Genetic Wellness

BY LEMOND GENETICS

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This Report Prepared For:

Jane Doe

LEMOND GENETICS

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Welcome to Your Genetic Wellness Personal Report

Genetic Wellness Personal Report

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Congratulations!

You are about to receive insights about your body that, up until now, have never been available. Only recently has research of the human body evolved enough to allow scientists to identify and analyze a person's DNA. Lemond Nutrition not only provides you with a roadmap of your specific genes but gives direction on how you can potentially optimize your health and well-being with this knowledge.

We spend a lifetime trying to learn more about ourselves, especially how our body works and how our health is affected by our habits and behaviors. Traditionally, we have learned what works and what doesn't work through trial and error. But experience alone doesn't always give us the information we need. *Lemond Nutrition's Genetic Wellness will help you to better understand the factors that can affect how your body ticks.*

This report will provide you with results in 5 key areas that can affect the way your body feels. Your report includes an analysis of your genotype for certain key genes that are related to nutrition and exercise.

What is Genetic Testing?

Genetic testing utilizes a physical specimen from the body (saliva, blood, or other tissues) to reveal information about a person's chromosomes or their genes. In addition to identifying key genes, information is evaluated about areas on each gene that may differ between people. These areas are known as single nucleotide polymorphisms (SNPs). We use the term genotype to describe the outcome of your individual genetic tests.

Which Body Traits Were Analyzed?

To produce your results for Lemond Nutrition's Genetic Wellness, the analysis looks at genes that are related to 5 major categories: *FOOD, FOOD SENSITIVITIES, NUTRIENTS, EXERCISE AND HEALTHY AGING*. These results are relevant because they can affect how you feel and how your body functions optimally, further affecting your performance.

How Are Your Results Determined?

We provide a genetic analysis that indicates which gene combinations you have in each category. You will receive a rating based on our calculated score for each trait in a category. Some categories only have one gene associated with that trait; other categories have several genes associated with that trait. The calculated score reflects the potential combined influences from one or more genes.

We are able to provide personalized health advice based on the potential implications of these results. In most cases, the outcomes for a genotype guide a response to a specific way of eating or exercise prescription. For example, many of the results are based on looking at study subjects' response to an exercise program where participants did cardio exercise

on only three days per week for a certain amount of time each session. Participants may have differed in their response to this regimen based on their genetics. We have evaluated your potential genetic response and provided suggestions on how to enhance it based on evidence-based dietary and exercise research recommendations, as well as the experience of our medical team.

Lemond Nutrition uses the best available research on which to base your results. We have established stringent criteria for studies that can be used to help us evaluate the potential impact of your genotype for each gene tested. In determining how to process your genetic analysis, we do not accept just any research that has been performed on a gene. We use the largest and most scientifically valid genome-wide association studies to calculate a score for the different genes or gene combinations. We pride ourselves on the importance of continuously updating the analyses as the science evolves. Therefore, Lemond Nutrition maintains the most up-to-date research database, and our analyses are modified as new and better research becomes available. Though there is still much to learn in the field of genetic analysis, we chose the best available research upon which to base our analysis and recommendations.

Why Is Your Genotype Important?

Your genotype reveals the blueprint for your body. The information we provide reflects your genotypes for each gene or set of genes. This shows your potential response, based on your genetic analysis. Keep in mind that if your results show the presence of certain genotypes and your results suggest that you will exhibit either an “enhanced” or “below average” response, this does not mean that the outcome associated with that genotype is how your body will or does react. Rather, it is a potential or possibility, not a determinant.

Your phenotype is the physical manifestation, or expression, of your genotype. But your phenotype may be different than your genotype—not all the genetic variations seen in an analysis are manifested or active. That’s because how your genes are expressed are affected by your lifestyle and other environmental factors. In fact, while your analysis might show that you have an increased or decreased potential for a certain health trait, it does not mean that you will express that trait. Remember, your phenotype for the trait may be different from the genotype the analysis shows.

This is very important to keep in mind because there is a tendency to view genotype results as a definitive diagnosis and to assume that you absolutely have certain traits when this is not what a genetic analysis measures. The analysis only measures your potential risk for different outcomes, or the possibility that your phenotype will express what your genotype predicts. Your results only suggest that there is a greater or lesser chance that you may exhibit certain traits or responses. The fields of nutrigenomics and exercise genomics are new, but growing, areas of research. Much still needs to be discovered to better understand genes, their interactions with each other, and the role in which other influences such as diet, exercise and the environment play in whether you will express a trait associated with a certain genotype.

What You’ll Learn About You

On the following pages, you will see a summary of your results. You’ll learn what your genotypes suggest about how your body responds to different macronutrients and types of exercise programs. You will also gain insights into your potential status for a variety of micronutrients, as well as the likely health affects you may experience from regular exercise. Your analyzed genotype results are followed by a detailed explanation and active plan. Our medical team has evaluated your potential response and considered what evidence-based research recommendations on eating and exercise suggest are the best approach for optimal health to provide you with concrete success strategies. This guidance will give you that extra edge to finding the right lifestyle for your body. While we can’t change our genes, we can change our behaviors to

take advantage of what our genes say about our bodies. the following pages, you will see a summary of your results. You'll learn what your genotypes suggest about your tendency to lose weight and body fat in response to different types of diets and exercise programs. You will also gain insights into your potential status for a variety of micronutrients, as well as the likely health effects you may experience from regular exercise. Your analyzed genotype results are followed by a detailed explanation and success strategy. Our medical team has evaluated your potential response and taken in to account what evidence-based research recommendations on diet and exercise suggest are the optimal approach for effective body weight management to provide you with concrete success strategies. This guidance may give you that extra edge in finding the right plan that helps you maximize the results you get from dieting and exercise. While we can't change our genes, we can change our behaviors to take advantage of what our genes say about our bodies.

What is a gene?

A gene is the basic physical and functional unit of heredity. Genes, which are made up of DNA, act as instructions to make molecules called proteins. In humans, genes vary in size from a few hundred DNA bases to more than 2 million bases. The Human Genome Project has estimated that humans have between 20,000 and 25,000 genes.

Every person has two copies of each gene, one inherited from each parent. Most genes are the same in all people, but a small number of genes (less than 1 percent of the total) are slightly different between people. Alleles are forms of the same gene with small differences in their sequence of DNA bases. These small differences can contribute to each person's unique physical features. Keep in mind that genes for certain traits can be present but might not be "expressed." Whether a gene is turned "on" or "off" to express, or not express, a specific trait often depends on lifestyle behaviors and environmental factors.

Key Definitions

Setpoint weight: The predetermined set weight for each individual that is regulated through energy intake or energy expenditure. The weight that our bodies want to be at in order to function optimally, without counting calories or dieting.

https://colleenchristensennutrition.com/what-is-a-set-point-weight/

Calories: A unit of measurement. Specifically defined as the amount of heat needed to raise the temperature of 1 gram of water by 1 degree Celsius. A unit of measurement that supplies our bodies with the energy needed to live. All daily activities rely on energy that comes from calories.

https://www.merriam-webster.com/dictionary/calorie

Genes: The basic physical and functional unit of heredity. Genes are passed from parents to offspring and contain DNA, or the information needed to specify traits.

https://www.genome.gov/genetics-glossary/Gene

Resting Metabolic Rate (RMR): The total number of calories burned when your body is completely at rest. RMR accounts

for low-effort daily activities including eating, walking, using the bathroom, sweating). RMR is a good reference for measuring daily calorie needs. (Either RMR/BMR can represent the calories burned at rest in your total daily energy expenditure or TDEE)

https://blog.nasm.org/nutrition/resting-metabolic-rate-how-to-calculate-and-improve-yours

Basal Metabolic Rate (BMR): Minimum number of calories required for basic functions at rest including digesting food, breathing, pumping blood through body. BMR makes up 60-70% of calories burned in your TDEE. Strict criteria are used for

Meta-analysis: A quantitative, formal, epidemiological study design used to assess previous research studies to come to conclusions about that body of research. A statistical process that combines the data of multiple research studies to find common results and to identify overall trends.

https://www.dictionary.com/e/tech-science/meta-analysis/

Thermic effect of feeding: The calories burned while digesting, absorbing, metabolizing, and storing food. TEF represents 10% of total daily energy expenditure and depends on several factors (age, meal timing, macronutrient composition).

https://examine.com/topics/thermic-effect-of-food/

REPORT SUMMARY

FOOD

Protein Utilization	HEIGHTENED	FTO
Fat Utilization	LOW	PPARG, TCF7L2, APOA5, CRY2, MTNR1B, PPM1K
Carb Utilization	HEIGHTENED	IRS1

FOOD SENSITIVITY

Lactose Intolerance	LIKELY	MCM6
Sensitivity to Saturated Fat	HEIGHTENED	TCF7L2, APOA2, FTO
Gluten Sensitivity	HEIGHTENED	HLA-DQ
Caffeine Metabolism	NORMAL	AHR, RP11-10017.3-001, ARID3B, CYP1A1
Cholesterol Response To Dietary Fat	SENSITIVE	LIPC
Insulin Response To Dietary Fat	SENSITIVE	FTO, PPM1K
Response to Monounsaturated Fats	LOWERED	CLOCK, ADIPOQ

NUTRIENTS

Vitamin A Tendency	LOW	BCMO1
Vitamin B6 Tendency	LOW	NBPF3
Vitamin B9 – Folate Tendency	NORMAL	MTHFR
Vitamin B12 Tendency	NORMAL	FUT2
Vitamin C Tendency	NORMAL	SLC23A1
Vitamin D Tendency	LOW	GC, NADSYN1, CYP2R1
Vitamin E Tendency	ABOVE AVERAGE	ZPR1, SCARB1, CYP4F2
Calcium Tendency	NORMAL	CASR, DGKD, GCKR, LINC00709, CARS, LOC105370176, CYP24A1
Copper Tendency	NORMAL	SMIM1, SELENBP1
Iron Tendency	ABOVE AVERAGE	TRF2, HFE, HFE, TMPRSS6

REPORT SUMMARY

Magnesium Tendency	NORMAL	MUC1, SHROOM3, TRPM6, DCDC5, ATP2B1, MECOM
Omega Levels	HEIGHTENED	FADS1, ELVOL2
Phosphorus Tendency	ABOVE AVERAGE	ALPL, CSTA, IHPK3, PDE7B, C12orf4, IP6K3
Polyunsaturated Fatty Acid Tendency	SLIGHTLY RAISED	FADS1-2
Selenium Tendency	ABOVE AVERAGE	DMGDH
Zinc Tendency	NORMAL	CA1, PPCDC, LINC01420

EXERCISE

Fat Loss Response To Cardio	ENHANCED	ADRB2, LPL
Fitness Response To Cardio	NORMAL	AMPD1, APOE
Body Composition Response To Strength Training	ENHANCED	NRXN3, GNPDA2, LRRN6C, PRKD1, GPRC5B, SLC39A8, FTO, FLJ35779, MAP2K5, QPCTL-GIPR, NEGR1, LRP1B, MTCH2, MTIF3, RPL27A, EC16B, FAIM2, FANCL, ETV5, TFAP2B
Hdl Response To Cardio	NORMAL	APOE
Insulin Sensitivity Response To Cardio	NORMAL	LIPC
Glucose Response To Cardio	NORMAL	PPARG
Trig Response To Cardio	BELOW AVERAGE	CYYR1, GLT8D2, RBFOX1, ZNF385D

HEALTHY AGING

Skin Aging	NORMAL	IRF4, SPATA33, RALY/ASIP, BNC2
Sleep Duration	BELOW AVERAGE	ABCC9, LOC101927400, DRD2
Longevity	NORMAL	FOXO3, APOC1 (APOE-CI-CII)
Mental Acuity	SLIGHTLY ABOVE AVERAGE	APOE, BDNF
Systemic Inflammation	NORMAL	CRP, APOC1 (APOE-CI-CII), HNF1A

FOOD SUMMARY

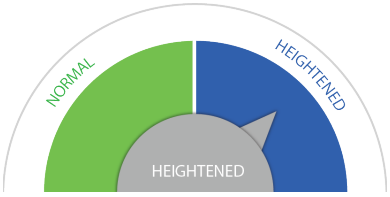
What foods does your body need? RDA guidelines outline the average need for macronutrients to be 45%-55% carbohydrates; 25%-35% protein; and 25%-30% fat of daily intake. Nevertheless, please keep in mind each individual has different energy requirements because nobody is the same.

