acids, and for normal functioning of the nervous system. It is also an essential nutirient for healthy skin, hair, fingernails, and mucous membranes. Genetic variations in biotinidase enzyme are associated with biotin deficiencies.

Symptoms of biotin imbalance include hair loss, brittle fingernails, fatigue, insomnia, and depression.

As biotin deficiency is rare, there is no RDA for biotin. 30 micrograms per day is considered adequate for adults. Other factors that could increase ones biotin requirements include smoking and pregnancy.

Genes Tested

BTD, PTEN

Your percentile score

Your score falls within the 10th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score falls within the normal range.

Dietary Recommendations

You should be able to maintain healthy biotin levels through your diet.

Please refer to 'Nutrition Sources' at the end of this report for suggested vitamin B7 food sources.

Supplement Recommendations

Based on your genetic profile, you do not require supplementation.

Vitamin B9

Vitamin B9 (folate), is essential for DNA synthesis, impacts genetic expression, cell repair and maintenance, protein metabolism, and the formation of blood cells. It is especially important in pregnancy, and for women trying to conceive. Folate deficiencies are associated with anemia, high homocysteine levels, increased risk of cardiovascular disease, increased risk of neural tube defects during pregnancy.

RDA for adults is 400 micrograms per day. Factors that increase folate needs include trying to conceive or being pregnant, being over fifty years old, following gluten-free or low-gluten diets, having cardiovascular disease, and cognitive decline.

Genes Tested

MYT1L, PRICKLE2, MTHFR, HAS2, SLC36A4, BRAP, FSIP1, FAM189A1, SRP14, NUDT7 (6)...

Your percentile score

Your score falls within the 5th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score falls within the normal range.

Dietary Recommendations

You should be able to maintain sufficient folate levels through a balanced diet. **Leafy greens, organ meats, citrus fruit juices, legumes, nuts and fortified foods, such as enriched breads and cereals** are good sources of folate.

The bioavailability of folic acid is assumed to be 100% when taken as a supplement, while folic acid in fortified food is estimated to have about 85% bioavailability.

Bioavailability of food sources varies widely between 25-50%, due to certain compounds in foods such as wholegrains and legumes, which inhibit folate absorption. Thus, naturally occurring folates are not as bioavailable as folic acid supplements.

Please refer to 'Nutrition Sources' at the end of this report for suggested folate food sources.

Supplement Recommendations

Based on your genetic profile, you do not require supplementation. Supplementation is recommended if you are trying to conceive, or are

pregnant.

You should always consult with a physician or other healthcare provider before making any significant changes to your diet and lifestyle.

Vitamin B12

Vitamin B12 (cobalamin) is needed for normal functioning of your brain, nervous and digestive systems. It is involved in making DNA, forming red blood cells, and fatty acid and amino acid metabolism. Vitamin B12 can be only manufactured by bacteria, and is typically found in animal food sources.

Deficiency in vitamin B12 may be a factor in anemia, fatigue, and stomach inflammation, and is usually due to poor absorption, rather than dietary deficiency. Other factors linked with vitamin B12 deficiency include vegetarian and vegan diets, pregnancy, high intensity training, alcohol consumption, being over 50 years old, depression and gastrointestinal disorders.

Genetic variations may negatively affect vitamin B12 absorption, resulting in potential deficiency.

RDA for adults is 2.4 micrograms.

Genes Tested

CUBN, TCN1, MS4A3, CLYBL, FUT2, RASIP1, FUT6, PRELID2, MUT, TMEM215-ASS1P12 (24)...

Your percentile score

Your score falls within the 15th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score falls within the normal range.

Dietary Recommendations

Based on your genetic profile, you should not have difficulties maintaining sufficient vitamin B12 levels.

Your needs will increase if you follow a vegetarian or vegan diet, over 50 years old, or regularly take antacids.

Please refer to 'Nutrition Sources' at the end of this report for suggested vitamin B12 food sources.

Supplement Recommendations

Based on your genetic profile, you do not require supplementation.

Vitamin C

Vitamin C (ascorbic acid) is essential for healthy immune system function, making red blood cells, healthy connective tissues, blood vessels, bones, teeth, and gums. It is a powerful antioxidant, and an important factor in iron absorption. Deficiency in this nutrient is uncommon in developed countries, and higher blood levels of vitamin C has been linked to lower risk of death from all causes, including cardiovascular diseases and cancer. Humans cannot produce or store vitamin C, and must get this essential vitamin daily from our diet. Genetic variations on SLC23A1 is associated with lower levels of vitamin C.

RDA for men and women is 90mg and 75mg respectively. If you are a smoker, or under heavy physical stress, e.g. marathon runner or skier, you are at higher risk for vitamin C deficiency.

Genes Tested

SVCT1, SLC23A2 , SLC23A1, SVCT2, SLC23A2

Your percentile score

Your score falls within the 40th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score falls within the normal range.

Dietary Recommendations

Based on your genetic profile, you should be able to maintain healthy vitamin C levels through your diet.

Vitamin C rich foods include **fruits such as oranges, grapefruits, cantaloupes, kiwi, mango, papaya, pineapple, strawberries, raspberries, blueberries, cranberries and watermelon.**

Broccoli, brussels sprouts, cauliflower, green and red peppers, spinach, cabbage, turnip greens, sweet or white potatoes, and tomatoes are also good sources of vitamin C.

The best food sources of vitamin C are **uncooked or raw fruits and vegetables, as it is destroyed by cooking and heat.** Lightly steaming your vegetables will lessen nutrient loss.

Please refer to 'Nutrition Sources' at the end of this report for suggested vitamin C food sources.

Supplement Recommendations

Based on your genetic profile, you do not require supplementation.

Vitamin D

Vitamin D is a fat-soluble vitamin that is critical to bone and muscle health, and healthy functioning of immune, endocrine and cardiovascular systems. Your body synthesises vitamin D in the skin with exposure to UVB rays from sunlight. There is a steady increase in cases of severe vitamin D deficiency in developed countries, mainly due to sun protection measures. Other factors contributing to vitamin D deficiency include environmental conditions (air pollution, geographical locations), as well as dark skin, older age, obesity, and genetic variations.

The RDA for adults is 5 micrograms. It increases to 10 micrograms for those above 50 years old, and further increases to 15 micrograms for those above 70 years old.

Genes Tested

CYP2R1, FAM155A, GC, MKLN1, MTMR4, NADSYN1, NPY, PAX3, ST6GALNAC3, VDAC1P12 (52)...

Your percentile score

Your score falls within the 60th percentile of the population.

Assessment Summary

SLIGHTLY HIGH RISK

You have a genetic predisposition for slight deficiency.

Dietary Recommendations

Vitamin D is naturally present in very few foods. **Oily fish, such as tuna, mackerel, trout, herring, sardines, cod, anchovies and carp** are one of the best sources of this vitamin. Vitamin D can also be found in **beef liver, cheese, egg yolks, and some mushrooms.**

Vitamin D fortified foods include milk, soya milk, ready-to-eat-cereals and margarine. It is best to get all your vitamin D from your diet and sun exposure.

Please refer to 'Nutrition Sources' at the end of this report for suggested vitamin D food sources.

Supplement Recommendations

If you need to avoid sun exposure, cannot get enough sunlight, or are elderly, you can boost your vitamin D levels via supplementation. It is best to supplement under the supervision of your health care professional.

Supplemental vitamin D comes in two forms- ergocalciferol (vitamin D2) and cholecalciferol (vitamin D3). As vitamin D3 is the active form, look for a

supplement that contains this form.

Most people absorb vitamin D easily. It may be taken any time during during the day, with or without food. You can confirm vitamin D deficiency through a 25-hydroxy vitamin D test.

Note on sun exposure: Your body makes vitamin D when exposed to the sun's UVB rays. Try to let the sun shine on your bare arms and legs without sunscreen twice weekly. The best time to do so is between 10am and 3 pm, for about 5 to 30 minutes. A good indication of enough sun exposure is when your skin turns a slight shade of pink. If you have darker skin, you will need greater sun exposure.

For the elderly, the recommended sun exposure may not be sufficient since ageing reduces the skin's ability to convert sunlight into vitamin D efficiently. Being outdoors, and under sun exposure, (using proper precautions), is very important as vitamin D is activated under UV light.

You should always consult with a physician or other healthcare provider before making any significant changes to your diet and lifestyle.

Vitamin K

Vitamin K (including vitamin K1, phytonadione, and K2, menaquinone), is a group of fat-soluble vitamins that is essential for promoting healthy blood clotting and healthy bones. Low vitamin K intake increases the risk of excessive bleeding, mineralization of blood vessels, and risk of osteoporosis and fractures. Genetic variations contribute to vitamin K imbalance.

There is no fixed RDA, however, 120 micrograms and 90 micrograms for men and women respectively is considered adequate.

Genes Tested

CTNAA2, KCNK9, CDO1, CYP4F2, ZNF259

Your percentile score

Your score falls within the 45th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score falls within the normal range.

Dietary Recommendations

Based on your genetic profile, you should be able to maintain a healthy vitamin K level through your diet.

Green leafy vegetables such as spinach, kale, broccoli, lettuce, Swiss chard and parsley are a good source of vitamin K1, with one cup of kale providing over 1,000 micrograms of vitamin K, approximately ten times the recommended minimum daily amount. Vitamin K rich fruits include kiwifruit, blueberries, prunes, figs, and grapes.

Absorption of vitamin K1 is greater when consumed with a little bit of fat, such as vegetable oil, (e.g. extra virgin olive oil, canola oil).

Fermented dairy products, such as yogurt and cheese, and fermented soy (miso paste and natto), provide vitamin K2, which is especially helpful in increasing bone density and reducing the risk of fractures.

Animal sources of vitamin K include chicken, eggs, beef, lamb, shrimp, sardines, tuna, and salmon.

Vitamin K is fairly stable as it is not destroyed by usual cooking methods or lost in cooking water.

Please refer to 'Nutrition Sources' at the end of this report for suggested vitamin K food sources.

Supplement Recommendations

Based on your genetic profile, you do not require supplementation.

Calcium

Calcium is an essential mineral, and a major constituent of bones and teeth. It plays a central role in healthy functioning of your nervous system, controls muscle contraction, and secretion of hormones, such as insulin. Our bodies do not produce calcium, hence we must get it through dietary sources. Calcium deficiency may result in bone loss and osteoporosis. Genetic variations in several key genes have been found to be associated with lower levels of calcium.

The RDA for adults is 1,000mg per day. It increases to 1,200mg per day for those over 50 years old. Other factors that may increase your chances of calcium deficiency include excessive alcohol consumption, premenstrual symptoms, vitamin D deficiency and magnesium deficiency.

Genes Tested

ARID1B, CD109, CYP24A1, DGKD, GATA3, GCKR, KNOP1P1, PRDM9, PTPRN2, WDR81 (43)...

Your percentile score

Your score falls within the 20th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score falls within the normal range.

Dietary Recommendations

Maintain healthy calcium levels through your diet. **Milk and dairy products, fish with edible bones e.g. sardines and anchovies, beans and bean products, fortified soya milk, green leafy vegetables such as kai lan, chye sim, bok choy, calcium fortified cereals and bread** are good sources of calcium.

Combining foods containing calcium and vitamin D optimises calcium absorption. Some examples are vitamin D fortified cereal with calcium fortified soy milk, or calcium enriched bread with salmon.

Please refer to 'Nutrition Sources' at the end of this report for suggested calcium food sources.

Supplement Recommendations

Based on your genetic profile, you do not require supplementation.

Iron

Iron is an essential mineral, and a key component of hundreds of proteins, including oxygen-carrying hemoglobin in red blood cells, and myoglobin (found in muscle cells). Absorption, transport and storage of iron are tightly regulated as it is both essential, and potentially toxic. Iron deficiency is the most common nutrient deficiency in the world, leading to symptoms such as anemia, fatigue and palpitations. If you suffer from chronic infections, and often feel sluggish, weak, and unable to focus, insufficient iron levels may be a factor. Individuals following a vegetarian or vegan diet, and atheletes typically have higher iron requirements. Genetic variations in the transferrin, transferrin receptor, transmembrane protease (TMPRSS6) genes are associated with lower iron status.

RDA is 8mg for men. Women have a higher requirement, at 18mg for 19-50 years old, and 8mg for women 51 years and over.

Genes Tested

TF, TFR2, LOC100507006-LOC105374768, IGL, HFE, LOC102724653-IGLV4-60, TMPRSS6

Your percentile score

Your score falls within the 30th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score falls within the normal range.

Dietary Recommendations

Iron comes in two forms - heme iron from animal sources, and non-heme iron from plants. Heme iron is absorbed more readily than non-heme iron.

Foods high in iron include beef, poultry, oysters, fish and organ meats such as liver. Good sources of non-heme iron include beans, fortified cereals, spinach and other dark leafy greens.

Vitamin C enhances absorption of non-heme iron, while wholegrains, legumes and nuts inhibit absorption by around 50% due to their phytate content. Polyphenols in coffee and tea may also reduce absorption. Calcium reduces absorption of both heme and non-heme iron.

Optimise iron bioavailability from your diet by avoiding tea or coffee, and eating calcium rich foods together with iron rich meals. **Eating fruits and vegetables together with an iron rich meal will improve its absorption, as they contain vitamin C and organic acids.**

Please refer to 'Nutrition Sources' at the end of this report for more suggested iron food sources.

Supplement Recommendations

Based on your genetic profile, you do not need supplementation. Consider testing your iron levels if you follow a vegetarian or vegan diet, or often fall ill, feel weak or lethargic.

Magnesium

Magnesium is an essential mineral involved in numerous physiological processes including energy metabolism, functioning of nervous system, and blood pressure regulation. Magnesium is needed for strong bones and maintaining heart health.

Deficiency in this mineral may be a factor in constipation, tension or migraine headaches, anxiety, depression, chronic fatigue and premenstrual syndrome. Magnesium deficiency has been associated with higher risk of osteoporosis, hypertension, cardiovascular disease, insulin sensitivity.

Genetic variations in genes coding for mucins, shroom-related proteins, and TRPM6 have been associated with lower levels of magnesium. RDA is 420mg and 320mg for men and women respectively.

Genes Tested

ATP2B1, DCDC5, HOXD9, LUZP2, METTL21C, MUC1, RPL35AP8-VIPR1, SHROOM3, TRPM6, FGFR2 (12)...

Your percentile score

Your score falls within the 15th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score for magnesium balance falls within the normal range.

Dietary Recommendations

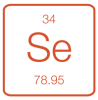
You should be able to maintain healthy magnesium levels through your diet. Some of the best sources of magnesium include **nuts (e.g. brazil nuts, almonds, cashews), seeds (e.g. pumpkin, sesame), avocados, oats and legumes**. In addition, bananas and dark chocolate are rich in magnesium.

Please refer to 'Nutrition Sources' at the end of this report for more suggested magnesium food sources.

Supplement Recommendations

Based on your genetic profile, you do not need supplementation.

Selenium



Selenium is an essential trace mineral that plays important role in healthy functioning of reproductive and immune systems, and thyroid gland. It is a powerful antioxidant, and acts in synergistically with vitamin C, vitamin E and glutathione. Selenium deficiency is more frequent in the parts of the world with low soil selenium levels, e.g. China, Korea, Finland.

Genetic variations have been found to be associated with lower levels of selenium. Factors that could increase your need for selenium include smoking, excessive alcohol consumption, rheumatoid arthritis, ulcerative colitis Crohn's disease.

RDA for adults is 55 micrograms.

Genes Tested

BHMT, CALCOCO1, CMYA5, CSMD1, DMGDH, HOXC13, KBTBD11, LPHN2, MYOM2, TTLL7 (20)...

Your percentile score

Your score falls within the 30th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score falls within the normal range.

Dietary Recommendations

You should be able to maintain your selenium requirements through your diet. **Organ meats, such as calf's liver, seafood, and muscle meats**are excellent sources of selenium.

As plant foods get their selenium from soil, plant based foods grown in selenium-rich soil have the most concentrated levels of this nutrient. As such, the selenium content of a food varies widely, as it depends so heavily on soil conditions.

Brazil nuts, mushrooms, particularly crimini and shiitake, are good plant sources of selenium.

Please refer to 'Nutrition Sources' at the end of this report for suggested selenium food sources.

Supplement Recommendations

Based on your genetic profile, you do not need supplementation.

Zinc

Zinc is needed for healthy immune system function, wound healing, cell division, and DNA synthesis. It supports normal growth and development, and is needed for smell and taste. Deficiency has been linked to impaired immune system function, increased colds and infections, diarrhea, loss of appetite, delayed wound healing, hair loss, impaired taste, and mental sluggishness. Several genetic variants have been associated with lower levels of zinc.

RDA for men and women is 11mg and 8mg respectively. Other factors that increase zinc requirements include vegetarian or vegan diet, pregnancy, lactation, excess alcohol consumption, sickle cell disease, gastrointestinal and digestive disorders (e.g. ulcerative colitis, Crohn's disease).

Genes Tested

CA1, FLRT2, FNTB, GALNT13, MEIS1-AS3, MIR4778, MT2A, PPCDC, SLC36A4, TMOD1 (48)...

Your percentile score

Your score falls within the 15th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score falls within the normal range.

Dietary Recommendations

You should be able to meet your daily zinc requirements through your diet.

Zinc from animal sources, e.g. meat, eggs, seafood, is more bioavailble than from plant foods, due to the presence of phytates, that inhibit absorption. As such, vegetarians and vegans are more prone to zinc deficiency. Improve your zinc levels by **eating more high protein foods.** Shellfish, beef, and lamb contain more zinc than fish. The dark meat of chicken contains more zinc than the light meat.

Other good sources include **nuts, seeds, whole grains, fortified cereals, legumes, and yeast.**

Please refer to 'Nutrition Sources' at the end of this report for suggested zinc food sources.

Supplement Recommendations

Based on your genetic profile, you do not need supplementation. You may want to consider supplementation if you follow a vegetarian or vegan diet, or are pregnant or lactating.

Take note that zinc can interact with several drugs such as antibiotics, penicillamine and diuretics, making them less effective.

You should always consult with a physician or other healthcare provider before making any significant changes to your diet and lifestyle.

CoQ10

Coenzyme Q10 (CoQ10) is found in every cell of your body. Especially high concentrations are found in organs with high energy requirements, such as the kidneys, liver, skeletal muscle and heart. CoQ10 provides energy to cells for growth and maintenance, and also protects them from free radical damage.