The daily caloric recommendation in the meal plan provided with your Genetic Wellness report was calculated based on maintenance energy needs for your age, gender and standard activities of daily living. Meet with a dietitian to get more specific needs tailored to you. Contact us at LemondNutrition.com or 888-422-8070.

PROTEIN UTILIZATION

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits a HEIGHTENED RESPONSE to the utilization of protein. Your score reflects the fact that your genotype does include the allele combination that could result in a decrease in body composition, and loss of lean muscle mass, due to a higher percentage of protein in the diet.



Your genetic profile indicates that your response is HEIGHTENED.

This indicates that you may experience weight change in response to eating a moderate to higher intake of protein.

SUCCESS STRATEGIES

Consuming a diet that is moderate-to-high in protein when you diet may help you maintain your setpoint weight. Since you have a higher risk of losing muscle mass when you lose weight, it is important to include regular resistance training.

BUILDING BENEFITS

Like soluble fibers, protein slows gastric emptying. The decreased rate of digestion creates longer satiety, so feelings of fullness. Protein also assists in keeping blood glucose levels steady rather than creating a rapid response, then severe drop in blood sugar.

This does not mean to avoid carbohydrates because they seem like a less efficient source of energy compared to protein. Instead, you should properly nourish your body to receive optimal fuel. A great example is snacks. Ideally, you should be having a carbohydrate source and a protein source every time you have a snack. Why? Because the carbohydrate will replenish the liver, and fuel cells by providing the body's main source of energy, glucose, while protein will create that feeling of satiety, as well as prevent a "sugar crash."

Planning to have protein at each snack will also ensure you are receiving an adequate amount throughout your day.

RELATED GENES / SNPs

FTO, LCT

The gene and associated SNPs included in this category have consistently been shown to be associated with muscle tissue and adipose tissue. Culturally, protein is the most beloved macronutrient; however, it's often overlooked that too much protein is more harmful than helpful (unless medically advised due to chronic conditions). Aside from water, protein is already the second most abundant substance in the body, with 60%-70% being stored in your skeletal muscle. Excessive protein can overwork our kidney function and put many other bodily functions under stress.

Most important to note, that when you increase your protein intake, you are also increasing your energy intake. Often, it's mistaken that increased protein automatically means increased muscle. However, protein is a macronutrient that still supplies energy. If you maintain the same level of physical activity, but increase your protein intake, you build an equal amount of muscle and adipose tissue.

On the other hand, if you engage in strenuous

FOOD

PROTEIN UTILIZATION

STRONG SOURCES OF PROTEIN

For the best source of protein, always choose animal sources or lean meats (heme protein). Animal sources are strong in many B vitamins, mostly B12 and iron, which are crucial for the metabolism of folate, synthesis of DNA, and transportation of oxygen within the body. Animal foods also contain all the essential amino acids in one food item, such as meat, fish or dairy products.

strength training or endurance activities, naturally you will need more protein to help restore muscle damage.

Our analysis of your genes investigated which genotype for this SNP was present in your DNA. Your rating of either NORMAL RESPONSE or HEIGHTENED RESPONSE reflects whether your genotype included those alleles that exhibited protein sensitivity.

If following a vegetarian diet, be sure to sufficiently pair incomplete proteins to acquire all essential amino acids. For example, be sure to have oats with peanut butter and walnuts, or rice with beans and broccoli. Remember, iron is also strong in dark green leafy vegetables, walnuts are a wonderful source of Omega-6, and broccoli contains Vitamin K.

For those on a vegan diet, it is highly advised to speak with a medical doctor and dietitian on how to appropriately supplement B12 due to the omission of animal sources from the diet.

PROTEIN PORTIONS

An easy and portable way to always know how much protein you need on your plate (if following standard guidelines) is your hand. Look at the circumference of your palm- that's about the size of protein you want on your plate at each meal. To add dimension to your portion, visualize a deck of cards placed in your palm as the minimum height your protein should reach.

Clearly though, not all protein is chicken breasts. For deli meats on a sandwich, aim for 4 thin slices as one serving, as for a whole egg, one is sufficient. When it comes to milk and cottage cheese, be sure to fill up eight ounces to receive a good number of amino acids.

SUGGESTED PROTEINS

suggested servings contain listed grams of protein

Chicken Breast (3oz) - 25g
Ground Turkey (3oz) - 22.5g
Lean Beef (3oz) - 22g
Broiled Fish (3oz) - 20g
Lentils/Black Beans (1/2c) - 9g
Turkey (3oz) - 24g
Pork/Lean Ham (3oz) - 18g
Lamb (3oz) - 21g
Quinoa (1/2c) - 12g
Tofu (1/2c - 4.4oz) - 11g

EXERCISE

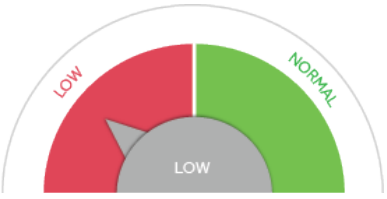
Since this SNP is also associated with the loss of muscle, it is recommended that you include progressive resistance training using heavier weights in the exercise plan that you follow. This may help minimize or prevent the loss of lean body mass.

Study your results from the genetic analysis regarding your exercise-related genes for a more specific exercise prescription. For optimal muscle strengthening, you should perform exercises with weights, targeting your major muscle groups. On 3 non-consecutive days per week, do 3 sets of 12 reps with weight heavy enough to feel "hard" or "very hard" by the end of each set.

FAT UTILIZATION

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits a LOW utilization of fat. This means that you may be sensitive to the amount and type of fat in your diet. This result also suggests that you may have a reduced level of fat oxidation, meaning less dietary fat is broken down.



Your genetic profile indicates that your utilization of fat has a LOW RESPONSE.

You may have a heightened sensitivity to fat in your diet. So, it's important that you know how to maximize fat intake necessary for nourishment through appropriate portions of nutrient dense fatty acids.

SUCCESS STRATEGIES

Since your genes suggest that you have a heightened sensitivity to excessive fat in your diet, you should consider reducing saturated and trans-fats. Portion toppings and incorporate EFAs to still provide the flavor you may crave, but prevent an imbalance of macronutrients within intake.

Because your genetic profile indicates that you might benefit from a lower-fat diet, it is suggested that you aim for 15 % to 25% of total calories coming from dietary fat, less than or equal to 10% of total fat intake coming from saturated fat, and less than 7% should come from trans fatty acids.

RELATED GENES / SNPs

PPARG, TCF7L2, APOA5, CRY2, MTNR1B , PPM1K

The genes and their associated SNPs that are included in this category have all been shown in scientific studies to have statistical significance with how sensitive people are to eating a diet high in fat. In other words, these studies showed that the amount of fat in the diet affected the body's structure depending on their genotype for these genes.

Our analysis of your genes investigated which genotype for each of these 6 genes was present in your DNA. Your rating of either NORMAL RESPONSE or LOW RESPONSE reflects whether your genotypes included some or all of those that carried a risk or inability to maintain set point weight range due to an excessive intake of fat.

EASY WAYS TO REDUCE YOUR TOTAL FAT:

- Substitute ground flaxseed for fat (butter or oil) in baked goods. Try using 3 T of ground flaxseed instead of 1 T of oil.
- If you eat animal foods, choose lean meats.
- Eat at least 7 ounces per week of fish. Prepare fish by grilling, baking, broiling, or poaching.
- Identify foods you prepare that you normally add fat to (oil, butter, cream, cheese, meat) and try to find a non-fat substitute. For example, if you normally add oil and bacon to cooked beans, skip both and add red peppers and jalapenos for flavor instead. Or if you butter your toast, spread with a bean dip instead. Sauté vegetables in vegetable broth rather than in olive oil. Explore your flavor

FAT UTILIZATION

palette. Yes, fat is flavorful but so are fruits, vegetables, and herbs. Citrus fruits can make a dish burst with color through its acidic pH; tri-colored carrots create a sweet undertone; and cilantro pairs great with various cuisines.

- Swap traditional oils for canola or olive oils when sauteing or baking.

SUGGESTED PROTEINS

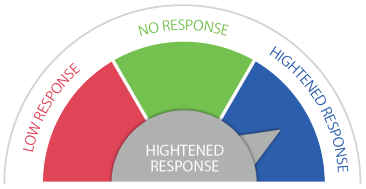
suggested servings contain listed grams of fats

Avocado (1/2 fruit) - 10g
Coconut Oil (1T) - 14g
Olive Oil (1T) - 14g
Nut Butters (1T) - 8g
Coconut (1 piece, 2" x 2" x 1/2") - 15g
Olives (1T) - .9g
Nuts/Seeds (1/4c) - 13g
Butter (1T) - 12g
Oils (1T) - 14g

CARBOHYDRATE UTILIZATION

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits a HEIGHTENED RESPONSE to the utilization of complex carbohydrates. Your score reflects the fact that your genotype appears to favor a higher complex carbohydrate diet. Complex carbohydrates include beans, whole grains, nuts, seeds, fruits and vegetables. This does not mean cutting out bread, pasta, oats, or cereals and only eating fruits, nuts, and vegetables; instead make at least half your daily serving of grains, whole grains.



Your genetic profile indicates that your utilization of complex carbohydrates has a HEIGHTENED RESPONSE.

This suggests that your genotype may favor a diet that is higher in complex carbohydrates. Complex carbohydrates include beans, whole grains, nuts, seeds, fruits, and vegetables. This does not mean cutting out bread, pasta, oats, or cereals and only eating fruits, nuts, and vegetables; instead make at least half your daily serving of grains, whole grains.

SUCCESS STRATEGIES

Incorporating and Eating complex carbohydrates: Complex carbohydrates are important to incorporate into one's diet to further maximize nutrient density. Not only do carbohydrates provide glucose to fuel metabolic pathways, brain cells, and the body's overall function, but they also supply other key vitamins and minerals. For example, beans are an additional source of zinc and magnesium; grains provide numerous sources of B vitamins (especially thiamin); vegetables and fruit are an exceptional source for fat soluble vitamins (A,D,E,K).