CoQ10 levels gradually decline with age. Variations in the NQO1 gene may result in inability to convert CoQ10 to ubiquinol, its active form. Individuals on medication to control high blood sugar or high cholesterol levels may have a greater need for CoQ10, as these medications block CoQ10 production.

Genes Tested

AGGF1, DCC, FST, HNF4A, NQO1, OLAH, PRMT8, SNRPCP13-ENPP7P11, BCR, COLEC12 (17)...

Your percentile score

Your score falls within the 75th percentile of the population.

Assessment Summary

SLIGHTLY HIGH RISK

You have a genetic predisposition for slight deficiency.

Dietary Recommendations

CoQ10 is naturally present in small amounts in a wide variety of foods. **Organ meats such as heart, liver, and kidney, as well as beef and fish contain high amounts of CoQ10.**

Other relatively rich sources include soybean and canola oils, and nuts. To maximise your CoQ10 intake from food, **braise, bake, boil or steam rather than fry.**

Please refer to 'Nutrition Sources' at the end of this report for suggested CoQ10 food sources.

Supplement Recommendations

The recommended adult dose for CoQ10 supplementation is 30mg-200mg daily, which is considerably higher than average dietary intake. Higher doses may be recommended for specific conditions

Look for the ubiquinol form of CoQ10, as this is the most bioavailable. CoQ10 is fat soluble, and is best taken with a meal containing fat to optimise absorption.

CoQ10 may reduce the body's response to blood thinners, e.g. warfarin, and

decrease insulin requirements in diabetics. Consult your physician if you are taking these medications.

Glutathione

Glutathione is produced naturally by the liver, and is known as the master antioxidant. It is involved in detoxification, healthy immune system function, tissue building and repair,and nutrient metabolism. It works together with and regenerates other antioxidants, such as vitamins C, vitamin E, selenium and carotenoids, enhancing their ability to protect against oxidative stress caused by free radicals, toxins, pollutants and pharmaceutical drugs.

Genetic variations in key enzymes are associated with glutathione deficiency, which contributes to free radical damage.

Genes Tested

DPM3, GCKR, GGT1, GSTT1, GSTT2B, MICAL3, OAS1, PKN2, SLC2A2, TBL2 (48)...

Your percentile score

Your score falls within the 55th percentile of the population.

Assessment Summary

SLIGHTLY HIGH RISK

You have a genetic predisposition for slight deficiency.

Dietary Recommendations

Glutathione is readily absorbed from food. Cooking greatly reduces glutathione content. Fresh, raw meat, eggs and organs are excellent sources of glutathione, but as we usually don't consume these foods raw, our best dietary sources are **fresh and frozen fruits and vegetables, such as asparagus, avocadoes, asparagus, squash, okra, cauliflower, broccoli, potatoes, spinach, walnuts, garlic, and tomatoes.**

Eating high protein foods such as beef, poultry, fish, cheese, tofu, legumes will also boost your glutathione levels, as they provide the amino acids required to make glutathione.

Studies show that **cruciferous vegetables, e.g. cauliflower, cabbage, watercress, bok choy, broccoli** can induce, or 'turn on' genes required to code for glutathione.

Please refer to 'Nutrition Sources' at the end of this report for suggested glutathione food sources.

Supplement Recommendations

Supplements in the form of L-glutathione are digested before they can be absorbed, hence are ineffective. Opt for more bioavailable forms such as **acetyl glutathione, liposomal glutathione, or in tri-peptide form.**

Alternatively, increase your glutathione levels by **supplementing with glutathione precursors such as cystine and N-acetyl-L-cysteine (NAC) , as well as vitamin C, selenium, vitamin B2 and vitamin B3.**

Undenatured whey protein is one of the best precursors for glutathione. Look for one that is from rGBH (Rcombinant Growth Hormone) free, grass fed cows.

You should always consult with a physician or other healthcare provider before making any significant changes to your diet and lifestyle.

Monounsaturated Fats

Monounsaturated fatty acids such as omega-7 (e.g. palmitoleic acid from macadamia nuts), and omega-9 (e.g. oleic acid from olive oil), have many health benefits. They are known for their anti-inflammatory properties, lower triglycerides and blood pressure, and support heart health. Good quality monounsaturated fats are also wonderful for your skin as they keep the epidermis hydrated, and supply ceramides and fats that are essential for healthy skin and hair.

Genes Tested

C6orf167, FAM13C1, HIF1AN, CSMD1, FADS1, FADS2, TEK, PHB2, LRCH1, GCKR (46)...

Your percentile score

Your score falls within the 45th percentile of the population.

Assessment Summary

SLIGHTLY HIGH RISK

You have a genetic predisposition for slight deficiency.

Dietary Recommendations

Based on your genetic profile, you may get additional benefits from increasing your consumption of monounsaturated fats.

Monounsaturated fats are found in **olive and canola oils, avocado, nuts and seeds, e.g. walnuts, almonds, flaxseeds, chia seeds.**

Please refer to 'Diet Plans and Tips 1.4' at the end of this report for some tips to increase MUFAs in your diet.

Supplement Recommendations

Not applicable.

Polyunsaturated Fats

Polyunsaturated fats include omega-3 and omega-6 fatty acids. They are considered good fats due to their health benefits. They improve cholesterol profiles by lowering triglycerides, reduce blood pressure, improve blood vessel function, prevent irregular heart rhythms, reduce inflammation, and improve joint pain and stiffness. Omega-3 fats appear to be important for cognitive (brain memory and performance), and behavioral function. Along with omega-3 fats, omega-6 fats play a crucial role in brain function, and normal growth and development. Omega-6 fats help stimulate skin and hair growth, maintain bone health, regulate metabolism, and maintain the reproductive system.

Large scale studies have identified genetic variations in enzymes that interfere with metabolism of omega-3 and omega-6 fats.

Recent study highlights that adults in most regions of the world have a low to very low status of omega-3 fatty acids.

Genes Tested

BICC1-RN7SKP196, CEP120-HMGB3P17, CSMD1, FADS1, FADS2, FADS3, JMJD1C, MKI67-LINC01163, NTAN1, LCT (66)...

Your percentile score

Your score falls within the 5th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score falls within the normal range.

Dietary Recommendations

Maintain a healthy balance between omega-3 and omega-6 fats by having adequate intake of omega-3 and omega-6 fats, while controlling for your intake of fats from fried and processed foods.

The main omega-3 fatty acids are eicosapentenoic acid (EPA) and docosahexaenoic acid (DHA), which are found in oily fish such as anchovies, herring, salmon, sardines, mackerel, trout and tuna.

Aim to eat two to three 150g serves of oily fish a week. You can further boost your omega 3 with fortified foods such as eggs, milk or soya milk.

Alpha linolenic acid (ALA) is an omega-3 fatty found exclusively in plant sources such as **walnuts, flaxseeds, sunflower seeds, and canola oil.**

Please refer to Nutrition Sources at the end of this report for suggested food sources of omega-3 fats.

Supplement Recommendations

Consider supplementation if you do not consume much oily fish. Opt for fish oils that are molecularly distilled, as these have been filtered to remove heavy metals such as mercury, lead and cadmium.

Supplementing with flaxseed oil will also boost your omega-3 levels.

You should always consult with a physician or other healthcare provider before making any significant changes to your diet and lifestyle.

Impaired Caffeine Metabolism

Caffeine is the most widely used mood-altering drug in the world as acts as a central nervous system stimulant. It is most commonly consumed through coffee or tea, as well as from various foods and drinks containing products derived from the kola nut.

Genetic variants in the enzyme responsible for metabolising coffee result in slower caffiene metabolism. Individuals with this genetic variation may experience restlessness, heart palpitations and insomnia.

Genes Tested

AHR, CLK3, CYP1A1, CYP2A6, MTUS2, NEDD4L, PRIMA1, ARID3B, NUMBL, GCKR (167)...

Your percentile score

Your score falls within the 40th percentile of the population.

Assessment Summary

NORMAL

Your predisposition score indicates that you are a fast metaboliser of caffeine, and should not experience any negative side effects from consuming caffeine.

Dietary Recommendations

Up to 400mg of caffeine a day appears to be safe for most healthy adults. Keep track of your caffeine consumption to ensure that you stay within healthy levels.

Please refer to 'Nutrition Sources' at the end of this report for sources of caffeine.

Supplement Recommendations

Not applicable.

Sensitivity to Gluten

Gluten sensitivity is sometimes called non-celiac gluten sensitivity, to distinguish it from celiac disease, which is an autoimmune condition. After eating foods containing gluten, people with gluten sensitivity may experience abdominal pain, diarrhea or constipation, and bloating. Other possible symptoms include fatigue, headaches, joint pain, and skin rash. Individuals with certain genetic variations are more likely to have gluten sensitivity. Some people with this genetic predisposition may never develop any symptoms, while others may develop them later in life.

Genes Tested

CREB1, BTNL2, NOTCH4, HLA-DRA, C15orf32, KCNK10, TSN, ARMC9, GPR65

Your percentile score

Your score falls within the 10th percentile of the population.

Assessment Summary

NORMAL

Your predisposition score within the normal range. You do not have genetic variations known to be associated with gluten sensitivity. This does not exclude Celiac disease and conditions associated with gluten. Consult your doctor if you notice symptoms such as abdominal pain, diarrhoea, constipation or bloating after consuming gluten containing foods.

Dietary Recommendations

Based on your genetic profile, you do not need to avoid gluten in your diet.

Supplement Recommendations

Not applicable.

Sensitivity to Salt

Sodium, the primary element we get from salt, is essential for life. It is important for multiple body functions, from maintaining the proper balance of water and minerals, to conducting nerve impulses, and muscle contractions. Too much sodium in your diet can lead to fluid retention, and high blood pressure. If this becomes chronic, it can factor in heart disease, stroke, kidney disease and congestive heart failure.

Individuals vary considerably in their response to sodium intake, and salt-sensitivity (a measure of how your blood pressure responds to salt intake), is partly determined by genetics. People with genetic variations in some genes are found to be more sensitive to sodium.

Genes Tested

ALX4, ARSJ, CDCA7, CSMD1, FAM110B, IRAK1BP1, KCNQ1, NSUN3, PRMT6, RAB9BP1 (6)...

Your percentile score

Your score falls within the 5th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score for sodium sensitivity falls within the normal range.

Dietary Recommendations

It is still a good idea to watch how much salt you consume. To maintain healthy sodium levels, **minimise your intake of processed processed and prepared foods**, eat fresh rather than packaged meats, consume more fresh fruit and vegetables, and read food labels. Look for hidden salt in processed foods, bread, biscuits and pies.

Enhance flavour of foods by using sugar, honey, red dates, sesame oil, fresh herbs and spices such as onions, ginger, lemongrass, cloves, pepper, fresh chilli, parsley.

Cook with less salt, sauces such as soya sauces, stock cubes and seasoning powder. Avoid salt and soya sauce at the table. Limit salted and preserved foods such as luncheon meat, sausages, ham, salted eggs and ikan bilis (soak in water before using to reduce its salt content).

While eating out, request for gravies to be served at the side, or less salt in cooking. Leave out soup in noodles and reduce gravy on rice.

When shopping, read the Nutrition Fact food labels, and choose products with 5% Daily Value (DV) or less. A DV of 20% or more is high. Look for 'low sodium', 'reduced sodium' or 'no salt added'.

Supplement Recommendations

Not applicable.

Glucose Balance

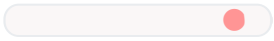
Glucose is the main source of energy for your body and brain. Its levels are tightly regulated, and low or high glucose levels may signal an underlying problem. Glucose levels are usually lowest in the morning, before the first meal of the day (fasting level), and are elevated for an hour or two after a meal.

Studies show that genetic variations are associated with higher levels of fasting glucose levels. Having a genetic predisposition to higher fasting levels of glucose is not indicative of a diabetic condition.

Genes Tested

ADRA2A, ARAP1, C2CD4B, CDKN2A, FADS1, LMO1, MADD, MTNR1B, PDK1, SLC30A8 (53)...

Your percentile score



Your score falls within the 85th percentile of the population.

Assessment Summary

HIGH RISK

Your genetic predisposition score falls within the potentially excessive range for blood sugar levels. This is not indicative of the presence of diabetes.

If you are overweight, have high blood cholesterol or cardiovascular disease, a history of gestational diabetes or have a first-degree relative with diabetes, screening for diabetes is recommended.

If test results are normal, monitor with repeat testing at least every three years.

Dietary Recommendations

Ensure healthy blood sugar levels by eating a **balanced diet, i.e. more whole foods than processed foods, maintaining a healthy weight, and avoiding excess alcohol consumption.**

Substitute refined carbohydrates such as white rice, white bread and sugars with brown rice, wholegrain bread and palm sugar.

Increase your fibre intake by eating more fresh vegetables, fruits and legumes.

Reducing your intake of saturated fats and trans fatsfound in meat (opt for lean meat, e.g. skinless chicken), processed meats, e.g. luncheon meat, pastries, and deep fried foods will help you manage your weight.

Grilling, stir-frying or steaming food, rather than deep-fryingwill also decrease your fat intake. Reducing portion sizes will also help to lower calorie intake.

Alcoholic drinks are often high in sugar, and weight gain is commonly associated with drinking. Avoid foods with a high sugar content, e.g. ice cream, sweets and sodas.

Look for low GI (Glycemic Index) foods to minimise spikes in blood glucose levels. Examples of low GI foods include apples, oranges, lentils, chick peas, sweet potato, low fat dairy products, wholegrain breads and cereals.

Supplement Recommendations

Cinnamon and turmeric have been shown to be beneficial for high blood glucose levels. Use these spices generously in your cooking, or take them as a tea.

The mineral chromium has shown some promising results in balancing blood sugar levels.

Impaired Satiety

Satiety refers to the physical sensation of fullness from eating. When satiety is normal, the brain receives a signal that enough calories have been consumed, reducing the feeling of hunger. People with certain genetic variations are more likely to be eat more without feeling full and satisfied.

Genes Tested

LEPR, LEPROT

Your percentile score

Your score falls within the 15th percentile of the population.

Assessment Summary

NORMAL

Your genetic predisposition score for this trait falls within the normal range.

Dietary Recommendations

There are no specific dietary recommendations, based on your genetic profile.

Supplement Recommendations

Not applicable.

Low-Carb Diet Effectiveness

Individuals with genetic variations in several genes associated with obesity, insulin sensitivity, and high levels of bad cholesterol (LDL), are more sensitive to carbohydrates in their diet. These people will benefit from a low carb diet (maximum 40% of daily calorie intake).

There are two major types of carbohydrates, refined (bad) and unrefined (good) carbs. Refined carbs include sugary foods and drinks, white bread, white rice and pasta. Unrefined carbohydrates are whole grains, and legumes, including brown rice, and whole wheat breads.

Genes Tested

LOC105370491, FGF21, TENM2, IZUMO1, LOC105377795, IRS1, TANK, AGTR2

Your percentile score

Your score falls within the 20th percentile of the population.

Assessment Summary

NORMAL

Your predisposition score falls within the normal range. A low-carb diet may not be of greater benefit to you compared to the average population.

Dietary Recommendations

There are no specific dietary recommendations based on your genetic profile.

Supplement Recommendations

Not applicable.

Low-Fat Diet Effectiveness

As the name implies, a low-fat diet restricts fat (particularly saturated fat) intake, while increasing protein intake. People with genetic variations in genes associated with sensitivity to fat are more responsive to low fat, high protein diets, if the goal is weight loss. A low fat diet recommends that fats comprise a maximum of 20% of your daily caloric intake (up to 12% monounsaturated fats). The remaining 80% of daily calories are comprised of carbohydrates and protein, with general recommendations to consume about 55-60% of carbs and 20-25% of proteins. If you are looking at building lean muscle mass, consider boosting protein intake to 40%, while decreasing carbohydrate intake to 40%.

Genes Tested

BECN1P2-LYPLA1P3, CLOCK, FNBP1, HNMT, OPRM1, PFKL, RARB, SOX5, TCF7L2, FGF21 (23)...

Your percentile score

Your score falls within the 10th percentile of the population.

Assessment Summary

NORMAL

Your predisposition score falls within the normal range. You are not likely to benefit more from a low-fat diet compared to the average population.

Dietary Recommendations

A low-fat diet restricts fat, saturated fat and cholesterol intake, resulting in lower caloric intake through fat. You can minimise your saturated fat intake by opting for lean cuts of meat such as chicken breast, eye of round steak, sirloin tip side steak, top round roast and steak.

Include reduced fat milk and dairy products. Limit foods that contain coconut milk or cream such as curries and some desserts, e.g. chendol, mango sticky rice with coconut cream.

Food preparation is important too.**Always trim away visible fat before cooking**. Grilling or broiling lean portions of chicken does not add any extra fat. Season food with herbs and spices such as ginger, garlic, lemongrass etc. These seasonings add plenty of flavor with minimal fat.

Stir fry vegetables in a non-stick pan instead of a wok, so as to lessen the amount of cooking oil needed. Coconut and olive oil are heathy options to cook with. When eating out, minimise or avoid gravy, sauces and fried sides, such as fried anchovies. Limit fried foods to an occasional splurge.

Please note that a low fat diet is not a no fat diet. Sufficient fat intake is essential to good health. Please refer to 'Diet Plans and Tips 1.1' at the end of this report for a suggested meal plan.

Supplement Recommendations

Not applicable.

Mediterranean Diet Effectiveness

The Mediterranean diet is known to have many health benefits. Rich in monounsaturated (good) fats, it reduces risk of heart disease, increases good cholesterol, and delays cognitive decline. It is also associated with longevity. People with certain genetic variations benefit greatly from the Mediterranean diet, which also helps to facilitate fat loss and improves metabolic health.

Genes Tested

TNF-a, TCF7L2, PPARγ2, TERC, FTO, APOE

Your percentile score

Your score falls within the 70th percentile of the population.

Assessment Summary

SLIGHTLY EFFECTIVE

Your genetic predisposition score indicates that you would respond slightly better to a Mediterranean diet than the average population. You would likely see more marked benefits in terms of weight loss and metabolic health.

Dietary Recommendations

The Mediterranean diet is a primarily plant based diet. **Whole grains, fresh fruits and vegetables, legumes, fish, seafood, herbs and spices are plentiful, with small amounts of lean meat and chicken.**

Eggs and dairy products are consumed in small amounts. Sweets are also minimal. Red wine is consumed with meals.

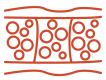
Monounsaturated fats, found in olive oil and nuts are heart protective.

Please refer to 'Diet Plans and Tips 1.2' at the end of this report for some tips to help you switch to a more Mediterranean way of eating.

Supplement Recommendations

Not applicable.

Cellulite



Cellulite appears as lumps and dimples in the skin. These are caused by fat deposits that push through the connective tissue layer beneath the skin, causing the skin above it to pucker. Common names for cellulite include orange-peel skin or cottage-cheese skin. Cellulite affects both males and females, but it is more common in females due to the specific distribution of fat, muscle, and connective tissue. Between 80 and 90 percent of women may experience cellulite at some point in their lives. It usually appears on the buttocks and thighs but can also occur on other areas of the body.

Some genes are found to elevate the risk of developing cellulite.

Genes Tested

HIF1A, ACE

Your percentile score

Your score falls within the 10th percentile of the population.

Assessment Summary

SLIGHTLY HIGH RISK

Your genetic variations may result in slightly higher risk of developing cellulite.

Skincare Recommendations

There are body creams on the market that claim to reduce cellulite. Many of them contain ingredients intended to promote fat breakdown, such as caffeine, aminophylline, theophylline.

Some evidence suggests that retinol cream can help with cellulite. Twice-daily application of a 0.3% retinol cream for 6 months can thicken your skin and reduce the appearance of cellulite.

Dietary Recommendations

Maintaining a healthy weight range and staying well hydrated is the key to prevent cellulite. You may want to increase uptake of food with high fiber content. Drink adequate water and have moderate amount of fats, carbohydrates, and salt in your food.

Foods rich in fibers include banana, figs, broccoli, cereal, beans. Cook with less salt and sauces such as soya sauces, stock cubes and seasoning powder. Avoid salt and soya sauce at the table. Limit salted and preserved foods such as luncheon meat, sausages, ham, salted eggs and ikan bilis (soak in water before using to reduce its salt content). While eating out, request for gravies to be served on the side, or less salt in cooking. Leave out soup in noodles and reduce gravy on rice.

Drinking water may help with cellulite. Not only does it keep you hydrated, it also helps remove toxins and encourage circulation and lymphatic flow.

Lifestyle Recommendations

As cellulite formation is caused by fat deposits under the skin, keeping your weight in a healthy range through regular exercise is the best way to prevent cellulite.

Rather than focusing on one type of exercise, aim for a regular workout routine that combines aerobic exercises (such as swimming, hiking, running and cycling) and strength training. Aerobic activities help burn fat, while strength training build muscles. Lift weights at least 2 days a week. Focus on your legs, hips, and backside. Strong, defined muscles under a thinner fat layer will make your skin smoother and less puckered.

Studies have show that lymphatic drainage massage - a type of massage that uses light pressure to help the lymphatic system drain fluids, debris, and toxins - are effective in decreasing fat and the circumference of the thigh where the massage was performed.

Compression garments are sometimes used to reduce the appearance of cellulite. These garments work by compressing arteries and increasing blood and lymph flow to reduce visible cellulite.

Stretch Marks

As the body grows, collagen and elastin, which are the connecting fibers in the dermis layer of the skin, slowly stretch to accommodate the increase in body volume. However, when there is large change in body size, for example during pregnancy, sudden weight gain and weight loss, bodybuilding, or puberty, stretching of the skin can cause the dermis to tear, allowing deeper layers of skin to show through, forming stretch marks. If one has insufficient collagen in the skin, the risk of developing stretch marks increases.

Stretch marks come in different colors, ranging from from red or pink to purplish-blue to thinner, pale, more scar-like streaks over time. They can occur on a range of body areas, including the stomach, thighs, hips, breasts, upper arms, and lower back. They can often fade over time without treatment and do not pose any health risks.

Over 50 percent of women experience stretch marks during pregnancy. For women who develop stretch marks during pregnancy, these usually become less noticeable around 6 to 12 months after giving birth.

Genes Tested

HMCN1, NPIPL2, SRPX, PNPLA1, TMEM18, FN1, ELN

Your percentile score

Your score falls within the 5th percentile of the population.

Assessment Summary

NORMAL

You do not have an elevated genetic risk of developing stretch marks.

Skincare Recommendations

If you develop stretch marks, products containing hyaluronic acid and retinoid cream derived from vitamin A (e.g. tretnoin) seem to be effective in making them less noticeable. Hyaluronic acid improves skin elasticity and hydration while retinoid creams works by increasing cell turnover and collagen production.

If you are pregnant or breastfeeding, it is important to check with your doctor before treating stretch marks as some products may contain ingredients that can harm your baby.

Dietary Recommendations

To prevent stretch marks, it is important to ensure that you have adequate collagen in your skin. Collagen is made up of amino acid building blocks. A diet with protein-rich food supply the amino acids needed to produce collagen. Natural food sources with high protein content include beef,

chicken, fish, beans, eggs, and dairy products.

The process of building collagen also requires vitamin C, E, zinc and copper. Foods rich in vitamin C and E include citrus fruits, berries, guava, tomato, plums, dark green leavy vegetables, capsicum, broccoli and kiwi. Foods rich in zinc include shellfish, beans, nuts (such as pine nuts, peanuts, cashews and almonds) and milk.

Anthocyanins and phytoestrogens help strengthen collagen fibers. Foods rich in anthocyanins include purple or red fruits and berries, e.g. cherries, grapes, blackberries, blueberries, and colourful vegetables, such as beetroot, purple cabbage, and eggplant. Best food sources for phytoestrogens include flaxseed and soy products, such as tofu.

Lifestyle Recommendations

You do not have the genetic predisposition to develop stretch marks. Maintain a healthy weight and avoid fad diets or sudden weight changes.

Supplementing with a good antioxidant, such as vitamin C, can help preserve collagen levels by reducing free radical damage. Polypodium leucotomos (available in oral capsules), lutein, and hops extract (xanthohumol) have been shown to protect against the loss of collagen.

Dry Skin

Sufficient hydration is fundamental for healthy skin. Aquaporins, a family of integral cell membrane proteins, allow the movement of water and glycerol across the cell membrane, and play a central role in keeping our skin hydrated.

The expression of aquaporin channels in human skin is strongly affected by aging and chronic sun exposure, with levels significantly decreased in both, and may explain the higher incidence of skin dryness observed in older people and/or skin areas that have been chronically exposed to sunlight. Genetic variations in aquaporin genes result in their lower expression, leading to impairments in our skin's hydration capacity. Expression of up to six different aquaporins (AQP1, AQP3, AQP5, AQP7, AQP9 and AQP10) genes are found in human skin. Among these, AQP3 - the most well-studied aquaporin in mammalian skin - regulates skin hydration, elasticity, skin barrier recovery and wound healing.

Genes Tested

OLFM1, aquaporin3, FCN1

Your percentile score

Your score falls within the 40th percentile of the population.

Assessment Summary

SLIGHTLY HIGH RISK

You have genetic variation in the aquaporin gene that may impair your skin's moisturizing capacity, predispose you to dry, tight skin, and lower hydration capacity. Your skin may be prone to sensitivity and irritation. Depending on your age, skin care routine, as well as other environmental and genetic factors, these symptoms may be visible or not. In extreme cases, it may lead to dermatitis and very dry skin. It is important to keep your skin well hydrated, and support your skin's moisturizing capacity

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Skincare Recommendations

Products that contain **retinoic acid** effectively improve skin hydration levels, by increasing the expression of aquaporin.

Glycerin is another valuable ingredient to look out for, as it significantly improves hydration of the upper layers of the skin, and restores it's normal protective barrier function.

Cold pressed oils such as sweet almond, avocado, or coconut oil are effective in improving skin hydration levels, as they are more readily absorbed, and contain nourishing fatty acids.

Avoid products that contain parabens, synthetic dyes, phthalates, triclosan, and mineral oil, as these may impair skin hydration.

Use soap-free face and body cleansers, as they as gentler and less drying on skin. Look for products that contain **hyaluronic acid and ceramides**, as they help your skin retain moisture, resulting in better hydrated and smoother skin.

Dietary Recommendations

Electrolytes are salts and minerals in the body that among many things, help maintain your skin's hydration level. Sodium, potassium, chloride and bicarbonate are important electrolytes to help keep your skin hydrated.

Include more **green leafy vegetables, sweet potatoes, broccoli, tomatoes, raisins and bananas** as they are rich in these minerals and salts. Silica, found in **celery and cucumber**, is another mineral that improves skin hydration and elasticity.

Hyaluronic acid (HA) is useful for supporting and maintaining skin hydration due to its ability to hold water. Boost your levels of HA by **drinking bone broths, consuming more soy foods, such as tempeh and tofu, and starchy root vegetables, such as sweet potato, yam, and taro**.

Essential fatty acids such as those found in fish oils, evening primrose oil, and chia seeds, help to counter excessive moisture loss through the skin. You may consider Increasing your intake of essential fatty acids if you have dry, flaky, or inflamed skin

Lifestyle Recommendations

Water is essential for healthy skin. It helps transport oxygen and nutrients to your cells, and dissolves nutrients from the foods we eat, making them usable to the body.

Not drinking enough water is a common cause for dehydration, and dry, flaky skin. Ensure that you **drink at least 2 litres of filtered, plain water daily** to maintain optimal hydration levels.

Supplements containing **hyaluronic acid, essential fatty acids, and ceramides (wheat extract)** help boost skin hydration levels.

For best results, use an inside-outside approach, e.g. combining food and supplementation with focused skin care products.

You should always consult with a physician or other healthcare provider before making any significant changes to your diet and lifestyle.

Freckles

Freckles are tan or light brown spots that are made up of clusters of skin cells containing the pigment melanin. Sun exposure encourages melanocytes to produce melanin, which helps protect the skin from the sun's ultraviolet rays.

Most people with large numbers of freckles have fair skin. This is because even though they normally produce less melanin than those with darker skin, their melanocytes produce more melanin during sun exposure, forming clusters of freckles.

Freckles are not painful or harmful. Unlike moles, which are raised, freckles do not protrude from the skin. Some genes are related to higher incidents of freckles on the skin.

Genes Tested

AFG3L1P, AKAP1, ASIP, BNC2, HSPA12A, IRF4, MC1R, PPARGC1B, RAB11FIP2, TYR (3)...

Your percentile score

Your score falls within the 5th percentile of the population.

Assessment Summary

NORMAL

You have a normal genetic disposition towards freckle formation on your skin.

Skincare Recommendations

To protect against increased melanin production due to sun exposure, a good quality broad spectrum sunblock is essential. Choose one that is mineral based, e.g. contains zinc or titanium oxide, as these offer protection by reflecting UVA and UVB rays, rather than absorbing them, which is how chemical sunscreens (e.g. avobenzone, oxyebenzone) work. Apply sunscreen to bare skin at least 15 minutes before going outdoors and re-apply every two hours, and immediately after swimming or excessive sweating.

Consider skin care products that contain protective ingredients such as blueberry extract, retinol, antioxidants (e.g. vitamins C and E), and polyphenols (e.g. green, black, or white tea extract).

Dietary Recommendations

Based on your genetics, you are unlikely to develop freckles. Some people like their freckles and others, not as much. If you do develop freckles, note that it is challenging to change the appearance of freckle through natural means. However, foods rich in vitamin C may help in regulating melanin production by inhibiting tyrosinase, an enzyme that controls the production of melanin. Some examples of rich sources of vitamin C include citrus fruits, berries, tomato, dark leafy vegetables and kiwi.

Lifestyle Recommendations

Regardless of whether you have freckles, it is a good idea to wear sunscreen when you are outdoors. Sunscreens should have be SPF 30 or higher in order to offer adequate protection if you are frequently out in the sun.

Avoid prolonged exposure to the sun, especially between 10am - 4pm, when UV rays are at their strongest. Wear a hat and protective clothing when you are in the sun.

Premature Collagen Breakdown

Collagen is important for skin elasticity, which is the skin's ability to stretch and revert to its original form without developing wrinkles and imperfections. Your skin’s smoothness, firmness and elasticity depend on the balance between collagen synthesis and its breakdown. An increased collagen breakdown process (due to aging, environmental or genetic factors) results in lower collagen levels, premature wrinkles and skin imperfections.

Genes Tested

MMP13, MMP3, MMP, MMP-1, MMP-3, MMP12, DCUN1D5, WTAPP1

Your percentile score

Your score falls within the 25th percentile of the population.

Assessment Summary

NORMAL

You do not have genetic variations that lead to higher rates of collagen breakdown. Follow general recommendations for skin care and anti-aging strategies.

Skincare Recommendations

Aging and chronic exposure to UV light are important contributors to diminishing collagen levels.

Look for collagen enhancing ingredients in your skin care products, such as **vitamin C, retinol, glycolic acid and niacinamide**to maintain your skin's elasticity and tone.

Dietary Recommendations

Maintain skin elasticity and firmness with **polyphenol rich sources, such as grape seed extract, berries, red wine and green tea.**

Flaxseed, soy products and bean sprouts, all rich in phytoestrogens are excellent support for skin elasticity and firmness, and help prevent signs of premature skin aging.

Antioxidant rich foods, such as citrus fruits, berries, guava, tomato, kiwi and custard apple help prevent collagen damage and encourage healthy collagen production.

Lifestyle Recommendations

Exposure to ultraviolet (UV) radiation is a key factor in stimulating collagen

breakdown, **so limit your time in the sun, and protect your skin with daily application of a zinc or titanium based sunscreen, with minimum SPF30.**

Reduce or eliminate exposure to environmental factors that stimulate the synthesis of MMP. This includes chlorinated water, smoking and anything that causes irritation, inflammation and production of free radicals.

Youthful Skin

As we age, we generally develop wrinkles, age spots and dryness. Our skin also becomes thinner and loses fat, making it less smooth, bouncy, and soft the touch. People who have youthfulness genes experience a much slower skin aging process, and look much younger as they age.

Genes Tested

DIAPH2, EDEM1, KCND2, MC1R, TRIM71, SOD2, CORO2A, CALN1, IRF4, DCC (38)...

Your percentile score

Your score falls within the 55th percentile of the population.

Assessment Summary

NORMAL

Your trait score falls within the average range of the population. No relevant SNPs are present. Hence, you have typical rate of aging. No known genetic variations that help to slow down your skin aging process have been found.

Skincare Recommendations

The key signs of skin aging are loss of skin tone (due to collagen breakdown), dryness, inflammation and pigmentation.

Minimise skin inflammation and dryness by keeping your skin well hydrated with products that contain hyaluronic acid, glycerin, or ceramides. These ingredients help hold moisture to your skin. Regular exfoliation will help regeneration of new skin cells. This helps your skin better absorb nourishing serums and moisturisers, and contributes to a smoother, brighter complexion.

Protect your skin from UV rays that cause premature aging by daily application of a **mineral based sunblock, with minimum SPF30.**

Dietary Recommendations

EGCG (epigallocatechin 3 gallate), found in **green tea, black tea, white tea, cocoa, dark chocolate, plums and apricots**, prevents collagen breakdown.

Collagen, the most abundant protein in the body, is responsible for skin elasticity, bounciness, and smoothness. Increasing your skin collagen levels is one of the best ways to prolonging skin youthfulness.

Consume more foods that are rich in nutrients that help build and strengthen collagen, such as **vitamin C, bone broth, anthocyanins, and phytoestrogens.**

Brightly coloured fruits and vegetables such as **citrus fruits, cherries, grapes, blackberries, blueberries, beetroot, purple cabbage, and eggplant**, are great source for vitamin C and anthocyanins. Soy products, such as **tofu and tempeh**, along with **flax seeds**, are good sources of phytoestrogens.

Lifestyle Recommendations

UV damage is the most important factor in skin aging. Ensure adequate sun protection, with a good broad spectrum sunblock, and wear a hat and cover up during prolonged sun exposure.

Supplement with a good antioxidant formulation that includes key ingredients such as, vitamin C, alpha lipoic acid, vitamin A (retinol), mixed carotenoids, tocopherol (vitamin E), and zinc.

Keep your skin well moisturised, and support your skin's detoxification processes by adding anti-oxidants to your diet.

Crow's Feet

Crow's feet are fine lines and wrinkles around the eye area. Our eyes are one of the first areas to show the signs of aging. The skin around the eyes is 40 percent thinner than that of the rest of our face, making it extra delicate. A combination of loss of skin elasticity and habitual skin movement are the main causes of crow's feet. In addition, sun damage, skin glycation, pollution, free oxygen radicals and hormonal changes could accelerate the appearance of fine lines and wrinkles.

Genes Tested

AHR, ELN, DCT

Your percentile score

Your score falls within the 70th percentile of the population.

Assessment Summary

SLIGHTLY HIGH RISK

You have a slightly higher genetic predisposition of developing crow's feet around your eyes.

Skincare Recommendations

Look for eye cream with ingredients that support collagen production, such as vitamin A (retinoid) and peptides. Collagen is a key protein layer underneath your skin which maintains its natural elasticity and youthfulness. Collagen production and turnover decreases with age, resulting in crow’s feet and fine lines. Vitamin A (retinoid) and peptides stimulate collagen production and helps restore skin elasticity.

Dietary Recommendations

As skin glycation increases skin aging, try to limit your sugar intake wherever possible. Glycation happens when excess sugar molecules within the bloodstream bind to collagen, thereby rendering it dysfunctional. Sugar also increases the risk of inflammation, which can cause the release MMP enzymes that break down collagen.

Increase intake of foods that are rich in healthy fats and antioxidants including vitamins C, E and A. Fatty fish (such as salmon and cod fish) and avocados are loaded with healthy fats that promote a dewier, more supple skin appearance.

Pomegranates, citrus fruits and berries contain rich sources of vitamin C, which revitalizes your skin cells and defends them from oxidating elements. Carotenoid-rich fruits and vegetables such as cantaloupes, apricots, carrots, sweet potatoes and spinach also boost your skin's health.

Vitamin E is one the most important antioxidant because it protects cell membranes and prevents damages to enzymes associated with them. Natural sources of vitamin E include vegetable oils such as sunflower oil, grains, oats, nuts, and dairy products.