Maximizing Your Fuel Mileage: As mentioned previously, to keep blood sugar levels stable, stay energized during physical activity, and to avoid midday fatigue, it is crucial to include carbohydrates at each meal and snack. Roughly every three hours your liver needs to be refueled to continue to produce more energy

RELATED GENES / SNPs

IRS1, FGF21

The gene and associated SNPs included in this category have been shown to be associated with a person's insulin sensitivity and the potential effects of the amount of carbohydrates and fat in the diet. Insulin is a hormone released by the body that helps cells take in glucose, or sugar, for energy. Glucose is present in the blood after the digestion of carbohydrates from foods like fruit, vegetables, legumes, grains, and dairy, takes place. Insulin is also released in response to eating protein as it helps to shuttle amino acids into cells, as well.

Glucose is a very important nutrient because our bodies rely on glucose to maintain blood sugar levels within a consistent range. In fact, brain cells and red blood cells use glucose as their primary source of energy. Cells also use fat as a fuel source, but to metabolize fat, there must be some glucose present to complete the process. Complex carbs provide the most nutrients and fiber, and during exercise can provide you with longer-lasting energy.

CARBOHYDRATE UTILIZATION

for your body (hence, why we suggest eating every three to four hours). Also, including carbohydrates throughout your day will help with hunger and fullness cues, as well as satiety.

Plate Guidance: Initially, seeing 45%-55% seems like it would take up the most space on your plate; however, a standard portion of a carbohydrate is smaller than you might think. If you hold up your fist, that equates to about 1 cup, and the standard portion of one serving of a carbohydrate is typically ½ cup. For bread, one slice is all you need for 15 grams of carbohydrates. Also, at Lemond Nutrition, we advise at minimum only ¼ of your plate be composed of carbohydrates. See? It doesn't take many carbohydrates to really pack a punch and effectively nourish your body.

Sometimes cells do not respond to the insulin being released, a condition known as insulin resistance. The result is the bloodstream becoming overloaded with glucose. Since carbohydrate intake triggers insulin release, many people assume that eating more carbs is not healthy and can lead to body fat and weight gain, as well as diabetes. But the relationship is not that simple. Many people who eat a high carbohydrate diet are not overweight and do not have diabetes, in fact, they may have much lower levels of blood glucose.

The variety and amount of carbohydrates you eat play a role. It's important that your carbohydrate intake is not just from dairy and fruit. Why? Because, again, your cell's primary source of energy is glucose. If you solely eat dairy and fruit, your body's cells will lack additional vitamins and minerals absorbed from grains, breads, and cereals. That means 45%-55% of your daily carbohydrate intake is an umbrella for grains, fruit, and dairy. Additionally, you should maintain a consistent baseline intake of carbohydrates throughout your day to help control blood sugar levels and keep your metabolic pathways fueled.

The IRS1 gene in this category seems to influence insulin resistance and the body's response to carbohydrates in the diet. A long term study found that people with a variant of this gene (who ate a high carbohydrate, low fat diet that consisted of high fiber, and raw foods) had greater insulin sensitivity. This translates to lower levels of insulin and insulin resistance.

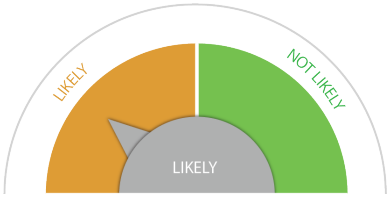
Research also finds that variations of the FGF21 gene, which helps regulate carbohydrate intake and metabolism, influence how peoples' body composition responds to disproportional dietary intake (i.e., low carbohydrate or excessive carbohydrates).

Our analysis of your genes investigated which genotype for this gene was present in your DNA. Your rating of either HEIGHTENED RESPONSE, LOW RESPONSE, or NO RESPONSE reflects whether your genotype included those genes that are responsive to insulin resistance through carbohydrate intake.

LACTOSE INTOLERANCE

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits characteristics that make you LIKELY to be or become lactose intolerant. That means you are likely to have or develop difficulty digesting lactose, the sugar found in milk, and suffer GI distress from consuming dairy products. Since dairy products are a major source of calcium and vitamin D, it's important to get enough of those essential nutrients elsewhere in your diet.



Your genetic profile indicates that you are LIKELY to develop lactose intolerance (if you haven't already been diagnosed).

You can manage your condition by limiting dairy products, whey, and other foods that contain lactose. Realize that limiting dairy may also mean shortchanging essential nutrients calcium and vitamin D. The National Osteoporosis Foundation says adults need 1,000 to 1,200 mg of calcium a day and 800 to 1,000 IUs of vitamin D a day to maintain bone integrity. You can maintain your bone, muscle, and general health by getting these nutrients from alternative food sources such as mushrooms, egg yolks, broccoli, and fish.

SUCCESS STRATEGIES

Lactose intolerance doesn't necessarily mean zero tolerance to all dairy products. Some people who are lactose intolerant can eat yogurt with live cultures without suffering GI symptoms. Experiment with small doses. It's a matter of getting to know your own body to know what you can and can't tolerate. If you believe you have lactose intolerance, it's a good idea to also consult with your doctor to be sure your symptoms are not being caused by another problem. Once you have been properly assessed, tested, and diagnosed there are many ways to manage it comfortably and healthfully.

Buy lactose free. These products have added lactase in them to help you break down the lactose and have similar nutritional profiles to traditional dairy

RELATED GENES / SNPs

MCM6

This gene and associated SNPs included in this category have been shown to have significant associations with a person's likelihood of being intolerant to the milk sugar lactose.

Lactose intolerance occurs when the small intestine does not make enough of an enzyme called lactase that you use to digest lactose. As lactose passes through the large intestine without being properly broken down and digested, it can cause a host of uncomfortable GI symptoms including gas, bloating, abdominal pain and diarrhea.

Lactose intolerance is one of the most common inherited conditions in the world, with about 65 percent of the human population experiencing a reduced ability to digest lactose during their lives. It occurs far more often in people of Asian, African, South American, and Native American descent than it does among Caucasians of European descent, among whom only about 15 percent of the population experiences the condition.

FOOD SENSITIVITY

LACTOSE INTOLERANCE

products. Be cautious, initially, when beginning to incorporate lactose free to ensure you can tolerate these products.

Watch dosing. Most people have some lactase, so chances are that you can have small amounts of lactose. Dry cheeses tend to have lower amounts of lactose. Most people with lactose intolerance can tolerate dairy yogurt because the probiotic activity breaks the lactose down.

Supplement the enzyme. You can take lactase capsules or tablets, such as Lactate, before eating or drinking dairy products or milk that may eliminate or ease symptoms.

Try milk alternatives. There is no shortage of alternative "milk" products on the market today. Some, like almond or cashew milk, may have more calcium than dairy milk, but not all offer as much calcium and/or vitamin D as milk, so read the labels to be sure that what you're buying is fortified.

Eat alternative calcium sources. Dairy isn't the only source of calcium. You can get healthful doses from canned sardines and salmon, fortified juices and cereals, fortified soy products, almonds and dark leafy greens like kale and collards.

Severity of symptoms is individualized. Some with lactose intolerance can take in small amounts, such as 12 grams of lactose, in yogurt or aged cheeses with minimal symptoms, while others need to avoid it entirely.

If you currently have lactose intolerance, chances are you know it. Some people, however, develop late-onset lactose intolerance, which can show up during your 40s or beyond. In Caucasians (but not other races where lactose intolerance is more common), certain variations of MCM6 are strongly linked to either being lactase persistent, meaning your lactase activity is maintained and you can digest lactose throughout adulthood, or developing lactose intolerance. In one Finnish study, adults with a specific variation of this gene were more than twice as likely to become lactose intolerant as an adult compared to those of other genotypes.

Our analysis investigated which genotype for this gene was present in your DNA. Your rating of LIKELY or NOT LIKELY reflects whether your genotype included those that carried a risk for becoming lactose intolerant.

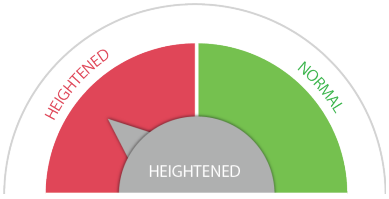
Check pre-packaged foods. If you're particularly sensitive to lactose, get in the habit of reading your labels carefully. Food manufacturers often add milk and milk products to a variety of foods including breakfast foods like waffles and pancakes, bread and baked goods, soups, even salad dressings and snacks.

Get your D. Sunlight is the main source of vitamin D, but we need it from our diet, too. If you don't eat dairy, get your vitamin D from fatty fish like wild-caught salmon, mackerel, and tuna and/or fortified foods like soymilk, juice and cereals.

SENSITIVITY TO SATURATED FAT

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits characteristics that make you likely to have a HEIGHTENED RESPONSE and sensitivity to dietary saturated fat and its association with elevated metabolic and cardiovascular health risk factors. Because saturated fat is so prevalent in the typical American intake, it may be especially important for you to be mindful of your saturated fat intake in order to maintain health goals.



Your genetic profile indicates you are likely to have a HEIGHTENED RESPONSE and sensitivity to dietary saturated fat.

You are at an increased risk for metabolic and cardiovascular conditions due to predisposed genes in combination with consuming a diet that is excessive in saturated fat.

SUCCESS STRATEGIES

Saturated fats are those that are found in many meats, poultry with skin, lard and cream, butter, cheese, and dairy products, as well as some plant-based oils, such as palm oil, palm kernel oil, and coconut oil. They are also found in many baked goods and fried foods.

Due to the various types of saturated fats, research isn't conclusive about how these fats all impact cardiovascular health. However, research shows that having a genotype that enhances sensitivity to these fats places you at a higher risk for negative health outcomes related to these types of fats.

The American Heart Association (AHA) recommends eating a diet that includes about 5% to 6% of your total daily calories from saturated fat.

About 70% of Americans eat more than 10% of our energy needs from saturated fat, according to the 2015-2020 Dietary Guidelines; yet the American Heart

RELATED GENES / SNPs

TCF7L2, APOA2, FTO

The genes and associated SNPs included in this category have been shown to have significant associations with a person's likelihood of being sensitive to saturated fat in their diet. Though it's generally recommended to limit saturated fat intake, scientists know that certain individuals have a greater risk for poor metabolic and cardiovascular health in response to eating higher levels of saturated fat. Research also finds that people with specific variations of the APOA2 gene are unable to break down saturated fats as well, making them more susceptible to shifts in body composition when in combination with a diet that is excessive in saturated fat. That risk is largely genetic.

Research finds that people with specific variations of the APOA2 gene are unable to break down saturated fats as well, making them more susceptible to shifts in body composition due to a diet that is excessive in saturated fat.

FOOD SENSITIVITY

SENSITIVITY TO SATURATED FAT

Our analysis investigated which genotype of these genes was present in your DNA. Your rating of NORMAL RESPONSE or HEIGHTENED RESPONSE reflects whether your genotypes included those that carried the likelihood of having a higher sensitivity to dietary saturated fat and its association with elevated metabolic and cardiovascular health risk factors.