Lifestyle Recommendations

Try to reduce your exposure to the sun's harmful ultraviolet (UV) rays which can cause photoaging. In addition to wearing sunscreen with SPF30 or higher, wearing a pair of UV-protecting shades whenever you are out in the sun is a good idea. Sunglasses do not only protect your eyes from UV damage, but also keep you from developing crow's feet due to excessive squinting. Maintain a healthy diet and drink plenty of water to improve skin hydration.

Sagging Eyelids

The skin around our eyes is 40 percent thinner than the rest of our face, making it more vulnerable and delicate to the effects of aging. Over time, the gradual loss of collagen's structural support under the skin cause eyelid to sag. This results in sleepy-looking eyes which can make an individual look older than they are. In severe cases, the sagging eyelid may obscure the field of vision. Studies showed that genetics may influence your chances of developing sagging eyelids.

Genes Tested

ATP8A1, COL1A2, DLGAP1, HOXD1, LOC285638, SFRP4, SMYD3, SNRPCP3-SIAH2, TSPAN8, ZNF385D (16)...

Your percentile score

Your score falls within the 15th percentile of the population.

Assessment Summary

NORMAL

You do not have a genetic predisposition towards sagging eyelids.

Skincare Recommendations

Look out for eye creams that include retinol, vitamin C, and peptides. These ingredients have been shown to be effective in stimulating collagen production via different cellular pathways.

Dietary Recommendations

Even though you are unlikely to develop sagging eyelids, it is important to maintain good health around the eye. Vitamin C is important in stimulating the production of collagen, which is a key structural protein that keep the skin plump and taut. Foods rich in vitamin C include citrus fruits, berries, guava, tomato, plums, apricots, capsicum, papaya, and dark green leafy vegetables.

Consuming more eggs, poultry, dairy products, oats, broccoli, brussel sprouts, onion, and garlic will boost your levels of collagen preserving amino acids, and help strengthen collagen fibers.

Lifestyle Recommendations

Exposure to the sun can cause the skin around your eyes to sag prematurely. In addition to wearing sunscreen with SPF30 or higher, it is a good idea to wear UV-blocking sunglasses whenever you are out in the sun.

If you do not get enough sleep, your eyes tend to look more be tired and droopy. Keep to a regular sleeping schedule and have adequate sleep

whenever possible so you feel refreshed and rested.

Smoking and excessive drinking also may cause premature collagen breakdown, making sagging eyelids more pronounced. It would be a good idea to refrain from smoking and limit alcohol intake.

Sagging Cheeks

Sagging of the cheeks and face are part of the natural aging process. As we age, weakening of the collagen and elastin layers causes skin to lose bounciness and plumpness. Moreover, the loss of facial fat can lead to a loss of cheek volume, making the cheeks sag downwards and form hollowness under the eyes.

Certain genetic variances have been found to increase the risk of sagging cheeks.

Genes Tested

NAT2, CYP1A1, MC1R

Your percentile score

Your score falls within the 45th percentile of the population.

Assessment Summary

SLIGHTLY HIGH RISK

Your genetic risk of developing sagging cheek is slightly higher than the normal range of the population.

Skincare Recommendations

Hyaluronic acid is a natural molecule that binds water to the collagen in your facial skin. Like collagen, hyaluronic acid breaks down over time, leaving your skin vulnerable to dehydration and sagging. Applying a moisturizer that contains hyaluronic acid daily can help rehydrate your skin, making it appear plumper and younger.

Skin care products that contain contain ginseng berry extract and polyphenols (e.g. green or black tea extract), grapeseed extract and resveratrol offer antioxidant, anti-inflammatory, and photoprotective benefits.

Vitamin A or retinol creams have been shown to help reduce wrinkles, tighten skin, and make skin damage less visible, while vitamin C and E serums work to tighten skin, reduce sun and age spots, and boost collagen production.

You can massage these products into your skin using an upward sweeping motion to enhance the uplifting effects and improve absorption.

Dietary Recommendations

As collagen is made up of amino acid building blocks, a diet with protein-rich food, whether from plant or animal sources, supply the amino acids needed to produce collagen. Natural food sources with high protein content include

beef, chicken, fish, beans, eggs and dairy products.

The process of building collagen also requires vitamin C, zinc and copper. You can get vitamin C from citrus fruits, berries, guava, tomato, plums, dark green leafy vegetables, apricots, capsicum, papaya, and kiwi. Food rich in minerals include shellfish, nuts, whole grains and beans.

Anthocyanins and phytoestrogens help strengthen collagen fibers. Foods rich in anthocyanins include purple or red fruits and berries (e.g. cherries, grapes, blackberries, blueberries) and colourful vegetables (e.g. beetroot, purple cabbage and eggplant). Best food sources for phytoestrogens include flaxseed and soy products, such as tofu.

Lifestyle Recommendations

Keeping your body properly hydrated will help your skin to maintain a youthful and plump appearance, as dehydration tend to make sagging skin look more wrinkled.

Supplementing with a good antioxidant, such as vitamin C, helps preserve collagen levels by reducing free radical damage. Polypodium leucotomos (available in oral capsules), lutein, and hops extract (xanthohumol) have been identified to protect against the loss of collagen.

Sun damage is a major cause of premature skin aging. Limit your time in the sun, especially between 10am to 4pm, when UVA rays are the strongest. Protect your skin from UV rays with daily application of a zinc- or titanium-based sunscreen with at least SPF30.

Smoking and excessive drinking may cause premature collagen breakdown, so it would be beneficial to quit smoking and limit alcohol drinks.

Antioxidant Deficiency

Our body produces antioxidants, enzymes that protect it from free radical damage. Free radicals are responsible for premature signs of skin aging. Increased amounts of free radicals start a dangerous chain reaction of damage to cellular DNA, skin proteins and lipids.

The key antioxidant enzymes our body produces are catalase and superoxide dismutase. These enzymes protect cells in the skin (as well as other tissues) from free radical damage, and are responsible for converting them into less harmful products. Those with genetic variations in the above enzymes have reduced protection from the harmful effects of superoxide radicals and hydrogen peroxide. This variation makes their skin cells more vulnerable to free radical damage.

Genes Tested

CAT, GPX1, NFE2L2, NQO1, SOD2, C16orf96, MYO3B, PCSK2, PKD2L1, RNF2 (3)...

Your percentile score

Your score falls within the 5th percentile of the population.

Assessment Summary

NORMAL

Your skin antioxidant genetic score is within typical for the population. Follow general recommendations for skin care that is rich with natural antioxidants that work together with your skin's intrinsic antioxidants.

Skincare Recommendations

Antioxidant-rich skin care products enhance the effect of your skin's own antioxidants. Ingredients to look out for include **alpha lipoic acid, vitamin C, vitamin E, and coQ10.** Green/black/white tea are abundant in free radical scavenging polyphenols.

Combining your antioxidant day cream with a **zinc or titanium based sunscreen** offers strong protection against premature signs of aging, such as wrinkles, pigmentation, and dull complexion. Using antioxidants in your night cream promotes cellular repair and healing.

Dietary Recommendations

Maintain optimal protection against free radical damage by including a wide variety of **antioxidant rich foods** in your diet, such as citrus fruits, grapes, berries, prunes, raisins, broccoli, cabbage, and coloured vegetables, such as capsicum, carrots and sweet potato.

Lifestyle Recommendations

Dried herbs and spices are a great source of antioxidants. Use generous amounts of garlic, clove, cinnamon, rosemary, thyme, and parsley in your cooking. Drinking herbal teas such as peppermint, sage and rosemary is also a great way to enhance antioxidant activity.

Skin Glycation

If glucose is not metabolised properly, collagen and elastin fibres in the skin can bind to excess sugar molecules. This results in the production of advanced glycation end products (AGEs), which results in skin inflammation, poor skin healing, loss of skin elasticity, and accelerated skin aging. Glycation has been described as caramelization (hardening) of the skin from the inside out. The skin-damaging effects of glycation causes wrinkles, dryness, skin laxity. Young skin has a network of supportive collagen fibres that lose their elasticity with age and as a result of glycation.

Some genetic variations are responsible for maintaining serum glucose levels, energy intake, and energy release, also controls glycation of the skin. Having variations in such genes can alter your body's ability to maintain normal glucose levels and interfere with energy metabolism, both of which lead to skin glycation.

Genes Tested

BCN2, IRF4, NAT2, RALY, SLC24A5, SLC45A2, SPATA33, TYR, PALLD, ZBTB38 (7)...

Your percentile score

Your score falls within the 40th percentile of the population.

Assessment Summary

SLIGHTLY HIGH RISK

Your genetic variations may result in higher levels of skin glycation. Glycation is the process of binding of excess glucose molecules with collagen fibres, which leads to the production of advanced glycation end products (AGEs).

Skincare Recommendations

Retinol based products help decrease the effects of AGEs.

Green tea, pomegranate and blueberry extract, niacinamide, and coenzyme Q10 are other key actives that show promising anti-glycation properties.

As skin glycation typically results in dehydrated skin with signs of inflammation, you would also benefit from products containing **hyaluronic acid, ceramides, and marine extracts, e.g. algae, kelp, collagen.**

Dietary Recommendations

Pyridoxine helps prevent the production of AGEs thereby reducing glycation, and preventing skin damage. A recent study found that thiamine to be one of the B vitamins blocks the production of free radicals by AGE molecules.

Food sources rich in pyridoxine include **chicken, fish roe, shellfish, fruits and vegetables with edible skin, for example, Tubers like sweet potatoes and beans**, are packed with B vitamins, that also help reduce glycation process.

Decrease your intake of sugar and simple carbohydrates and eat more low-glycaemic foods such as dark leafy greens, salmon, whole grains, green tea and fresh fruits.

Cinnamon, clove, ginger, garlic, oregano and allspice inhibit the production of AGEs.

Lifestyle Recommendations

Limit your sugar intake as sugar and protein molecules together form a harmful molecule called Advanced Glycation End Products or AGEs.

Eating too many sweets or sugary food can cause elevated blood sugar leading inflammation and cause to various conditions.

Drinking **green tea** has demonstrated strong anti-glycation properties as presence of catechins compound was reported to be present in green tea, which is an excellent source of many polyphenol antioxidants.

It was also reported in one the study green tea supplementation also reduced the accumulation of AGEs in case of high blood glucose levels.

UV Damage Risk

Photoaging describes damage to the skin due to ultraviolet radiation, and is a major contributor to premature aging. Extensive damage to the dermal connective tissue is a hallmark of photo aged skin. Disruption of the normal architecture of skin connective tissue impairs skin function and causes signs of aging, such as spider veins/broken blood vessel, pigmented spots, freckles, age spots, lentigines, an wrinkles around the eyes and mouth.

We report on genetic variations in the key genes that influence the extent of overall facial photoaging, combining pigmentation, sagging, and wrinkles. These genes strongly increase risk of photoaging, independent of age, BMI, skin colour, skin photo-type, menopausal status, smoking habits, and lifetime sun exposure.

Genes Tested

FBXO40, ID4-RPL29P17, IRF4, MC1R, NTM, RALY, STXBP5L, TYR, SLC45A2, PPARGC1B (13)...

Your percentile score

Your score falls within the 60th percentile of the population.

Assessment Summary

SLIGHTLY HIGH RISK

Your genetic variations may result in faster skin aging due to sun exposure.

Skincare Recommendations

A good quality **broad spectrum sunblock** is essential to protect against photoaging. Choose one that is mineral based, e.g. contains zinc or titanium oxide, as these offer protection by reflecting UVA and UVB rays, rather than absorbing them, which is how chemical sunscreens (e.g. avobenzone, oxyebenzone) work.

Look for skin care products that contain protective ingredients including **blueberry extract, retinol, antioxidants, such as vitamins C and E, and polyphenols, e.g. green/black/white tea extract.**

Dietary Recommendations

Photoaging is associated with poor defence against sun damage. **Vitamin C and E** offer protect the skin from sun damage. They help block both UVA and UVB rays, thereby reducing the effects of sun damage and photoaging. Foods rich in vitamin E include **nuts and seeds, e.g. almonds, peanuts, sunflower seeds, leafy greens, and oils, such as wheat germ and sunflower oil.**

Including more **antioxidants** in your diet will also help reduce the rate of photoaging. **Colourful fruits, such as berries, citrus fruits, kiwi and**

plums, dark green leafy vegetables, and dried herbs and spices are good sources of antioxidants.

Increase your intake of **photoprotective carotenoids**. Carotenoids are antioxidants that protect your skin from UV damage and premature aging. They are found in **red coloured fruits and vegetables, such as tomatoes, carrots, capsicum, and plum**.

Lifestyle Recommendations

Avoid prolonged exposure to the sun, especially between 10am - 4pm, when UV rays are at their strongest.

Wear a hat and protective clothing when you are in the sun. Daily application of a **mineral based sunscreen with minimum SPF30** will help minimise photoaging.

Sun Spots

Sun spots are characterized by an area of skin darkening, caused by the overproduction melanin. Melanin not only determines the colour of your skin, it also protects it from UV damage. Pigmentation commonly appears as skin ages, and tends to develop earlier, and be more pronounced in Asian, compared to Caucasian skin.

While there are no serious health impacts of sun spots, they do impact the evenness of one's complexion, and the youthful appearance of the skin. Genetic variations in certain genes have been found to be majorly associated with pigmentation in Asian population.

Genes Tested

IRF4, MC1R, NTM, RALY, SEC5L1, SLC45A2, TYR, AOAH, CADPS2, HERC2 (47)...

Your percentile score

Your score falls within the 30th percentile of the population.

Assessment Summary

NORMAL

Your skin pigmentation genetic score is within normal range of the population.

Skincare Recommendations

Exfoliate your skin regularly with mild chemical exfoliants, such as **alpha- or beta-hydroxy acids**, to brighten your complexion and reduce dead cell build-up.

Daily application of a **mineral based sunscreen with minimum SPF30**, and limiting your time in the sun, will help prevent pigmentation.

Dietary Recommendations

Ensure that you include a wide range of **carotenoids and antioxidants** in your diet. These nutrients help protect your skin from UV damage and premature aging.

Carotenoids are found in red coloured fruits and vegetables, such as **tomatoes, carrots, capsicum, and plum.**

Vitamins A, C and E are antioxidants that help with skin brightening and general skin health. Good food sources include **citrus fruits, green leafy vegetables, sweet potato, carrots, capsicum, papaya, and broccoli.**

Lifestyle Recommendations

Supplementation with **L-cysteine and vitamin C** boosts glutathione levels. Glutathione, the body's master antioxidant, helps reduce pigmentation.

Besides benefits to your overall health, exercise helps boost glutathione levels. Ensure **physical activity for at least 45 mins three times a week for best benefits.**

Wear a hat and cover up during prolonged sun exposure.

You should always consult with a physician or other healthcare provider before making any significant changes to your diet and lifestyle.

Impaired Detoxification

Our skin is the largest organ in the body. It is exposed to the elements, such as wind, pollution, UV radiation, and various environmental toxins, including bacteria, pollution, irritants, and chemicals in skin care products. Skin maintains a sophisticated system of fighting off these potentially damaging factors. If you have a genetic predisposition towards decreased skin detoxification capacity, your skin may not be able to eliminate these harmful agents as readily.

Genes Tested

ADORA2A-AS1, BCL11A, MFHAS1, MIR597, MOCS2, SGOL1, TBC1D22B, TGFB2, TNKS, UBE2E1 (209)...

Your percentile score

Your score falls within the 80th percentile of the population.

Assessment Summary

SLIGHTLY HIGH RISK

You have genetic variations that may compromise your levels of glutathione, and lower your skin's detoxification ability.

Skincare Recommendations

Minimise your exposure to excess toxins by using only **fragrance free, natural and/or organic skin care products.**

Facials improving skin oxygenation and incorporating **lymphatic massage** will enhance skin detoxification, as will **gentle exfoliation with an enzyme or alpha hydroxy acid (AHA) based product**.

Regular exfoliation unclogs pores, keeps your skin supple and allows better absorption of serums and moisturisers.

Dietary Recommendations

Red meat and organ meats (preferably organic) are the best dietary sources of glutathione.

Fresh fruit and vegetables, such as **spinach, potatoes, asparagus, avocado, squash, okra, cauliflower, broccoli, walnuts, garlic and tomato**, contain the highest glutathione per serving. Note that once cooked, glutathione levels are negligible.

Lifestyle Recommendations

Daily dry brushing your skin with a natural bristled brush helps

release toxins from the skin and clear away dead cells that may inhibit detoxification processes.

Water is the simplest, and one of the best tools for detxofication. **Drink at least eight glasses of filtered, plain water daily**, to assist detoxification.

Most oral glutathione supplements have shown poor absorption. However, there are other ways to boost glutathione levels, including supplementing with **alpha lipoic acid or whey protein** You should always consult with a physician or other healthcare provider before making any significant changes to your diet and lifestyle.

Whey protein from grass fed, hormone free cows contains all the key building blocks for glutathione production, and is possibly the best food source for boosting glutathione levels.

General Wrinkles

Wrinkles gradually appear on our skin as we age. The smooth, plump appearance of young, healthy skin is largely due to the presence of healthy collagen levels. Over time, the body's capability to produce collagen slows down, while the rate of collagen and elastin loss speeds up. As a result, the skin becomes thinner and less resistant to environmental damage. In addition, exposure to harmful UV rays and pollutants, poor hydration, and unhealthy lifestyle choices such as smoking can accelerate wrinkle formation.

Certain genes have been found to be associated with higher likelihood of developing wrinkles.

Genes Tested

BMP6, DUBR, HACD4, LINGO2, MMP-1, MMP-3, PPP2R1B, RIMS2, STXBP5L, SYNDIG1 (30)...

Your percentile score

Your score falls within the 15th percentile of the population.

Assessment Summary

NORMAL

You have average genetic risk of developing wrinkles. Follow general skin care recommendations, and ensure adequate sun protection and hydration to maintain youthful and healthy skin.

Skincare Recommendations

Skin care products that contain ginseng berry extract and polyphenols, (e.g. green or black tea extract), grapeseed extract and resveratrol offer antioxidant, anti-inflammatory, and photoprotective benefits that combat wrinkles.

Other ingredients to look out for include retinol (vitamin A), vitamins C & E, fucoidan (a complex polysaccharide that is found in many species of brown seaweed), and pomegranate seed.

Dietary Recommendations

Even if you don't have elevated risk of developing wrinkles, prevention is better than cure. It is never too early to start eating the right foods to boost collagen levels and prevent premature wrinkles.

Consuming eggs, poultry, dairy products, oats, broccoli, brussel sprouts, onion, and garlic will boost your levels of collagen-preserving amino acids, and help strengthen collagen fibers.

Including antioxidants in your diet will also help reduce the rate of photoaging and oxidation. Colourful fruits, such as berries, citrus fruits, kiwi

and plums, dark green leafy vegetables, and dried herbs and spices are good sources of antioxidants. Aim for a cup these fruits and vegetables a day. You can have them blended into a smoothie or tossed into a salad.

Having too much sugar in your diet sets off a process called glycation, producing advanced glycation end products (AGEs) which can accelerate wrinkles by breaking down collagen. AGEs have been linked to food preparation methods such as grilling and frying. It is a good idea to limit sugary foods and drinks and use healthier cooking methods (such as baking and boiling) to reduce AGEs formation.

Lifestyle Recommendations

Ultraviolet rays are the main culprit of most wrinkles on your face, neck, arms, and hands. Limit your time in the sun, especially between 10am to 4pm when UVA rays are the strongest, and protect your skin from UV rays with daily application of a zinc or titanium based sunscreen, with minimum SPF30.

Wear a hat that shields your face from the sun during long periods outdoors. When possible, wear long pants and long-sleeved shirts when you are adventuring outdoors to protect your body skin from harmful UV rays.

Smoking and excessive drinking may cause premature collagen breakdown, so it would be beneficial to quit smoking and limit alcohol drinks.

Impaired Skin Barrier Function

The skin's barrier is the first line of defence from external environment. It protects the skin, prevents entry of harmful pathogens and toxins, and helps to maintain proper skin hydration. Skin barrier function is performed primarily in the outermost layer of the epidermis called the stratum corneum (SC). The SC serves as a physical barrier, and helps regulate body temperature, as well as playing an important role in immune defence.

Some genetic variations are correlated with skin barrier defects, including skin sensitivity, skin irritation and eczema and allergies. Other genes play important roles in protecting the skin from environmental toxins.

Genes Tested

AK097288, AL833181, BCL11A, FST, ITGA1, ITGA2, MOCS2, NDUFS4, PELO, TBC1D22B (211)...

Your percentile score

Your score falls within the 55th percentile of the population.

Assessment Summary

SLIGHTLY HIGH RISK

Your skin barrier function may be compromised due to presence of genetic variations in the FLF gene. Genetic variations in the FLF gene are also associated with eczema and allergies, however, manifestation of these conditions involves other genetic and environmental factors. You are likely to have sensitive skin and be more susceptible to a compromised skin barrier, resulting in sensitivity to allergens as well as certain environmental pollutants and chemicals.

Skincare Recommendations

Use skin care products formulated for sensitive skin, ie. hypoallergenic, fragrance free, free from irritating chemicals. Try to use natural or organic products, to avoid exposure to synthetic chemicals.

Our customised serum includes an active botanical anti-inflammatory complex, that soothes itch, redness and skin dryness.

Dietary Recommendations

Dermal sensitivity is associated with increased inflammation, itch and redness. In order to decrease skin inflammation, you may want to try **excluding common allergic triggers, such as dairy, shellfish, and wheat.** Consider doing a comprehensive allergy test, to help you identify potential dietary triggers, if you experience chronic skin inflammation.

Increasing your intake of omega-3 fatty acids and probiotics may help decrease skin inflammation, and help with dryness and itch.

Omega-3 fatty acids aren't naturally produced by the body, so it is important to eat a variety of the following foods to boost levels of this nutrient. **omega-3 fatty acid sources include cold water fish (e.g. salmon and mackerel), flaxseed oil, chia seeds, walnuts and spinach.**

Probiotic promoting foods are usually fermented foods, such as curd, yogurt, kefir, kim chi, sauerkraut and miso paste.

Lifestyle Recommendations

As your skin is easily irritate, ensure that you **wear gloves when using detergents and chemicals.** Try to limit your exposure to chemicals by using natural detergents and housekeeping products where possible.

Excess environmental conditions may trigger skin irritation, eg. heat, dryness, cold, strong wind. Take note of what irritates your skin and avoid these conditions as much as you can.

Consider supplementing with a good **probiotic supplement** that contains a minimum of 20 billion CFUs.

Sun Sensitivity

Humans vary over 1000-fold in their sensitivity to the harmful effects of ultraviolet radiation. Skin pigmentation, tanning ability and sensitivity to sun are traits that are largely inherited. The main determinants of sensitivity to sun are related to melanin pigmentation, skin inflammation and repair processes. The NTM gene is strongly associated with skin sensitivity to sun but there is no association in either direction with tanning or sunburns. This observation suggests that there is a pigmentation-independent mechanism underlying sunburn reaction.

Genes Tested

IRF4, MC1R, NTM, TYR, AAR2, ASIP, BNC2, DBNDD1, DEF8, SPIRE2 (72)...

Your percentile score

Your score falls within the 10th percentile of the population.

Assessment Summary

NORMAL

You do not have genetic variations in the genes associated with increased skin sensitivity to sunlight.

Skincare Recommendations

Maintain your skin health and protect your skin from UV damage by daily application of a **mineral based sunscreen with minimum SPF30.**

Dietary Recommendations

Sun sensitivity is associated with poor intrinsic defence against sun damage. **Vitamin C, E and carotenoids** offer protection from UV damage.

Food sources rich in vitamin E include **nuts and seeds (e.g. almonds, peanuts, sunflower seeds), leafy greens, and oils, such as wheat germ and sunflower oil.**

Increase your intake of **citrus fruits, berries, guava, tomato, plums, green leafy vegetables, capsicum, papaya and kiwi** to boost your vitamin C levels.

Carotenoids are antioxidants that protect your skin from UV damage and premature aging. They are found in red coloured fruits and vegetables, such as **tomatoes, carrots, capsicum, and plum.**

Green tea is abundant in polyphenols, which are protective against UV radiation and signs of photoaging. Protective polyphenols can also be found in black and white teas, as well as **grape skin and red wine.**

Lifestyle Recommendations

Although you do not have the tendency for increased sun sensitivity, try to avoid spending time in the sun between 10am - 4pm, when UV rays are at their strongest. This will help prevent premature skin aging, UV damage, and pigmented spots.

Suggested Nutrient Sources

Nutrient	Food Source
Caffeine Metabolism 	1 cup coffee, long black, brewed = 145mg 30ml espresso = 87mg 1 cup coffee, black, instant = 77.3mg 1 tsp coffee powder, instant = 55.6mg 1 cup black tea, brewed = 47.5mg 1 cup green tea, brewed = 32.5mg 1 cup Coca-Cola = 26mg 1 tbsp cocoa powder = 10.8mg 1 square dark chocolate = 6.3mg 1 square milk chocolate = 1.4mg 1 cup herbal tea = 0mg *1 cup of liquid = 250ml *1 square of chocolate = 7g
CoQ10 	45g pork heart = 9mg 45g chicken liver = 5.6mg 45g beef heart = 5.1mg 90g beef, fried = 2.6mg 90g herring = 2.3mg 90g pork = 2.2mg 90g chicken, fried = 1.4mg 90g mackerel = 1.2mg 90g rainbow trout, steamed = 0.9mg 1 tbsp soybean oil = 1.3mg 1 tbsp canola oil = 1mg ½ cup soybean, boiled = 1.2mg 2 tbsp peanut, roasted = 0.8mg 2 tbsp sesame seed, roasted = 0.7mg 2 tbsp pistachio nuts, roasted = 0.6mg *90g portion of meat or fish is roughly the size of a deck of playing cards

Glutathione

90g veal cutlet = 21.5mg
90g pork chop, pan-fried = 21.2mg
90g ham, boiled = 21mg
90g beef, pan-fried = 12.1mg
90g chicken, with/without skin, fried = 11.8mg

½ cup asparagus, cooked = 28.3mg
½ avocado = 27.7mg
1 medium potato, with skin, boiled = 13.6mg
1 cup okra, cooked = 12mg
1 medium grapefruit = 10.3mg
1 cup papaya, pared = 9.6mg
1 cup broccoli, cooked = 9.1mg
1 medium red capsicum, raw = 8.3mg
1 medium tomato, raw = 6.8mg
1 cup cucumber, pared = 5.4mg
1 handful walnuts = 5mg
1 cup spinach, raw = 4.1mg

*90g portion of meat or fish = roughly the size of a deck of playing cards
*1 handful of nuts = 30g

Calcium

1 whole sardine fish, canned, with bones = 270mg
2 tbsp ikan bilis, with bones = 270mg

4 scoops milk powder, calcium-fortified = 500mg
1 cup soybean milk, calcium-fortified = 450mg
1 cup yoghurt, plain, low-fat = 415mg
1 cup milk, low-fat = 380mg
1 cup orange juice, calcium-fortified = 365mg
1 slice cheddar cheese = 303mg
½ cup tofu, made with calcium = 225mg
1 mug kai lan, cooked = 195mg
1 mug kale, cooked = 177mg
90g tau kwa = 150mg
1 mug spinach, cooked = 140mg
1 mug chye sim, cooked = 140mg
210g baked beans, canned = 110mg
2 slices bread, calcium-fortified = 100mg
1 handful almonds = 92mg
1 tbsp sesame seeds = 88mg
⅔ cup dhal, cooked = 85mg
1 tbsp chia seeds = 78mg
2 whole figs, dried = 65mg
1 mug broccoli, cooked = 50mg
¼ tsp basil, dried = 14mg
¼ tsp thyme, dried = 13mg
¼ tsp marjoram, dried = 11mg
¼ tsp sage, dried = 11mg

*1 cup of liquid = 250ml
*1 mug of cooked vegetables = 100g
*90g portion of tau kwa = roughly the size of a deck of playing cards

Iron

4 medium pacific oysters, raw = 10.2mg
45g pork liver, cooked = 8.1mg
45g chicken liver, cooked = 3.6mg
90g beef, cooked = 2.8mg
90g duck, without skin, roasted = 2.6mg
45g pork kidney, cooked = 2.4mg
90g lamb, cooked = 2.3mg
90g pork, cooked = 1.3mg
90g chicken, cooked = 1.2mg
90g tuna, canned = 1mg

1 cup baked beans = 5mg
¾ cup spinach, boiled = 3.6mg
¾ cup Swiss chard, boiled = 2.6mg
½ cup tofu = 2.4mg
¾ cup kale, cooked = 2.3mg
¾ cup chickpea, canned, boiled = 2.2mg
¾ cup lentil, boiled = 2mg
¾ cup kidney bean, boiled = 2mg
¾ cup broad bean, boiled = 2mg
½ cup apricot, dried = 1.6mg
1 large egg, boiled = 0.9mg
1 handful cashew nuts = 1.5mg
1 handful almonds = 1.1mg
1 handful walnuts = 0.8mg
1 medium potato, baked = 0.8mg

*90g portion of meat or fish = roughly the size of a deck of playing cards
*1 handful of nuts = 30g

Magnesium

90g Atlantic mackerel, grilled = 82.4mg
90g king mackerel, grilled = 40mg
90g salmon, grilled = 29mg

1 handful almonds, roasted = 81.5mg
1 handful cashew nuts, roasted = 76.1mg
½ cup black beans, cooked = 60mg
½ cup edamame, shelled, cooked = 50mg
2 tbsp peanut butter, smooth = 49mg
2 slices whole-wheat bread = 46mg
1 cup avocado, cubed = 44mg
1 medium potato, baked, with skin = 43mg
½ cup brown rice, cooked = 42mg
1 cup spinach, raw = 32mg
1 medium banana = 32mg
1 square dark chocolate = 8.4g

*90g portion of meat or fish = roughly the size of a deck of playing cards
*1 handful of nuts = 30g

Selenium

90g yellowfin tuna, cooked = 92mcg
10 small clams, steamed = 61mcg
90g shrimp, shelled, deveined = 52.9mcg
90g halibut, cooked = 47mcg
1 whole sardine fish, canned, with bones = 45mcg
90g ham, roasted = 42mcg
90g salmon, grilled = 39.8mcg
45g chicken liver, pan-fried = 38.8mcg
90g beef, roasted = 33mcg
90g turkey, roasted = 31mcg
90g chicken, roasted = 22mcg

1 large egg, boiled = 15mcg
1 cup cottage cheese, 1% fat = 20mcg
1 handful Brazil nuts = 544mcg
2 slices whole-wheat bread = 26mcg
1 cup mushroom, fresh = 13.6mcg
1 cup baked beans = 13mcg
½ cup brown rice, cooked = 5.9mcg

*90g portion of meat or fish = roughly the size of a deck of playing cards
*1 handful of nuts = 30g

Zinc

4 medium oysters, raw = 42.8mg
90g Alaskan king crab, cooked = 6.5mg
90g lobster, steamed = 4.7mg
90g beef, roasted = 3.8mg
90g blue crab, cooked = 3.2mg
90g pork chop, broiled = 1.9mg
90g turkey breast, roasted = 1.5mg
90g shrimp, cooked = 1.4mg

1 cup rolled oats, cooked = 2.3mg
¼ cup pumpkin seeds, roasted = 2.2mg
½ cup baked beans = 1.9mg
½ cup lentils, boiled = 1.3mg
1 handful peanuts, roasted = 0.8mg
1 handful walnuts, roasted = 0.8mg
1 handful cashew nuts, roasted = 1.7mg
1 handful almonds, roasted = 1.1mg
½ cup brown rice, cooked = 0.7mg
1 large egg = 0.6mg
½ cup kidney beans, canned = 0.6mg

*90g portion of meat or fish = roughly the size of a deck of playing cards
*1 handful of nuts = 30g

Polyunsaturated Fats

90g Atlantic salmon, farmed, grilled = 4.3g
90g Atlantic mackerel, grilled = 3.8g
1 whole sardine fish, canned, with bones = 1.7mg
90g rainbow trout, farmed, grilled = 1.6mg
90g swordfish, grilled = 1.2mg
100g tuna, canned = 0.8g

1 handful walnuts = 14.9g
1 tbsp sunflower oil = 10.4g
1 tbsp soybean oil = 7.5g
1 tbsp pine nuts = 5.8g
1 tbsp canola oil = 3.7g
1 tbsp chia seeds = 3.6g
1 tbsp sesame seeds = 2.7g
1 tbsp pumpkin seeds = 2.6g
1 tbsp flaxseeds = 1.5g
1 tbsp sunflower seeds = 1.4g

*90g portion of meat or fish = roughly the size of a deck of playing cards
*1 handful of nuts = 30g

Vitamin A

1 tbsp cod liver oil = 4080mcg
45g beef liver, pan-fried = 3291mcg
45g pork liver, braised = 2430mcg
90g bluefin tuna, grilled = 681mcg

1 medium sweet potato, with skin, baked = 1403mcg
½ cup spinach, boiled = 573mcg
½ cup carrot, raw = 459mcg
½ cup kale, cooked = 443mcg
½ cup butternut pumpkin, raw = 277.2mcg
1 cup ricotta cheese, skim = 266mcg
1 cup milk, vitamin A and D-fortified, skim = 149mcg
1 medium grapefruit = 143mcg
½ cup cantaloupe, raw = 135mcg
½ cup red capsicum, raw = 117mcg
1 medium mango = 112 mcg
1 wedge watermelon = 80mcg
1 large tomato, raw = 76.4mcg
1 large egg, hard-boiled = 75mcg
1 cup black-eyed peas, boiled = 66mcg
5 apricots, dried, sulphured = 63mcg
½ cup broccoli, boiled = 60mcg

*90g portion of meat or fish = roughly the size of a deck of playing cards

Vitamin B1

90g pork loin, grilled = 0.7mg
90g yellowfin tuna, baked = 0.56mg
90g trout, baked = 0.4mg
90g Atlantic salmon, grilled = 0.28mg
6 large mussels, cooked = 0.27mg
90g beef, grilled = 0.08mg

1 tsp nutritional yeast = 0.66mg
1 cup whole-wheat breakfast cereal, vitamin B-fortified = 0.61mg
1 handful sunflower seeds, roasted = 0.43mg
2 slices whole-wheat bread = 0.5mg
2 slices white bread, enriched = 0.3mg
1 cup butternut pumpkin, baked = 0.21mg
½ cup black beans, boiled = 0.21mg
½ cup green peas, boiled = 0.2mg
½ cup brown rice, cooked = 0.18mg
1 cup yoghurt, plain, low-fat = 0.13mg
1 handful pecans = 0.13mg
½ cup rolled oats, cooked = 0.08mg

*90g portion of meat or fish = roughly the size of a deck of playing cards
*1 handful of nuts or seeds = 30g

Vitamin B2

45g beef liver, pan-fried = 1.45mg
90g beef tenderloin, lean, grilled = 0.43mg
10 small clams, steamed = 0.4mg
90g pork tenderloin, lean, broiled = 0.32mg
90g chicken breast, without skin = 0.19mg
90g Atlantic salmon, grilled = 0.14mg
90g Atlantic cod, grilled = 0.07mg

1 tsp nutritional yeast = 2.4mg
1 cup whole-wheat breakfast cereal, vitamin B-fortified = 0.91mg
1 cup yoghurt, plain, low-fat = 0.85mg
1 cup milk, reduced fat = 0.55mg
1 cup portabella mushroom, grilled = 0.49mg
1 cup cottage cheese, low-fat = 0.46mg
2 slices wholemeal bread = 0.4mg
1 handful almonds = 0.32mg
2 slices white bread, enriched = 0.2mg
1 large egg, hard-boiled = 0.18mg
½ cup whole-wheat pasta, boiled = 0.12mg
½ cup quinoa, cooked = 0.11mg
1 cup kidney beans, canned = 0.11mg
1 handful sunflower seeds, roasted = 0.07mg
1 cup spinach, raw = 0.06mg
1 large apple, with skin = 0.05mg
1 large tomato, raw = 0.04mg

*90g portion of meat or fish = roughly the size of a deck of playing cards
*1 handful of nuts or seeds = 30g

Vitamin B_3

90g chicken breast, without skin, grilled = 12.1mg
90g tuna, light, canned in water = 12mg
45g beef liver, pan-fried = 7.5mg
90g Atlantic salmon, grilled = 7.2mg
90g pork tenderloin, roasted = 6.3mg
90g ground beef, lean, pan-fried = 6.2mg