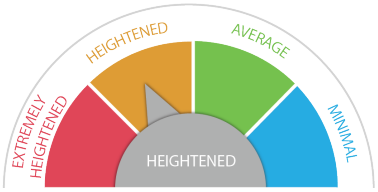
Association (AHA) recommends eating a diet that includes about 5% to 6% of your daily energy needs from saturated fat.

To keep your saturated fat intake in check, substitute fried meals at fast food restaurants with a fried chicken salad instead; enjoy baked goods in moderation; and slowly begin to incorporate healthy fat alternatives, such as nuts, seeds, lean meats, fish, olive, or canola oil, into your daily intake.

FOOD SENSITIVITY

CELIAC DISEASE RISK

WHAT YOUR GENES SAY ABOUT YOU:



Our analysis indicates that your genetic profile exhibits characteristics that give you a HEIGHTENED likelihood of having or developing Celiac Disease. That means that your body may become over-reactive to gluten, which are proteins found in rye, barley, malt, oats, and wheat. This immunological reaction over-reaction can cause gas, or bloating, joint inflammation, fatigue, mood changes, seizures, or mouth ulcerations and in extreme cases an autoimmune inflammatory reaction that causes intestinal damage and nutritional deficiencies. About one in 100 people worldwide and about 3 million Americans have celiac disease, the most extreme form of gluten sensitivity. However, research shows it is often undiagnosed, and many more people have gluten sensitivity. Your heightened -risk genotype is not a diagnosis. It does not mean you have or will have gluten intolerance, only that you are genetically more susceptible. To accurately determine if you are intolerant to gluten, seek medical counsel through proper screening and testing. Once you have been tested, and if you are diagnosed with Celiac Disease, you should then establish dietary care with a registered dietitian to receive appropriate nutrition therapy. Our team at Lemond Nutrition is highly skilled in the treatment of Celiac Disease and always works alongside your medical, interdisciplinary team to ensure the best quality of care.

Your genetic profile indicates that you have a HEIGHTENED risk for gluten intolerance.

That means you are at risk for not being able to digest or tolerate gluten intolerance, a protein found in wheat, barley, malt, oats, or rye.

Researchers do not know why some individuals that have the gene that expresses Celiac Disease turns on in some and not others.

About 1 percent of the population has celiac disease, which is an autoimmune condition that triggers a harmful inflammatory reaction when gluten is consumed. About one in 20 people have a negative reaction, such as GI distress, to foods with gluten, but not an inflammatory response.

SUCCESS STRATEGIES

As someone with a heightened-risk genotype, it is worth self-monitoring for signs of Celiac Disease, and taking appropriate action if they occur.

RELATED GENES / SNPs

HLA-DQ

You may have heard the terms “gluten sensitivity” and “gluten intolerance.” Both terms refer to a difficulty digesting gluten. People can also have varying degrees of gluten sensitivity, which can cause stomach upset, GI issues, rashes, and fatigue without intestinal damage. Although gluten sensitivity or gluten intolerance can be disruptive by their symptoms, they are less likely to cause serious health conditions.

Celiac Disease (CD) is different in that the response is auto-immune damage to gluten. In CD, the trigger (gluten) causes an inflammatory response that damages the intestines, leads to GI distress, blistering rashes and, often the cause of nutritional

FOOD SENSITIVITY

CELIAC DISEASE RISK

Know the symptoms. Some of the symptoms of gluten intolerance are like irritable bowel syndrome: gas, bloating, abdominal pain, cramping and diarrhea. As someone with a heightened risk for developing the condition, it's a good idea to be aware of them all. Other symptoms may include:

- Constipation
- Peripheral neuropathy
- Mouth ulcerations
- Nausea/Vomiting
- Itchy, blistery rash
- Chronic Fatigue
- Seizures
- Iron Deficient Anemia
- Joint and muscle pain
- Headaches
- Failure to Thrive (in children)

See your doctor. If you suspect you have gluten intolerance, schedule an appointment with a GI specialist or ask your PCP for a referral to be accurately screened and tested. Blood tests and endoscopies can diagnose celiac disease. If you are diagnosed with Celiac Disease, you should then establish dietary care with a registered dietitian to receive appropriate nutrition therapy.

Be a gluten savvy shopper. The traditional American diet is heavily grain-based, so it will take some work to steer clear of gluten if you are diagnosed with Celiac Disease. There are some basic rules that will make your shopping easier:

deficiencies.

Celiac Disease is linked to the human leukocyte antigen (HLA) genes, specifically the HLA-DQ family, which includes various types and subtypes ranging from HLA-DQ1 through HLA-DQ9. Everyone inherits two HLA-DQ genes, one from their mother and one from their father, so there are many possible inherited combinations.

Of all the types, HLA-DQ2 and HLA-DQ8 appear in about 30 percent of the population and are the most closely linked to gluten intolerance. Carrying one or both increases your risk for celiac disease but does not necessarily mean you will develop the autoimmune disorder.

People possessing DQ2.5 have significantly elevated risk for gluten sensitivity. Research on DNA from more than 10,100 people in the U.S. concluded that those carrying two DQ2.5 haplotypes had the highest risk for gluten intolerance.

Our analysis investigated which genotype for these genes was present in your DNA. Your rating of EXTREMELY HEIGHTENED, HEIGHTENED, AVERAGE, or MINIMAL response reflects whether your genotype includes those that carry the likelihood of having or developing an intolerance to gluten.

Identify Gluten on Labels. Legally, most foods should be properly labeled if wheat is an ingredient in a food product or, if a food item is gluten free, there is typically a gluten free label on the packaging. To make shopping easier, educate yourself on where these lists and labels are located on packaging to be able to easily identify tolerable foods.

Further, become aware of the interchangeable terms used in placement of wheat, rye, malt, or barley or common foods. A brief list is given below:

- Graham or Durum flour
- Farina or Semolina
- Beer
- Soy sauce

CELIAC DISEASE RISK

- Bouillon Cubes

Select alternative sources.

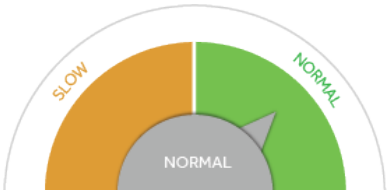
Fortunately, there are still many nutrient dense alternatives to these foods, including rice, quinoa, millet, buckwheat, as well as beans and potatoes. Many grocery stores also have aisles or sections dedicated to gluten-free pastas, breads, and baked goods.

Choose processed "gluten-free" foods wisely. Gluten-free has become somewhat of a health food trend among people who engage in dieting, inaccurately misdiagnose themselves, or experience skin irritability. While eating fresh foods is beneficial for your health, gluten-free foods by themselves are not necessarily better for you. In fact, many packaged gluten-free foods, especially baked goods, are higher in sugar, fat, and sodium to improve the flavor and texture after the gluten is removed.

CAFFEINE METABOLISM

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits a NORMAL rate of caffeine metabolism. Having this genotype means you can enjoy the ergogenic benefits of this stimulant that include increased alertness, improved fat burning and glycogen sparing, lower rate of perceived exertion during hard efforts, and increased time to fatigue, especially during endurance events.



Your genetic profile indicates that youare likely to have a NORMAL rate of caffeine metabolism.

Your liver breaks down and clears the stimulant at a normal rate, and you are likely to benefit from using caffeine as an ergogenic aid in the sports and activities of your choice.

Research dating back to the '70s has consistently shown that caffeine can improve sports performance, particularly endurance performance, where the average improvement in exercise trials is about 24 percent in time to exhaustion and 3.1 percent in time to completion. It may also improve muscle power and endurance for power and sprint-based sports.

Caffeine primarily interacts with adenosine, a chemical in your central nervous system that regulates sleeping and waking. As adenosine accumulates, it inhibits nerve activity and causes drowsiness. Caffeine essentially blocks adenosine, preventing your nerve activity from slowing down, which increases alertness and brain activity and reduces tiredness, which benefits all sports performance. It also increases circulating epinephrine, the hormone responsible for your fight or flight response, which helps you feel physically and mentally keyed up to perform.

SUCCESS STRATEGIES

For maximum benefit, ingest 3 to 6 milligrams of caffeine per kilogram of body

RELATED GENES / SNPs

AHR, RP11-10017.3-001, ARID3B, CYP1A1

The genes and their associated SNPs that are included in this category have been shown to have significant associations with a person's ability to metabolize caffeine.

Caffeine is well known and widely used as a legal stimulant. On the endurance front, caffeine increases the body's ability to use stored fat as fuel, which spares limited muscle glycogen (stored carbohydrate) stores. It also increases beta-endorphins to enhance feelings of wellness while also lowering your perceived exertion, so hard efforts feel easier. However, not everyone responds equally...or favorably. Some people suffer from negative caffeine side effects after one ill-timed cup of coffee, while others can drink several cups a day and feel fine.

We now know this disparity is largely hereditary. Caffeine is rapidly absorbed into the bloodstream, with levels peaking after about 90 minutes and starting to drop off after about 3 to 4 hours. Caffeine eventually gets broken down in the liver by enzymes (Cytochrome P450 1A2, or CYP1A2) that

CAFFEINE METABOLISM

weight, or about 200 to 400 milligrams (2 to 3 cups of coffee) for a 150 lb. (68 kg) athlete about 30 minutes to an hour before exercise.

You will likely find that caffeine is particularly useful for endurance-based activity. Recently, British researchers found that relatively low doses of the stimulant, about two cups of coffee, could improve 40K time trial performance in trained cyclists by 55 to 84 seconds. In another study appearing in the Journal of Pain, exercise scientists found that cyclists who took caffeine before riding 30 minutes on stationary bikes had significantly less muscle pain during their effort than those who pedaled caffeine-free.

Though the research is a bit less conclusive, caffeine also may help improve strength performance. One review of 27 studies found that caffeine improved leg muscle power by up to 7 percent, but didn't seem to impact smaller muscle groups. It also appears to improve muscle endurance, so you can perform more repetitions for a given weight.

It may also boost performance in sprint activities. In a study on runners, those drinking regular coffee were 4.2 seconds faster in a 1500-meter run than those who were given decaf. And in studies on team sports, caffeine was shown to improve the passing accuracy in rugby and soccer sprint time.

metabolize the chemical. Depending on your genetic makeup, you will be able to metabolize caffeine at a normal rate, or your rate may be significantly slower. One study of 9,876 individuals found that variants in several genes were associated with slow caffeine metabolism (which was also associated with lower coffee consumption, indicating that people generally self regulate).

Being a slow caffeine metabolizer means the caffeine stays in your system longer, which can have adverse effects such as increasing blood pressure and may increase the risk of heart attack. Slow metabolizers also do not enjoy the same level of ergogenic improvement as people who metabolize the drug normally.

Our analysis investigated which genotype for these genes was present in your DNA. Your rating of NORMAL or SLOW reflects whether your genotype included those that carried a risk of adverse side effects in response to caffeine use or whether you are likely to benefit from using caffeine as an ergogenic aid.

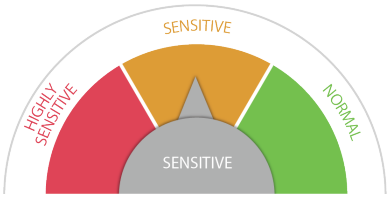
Watch the dosage. Being a normal caffeine metabolizer does not make you immune to the potential negative side effects from too much caffeine, such as jitteriness and GI distress. So it is important to use it prudently.

One cup (8 oz.) of coffee generally delivers 100 to 150 mg of caffeine. Going above 600 mg can have adverse effects and may be prohibited by your sport's governing body. For endurance events lasting longer than two to three hours, you also may benefit from taking another dose of about 50 to 150 mg in the form of a caffeinated gel or energy drink for a boost during the latter part of the event.

Despite its longstanding reputation as such, caffeine is not a diuretic, so won't dehydrate you. As with any ergogenic aid, always be sure to test your response to caffeine in training before trying it during an event.

CHOLESTEROL RESPONSE TO DIETARY FAT

WHAT YOUR GENES SAY ABOUT YOU:



Our analysis indicates that your genetic profile exhibits characteristics that give you a SENSITIVE cholesterol response to eating dietary fat. That means you may be more inclined to see significant changes in your cholesterol levels in response to a moderate or higher dietary fat intake. The good news is that you don't have to—nor should you—eliminate this essential macronutrient from your diet. Foods rich in healthful fats like nuts, vegetable oils and fish have protective effects, particularly for cardiovascular disease. They also help you absorb a host of vitamins, promote satiety, and taste great. It's a matter of maintaining a balanced intake of dietary fat to optimize the benefits of unsaturated fats while not restricting all fats.

Your genetic profile indicates that you have a SENSITIVE cholesterol response to consuming dietary fat.

We recommend that you follow a diet that is about 20 percent of your total daily calories, which will account for saturated fat and total fat. Focus on maximizing the nutritional density of unsaturated fats, while consuming moderate to minimal amounts of saturated or trans fats.

SUCCESS STRATEGIES

Know your fats. It's official: The U.S. Departments of Agriculture and Health and Human Services lifted the ceiling on total fat consumption in the American diet because evidence shows that eating more foods containing polyunsaturated and monounsaturated fats like nuts, vegetable oils and fish have protective effects, particularly for cardiovascular disease. So, it's important to know your forms of fat:

Unsaturated

Liquid at room temperature and generally considered heart healthy; found in plants like nuts, seeds, and vegetable oils and seafood. Focus your diet primarily around these. Specific foods to include in your daily and/or weekly diet:

RELATED GENES / SNPs

LIPC

The gene and associated SNPs included in this category have been shown to have significant associations with a person's cholesterol response to eating dietary fat.

Much confusion and controversy has been associated with consumption of dietary fat in correlation to potential health risks. The results are mixed, and consensus is very hard to come by. It's possible that the situation is so confounded because individual responses are just that, individual. A growing body of gene research indicates that variations in your genetic code may impact how your body responds to a host of dietary factors, including fat.

In one study, researchers measured the total cholesterol, triglycerides, LDL cholesterol, HDL cholesterol levels, and genotype of 743 men and women. These candidates were asked to follow either a high fat (40 percent

CHOLESTEROL RESPONSE TO DIETARY FAT

Olive oil - A study published in the journal Molecules reported that components of olive oil, including oleic acid and secoiridoids, protect your body on the cellular level. .

Fish - The new US Dietary Guidelines recommend eating 8 ounces per week to get healthy amounts of polyunsaturated omega-3 fatty acids, eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA), which fight inflammation and chronic disease.

Avocados - Animal research shows avocados may help lower inflammation, as well as improve cholesterol levels.

Tree nuts - According to a study in the British Journal of Nutrition, people who ate a daily one-ounce serving of nuts had a 50% lower rate of diabetes, a 30% reduction in heart disease and a nearly 50% lower incidence of stroke.

Saturated

Solid at room temperature and found in animal foods as well as coconut and palm oil; often deemed to raise LDL cholesterol and lead to plaque buildup in arteries. Per clinical nutrition guidelines, it is best to be more conservative with saturated fats to minimize cardiovascular risk.

Trans

Liquid fats made solid through a process called hydrogenation; found in fried foods, baked goods, and processed snack foods. Like saturated fats, trans fats raise LDL cholesterol yet also lower HDL cholesterol.

Smaller portions that pack a bigger punch. Out of the three macronutrients, fat contains the most energy per gram, so it does not take a significant amount of dietary fat to meet your daily recommendations. Again, the best measuring tool you'll always have with you is your hand. Some quick references, as well as exchanges, are found below:

- 1 teaspoon = the tip of your index finger

of daily calories) or a low-fat (20 percent of daily calories) intake for two years. At the end of this two-year period, these men and women had their lipids levels retested.

At the end of the study, the men and women who carried the A allele form of this gene were particularly sensitive to dietary fat in that when they ate a low-fat diet, their total and LDL cholesterol levels dropped compared to their peers with other genotypes. Conversely, when they ate a higher fat diet, their total and LDL cholesterol levels rose. Other studies have pinned increases in protective HDL cholesterol with other variations of the LIPC gene.

In summary, dietary fats consist of unsaturated fats (polyunsaturated and monounsaturated), saturated fats, and trans fats. Surprisingly, most foods contain a mixture of these fats, so, realistically it's impossible to eliminate all fats. Further, fats are important for these additional reasons also:

- Increased absorption of vitamins A, D, E, K
- Composes 60% of the brain
- Heart's primary fuel
- Precursor for cortisol, bile acids, and vitamin D

For reasons listed above, one cannot live without fat; hence, why fat is one of three macronutrient building blocks for the body. To give more momentum to why fat is so crucial for our bodies, would you consider consumption of dietary fat a form of self-care? Because fat keeps skin and hair healthy, while also ensuring regulation of your body temperature and protection of organs. This does not mean eating excessive amounts of dietary fat, but what this share is, you must have adequate amounts of fat within the diet to maintain bodily functions.

FOOD SENSITIVITY

CHOLESTEROL RESPONSE TO DIETARY FAT

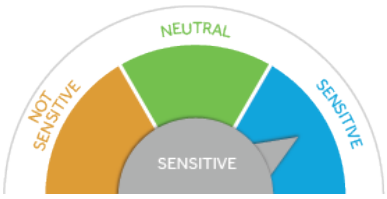
Our analysis investigated which genotype for this gene was present in your DNA. Your rating of NORMAL, SENSITIVE or HIGHLY SENSITIVE reflects whether your genotypes included those that increased your cholesterol sensitivity to dietary fat.

- 1 tablespoon = whole thumb, from tip of thumb to where thumb connects to palm
- 1 tsp of mayo = 1 fat exchange
- 1 tsp of butter = 1 fat exchange
- 1 tsp of vegetable oil
- 1 tbsp of cream cheese = 1 fat exchange
- 1 tbsp regular salad dressing = 1 fat exchange

INSULIN RESPONSE TO DIETARY FAT

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits characteristics that give you a SENSITIVE insulin response to consuming dietary fat. That means you will experience more positive insulin sensitivity (and less insulin resistance) by eating a high fat diet (about 40%), such as a Mediterranean style diet. The types of fat you choose still matter for insulin sensitivity and overall health, however, as do your carbohydrate choices.



Your genetic profile indicates that you have a SENSITIVE insulin response to consuming dietary fat. Following a higher fat (40%) Mediterranean style diet will help you maintain healthy insulin sensitivity and blood sugar levels.

Carbohydrates also play a major role in insulin response, so it is important to choose complex, healthier carbohydrates, as well.

SUCCESS STRATEGIES

Go ahead and eat like a Greek... or a Parisian or any other dweller of the Mediterranean region. That diet, which is rich in olive oil, fatty fish, nuts and seeds and various types of cheeses derives about 40 percent of its calories from healthy fats and works well with your genotype to maintain healthy insulin sensitivity and blood sugar levels. Note that though your genotype is more positively responsive to a higher fat diet, it does not mean it's a good idea to break out the bacon every morning. Research is clear that unsaturated fat tends to create a healthier insulin response than saturated fat and is a healthier choice for overall health. see Types of Fat in Blood Lipid Response to Dietary Fat section for a rundown of the types of fats and foods found in each category.

RELATED GENES / SNPs

FTO

The gene and associated SNPs included in this category have been shown to have significant associations with a person's insulin response to eating dietary fat.

When most of us think insulin, we think sugar and carbohydrates. However, dietary fat also drives insulin response and has long been vilified as contributing to insulin resistance and subsequent fat storage—especially deep in the abdomen where it wreaks havoc on metabolic health—and chronic conditions like diabetes and heart disease.

Low fat diets have been shown to help some people maintain healthy insulin sensitivity. As with many dietary interventions, however, they didn't and don't work for everyone. There are many reasons why, of course. The type of carbohydrates you replace fats with, how much protein you eat, how much you eat, how much you exercise and the type of fat you eat all factor into your insulin response. Research shows that there is a genetic component as well.

FOOD SENSITIVITY

INSULIN RESPONSE TO DIETARY FAT

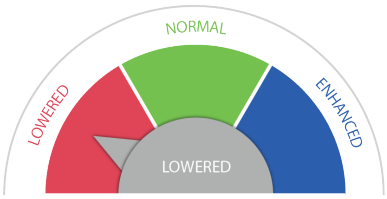
Make your carbs complex. While you're eating Mediterranean style high fat, eat Mediterranean style complex carbohydrate as well. Carbohydrates have an enormous impact on insulin response and blood sugar levels independently of fat intake. The occasional pastry or croissant is okay, but aim to eat the lion's share of your carbohydrates not from sugary refined carbs, which can spike your insulin and set you up for insulin resistance overtime, but rather from slower digesting complex carbs. Good sources include whole plant foods such as fruits, vegetables, legumes, whole grains (such as brown rice, quinoa and oats), nuts and seeds. Lemond Nutrition does believe in honoring those occasional food cravings instead of having a militaristic approach to food. These are general guides that we recommend for balance.

In a study published in The Journal of Nutrition, Boston-based researchers genotyped FTO (the gene associated with fat mass and obesity) variants among 743 larger bodied men and women who were following either a high fat (40% of total calories) or a low fat (20% of total calories) diet for two years. In the end, regardless of how much weight they lost, those who carried certain FTO variations had less improvement in insulin sensitivity/resistance following a low fat diet than following a high fat diet—a finding that echoed an earlier European study, which also found risk allele carriers of FTO benefitted more from a high fat diet when it came to improving insulin resistance.

Our analysis investigated which genotype for this gene was present in your DNA. Your rating of NEUTRAL, NOT SENSITIVE or SENSITIVE reflects how your insulin sensitivity (a good thing, as it prevents/improves insulin resistance) responds when you consume dietary fat.

RESPONSE TO MONOUNSATURATED FATS

WHAT YOUR GENES SAY ABOUT YOU:



Our analysis indicates that your genetic profile exhibits characteristics that make you likely to have a LOWERED sensitivity to an intake that is high in monounsaturated fat (MUFA). That means that consuming a high-MUFA intake may be related to poor fasting blood sugar levels. Although you don't need to eliminate these fats, which have been found to low density lipoprotein (LDL) cholesterol levels and have beneficial effects on your heart health when eaten in moderation.

Your genetic profile indicates you are likely to have a LOWERED sensitivity to an intake that is high in monounsaturated fat (MUFA).

You may be at an increased risk for poor blood sugar control in response to a high-MUFA diet. Aim to eat a moderate MUFA diet to manage blood sugar levels while still gaining benefits from unsaturated fats.