1 tsp nutritional yeast = 14mg
2 slices wholemeal bread = 5.4mg
½ cup mushroom, cooked = 4.7mg
1 cup whole-wheat breakfast cereal, vitamin B-fortified = 4.3mg
1 handful of peanuts, roasted = 4.2mg
2 slices white bread, enriched = 3.6mg
½ cup brown rice, cooked = 2.9mg
1 California avocado = 2.6mg
1 medium russet potato, with skin, baked = 2.3mg
1 handful sunflower seeds, roasted = 2mg
1 handful pumpkin seeds, roasted = 1.3mg
½ cup lentils, boiled = 1mg
½ cup green peas, canned = 0.9mg
1 medium banana = 0.8mg
½ cup edamame, shelled, cooked = 0.7mg
½ cup raisin = 0.6mg
½ cup cherry tomato, raw = 0.5mg
½ cup broccoli, boiled = 0.4mg
1 handful cashew nuts, roasted = 0.4mg

*90g portion of meat or fish = roughly the size of a deck of playing cards
*1 handful of nuts or seeds = 30g

Vitamin B5

45g beef liver, boiled = 4.2g
90g chicken breast, without skin, roasted = 1.3mg
90g bluefin tuna, cooked = 1.2mg
90g ground beef, lean, broiled = 0.6mg
90g rainbow trout, grilled = 2mg
90g Atlantic salmon, grilled = 1.3mg

½ cup shiitake mushroom, cooked = 2.6mg
1 handful sunflower seeds = 2.4mg
1 California avocado = 2mg
1 cup milk, whole-fat/low-fat = 0.9mg
½ cup white button mushroom, stir-fried = 0.8mg
1 medium russet potato, with skin, baked = 0.7mg
1 large egg, hard-boiled = 0.7mg
½ cup broccoli, boiled = 0.5mg
½ cup chickpea, canned = 0.4mg
1 large whole-wheat pita = 0.5mg
1 handful peanuts, roasted = 0.5mg
1 cup yoghurt, plain, low-fat = 1.5mg
½ cup brown rice, cooked = 0.4mg
1 cup oats, cooked = 0.8mg
2 slices whole grain bread = 0.2mg
½ cup lentils, cooked = 0.6mg
1 medium sweet potato, with skin, baked = 1mg
½ cup cauliflower, boiled = 0.3mg
1 small ear corn, boiled = 0.7mg
1 medium tomato, raw = 0.1mg

*90g portion of meat or fish = roughly the size of a deck of playing cards
*1 handful of nuts or seeds = 30g

Vitamin B6

45g beef liver, pan-fried = 0.44mg
90g yellowfin tuna, grilled = 0.94mg
90g Atlantic salmon, grilled = 0.65mg
90g chicken breast, without skin, roasted = 0.54mg
90g ground beef, lean, broiled = 0.33mg

1 tsp nutritional yeast = 2.8mg
1 medium potato, with skin, baked = 0.54mg
1 cup whole-grain breakfast cereal, vitamin B-fortified = 0.45mg
1 medium banana = 0.43mg
½ cup bok choy, steamed = 0.24mg
1 handful pistachio nuts, roasted = 0.3mg
1 handful sunflower seeds = 0.23mg
1 handful hazelnuts, roasted = 0.2mg
1 cup milk, whole fat = 0.18mg
1 cup ricotta cheese, whole fat = 0.18 mg
1 handful peanuts, roasted = 0.18mg
½ cup brown rice, cooked = 0.15mg
½ cup chickpea, canned = 0.12mg
½ cup tofu, firm = 0.12mg
½ cup kale, cooked = 0.12mg
½ cup bulgur, cooked = 0.08mg
½ cup spinach, steamed = 0.08mg
1 slice cantaloupe = 0.06mg
¼ cup raisin = 0.05mg
1 slice papaya = 0.05mg

*90g portion of meat or fish = roughly the size of a deck of playing cards
*1 handful of nuts or seeds = 30g

Vitamin B7

45g chicken liver, cooked = 83.9mcg
45g beef liver, cooked = 18.7mcg
90g pink salmon, canned = 5.3mcg
90g pork chop, cooked = 4mcg
90g tuna, canned = 0.6mcg

1 large whole egg, hard-boiled = 10mcg
1 medium sweet potato, with skin, cooked = 5mcg
1 handful peanuts, roasted = 4.9mcg
1 cup carrot, raw = 4.8mcg
1 egg yolk, hard-boiled = 4.1mcg
1 handful sunflower seeds, roasted = 2.6mcg
1 egg white, hard-boiled = 2mcg
1 medium avocado = 2mcg
8 medium strawberries = 1.7mcg
1 handful almonds, roasted = 1.5mcg
1 medium tomato, raw = 1.1mcg
1 cup broccoli, raw = 0.9mcg
1 handful walnuts = 0.8mcg
1 tsp nutritional yeast = 0.7mcg
1 cup baby spinach, raw = 0.7mcg
2 dice-sized cubes of cheddar cheese = 0.4mcg
1 cup milk, reduced-fat = 0.3mg
1 handful raisins = 0.2mcg

*90g portion of meat or fish = roughly the size of a deck of playing cards
*1 handful of nuts or seeds = 30g
*2 dice-sized cubes of hard cheese = 20g

Vitamin B9

45g beef liver, braised = 108mcg
6 large mussels, steamed = 65mcg
90g halibut, cooked = 12mcg
90g ground beef, lean, cooked = 7mcg
90g chicken breast, roasted = 3mcg

1 tsp nutritional yeast = 300mcg
1 cup whole-wheat breakfast cereal, vitamin B-fortified = 198mcg
1 tsp nutritional yeast = 188mcg
½ cup lentils, boiled = 179mcg
1 medium Hass avocado = 143mcg
½ cup spinach, boiled = 131mcg
½ cup black-eyed peas, boiled = 105mcg
1 cup arugula, raw = 94mcg
4 spears asparagus, boiled = 89mcg
1 medium orange = 83mcg
½ cup Brussels sprout, boiled = 78mcg
½ cup Chinese cabbage, boiled = 77mcg
1 cup baby spinach, raw = 73mcg
1 cup kale, raw = 71mcg
1 handful sunflower seeds = 68mcg
1 cup romaine lettuce, raw = 64mcg
½ cup broccoli, cooked = 52mcg
½ cup mustard green, boiled = 52mcg
1 slice papaya = 48mcg
½ cup green pea, boiled = 47mcg
½ cup kidney bean, canned = 46mcg
2 slices wholegrain bread = 45mcg
½ cup bok choy, stir-fried = 39mcg
1 handful hazelnuts, blanched = 32mcg
1 handful walnuts = 28mcg
1 handful peanuts, roasted = 27mcg
1 slice cantaloupe = 26mcg
1 medium banana = 24mcg
1 large egg, hard-boiled = 22mcg
1 handful pistachio nuts, roasted = 15mcg
1 tbsp flaxseeds = 12mcg
1 cup milk, low-fat = 12mcg

*90g portion of meat or fish = roughly the size of a deck of playing cards
*1 handful of nuts or seeds = 30g

Vitamin B12

10 small clams, steamed = 89.1mcg
45g beef liver, pan-fried = 37.4mcg
4 medium pacific oysters, raw = 24.5mcg
6 large mussels, steamed = 20.4mcg
90g Atlantic/king mackerel, cooked = 16.7mcg
90g Alaskan king crab, steamed = 9.8mcg
90g sardine, with bones, canned = 7.7mcg
45g chicken liver, pan-fried = 7.5mcg
90g beef, lean, grilled = 5.3mcg
90g rainbow trout, grilled = 3.7mcg
90g Atlantic salmon, grilled = 2.6mcg
90g ground beef, lean, pan-browned = 2.4mcg
90g tuna, canned = 2.2mcg

1 tsp nutritional yeast = 6mcg
1 cup milk, reduced-fat = 1.6mcg
1 cup yoghurt, plain, low-fat = 1.2mcg
1 cup milo, vitamin B-fortified = 1mcg
1 cup almond milk, vitamin B-fortified = 1mcg
1 cup soy milk, vitamin B-fortified = 1mcg
2 dice-sized cubes Swiss cheese = 0.9mcg
1 large egg, hard-boiled = 0.7mcg
1 cup oat milk, vitamin B-fortified = 0.7mcg
1 cup non-dairy milk, fortified = 0.6 – 2.1mcg
2 dice-sized cubes feta cheese = 0.5mcg
2 dice-sized cubes brie cheese = 0.5mcg

*90g portion of meat or fish = roughly the size of a deck of playing cards
*2 dice-sized cubes of cheese = 20g

Vitamin C

1 medium yellow capsicum, raw = 219mg
½ cup guava = 188mg
1 medium red capsicum, raw = 152mg
1 cup orange juice, freshly-squeezed = 124mg
1 cup kale, raw = 107mg
1 medium green capsicum, raw = 96mg
1 slice papaya = 79mg
1 medium navel orange = 70mg
1 medium kiwi = 64mg
1 slice pineapple = 62mg
½ cup mustard spinach, boiled = 59mg
8 medium strawberries = 56mg
½ green chilli pepper, raw = 55mg
½ cup broccoli, cooked = 51mg
½ cup Brussels sprout, cooked = 48mg
8 lychees = 47mg
½ medium pink/red grapefruit = 46mg
½ red chilli pepper, raw = 32mg
½ cup cantaloupe = 29mg
½ cup white cabbage, boiled = 28mg
½ cup red cabbage, boiled = 26mg
1 medium mandarin orange = 24mg
1 medium potato, with skin, baked = 17mg
1 medium tomato, raw = 17mg
1 tsp lemon juice, freshly squeezed = 3mg

Vitamin D

1 tbsp cod liver oil = 34mcg / 1360 IU
90g Atlantic mackerel, raw = 17mcg / 680 IU
90g rainbow trout, grilled = 16.2mcg / 645 IU
90g swordfish, grilled = 14.9mcg / 596 IU
90g pink salmon, canned = 13mcg / 520 IU
90g Atlantic salmon, grilled = 11.8mcg / 472 IU
90g jack mackerel, grilled = 11.4mcg / 456 IU
90g Atlantic halibut, grilled = 5.2mcg /208 IU
90g bluefin tuna, raw = 5.1mcg / 204 IU
90g tuna, canned = 1.8mcg / 72 IU
90g yellowfin tuna, raw = 1.5mcg / 60 IU
2 whole sardines, with bones, canned = 1.4mcg / 56 IU
45g beef liver, pan-fried = 0.5mcg / 20 IU
90g tenderloin beef, 1/8-inch fat, broiled = 0.3mcg / 11 IU
90g chicken thigh, with skin, fried = 0.2mcg / 7 IU

½ cup portabella mushroom, treated with ultraviolet light, grilled = 8mcg / 320 IU
1 cup orange juice, vitamin D-fortified = 2.5mcg / 100 IU
1 cup almond milk, vitamin D-fortified = 2mcg / 80 IU
1 cup rice milk, vitamin D-fortified = 2mcg / 80 IU
4 scoops milk powder, full-fat, vitamin-D fortified = 1.9mcg / 76 IU
1 cup milk, low-fat, vitamin D-fortified = 1.8mcg / 72 IU
1 cup soy milk, vitamin D-fortified = 1.6mcg / 64 IU
1 cup oat milk, vitamin D-fortified = 1.3mcg / 52 IU
1 egg yolk = 1.1mcg / 44 IU

*90g portion of meat or fish = roughly the size of a deck of playing cards

Vitamin K

90g tuna, canned = 37mcg
90g chicken breast, roasted = 13mcg
90g ground beef, medium fat, broiled = 6mcg
45g beef liver, pan-fried = 2mcg
45g chicken liver, pan-fried = 6mcg

½ cup kale, cooked = 550mcg
½ cup collard green, frozen, boiled = 530mcg
½ cup spinach, cooked = 444mcg
½ cup turnip green, boiled = 426mcg
½ cup Swiss chard, cooked = 287mcg
½ cup parsley, raw = 246mcg
½ cup Brussels sprouts, cooked = 150mcg
1 cup spinach, raw = 145mcg
1 cup kale, raw = 113mcg
½ cup broccoli, boiled = 110mcg
1 tbsp natto = 100mcg
1 cup green leaf lettuce, cooked = 97mcg
1 cup watercress, raw = 85mcg
½ cup green cabbage, cooked = 82mcg
½ cup soybean, roasted = 43mcg
5 spears asparagus = 38mcg
1 medium kiwi = 31mcg
1 tbsp soybean oil = 25mcg
½ cup edamame, boiled = 21mcg
½ cup okra, raw = 16mcg
½ cup blueberries = 14mcg
½ cup grapes = 11mcg
1 tbsp canola oil = 10mcg
1 handful cashew, roasted = 10mcg
1 tbsp pine nuts = 5.4mcg

*90g portion of meat or fish = roughly the size of a deck of playing cards
*1 handful of nuts or seeds = 30g

Diet Plans & Tips

1.1 Low Fat Diet

LOW FAT DIET MEAL PLAN:

Breakfast

- 1 kale, tomato and poached egg on toast
- 1 cup of coffee with a splash of skim milk

Morning Snack

- 1 glass of banana and skim milk smoothie
- 1 tsp of ground flaxseeds

Lunch

- 1 bowl of summer vegetable salad
- 1 serve of oven-baked fish and chips

Afternoon Snack

- 7 cashews
- 1 apple

Dinner

- 1 bowl of stir-fried vegetables
- 1 palm-sized serve of ginger chicken stir-fry
- ½ bowl of rice

Evening Snack

- ½ cup of low-fat cottage cheese
- 1 peach

Daily Totals

- Energy: 1828 kcal
- Fat: 50.4 g (24.4%)
- Saturated fat: 9.4 g (4.6%)
- Carbohydrate: 216.6 g (47%)
- Fibre: 41.5 g (4.3%)
- Protein: 103.7 g (23.1%)

Tips for eating on a Low-Fat Omnivorous Diet:

- Limit total intake of fats and oils, especially saturated and trans fats. Choose beneficial monounsaturated and polyunsaturated fats
- Minimise the use of fats and oils when preparing meals at home. Use an oil spray to distribute oil over a larger surface on pans and baking sheets
- Trim off visible fat and skin when preparing meat for cooking. Drain and discard fat during the

cooking process

- Remove solidified fat from refrigerated soups, gravies and stews before reheating

Recommended:

- Cereals and grains
    - Noodle and pasta – opt for whole-grain
    - Oatmeal – opt for steel-cut oats, rolled oats
    - Chapati and thosai
    - Tortilla – opt for whole-wheat
    - English muffin and bagel – opt for whole-grain
    - Pita bread
    - Low-fat, plain crackers

  Fruits and vegetables
    - Fruits and vegetables are generally low-fat. See exceptions under Moderate

  Protein
    - White fish – e.g. haddock, cod, grouper, tilapia, snapper, red mullet, flounder, pollock, halibut, sea bass, sea bream
    - Seafood
    - Poultry – remove skin and trim off visible fat
    - Red meat – opt for grass fed and leaner cuts e.g. loin and round cuts
    - Ground meat – opt for lean ground meat (below 15% fat); generally more expensive than fattier ground meat
    - Beans
    - Lentils
    - Peas
    - Mushrooms
    - Soybeans and soy products – e.g. tofu, tempeh, edamame
    - Seitan
    - Eggs
    - Nutritional yeast
    - Spirulina

  Sauces and dressings
    - Lemon juice
    - Vinegar and vinaigrette
    - Low-fat yoghurt

  Dairy
    - Opt for skim, low-fat and reduced fat varieties

  Non-dairy milks
    - Almond, soy and rice milks have the lowest fat content

Moderate:

- Unsaturated fats

- Oils – e.g. olive, canola, avocado, sesame, grapeseed
- Nuts and non-hydrogenated nut butters – e.g. almond, peanut and cashew
- Seeds and non-hydrogenated seed butters – e.g. chia, flax, pumpkin and sunflower

High-fat fruits and vegetables

- Avocados, coconut and olives

Oily fish

- Salmon, tuna, sardine, herring, anchovies, swordfish, trout and mackerel

Limit:

- Processed food
    - Processed meat – e.g. bacon, sausages, ribs, spam
    - Convenience meals and fast food
    - Junk food and processed snack foods
    - Ice cream

Trans fats

- Commercial baked goods
- Stick margarine, vegetable shortening and coffee creamer
- Deep-fried food
- Partially-hydrogenated oils

Saturated fats

- Ghee, lard, palm oil and coconut oil
- Fatty cuts of meat – e.g. ribeye, short ribs, filet mignon, skirt steak, pork belly, pork shoulder flap, chicken thigh
- Full-fat dairy

Creamy sauces and dressings

- Mayonnaise, aioli, tartar sauce, hollandaise sauce, cream sauce, ranch dressing and other creamy salad dressings

When eating out:

- Thunder tea rice
    - Request for extra herbs and vegetables

Mixed vegetable rice/Teochew porridge

- Opt for steamed sliced meat, steamed fish, steamed eggs and vegetable dishes
- Remove skin from poultry and trim off any visible fat from meats
- Skip ikan bilis, fried shallots, minced meat, deep-fried items and dishes steeped in oil and gravy

Chicken rice

- Opt for steamed chicken breast and remove skin and visible fat from chicken
- Request for steamed plain rice instead of flavoured rice
- Request for extra cucumber slices or blanched vegetables

Yong tau foo

- Request for clear soup over curry soup and dry version ladened with sauces
- Select leafy vegetables, cruciferous vegetables, mushrooms, black fungus, stuffed vegetables, tofu, tau pok, tau kwa and other lean proteins
- Skip fried items
- Request for less oil if possible

Fish soup

- Opt for blanched fish slices over fried fish fillets
- Request for extra tofu and vegetables
- Skip evaporated milk and fried shallots

Indian

- Opt for dry dishes and tomato-based curries e.g. kebab, tandoori, and madras
- Remove skin from poultry and trim off any visible fat from meats
- Skip curries that contain cream and coconut milk e.g. korma, pasanda, rogan josh, tikka masala and saag paneer
- Order legume-based dishes e.g. dal, sambar and chana masala
- Opt for salads, chapati, thosai, idli and plain rice over rotis, naans and pilau rice
- Skip fried items e.g. pakora, samosa, gulab jamun and vada
- Limit coconut chutney