SUCCESS STRATEGIES

Monounsaturated fat (MUFA) is a type of dietary fat that is typically found in plant foods, such as nuts, avocados, and vegetable oils (olive, peanut, and canola).

The good news is that research shows that people of your genotype experience no negative health impact from a diet that is moderate in monounsaturated fats, or less than 13% of your daily energy needs. When eaten in moderation, these fats have been shown to decrease LDL cholesterol and provide heart healthy benefits. Foods rich in monounsaturated fats also are an important source of the antioxidant vitamin E. However, people with your genotype may experience adverse health effects in the form of poor blood sugar control in response to eating a diet that is high in monounsaturated fat (exceeding the recommended 13% of daily energy needs).

Nevertheless, you can optimize your genotype by following a low dietary fat, high fiber intake that includes a variety of vegetables, fruits, beans and legumes, fish,

RELATED GENES / SNPs

CLOCK, ADIPOQ

The genes and associated SNPs included in this category have been shown to have significant relations with a person's sensitivity to dietary monounsaturated fats. These SNPS will further determine if there are positive or negative correlations between the consumptions of monounsaturated fats and your health.

Monounsaturated fatty acids, or MUFAs as they're often called for short, are generally considered one of the most beneficial forms of dietary fat. In fact, some research has found connections between eating a high-MUFA diet and improved blood sugar control. How your body will respond is partly determined by your DNA.

Studies of the CLOCK gene specifically find that people with certain variants experienced improved insulin sensitivity and blood sugar control in response to a high MUFA diet.

Our analysis investigated which genotype for these genes was present in your DNA. Your

FOOD SENSITIVITY

RESPONSE TO MONOUNSATURATED FATS

rating of LOWERED, NORMAL or ENHANCED sensitivity reflects whether your genotypes included those that carried the likelihood of having a negative, normal, or greater sensitivity to consuming a high MUFA diet with respect to insulin sensitivity and blood sugar control.

lean meats, poultry, and whole grains.

SUMMARY

What nutrients do you need?

NUTRIENTS	TENDENCY	GOOD SOURCES INCLUDE
Vitamin A	LOW	Carrots, Kale, Tuna
Vitamin B6	LOW	Pistachios, Watermelon, Potatoes
Folate	NORMAL	Pinto Beans, Asparagus, Broccoli
Vitamin B12	NORMAL	Lean meat, Seafood, Fortified Dairy Product
Vitamin C	NORMAL	Red Bell Peppers, Strawberries, and Oranges
Vitamin D	LOW	Salmon, Egg Yolks, Fortified Dairy Milk
Vitamin E	ABOVE AVERAGE	Almonds, Spinach, Sweet Potatoes
Calcium	NORMAL	Milk, Yogurt, Kale
Copper	NORMAL	Dark Chocolate, Dried Apricots, Sunflower Seeds
Iron	ABOVE AVERAGE	Spirulina, Grass Fed Beef, Lentils
Magnesium	NORMAL	Spinach, Chard, Pumpkin Seeds
Omega Levels	HEIGHTENED	Salmon, Flax Seeds, Walnuts
Phosphorus	ABOVE AVERAGE	Sunflower seeds, Tuna, Turkey, Mung Beans
Polyunsaturated Fatty Acid Levels	SLIGHTLY RAISED	
Selenium	ABOVE AVERAGE	Brazil Nuts, Yellowfin Tuna, Halibu
Zinc	NORMAL	Oysters, Toasted Wheat Germ, Beef, Pumpkin and Squash Seeds

HOW DO MICRONUTRIENTS AFFECT MY BODY WEIGHT?

Micronutrients have not been shown to have a direct effect on body weight or body fat. So why are they included in this genetic analysis?

The vitamins tested play important roles in a variety of functions in the body that may affect your body weight—or your ability to manage it.

NUTRIENTS

SUMMARY

Many micronutrients are involved in the body's metabolism of fat, carbohydrates and protein. When you are eating and exercising, you want your metabolism to function smoothly. The body does find ways to cope when some nutrients are not available. But for optimum performance and energy, you'll do best when your body has all it needs to work properly.

Some nutrients such as vitamin C and vitamin D may not affect body weight directly, but they play a role in bone health, inflammation and healing. The stresses you put your body under when exercising may be bolstered if you are well nourished in these nutrients.

DO MY RESULTS SHOW THAT I AM LOW IN NUTRIENTS?

If you scored LOW or BELOW AVERAGE, your genotype results show that you may have a higher risk for having blood levels of certain nutrients that may be in the lower end of the normal range. For a few nutrients, such as vitamin B12, it may be optimal to be in the mid range of normal, or higher. This genotype risk assessment is based on studies where study participants with certain genotypes for the various nutrients tested were shown to be more likely to be in the lower end of the normal range for a nutrient.

Be careful of assuming these results indicate you are low, or deficient in a certain nutrient. The only way to know for sure if you are in the low end of the normal range for a nutrient, or if you are actually deficient, is to consult with your physician and get a specific blood test designed to assess a specific nutrient. This genetic test can only assess your risk; the blood test is what can assess your actual levels.

WHICH FOOD CHOICES FOR CERTAIN MACRONUTRIENTS ARE THE BEST FOR ME?

Our genetic testing analyzes your genotype and assesses your potential levels of macronutrients. This testing does not test your individual sensitivity or response to certain foods that may contain these macronutrients. You may have other individualized responses that are not detected in the genetic tests. For example, you may be allergic to the proteins in dairy foods. Or you may have a negative response to the lactose sugars in dairy products. This report cannot inform you about these reactions. Any food recommendations that are suggested to help you obtain certain nutrients should be modified based on other factors that you may already know about.

HOW CAN I MONITOR MY NUTRIENT INTAKE?

Your body absorbs a certain amount of nutrient as food or supplements are digested. Then your body uses or stores the nutrient as needed. There are many factors that affect how much of a nutrient you take in, how much of a nutrient is absorbed and used by your body, and whether your body stores are in the normal range.

Your genotype for certain nutrients can indicate that you may be at risk for having lower levels of certain nutrients. But since the genotype analysis is not measuring what you eat, the supplements you take, or actually measuring levels in your blood or tissues, the genotype analysis alone cannot relate your true status.

People who are low or deficient in a nutrient may absorb more from food than someone who is not deficient. A person who needs more of a certain nutrient may absorb more of it from a food than someone who has normal levels. There are also other factors that can affect absorption positively or negatively, and that can affect how your body uses what you take in.

How do you know what your true nutritional status is? A blood test is generally the only way to truly test your true nutritional status. What is in the blood when tested may not always reflect what is in the tissues or how much is being used by the body. But at present, this is the measure used for most nutrients. There may also be different blood tests that monitor the same nutrient.

SUMMARY

Keep these factors in mind as you interpret your genotype results and the suggestions given. No one result is going to give you all the information you need. But taken together, the results of your genotype analysis, along with a blood test can help you spot potential areas where you can optimize your nutrition.

SHOULD YOU TAKE A SUPPLEMENT?

Most nutritionists recommend that nutrients be obtained first through food. Research studies have tended to show more favorable outcomes when research participants obtained nutrients from food sources rather than from supplements. Nutritional experts vary in their opinions about whether people should take supplements or not.

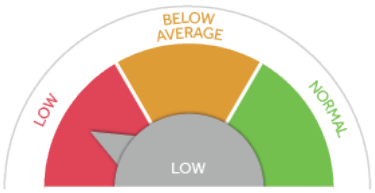
Most supplements are considered safe. But be cautious with dosing because research on appropriate levels has identified ranges for some nutrients beyond which toxic effects can occur. These ranges are known as the Upper Intake Level, or UL. It is difficult to reach the UL by getting the nutrients from food, but it is easy to reach these high risk levels from supplementation.

If you do choose to supplement, keep track of the nutrients you get from all foods. Read food labels since some foods that you eat may also be fortified in the supplements you are taking. Use dietary software to input what you eat and supplement with so you can keep an estimate of your total nutrient intake and will be less likely to overdose. Also consult with your doctor if needed. Some supplements, including vitamin A and vitamin B6, can interact with medications you may be taking.

VITAMIN A TENDENCY

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that for the gene investigated, your genotype showed the allele combinations that exhibit a LOW ability to convert high doses of betacarotene from a supplement into the active form of Vitamin A that is shown in a blood test. This means that if you take a beta-carotene supplement, your ability to convert the nutrient into an active form of Vitamin A is likely to be reduced. It is unclear how your body might respond to food sources of beta-carotene, but it might show a reduced conversion ability as well.



Your genetic profile indicates that your response is LOW.

This suggests that your ability to convert high doses of beta-carotene from a supplement into an active form of Vitamin A is reduced compared to others with a different genotype. You may want to get a blood test to assess your blood levels of Vitamin A, and then consume more beta-carotene and Vitamin A-rich foods, or possibly take low dose supplements if you are low or deficient.

SUCCESS STRATEGIES

- If you take supplemental forms of beta-carotene in fortified foods or supplements, or if you have any signs of poor vision, you may want to request a blood test assessing your levels of Vitamin A from your doctor. If your body is deficient, vision and other aspects of health can be affected, so you may want to increase your intake of beta-carotene and Vitamin A-rich foods, and perhaps take low-dose Vitamin A supplements if you are low or deficient.
- Vitamin A is needed for good vision and needs may increase in women who are pregnant or lactating.
- Make sure not to exceed recommended levels of supplemental betacarotene or Vitamin A, as toxicity can occur.
- Be aware that some medications, alcohol or health conditions may interact with Vitamin A supplements and cause adverse effects.

RELATED GENES / SNPs

BCMO1

The gene and its associated SNPs that are included in this category have been shown to have statistically significant associations with a person's blood levels of Vitamin A. Vitamin A promotes good vision, is involved in protein synthesis that affects skin and membrane tissues, and helps support reproduction and growth. The nutrient is found in plant foods in its precursor forms such as beta-carotene. Beta-carotene is converted by the body into different active forms of Vitamin A: retinol, retinal and retinoic acid. Animal foods, such as meat and dairy, provide the retinol form of Vitamin A.

It is rare to over-consume beta-carotene in plant foods to reach toxic levels. However, it is possible to consume toxic levels of Vitamin A from organ meats or fortified foods. Pregnant women are advised to eat liver no more than once every two weeks.

Vitamin A in the form of beta-carotene is found in foods such as vegetables, especially leafy greens like spinach and orange foods

NUTRIENTS

VITAMIN A TENDENCY

such as carrots, sweet potatoes, apricots, mango and cantaloupe, as well as in the retinol form in dairy and in organ meats like liver.

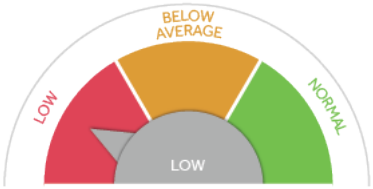
VITAMIN A-RICH FOODS TO INCLUDE IN YOUR DIET:

Broccoli, Swiss chard, collard greens, kale, carrots, butternut squash, apricots, goat's cheese, liver, tuna.