Malay

- Opt for assam-based dishes and dishes with less gravy and curry
- Mee siam, mee rebus, mee soto, nasi kerabu, kerabu salad, satays and ikan bakar are some good low-fat choices
- Remove skin from poultry and trim off any visible fat from meats
- Skip fried items e.g. begedil, curry puffs, goreng pisang, ayam goreng and ayam balado
- Limit dishes with coconut milk and sambal chilli

Thai

- Opt for steamed dishes, fresh salads, fresh summer rolls, larb gai, grilled lean proteins and sauteed vegetables
- Remove skin from poultry and trim off any visible fat from meats
- Choose tom yum soup and plain rice over curries with coconut milk and fried rice
- Skip fried dishes, coconut-based desserts and milky iced teas

Western

- Opt for fresh salads with vinaigrettes or non-creamy salad dressings over coleslaws
- Opt for clear or tomato-based soups e.g. minestra maritata, minestrone and tomato soup instead of creamy soups e.g. mushroom soup
- Select grilled, baked, pan-seared or roasted lean meat, poultry, fish and vegetables and plant proteins
- Choose tomato and olive oil-based pastas over pastas with white sauce
- Choose pizzas with tomato sauce over pizzas with white sauce
- Skip dishes rich in cream and cheese e.g. mac and cheese
- Skip fried items e.g. French fries, fried chicken, fish and chips
- Remove skin from poultry and trim off any visible fat from meats

Kopi stall

- Opt for half-boiled eggs and kaya toast. Request for no butter in toast
- Skip condensed milk and evaporated milk in drinks. Order kopi O and teh O instead

1.2 Mediterranean Diet

MEDITERRANEAN DIET MEAL PLAN:

Breakfast

- 1 serve of egg scramble sandwich
- 1 cup of coffee with no sugar/creamer

Morning Snack

- 1 glass of banana and soy milk smoothie
- 1 tsp of ground flaxseeds
- 6 almonds

Lunch

- 1 bowl of minestrone soup
- 1 bowl of pumpkin pasta

Afternoon Snack

- 5 baby carrots
-
- 1½ tbsp of hummus
- 1 small plum

Dinner

- 1 bowl of stir-fried vegetables
- 1 palm-sized serve of steamed fish with ginger
- ½ bowl of brown rice

Evening Snack

- ⅓ of an avocado
- 6 cashews

Daily Totals

- Energy: 1965 kcal
- Fat: 69.5 g (31.3%)
- Saturated fat: 10.4 g (4.7%)
- Carbohydrate: 213.5 g (42.7%)
- Fibre: 65.1 g (6.3%)
- Protein: 87.8 g (18.2%)

Tips for eating on a Mediterranean Omnivorous Diet:

- Main part of diet consists of plant-based whole foods e.g. whole grains, vegetables, fruits, nuts, seeds, legumes, herbs, spices and heart-healthy oils
- Incorporate eggs, dairy, poultry and fish occasionally
- Consume red meat sparingly

Recommended:

- Fruits and vegetables
  - 3 servings of fruit and at least 4 servings of vegetables per day
  - Eat a variety of different-coloured fruits and vegetables prepared both raw and cooked, to maximise amount of nutrients obtained

  Unrefined, whole-grain carbohydrates
  - Brown and multi-grain rice
  - Steel-cut oats
  - Brown rice bee hoon
  - Mung bean noodles
  - Whole-wheat pasta
  - Whole-wheat roti, thosai and chapati
  - Whole-grain bread

  Nuts and seeds
  - Eat them dry-roasted or even better, raw
  - Eat nuts with skin on for even more nutrients
  - Opt for unsalted and unsweetened varieties
  - Non-hydrogenated nut butters and seed butters are also rich in protein and good fats

  Legumes
  - At least 3 servings of legumes per day

  Herbs and spices
  - Use both dried and fresh liberally

  Heart-healthy oils
  - Olive oil
  - Avocado oil
  - Nut oils
  - Certain seed oils e.g. canola, soybean and sesame

  Sauces and dressings
  - Vinaigrettes
  - Olive oil
  - Lemon juice
  - Tahini
  - Hummus
  - Plain, Greek yoghurt

  Snacks
  - Dry-roasted nuts and seeds
  - Legumes
  - Fresh fruits and vegetables

  Eating out
  - Difficult to control type of cooking oil used
  - Select dishes cooked with minimal oil e.g. boiling, steaming, grilling, broiling, braising, roasting

or poaching
    - If possible, request for whole grains as main base of the meal instead of refined carbohydrates
    - Request to add more vegetables and legumes to meals

Moderate:

- Eggs
    - No more than 4 eggs per week and 3 yolks per week

  Dairy
    - Limit to occasionally
    - Choose plain, unsweetened varieties
    - Opt mainly for low-fat/skim versions and allow for one full-fat version per day

  Coconut
    - Opt for whole coconuts including flesh and pressed coconut cream, or virgin/extra virgin coconut oil

  Poultry
    - Limit to occasionally
    - Opt for lean breast meat
    - Remove skin and trim off any visible fat before cooking or eating

  Fish and seafood
    - 2 to 3 servings of fish and seafood per week
    - Opt for oily fish e.g. salmon, tuna, sardine, herring, anchovies, swordfish, trout and mackerel

  Alcohol
    - Red wine in moderation – no more than 2 half-glasses per day for men, no more than 1 half-glass per day for women

Little to none:

- Saturated fats
    - Red meat – opt for lean cuts e.g. loin and round, preferably grass-fed
    - Butter and ghee
    - Highly-processed coconut oil

  Added sugars
    - Table sugar
    - Honey
    - Maple syrup
    - High-fructose corn syrup

  Trans fats
    - Commercial baked goods
    - Stick margarine, vegetable shortening and coffee creamer
    - Deep-fried food
    - Partially-hydrogenated oils

Processed food

- Processed meat e.g. deli meats, ribs, sausages, spam, bacon, fish paste
- Convenience meals and fast food
- Junk food and processed snack foods

Alcohol

- Avoid all types of alcohol except red wine. See Moderate for advice on red wine

Eating out

- Difficult to control type of cooking oil used
- Avoid fried, pan-fried and stir-fried dishes
- Avoid refined carbohydrates

1.3 Low Carb Diet

LOW CARB DIET MEAL PLAN:

Breakfast

- 1 serve of herb omelette with fried tomatoes
- 1 cup of coffee with no sugar/creamer

Morning Snack

- 1 guava
- 6 Brazil nuts

Lunch

- 1 bowl of mushroom soup
- 1 bowl of spinach and kale salad
- 1 palm-size serve of garlic butter salmon

Afternoon Snack

- 1 handful of turnip fries
- 3 tbsp of plain Greek yoghurt
- 2 tsp sesame seeds

Dinner

- 1 serve of nasi ayam
- 1 serve of kangkong belacan

Evening Snack

- 1 index finger-sized piece of brie
- 1 pear

Daily Totals

- Energy: 1846 kcal
- Fat: 91.3 g (43.7%)
- Saturated fat: 28.6 g (13.7%)
- Carbohydrate: 136.2 g (28.9%)
- Fibre: 37.4 g (3.9%)
- Protein: 97.6 g (21.5%)

Tips for eating on a Low-Carb Omnivorous Diet:

- Eat whole fruits as fibre helps to slow down digestion. Limit intake of fruit juices, including freshly-squeezed
- Eat fruits together with a protein or fat e.g. nuts, seeds and dairy to slow down the absorption of fruit sugars

Recommended:

- Protein
    - Poultry – opt for skinless

- Fish – both oily and white
- Seafood
- Eggs
- Soybean and soy products – e.g. tofu, tempeh and edamame
- Nuts and non-hydrogenated nut butters – e.g. walnut, Brazil, macadamia, pecan
- Seeds and non-hydrogenated seed butters – e.g. sunflower, pumpkin, flax, sesame
- Seitan
- Mushrooms
- Nutritional yeast
- Low carb beans and peas – e.g. green beans, black soybeans, lupini beans, sugar snap peas, snow peas
- Spirulina

Healthy fat

- Oils – e.g. olive, avocado, sesame, sunflower, canola, safflower
- High fat fruits and vegetables e.g. olive, avocado

Fruits and vegetables

- Fruits high in water or fibre – e.g. watermelon, cantaloupe, peach, berries, citrus
- Non-starchy vegetables – e.g. bell peppers, cruciferous vegetables, zucchini, mushroom, tomato, leafy greens
- See Moderate for examples of fruits and vegetables with higher carbohydrate content

Salad dressings

- Olive oil, vinegar and yoghurt-based dressings

Non-dairy milks

- Almond, macadamia, soy, cashew, flax and pea milks have the lowest carbohydrate content

Moderate:

- Saturated fats
    - Red meat – opt for grass-fed
    - Plain, unsweetened dairy – opt for low-fat versions and keep to one full-fat version per day
    - Coconut – opt for whole coconuts including flesh and pressed coconut cream, or virgin/extra virgin coconut oil instead of processed coconut oil

Unrefined grains

- Brown and wild rice
- Whole-grain pasta
- Bulgur
- Buckwheat
- Quinoa
- Millet
- Rye bread

Fruits and vegetables

- High-carb fruits – e.g. banana, apple, grapes, cherries, mango
- Starchy vegetables – e.g. potato, sweet potato, yam, corn, beet

Legumes

- Lentils
- Most beans
- Most peas

Non-dairy milks

- Rice, oat and coconut milks have the highest carbohydrate content

Limit:

- Processed food

  - Processed meat – e.g. deli meats, sausages, spam, bacon, fish paste
  - Convenience meals and fast food
  - Junk food and processed snack foods
  - Sugary desserts

  ### Trans fats

  - Commercial baked goods
  - Stick margarine, vegetable shortening and coffee creamer
  - Deep-fried food
  - Partially-hydrogenated oils

  ### Refined grains and grain products

  - White rice
  - White bread
  - Pasta
  - Instant oatmeal
  - Sugary cereals

  ### Added sugars

  - Table sugar
  - Honey
  - Maple syrup
  - High-fructose corn syrup

  ### Beverages

  - Sweetened dairy
  - Sugar-sweetened sodas
  - Alcohol
  - Commercial low-fat salad dressings

When eating out:

- Chicken rice

  - Opt for steamed chicken breast
  - Request for extra vegetables
  - Limit rice
  - Request for brown rice if possible

  ### Mixed vegetable rice/Teochew porridge

- Opt for braised or lightly stir-fried meat and vegetables e.g. steamed minced pork, steamed egg, tofu, okra, pak choi and bitter gourd
- Skip sauce-laden items
- Limit rice, noodles and porridge
- Request for brown rice or whole-grain bee hoon if possible

Fish soup

- Opt for blanched fish slices over fried fish fillets
- Opt for clear soup instead of version with evaporated milk
- Request for more tofu and vegetables
- Limit rice and noodles
- Opt for brown rice if possible

Roast meat rice

- Opt for duck or roast pork
- Avoid char siew
- Request to add egg, vegetables and bean curd
- Limit rice
- Request for brown rice if possible; if not, stick to white rice and avoid yam rice

Yong tau foo

- Request for clear soup over curry soup and dry version ladened with sauces
- Select blanched and raw vegetables - e.g. leafy vegetables, cruciferous vegetables, mushrooms, black fungus, tofu, tau pok, tau kwa and other lean proteins
- Skip fried items, processed meat, fish balls and vegetables stuffed with fish paste
- Limit rice and noodles
- Request for brown rice or whole-grain bee hoon if possible

Western

- Opt for fresh salads with dressing on the side
- Opt for thin-crust pizzas over thick crusts and limit amount of crust consumed
- Select grilled, baked, pan-seared or roasted meats and vegetables
- Avoid gravies and soups thickened with corn starch
- Skip pasta dishes, burger buns, French fries, mashed potato and breaded and fried items

Bak kut teh

- Order vegetable side dishes
- Skip fried dough sticks
- Limit rice
- Opt for brown rice if possible

Indian

- Opt for salads and dry dishes e.g. raita, kebab, tandoori, tikka masala, egg and paneer bhurjis
- Skip curries that contain sugar, flour or starch
- Skip rotis, white rice, potatoes, breaded and fried items and sugary desserts
- Avoid most chutneys as they contain sugar
- Request for brown rice if possible

- Regulate amount of brown rice, chapati, thosai and lentil-based dishes consumed

Malay

- Opt for proteins e.g. satays, ayam masak merah, beef rendang, udang sambal and sup kambing
- Order vegetable dishes e.g. sayur lodeh and kangkong belacan
- Skip breaded and fried items e.g. goreng pisang, curry puff, begedil
- Skip sugary desserts and dishes with sweet gravies e.g. satay gravy, mee siam and mee rebus
- Avoid curries that contain sugar, flour or starch
- Request for brown rice and whole-grain bee hoon if possible
- Limit rice, noodles and potatoes

Kopi stall

- Opt for half-boiled eggs and peanut butter toast. Request for wholemeal bread if possible
- Skip sugar, condensed milk and evaporated milk in drinks. Order kopi O kosong and teh O kosong instead

Korean/Japanese

- Opt for bento sets with oily fish e.g. salmon or saba, miso soup, side salad and a piece of fruit
- Request to for no sauce and for salad dressing to be on the side
- Limit rice and noodles
- Opt for brown rice or buckwheat noodles if possible

1.4 Mono Unsaturated Fats

Some ways you can include monounsaturated fats into your diet:

- Add 2tbs ground flaxseed in your cereal, or use for baking bread and muffins. Whole flaxseeds should always be ground to maximise absorption of fats, and consumed within 24 hours after grinding
- Mix flaxseed oil or chia seeds into salads
- Have a handful of nuts as a snack
- Cook with olive oil or canola oil

1.5 Satiety

You can also adopt some of the following tips to help you feel fuller with lesser calories:

- At each meal, fill at least half your plate with fruits and vegetables
- Have broths or low calorie soups, and salads as appetiser instead of fried items
- Drink water and low calorie drinks in between meals
- Keep a jar of oat bran or wheat germ handy. Sprinkle over salad, soup, breakfast cereals and yogurt
- Add beans to salads, pizzas, sandwiches, soups, curries
- Add barley to rice as a carbohydrate in a meal
- Have a protein rich snack instead of one that is carb heavy

References

1. Adhikari K et al. A genome-wide association scan in admixed Latin Americans identifies loci influencing facial and scalp hair features. Nat Commun. 2016 Mar 1;7:10815. doi: 10.1038/ncomms10815.
2. Ahmetov I et al. Genome-wide association study identifies three novel genetic markers associated with elite endurance performance. Biol Sport. 2015 Mar;32(1):3-9. doi: 10.5604/20831862.1124568. Epub 2014 Oct 21.
3. Ahn J et al. Genome-wide association study of circulating vitamin D levels. Hum Mol Genet. 2010 Jul 1;19(13):2739-45. doi: 10.1093/hmg/ddq155. Epub 2010 Apr 23.
4. Anderson D et al. Genome-wide association study of vitamin D levels in children: replication in the Western Australian Pregnancy Cohort (Raine) study. Genes Immun. 2014 Dec;15(8):578-83. doi: 10.1038/gene.2014.52. Epub 2014 Sep 11.
5. Benyamin B et al. Novel loci affecting iron homeostasis and their effects in individuals at risk for hemochromatosis. Nat Commun. 2014 Oct 29;5:4926. doi: 10.1038/ncomms5926.
6. Broer L et al. GWAS of longevity in CHARGE consortium confirms APOE and FOXO3 candidacy. J Gerontol A Biol Sci Med Sci. 2015 Jan;70(1):110-8. doi: 10.1093/gerona/glu166. Epub 2014 Sep 8.
7. Byrne EM et al. A genome-wide association study of caffeine-related sleep disturbance: confirmation of a role for a common variant in the adenosine receptor. Sleep. 2012 Jul 1;35(7):967-75. doi: 10.5665/sleep.1962.
8. Castro R et al. 5,10-Methylenetetrahydrofolate reductase 677C-->T and 1298A-->C mutations are genetic determinants of elevated homocysteine. QJM. 2003 Apr;96(4):297-303.
9. Chambers JC et al. Genome-wide association study identifies loci influencing concentrations of liver enzymes in plasma. Nat Genet. 2011 Oct 16;43(11):1131-8. doi: 10.1038/ng.970.
10. Chang ALS et al. Identification of genes promoting skin youthfulness by genome-wide association study. J Invest Dermatol. 2014 Mar;134(3):651-657. doi: 10.1038/jid.2013.381. Epub 2013 Sep 13.
11. Chang X et al. Genome-wide association study of serum minerals levels in children of different ethnic background. PLoS One. 2015 Apr 17;10(4):e0123499. doi: 10.1371/journal.pone.0123499.eCollection 2015.
12. Cheng YC et al. Genome-wide association scan identifies variants near Matrix Metalloproteinase (MMP) genes on chromosome 11q21-22 strongly associated with serum MMP-1 levels. Circ Cardiovasc Genet. 2009 Aug;2(4):329-37. doi:10.1161/CIRCGENETICS.108.834986. Epub 2009 May 14.
13. Chu AY et al. Novel locus including FGF21 is associated with dietary macronutrient intake. Hum Mol Genet. 2013 May 1;22(9):1895-902. doi: 10.1093/hmg/ddt032. Epub 2013 Jan 30.
14. Comuzzie AG et al. Novel genetic loci identified for the pathophysiology of childhood obesity in the Hispanic population. PLoS One. 2012;7(12):e51954. doi: 10.1371/journal.pone.0051954. Epub 2012 Dec 14.
15. Cornelis MC et al. Genome-wide association study of caffeine metabolites provides new insights to caffeine metabolism and dietary caffeine-consumption behavior. Hum Mol Genet. 2016 Dec 15;25(24):5472-5482. doi: 10.1093/hmg/ddw334.
16. Cornelis MC et al. Genome-wide association study of selenium concentrations. Hum Mol Genet. 2015 Mar 1;24(5):1469-77. doi: 10.1093/hmg/ddu546. Epub 2014 Oct24.
17. Dashti HS et al. Meta-analysis of genome-wide association studies for circulating phylloquinone concentrations. Am J Clin Nutr. 2014 Dec;100(6):1462-9. doi: 10.3945/ajcn.114.093146. Epub 2014Oct 8.
18. Daugherty M et al. Complete reconstitution of the human coenzyme A biosynthetic pathway via comparative genomics. J Biol Chem. 2002 Jun 14;277(24):21431-9. Epub 2002 Mar 28.
19. Deelen J et al. Genome-wide association meta-analysis of human longevity identifies a novel locus conferring survival beyond 90 years of age. Hum Mol Genet. 2014 Aug 15;23(16):4420-32. doi: 10.1093/hmg/ddu139. Epub 2014 Mar31.
20. Deelen J et al. Genome-wide association study identifies a single major locus contributing to survival into old age; the APOE locus revisited. Aging Cell. 2011 Aug;10(4):686-98. doi: 10.1111/j.1474-9726.2011.00705.x. Epub2011 May 6.
21. Degenhardt F et al. Genome-wide association study of serum coenzyme Q10 levels identifies susceptibility loci linked to neuronal diseases. Hum Mol Genet. 2016 Jul 1;25(13):2881-2891. Epub 2016 May 5.
22. Do R et al. Genetic variants of FTO influence adiposity, insulin sensitivity, leptin levels, and resting metabolic rate in the Quebec Family Study. Diabetes. 2008 Apr;57(4):1147-50. doi: 10.2337/db07-1267. Epub 2008 Mar 3.
23. Dorajoo R et al. A genome-wide association study of n-3 and n-6 plasma fatty acids in a Singaporean Chinese population. Genes Nutr. 2015 Nov;10(6):53. doi: 10.1007/s12263-015-0502-2. Epub 2015 Nov 19.
24. Dupuis J et al. New genetic loci implicated in fasting glucose homeostasis and their impact on type 2 diabetes risk. Nat Genet. 2010 Feb;42(2):105-16. doi: 10.1038/ng.520. Epub 2010 Jan 17.
25. Emanuele E et al. A multilocus candidate approach identifies ACE and HIF1A as susceptibility genes for cellulite. J Eur Acad Dermatol Venereol. 2010 Aug;24(8):930-5. doi:10.1111/j.1468-3083.2009.03556.x. Epub 2010 Jan 6.
26. Eny KM et al. GWAS identifies an NAT2 acetylator status tag single nucleotide polymorphism to be a major locus for skin fluorescence. Diabetologia. 2014 Aug;57(8):1623-34. doi: 10.1007/s00125-014-3286-9. Epub 2014Jun 17.

27. Erikson GA et al. Whole-Genome Sequencing of a Healthy Aging Cohort. Cell. 2016 May 5;165(4):1002-11. doi: 10.1016/j.cell.2016.03.022. Epub 2016 Apr21.
28. Eriksson N et al. Web-based, participant-driven studies yield novel genetic associations for common traits. PLoS Genet. 2010 Jun 24;6(6):e1000993. doi: 10.1371/journal.pgen.1000993.
29. Ferrucci L et al. Common variation in the beta-carotene 15,15'-monooxygenase 1 gene affects circulating levels of carotenoids: a genome-wide association study. Am J Hum Genet. 2009 Feb;84(2):123-33. doi: 10.1016/j.ajhg.2008.12.019. Epub 2009Jan 29.
30. Fischer A et al. Association between genetic variants in the Coenzyme Q10 metabolism and Coenzyme Q10 status in humans. BMC Res Notes. 2011 Jul 21;4:245. doi: 10.1186/1756-0500-4-245.
31. Gao W et al. Genetic variants associated with skin aging in the Chinese Han population. J Dermatol Sci. 2017 Apr;86(1):21-29. doi: 10.1016/j.jdermsci.2016.12.017. Epub2016 Dec 22.
32. Gao W et al. Genetic variants associated with skin aging in the Chinese Han population. J Dermatol Sci. 2017 Apr;86(1):21-29. doi: 10.1016/j.jdermsci.2016.12.017.Epub 2016 Dec 22.
33. Garcia-Calzon S et al. Pro12Ala polymorphism of the PPARÅ'â‰¥2 gene interacts with a mediterranean diet to prevent telomere shortening in the PREDIMED-NAVARRA randomized trial. Circ Cardiovasc Genet. 2015 Feb;8(1):91-9. doi: 10.1161/CIRCGENETICS.114.000635. Epub 2014 Nov 18.
34. Gomez-Delgado F et al. Chronic consumption of a low-fat diet improves cardiometabolic risk factors according to the CLOCK gene in patients with coronary heart disease. Mol Nutr Food Res. 2015 Dec;59(12):2556-64. doi: 10.1002/mnfr.201500375. Epub2015 Oct 8.
35. Guan W et al. Genome-wide association study of plasma N6 polyunsaturated fatty acids within the cohorts for heart and aging research in genomic epidemiology consortium. Circ Cardiovasc Genet. 2014 Jun;7(3):321-331. doi:10.1161/CIRCGENETICS.113.000208. Epub 2014 May 13.
36. Han Y et al. Bivariate genome-wide association study suggests fatty acid desaturase genes and cadherin DCHS2 for variation of both compressive strength index and appendicular lean mass in males. Bone. 2012 Dec;51(6):1000-7. doi: 10.1016/j.bone.2012.08.127. Epub 2012 Aug 31.
37. Hazra A et al. Genome-wide significant predictors of metabolites in the one-carbon metabolism pathway. Hum Mol Genet. 2009 Dec 1;18(23):4677-87. doi: 10.1093/hmg/ddp428. Epub 2009 Sep 10.
38. He J et al. Genome-wide association study identifies 8 novel loci associated with blood pressure responses to interventions in Han Chinese. Circ Cardiovasc Genet. 2013 Dec;6(6):598-607. doi:10.1161/CIRCGENETICS.113.000307. Epub 2013 Oct 28.
39. He L et al. Two new susceptibility loci 1q24.2 and 11p11.2 confer risk to severe acne. Nat Commun. 2014;5:2870. doi: 10.1038/ncomms3870.
40. Heilmann S et al. Androgenetic alopecia: identification of four genetic risk loci and evidence for the contribution of WNT signaling to its etiology. J Invest Dermatol. 2013 Jun;133(6):1489-96. doi: 10.1038/jid.2013.43. Epub 2013Jan 28.
41. Hwang JY et al. Genome-wide association meta-analysis identifies novel variants associated with fasting plasma glucose in East Asians. Diabetes. 2015 Jan;64(1):291-8. doi: 10.2337/db14-0563. Epub 2014 Sep 3.
42. Jacobs LC et al. A Genome-Wide Association Study Identifies the Skin Color Genes IRF4, MC1R, ASIP, and BNC2 Influencing Facial Pigmented Spots. J Invest Dermatol. 2015 Jul;135(7):1735-1742. doi: 10.1038/jid.2015.62. Epub 2015Feb 23.
43. Jacobs LC et al. Intrinsic and extrinsic risk factors for sagging eyelids. JAMA Dermatol. 2014 Aug;150(8):836-43. doi: 10.1001/jamadermatol.2014.27.
44. Kauwe JS et al. Genome-wide association study of CSF levels of 59 alzheimer's disease candidate proteins: significant associations with proteins involved in amyloid processing and inflammation. PLoS Genet. 2014 Oct 23;10(10):e1004758. doi: 10.1371/journal.pgen.1004758.eCollection 2014 Oct.
45. Kayaalti Z et al. The potential effect of metallothionein 2A -5A/G single nucleotide polymorphism on blood cadmium, lead, zinc and copper levels. Toxicol Appl Pharmacol. 2011 Oct 1;256(1):1-7. doi: 10.1016/j.taap.2011.06.023.Epub 2011 Jul 13.
46. Keene KL et al. Genetic Associations with Plasma B12, B6, and Folate Levels in an Ischemic Stroke Population from the Vitamin Intervention for Stroke Prevention (VISP) Trial. Front Public Health. 2014 Aug 6;2:112. doi: 10.3389/fpubh.2014.00112. eCollection2014.
47. Kilpeläinen TO et al. Genetic variation near IRS1 associates with reduced adiposity and an impaired metabolic profile. Nat Genet. 2011 Jun 26;43(8):753-60. doi: 10.1038/ng.866.
48. Kim YJ et al. Large-scale genome-wide association studies in East Asians identify new genetic loci influencing metabolic traits. Nat Genet. 2011 Sep 11;43(10):990-5. doi: 10.1038/ng.939.
49. Le Clerc S et al. A genome-wide association study in Caucasian women points out a putative role of the STXBP5L gene in facial photoaging. J Invest Dermatol. 2013 Apr;133(4):929-35. doi: 10.1038/jid.2012.458. Epub 2012Dec 6.
50. Leonardi R et al. Modulation of pantothenate kinase 3 activity by small molecules that interact with the substrate/allosteric regulatory domain. Chem Biol. 2010 Aug 27;17(8):892-902. doi: 10.1016/j.chembiol.2010.06.006.
51. Li R et al. Six novel susceptibility Loci for early-onset androgenetic alopecia and their unexpected association with common diseases. PLoS Genet. 2012 May;8(5):e1002746. doi: 10.1371/journal.pgen.1002746. Epub 2012 May 31.
52. Lin X et al. Genome-wide association study identifies novel loci associated with serum level of vitamin B12 in Chinese men. Hum Mol Genet. 2012 Jun 1;21(11):2610-7. doi: 10.1093/hmg/dds062. Epub 2012 Feb24.
53. Liu XG et al. Genome-wide association and replication studies identified TRHR as an important gene

for lean body mass. Am J Hum Genet. 2009 Mar;84(3):418-23. doi: 10.1016/j.ajhg.2009.02.004. Epub 2009Mar 5.

54. Locke AE et al. Genetic studies of body mass index yield new insights for obesity biology. Nature. 2015 Feb 12;518(7538):197-206. doi: 10.1038/nature14177.
55. Malovini A et al. Association study on long-living individuals from Southern Italy identifies rs10491334 in the CAMKIV gene that regulates survival proteins. Rejuvenation Res. 2011 Jun;14(3):283-91. doi: 10.1089/rej.2010.1114. Epub 2011May 25.
56. Manning AK et al. A genome-wide approach accounting for body mass index identifies genetic variants influencing fasting glycemic traits and insulin resistance. Nat Genet. 2012 May 13;44(6):659-69. doi: 10.1038/ng.2274.
57. Mattei J et al. TCF7L2 genetic variants modulate the effect of dietary fat intake on changes in body composition during a weight-loss intervention. Am J Clin Nutr. 2012 Nov;96(5):1129-36. doi: 10.3945/ajcn.112.038125. Epub 2012Oct 3.
58. Meyer TE et al. Genome-wide association studies of serum magnesium, potassium, and sodium concentrations identify six Loci influencing serum magnesium levels. PLoS Genet. 2010 Aug 5;6(8). pii: e1001045. doi: 10.1371/journal.pgen.1001045.
59. Meyre D et al. Genome-wide association study for early-onset and morbid adult obesity identifies three new risk loci in European populations. Nat Genet. 2009 Feb;41(2):157-9. doi: 10.1038/ng.301. Epub 2009 Jan 18.
60. Molti Puigmarti C et al. FADS1 FADS2 gene variants modify the association between fish intake and the docosahexaenoic acid proportions in human milk. Am J Clin Nutr. 2010 May;91(5):1368-76. doi: 10.3945/ajcn.2009.28789. Epub 2010Mar 24.
61. Mondul AM et al. Genome-wide association study of circulating retinol levels. Hum Mol Genet. 2011 Dec 1;20(23):4724-31. doi: 10.1093/hmg/ddr387. Epub 2011 Aug 30.
62. Naval J et al. Genetic polymorphisms and skin aging: the identification of population genotypic groups holds potential for personalized treatments. Clin Cosmet Investig Dermatol. 2014 Jul 1;7:207-14. doi: 10.2147/CCID.S55669.eCollection 2014.
63. Navarini AA et al. Genome-wide association study identifies three novel susceptibility loci for severe Acne vulgaris. Nat Commun. 2014 Jun 13;5:4020. doi: 10.1038/ncomms5020.
64. Ng E et al. Genome-wide association study of toxic metals and trace elements reveals novel associations. Hum Mol Genet. 2015 Aug 15;24(16):4739-45. doi: 10.1093/hmg/ddv190. Epub 2015 May29.
65. O'Seaghdha CM et al. Common variants in the calcium-sensing receptor gene are associated with total serum calcium levels. Hum Mol Genet. 2010 Nov 1;19(21):4296-303. doi: 10.1093/hmg/ddq342. Epub 2010 Aug12.
66. O'Seaghdha CM et al. Meta-analysis of genome-wide association studies identifies six new Loci for serum calcium concentrations. PLoS Genet. 2013;9(9):e1003796. doi: 10.1371/journal.pgen.1003796. Epub 2013 Sep 19.
67. Pichler I et al. Identification of a common variant in the TFR2 gene implicated in the physiological regulation of serum iron levels. Hum Mol Genet. 2011 Mar 15;20(6):1232-40. doi: 10.1093/hmg/ddq552. Epub 2010 Dec 28.
68. Pomponio RJ et al. Arg538 to Cys mutation in a CpG dinucleotide of the human biotinidase gene is the second most common cause of profound biotinidase deficiency in symptomatic children. Hum Genet. 1997 Apr;99(4):506-12.
69. Qi Q et al. Insulin receptor substrate 1 gene variation modifies insulin resistance response to weight-loss diets in a 2-year randomized trial: the Preventing Overweight Using Novel Dietary Strategies (POUNDS LOST) trial. Circulation. 2011 Aug 2;124(5):563-71. doi: 10.1161/CIRCULATIONAHA.111.025767.Epub 2011 Jul 11.
70. Razquin C et al. A 3-year intervention with a Mediterranean diet modified the association between the rs9939609 gene variant in FTO and body weight changes. Int J Obes (Lond). 2010 Feb;34(2):266-72. doi: 10.1038/ijo.2009.233. Epub 2009Nov 17.
71. Roswall N et al. Association between Mediterranean and Nordic diet scores and changes in weight and waist circumference: influence of FTO and TCF7L2 loci. Am J Clin Nutr. 2014 Oct;100(4):1188-97. doi: 10.3945/ajcn.114.089706. Epub 2014 Aug 6.
72. Rubicz R et al. Genome-wide genetic and transcriptomic investigation of variation in antibody response to dietary antigens. Genet Epidemiol. 2014 Jul;38(5):439-46. doi: 10.1002/gepi.21817.
73. Scannell Bryan M et al. Genome-wide association studies and heritability estimates of body mass index related phenotypes in Bangladeshi adults. PLoS One. 2014 Aug 18;9(8):e105062. doi: 10.1371/journal.pone.0105062.eCollection 2014.
74. Seip RL et al. Physiogenomic comparison of human fat loss in response to diets restrictive of carbohydrate or fat. Nutr Metab (Lond). 2008 Feb 6;5:4. doi: 10.1186/1743-7075-5-4.
75. Senthilkumari S et al. Polymorphisms in sodium-dependent vitamin C transporter genes and plasma, aqueous humor and lens nucleus ascorbate concentrations in an ascorbate depleted setting. Exp Eye Res. 2014 Jul;124:24-30. doi: 10.1016/j.exer.2014.04.022. Epub 2014 May8.
76. Shi H et al. NAD Deficiency, Congenital Malformations, and Niacin Supplementation. N Engl J Med. 2017 Aug 10;377(6):544-552. doi: 10.1056/NEJMoa1616361.
77. Sulem P et al. Genetic determinants of hair, eye and skin pigmentation in Europeans. Nat Genet. 2007 Dec;39(12):1443-52. Epub 2007 Oct 21.
78. Sulem P et al. Two newly identified genetic determinants of pigmentation in Europeans. Nat Genet. 2008 Jul;40(7):835-7. doi: 10.1038/ng.160. Epub 2008 May 18.

79. Sun Q et al. Genome-wide association study identifies polymorphisms in LEPR as determinants of plasma soluble leptin receptor levels. Hum Mol Genet. 2010 May 1;19(9):1846-55. doi: 10.1093/hmg/ddq056. Epub 2010 Feb17.

80. Tanaka T et al. Genome-wide association study of vitamin B6, vitamin B12, folate, and homocysteine blood concentrations. Am J Hum Genet. 2009 Apr;84(4):477-82. doi: 10.1016/j.ajhg.2009.02.011. Epub 2009Mar 19.

81. Tanaka T et al. Genome-wide meta-analysis of observational studies shows common genetic variants associated with macronutrient intake. Am J Clin Nutr. 2013 Jun;97(6):1395-402. doi: 10.3945/ajcn.112.052183. Epub 2013 May 1.

82. Timpson NJ et al. Genetic variation at the SLC23A1 locus is associated with circulating concentrations of L-ascorbic acid (vitamin C): evidence from 5 independent studies with >15,000 participants. Am J Clin Nutr. 2010 Aug;92(2):375-82. doi: 10.3945/ajcn.2010.29438. Epub 2010Jun 2.

83. Tung JY et al. Genome-wide association analysis implicates elastic microfibrils in the development of nonsyndromic striae distensae. J Invest Dermatol. 2013 Nov;133(11):2628-2631. doi: 10.1038/jid.2013.196. Epub2013 Apr 30.

84. Tural E et al. PPAR-α and PPARGC1A gene variants have strong effects on aerobic performance of Turkish elite endurance athletes. Mol Biol Rep. 2014 Sep;41(9):5799-804. doi: 10.1007/s11033-014-3453-6. Epub 2014 Jul 5.

85. Vierkâˆšâˆ‚tter A et al. MMP-1 and -3 promoter variants are indicative of a common susceptibility for skin and lung aging: results from a cohort of elderly women (SALIA). J Invest Dermatol. 2015 May;135(5):1268-1274. doi: 10.1038/jid.2015.7. Epub 2015 Jan 19.

86. Wu JH et al. Genome-wide association study identifies novel loci associated with concentrations of four plasma phospholipid fatty acids in the de novo lipogenesis pathway: results from the Cohorts for Heart and Aging Research in Genomic Epidemiology (CHARGE) consortium. Circ Cardiovasc Genet. 2013 Apr;6(2):171-83. doi:10.1161/CIRCGENETICS.112.964619. Epub 2013 Jan 29.

87. Zhang M et al. Genome-wide association studies identify several new loci associated with pigmentation traits and skin cancer risk in European Americans. Hum Mol Genet. 2013 Jul 15;22(14):2948-59. doi: 10.1093/hmg/ddt142. Epub 2013 Apr1.