VITAMIN B6 TENDENCY

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic response is LOW. Your score reflects the fact that your genotype showed the most unfavorable allele combination. This means there is a risk that your blood levels of B6 may be lower than normal. Keep in mind that increased risk does not mean that your blood levels are low. You can only know this by requesting a blood test from your physician or other healthcare provider.



Your genetic profile indicates that your response is LOW,

indicating that you are at risk for having low levels of Vitamin B6. Check your status by asking your doctor for a blood test. Eat enough B6-rich foods and supplement if you are low.

SUCCESS STRATEGIES

Since you are at risk for having lower levels of Vitamin B6 in your blood, it is especially important that you get adequate amounts of this nutrient in your diet. Monitor your intake by keeping a food log and using a dietary app to obtain a nutrient analysis to see how much Vitamin B6 you consume. It's a good idea to keep a food log periodically, especially if you go through periods in life where you are aware that you may not be eating properly.

If your blood tests show low levels, you may wish to take a Vitamin B6 supplement. Be sure to avoid high doses, as they can cause nerve damage.

VITAMIN B6-RICH FOODS TO INCLUDE IN YOUR DIET:

Pistachios, pinto beans, wheat germ, bananas, watermelon, carrots, spinach, peas, squash, potatoes, avocados, yellowfin tuna, sunflower seeds

RELATED GENES / SNPs

NBPF3

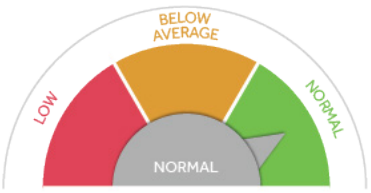
The gene and its associated SNPs included in this category have been shown to have statistically significant associations with a person's blood levels of Vitamin B6. In one large study, people who carried the most unfavorable pairs of genes, or alleles had lower levels of Vitamin B6.

Vitamin B6 is important for nerve cell function, energy metabolism and the production of hormones, such as serotonin and epinephrine. Low levels of B6 are also linked to higher levels of homocysteine, which increases heart disease risk. B6 is found in many foods including grains, legumes, vegetables, milk, eggs, fish, lean meat and flour products.

VITAMIN B9 – FOLATE TENDENCY

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile is NORMAL. It appears that you are likely to have normal blood levels of folate. This suggests that you may not have to worry about increased heart disease risk from higher levels of homocysteine.



Your genetic profile indicates that your response is NORMAL.

You appear to be likely to have normal blood levels of folate. To make sure you get enough, make sure to eat plenty of whole plant foods every day.

SUCCESS STRATEGIES

- All women should ensure they get enough folate in their diet. You will get folate that is added to whole grains in cereals and breads, but you should also eat other food sources of folate. The foods highest in folate include legumes, fruits and vegetables, especially greens.
- Smoking can also decrease folate levels. You may need to consume more through food and/or supplements if you smoke — or better yet, quit smoking!
- If you eat few vegetables and fruits, your folate intake and blood levels may be low, despite having a more favorable genotype. You may wish to ask your doctor to assess your levels of serum folate with a blood test.

RELATED GENES / SNPs

MTHFR

This gene and its associated SNPs have been shown to have significant associations with a person's folate, or vitamin B9, status. Folate plays many important roles in the body, including acting as a coenzyme in DNA creation and in energy metabolism reactions. Folate also plays a role in biochemical processes that affect the metabolism of an amino acid, homocysteine. One SNP associated with this gene is associated with enzyme activity that can lead to higher levels of homocysteine. Since homocysteine is a risk factor for heart disease, high levels may be of concern. In child-bearing women, getting sufficient amounts of folate is important because low levels can lead to neural tube birth defects. As a public health measure, grains are fortified with folate to ensure that women of childbearing age get enough. Low levels of folate can also lead to anemia.

In studies on this gene, people who carried the most unfavorable pairs of genes, or alleles, had only a 10%-20% efficiency at processing folate. And those with the below average allele had a 60% efficiency at processing folate. People with more of the

VITAMIN B9 – FOLATE TENDENCY

unfavorable alleles are more likely to have high homocysteine and low Vitamin B12 levels. Poor ability to process folate may be fairly common: Around 53% of women appear to have these unfavorable genotypes.

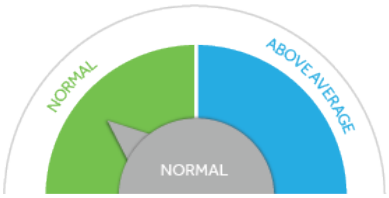
FOLATE-RICH FOODS TO INCLUDE IN YOUR DIET:

Lentils, pinto beans, asparagus and broccoli are excellent sources of folate.

VITAMIN B12 TENDENCY

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile is NORMAL. Your score reflects the fact that your genotype showed few, if any, of the unfavorable allele combinations. This suggests that, as long as you consume a healthy diet that includes Vitamin B12, you are likely to have normal blood levels of vitamin B12.



Your genetic profile indicates that your response is NORMAL.

This suggests that your blood levels of Vitamin B12 are likely to be normal.

Keep in mind, however, that vitamin B12 deficiencies can develop with some health conditions. Also, aging can result in poorer absorption of vitamin B12 from foods. If you follow a plant-based vegan diet that does not include fortified foods, levels also can become low.

SUCCESS STRATEGIES

Getting a nutrient analysis of what you eat can give you an indication of how much of a nutrient you are consuming. Do periodic checks of your estimated vitamin B12 intake with a food log using a dietary app.

To assess how well nutrients in your foods are absorbed, it is a good idea to get periodic testing of your blood levels of vitamin B12. If absorption is impaired, your blood levels may be low and you may wish to supplement with B12.

VITAMIN B12-RICH FOODS TO INCLUDE IN YOUR DIET:

Lean meat, seafood, dairy products, eggs, fortified breakfast cereals, certain brands of fortified nutritional yeast.

RELATED GENES / SNPs

FUT2

The gene and associated SNPs included in this category have been shown to have significant associations with a person's blood levels of Vitamin B12. In one large study, those women who carried the most unfavorable pairs of genes, or alleles, had slightly lower levels of Vitamin B12 compared to others with more favorable genotypes. However, they were not deficient: their levels were still in the normal range, just on the low end. Around 70% of people have genotypes that suggest they may be at risk for having blood levels of B12 that are at the lower end of the normal range. There are several reasons why blood levels of B12 can be low. Some people do not get enough in their diet and so they are simply not getting enough of the nutrient. Some other people get enough, but do not absorb it efficiently. A small percentage of people over 50 or those who have had gastrointestinal surgery or GI disorders such as Crohn's disease may also have reduced abilities to absorb it.

NUTRIENTS

VITAMIN B12 TENDENCY

Research also indicates that around 30% of people have genotypes that suggest they may be predisposed to having higher than normal levels of vitamin B12. Their levels are not excessive, just on the high end of the normal range.

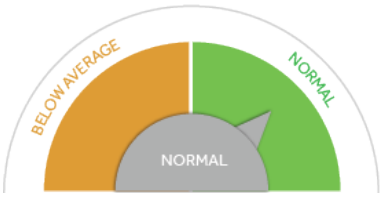
Vitamin B12 is important for many processes in the body, including red blood cell formation, neurological function and cognitive performance. Deficiencies of B12 can cause pernicious anemia, and is also associated with high levels of homocysteine, which may impair arteries and increase risk of heart disease. There is some evidence that subclinical symptoms may be associated with being in the low end of the normal range.

Vitamin B12 is produced by microorganisms found in soil and water, and in both the guts of animals and humans. In the modern world, highly-sanitized food processing systems have eliminated many naturally occurring sources of Vitamin B12-providing bacteria in plant products. Vitamin B12 is typically obtained from animal foods such as meat, or fortified foods such as dairy and plant milks. Certain mushrooms and seaweed may provide some Vitamin B12, but are not considered to be reliable sources.

VITAMIN C TENDENCY

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile suggests that you are likely to have NORMAL levels of Vitamin C. Your score reflects the fact that for the gene investigated, your genotype did not show the unfavorable allele combinations. This means that if you consume enough Vitamin C in the foods you eat, blood levels of L-ascorbic acid should be in the normal range. If you smoke, however, you may deplete some of your Vitamin C and may need more.



Your genetic profile indicates that your response is NORMAL.

If you eat enough Vitamin C-rich foods, you should have normal levels in your blood.

SUCCESS STRATEGIES

- To ensure your body gets the Vitamin C it needs, make sure to include a wide variety of plant foods, including citrus in your diet.
- If you wish to supplement with Vitamin C, avoid very high doses because they can cause diarrhea and gastrointestinal distress.

VITAMIN C-RICH FOODS TO INCLUDE IN YOUR DIET:

Broccoli, red bell peppers, kiwi fruit, Brussels sprouts, strawberries, oranges, watermelon, pinto beans.

RELATED GENES / SNPs

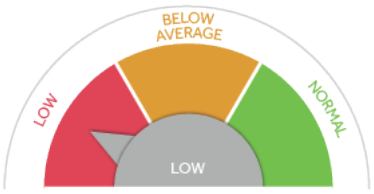
SLC23A1

The gene and associated SNP included in this category has been shown to have statistically significant associations with a person's blood levels of L-ascorbic acid, or Vitamin C. Those people who carried more unfavorable pairs of genes, or alleles, were more likely to have lower blood levels of the nutrient.

Vitamin C is a nutrient that has many functions in the body, including acting as an antioxidant, and is needed for skin and membrane tissues. Low levels have also been associated with diseases such as heart disease and cancer. Vitamin C also helps with the absorption of iron. The nutrient must be obtained from foods since the human body cannot make its own, as some other animals can. Vitamin C can be found in citrus fruits, but is also in many fruits, vegetables and legumes.

VITAMIN D TENDENCY

WHAT YOUR GENES SAY ABOUT YOU:



Our analysis indicates that your genetic response is LOW. Your score reflects the fact that for the genes investigated, your genotype showed many of the unfavorable allele combinations that increase your risk of having extremely low levels of Vitamin D. This does not mean you definitely are deficient. But you should speak to your doctor and get tested to monitor your status. If you get inadequate sun exposure, take in small amounts through natural or fortified foods, or have trouble with absorption of the Vitamin D you do get from foods, you could be at greater risk of being low.

Your genetic profile indicates that your response is LOW,

so your levels of Vitamin D may be extremely low or even deficient. Get your blood tested for Vitamin D on a regular basis. Increase your sun exposure and add more Vitamin D-rich foods or supplements, if your levels are low.

SUCCESS STRATEGIES

- Get tested regularly since you are at high risk of having low levels of Vitamin D.
- Getting outside on most days of the week for a few minutes is crucial to generate your body's production of Vitamin D. Most people do not get Vitamin D through food; sunlight is considered to be the best source.
- Expose yourself to the sun on most days of the week for at least 10 to 15 minutes (30 to 50 minutes if you have naturally dark skin). Spend more time outdoors in winter months, or if you live in northern latitudes
- Sunscreen can block the rays that trigger your Vitamin D production. Spending a short amount of time outside without wearing sunscreen may be beneficial. If you have any doubts, discuss the best approach with a dermatologist.
- If you are deficient in Vitamin D, do a nutrient analysis to determine how much Vitamin D you consume, then eat more foods that contain Vitamin D, including natural foods or fortified foods, or take a supplement.

RELATED GENES / SNPs

GC, NADSYN1, CYP2R1

The genes and their associated SNPs that are included in this category have been shown to have statistically significant associations with a person's blood levels of Vitamin D (which is actually a hormone). One study found that several SNPs linked to low levels of Vitamin D were from genes that may play a role in the Vitamin D conversion and delivery process. Those people who carried unfavorable pairs of genes, or alleles, had a higher risk of low levels of Vitamin D, and those who carried several unfavorable SNPs had a much higher chance of being deficient in Vitamin D.

Vitamin D has been proven in research to be crucial for bone health. Low levels of Vitamin D have been associated with a variety of health conditions, including heart disease, diabetes, depression and cancer.

A blood test from your doctor can determine your blood levels of Vitamin D. Vitamin D is primarily produced by the body from exposure to ultraviolet rays from sunlight, and this is considered to be the optimal

NUTRIENTS

VITAMIN D TENDENCY

- If you take a Vitamin D supplement, avoid overly-high doses, unless by prescription through your doctor, as they may cause adverse effects.

VITAMIN D-RICH FOODS TO INCLUDE IN YOUR DIET:

Salmon, mackerel, sardines, egg yolks, fortified almond, soy or other plant milk, fortified dairy milk.

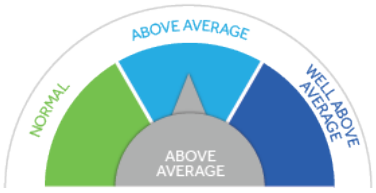
source since Vitamin D generated by the body lasts longer in the body than Vitamin D taken in supplement form. Your levels are likely to be higher if you live in the southern latitudes and during the summer. However, it is not uncommon for people with lots of exposure to the sun to still have low levels of Vitamin D. In general, only 10 to 15 minutes of sun exposure to bare skin per day during the summer months is needed for a Caucasian to produce the Vitamin D he or she needs. Darker skinned people will need to spend 2-5 times more time in the sun. Since Vitamin D is stored in the body, stores can be built up during warmer months and may compensate for less sun exposure during winter months.

Vitamin D can be obtained through foods such as oily fish and egg yolks, as well as fortified dairy and plant milks, and fortified cereals. Vitamin D can also be taken in supplements. If you test low and choose to take a Vitamin D supplement, be careful of taking higher doses because there can be adverse effects.

VITAMIN E TENDENCY

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits characteristics that make you likely to have ABOVE AVERAGE levels of vitamin E. That's a good thing because surveys show many, if not most, people don't get adequate levels of this important antioxidant through their diet, and some research has linked higher blood levels of alpha-tocopherol (the form of Vitamin E used most in the human body) to lower levels of chronic diseases like cancer and heart disease.



Your genetic profile indicates that your response is ABOVE AVERAGE.

Your genetic profile indicates that you are likely to have ABOVE AVERAGE blood vitamin E levels. This may provide a health boost as research has found that higher circulating levels of this powerful antioxidant are linked with lower levels of heart disease, cancer, and other chronic conditions. This also means you are likely to be responsive to vitamin E supplements, which may have adverse health effects in high doses. So it's wise to get your E from food sources.

SUCCESS STRATEGIES

Many people fall short of getting the 15 milligrams of vitamin E they need each day. Take advantage of your genetic predisposition for having above average levels by eating a diet rich in this essential micronutrient as well as foods that encourage its absorption. Nuts, seeds, and nut and seed butters and spreads are some of the best sources of vitamin E and can provide up to one-third of your daily needs in just one serving. Other good food sources include dark leafy green vegetables like spinach and Swiss chard, avocados, and whole grains. Because vitamin E is a fat-soluble vitamin, you need a little fat for your body to absorb it. Nuts, seeds, and avocados naturally contain fat. Give your leafy greens a boost by drizzling them in olive oil, which also contains vitamin E. Taking a multi-vitamin (many of which contain 100% or just over 100% of the recommended daily value for vitamin E) is likely okay, but be wary of higher doses since your genotype is likely to be quite responsive to vitamin E supplements and high

RELATED GENES / SNPs

ZPR1, SCARB1, CYP4F2

The genes and their associated SNPs included in this category have been shown to have significant associations with a person's serum vitamin E (alpha-tocopherol) levels.

Vitamin E is a fat-soluble vitamin that helps your body make red blood cells and acts as a potent antioxidant, protecting your cells from free radical damage and helping prevent chronic diseases such as heart disease, diabetes, and cancer. Vitamin E exists in many forms. Alpha-tocopherol is the form we use as humans.

Diseases that interfere with fat absorption, such as Crohn's disease and cystic fibrosis, may lead to vitamin E deficiencies, but otherwise vitamin E deficiency in healthy individuals without underlying health conditions is rare. That's not to say that we all get adequate amounts of this vital nutrient, however. Though national surveys are mixed, some have found that most Americans miss the minimum RDA of 15 milligrams (22.4 IU), with the average American getting half that

VITAMIN E TENDENCY

doses may have adverse effects.

VITAMIN E-RICH FOODS TO INCLUDE IN YOUR DIET:

Almonds, spinach, sweet potato, avocado, wheat germ, palm oil sunflower seeds

amount, especially if they restrict fat—an important vitamin E source—in their diet.

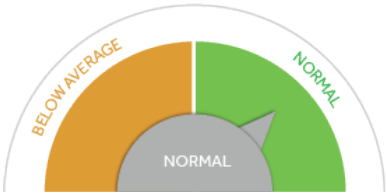
Because there are only a few foods— notably nuts and seeds—that are rich in vitamin E, people concerned with getting enough of this antioxidant often choose to take vitamin E supplements. The research on vitamin E supplementation, however, is equivocal. One study of nearly 40,000 women followed for 10 years found that women taking 600 IU of natural vitamin E supplements had a 24 percent reduction in cardiovascular deaths. Another study of almost 15,000 men, however, found that those taking 400 IU of synthetic alphatocopherol not only saw no benefit, but also had a significantly higher risk of stroke. Other evidence indicates that high dose supplements may also increase the risk for prostate cancer. (Taking vitamin E supplements is also not advised if you take other blood thinners as it increases risk for bleeding.)

Though diet is the primary factor that influences your serum vitamin E levels, research indicates that your genes also may have some influence. Some individuals also appear to be genetically more responsive to vitamin E supplementation than others. Since some research has linked taking high doses of vitamin E supplements to higher risks of the same diseases they're intended to prevent, knowing your genotype may be beneficial. Our analysis investigated which genotype for these genes was present in your DNA. Your rating of NORMAL, ABOVE AVERAGE, or WELL ABOVE AVERAGE reflects your likelihood of having normal or high blood serum levels of vitamin E.

CALCIUM TENDENCY

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits characteristics that make you likely to have NORMAL blood levels of calcium. That means you likely have adequate circulating calcium in your bloodstream so your body doesn't have to leech it from your bones to maintain healthy cellular function. You should continue getting 1,000 mg (men) to 1,200 mg (women) of calcium a day through a vitamin and mineral-rich diet.



Your genetic profile indicates that you are inclined to have NORMAL blood levels of calcium.

Continue eating a healthy diet and maximize your skeletal health with bone-building lifestyle and exercise habits.

SUCCESS STRATEGIES

Our bodies become less adept at absorbing calcium as we age, so it's important to continue eating a diet that is rich in this essential mineral as well as to perform healthy lifestyle practices to keep your skeleton strong.

Consume more calcium. Some food sources of calcium are dairy, canned fish like salmon and sardines, tofu, almonds and fortified alternative milk products., as well as collard greens, kale and spinach.

Skip supplements. Calcium supplements have been the topic of considerable controversy in recent years. Some research finds that they are not useful for preventing fractures and may be linked to increase risk for heart disease. You can get plenty of calcium in your diet and your genotype does not call for additional amounts.

Stay active. Be sure to get regular "impact" exercise like jogging, tennis, or strength training. Your bones need some stress to get the signal to grow. Every time you load or add resistance to your bones, they release calcium into your blood. That calcium is then circulated and sent back to your bones which

RELATED GENES / SNPs

CASR, DGKD, GCKR, LINC00709, CARS, LOC105370176, CYP24A1

The genes and their associated SNPs that are included in this category have been shown to have significant associations with a person's blood calcium levels.

Calcium is the most plentiful mineral in the human body and is used by nearly every cell in the body. It's well known that the mineral is essential for maintaining skeletal and dental health, as your bones and teeth are where the lion's share of calcium is stored. Calcium also is required for nerve function, muscle contraction, hormone release and heart health.

Your body keeps the amount of calcium circulating in your bloodstream within a certain range to allow all your specific cells to have what they need to perform their jobs. When those levels dip below that range, your body pulls what it needs from your skeleton. Over time that leads to weakened bones.

Your calcium levels are influenced by your

CALCIUM TENDENCY

then grow and become stronger. So these activities help keep them strong. Strength training two or three days a week has also been shown in studies to help build and maintain bone density.

CALCIUM-RICH FOODS TO INCLUDE IN YOUR DIET:

Milk, almonds, okra, broccoli, cheese, kale, yogurt

diet, how well your intestines absorb the calcium you take in, levels of phosphate in the body, your vitamin D levels and by levels of certain hormones like parathyroid hormone, calcitonin and estrogen. Emerging research also shows that your genotype may influence blood calcium levels. In one very large study of 39,400 men and women, researchers found variations in these genes had a significant impact on blood calcium levels, which echoes findings from previous animal research as well as a study of 1,747 twins that estimated heritability to be 33 percent for blood serum calcium levels.

Our analysis investigated which genotype for these genes was present in your DNA. Your rating of NORMAL or BELOW AVERAGE reflects whether or not your genotypes included those that increased your risk for low blood calcium levels.

COPPER TENDENCY

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits characteristics that make you likely to have a NORMAL blood copper level. That's good news because this essential mineral plays a key role in red blood cell production, immunity and the formation of collagen, which is essential for your bones and connective tissues.

Your genetic profile indicates that you are likely to have a NORMAL blood level of copper.

You can be sure to get the 900 micrograms you need daily and to maintain healthy blood levels by eating foods rich in copper. This is especially important if you take iron, zinc and/or vitamin C supplements, as these can interfere with copper absorption, even in people who are genetically inclined to normal levels.

SUCCESS STRATEGIES

Surveys show that many people do not get the optimum amount of copper in their daily diet, so it's important to eat well regardless of your genetic profile. Fortunately, the mineral is found in a wide variety of food sources, so there are bound to be copper-rich foods that you will find easy to include in your diet. Good sources include: shellfish, tree nuts, legumes and beans, fortified cereals, whole grains, potatoes, dark leafy green vegetables, mushrooms, dried fruit and cocoa.

RELATED GENES / SNPs

SMIM1, SELENBP1

The genes and their associated SNPs that are included in this category have been shown to have significant associations with a person's blood copper levels.

Copper is an often overlooked essential mineral that helps your body absorb iron and form red blood cells, maintains immunity, assists with energy production and helps keep bones, connective tissues, nerves and blood vessels healthy. The recommended daily amount is 900 micrograms a day. Copper is toxic in very high doses and toxicity is most often associated with a rare condition called Wilson's disease. Chronically low copper levels can pave the way for heart disease, poor bone and joint health and low immunity. Marginal to low levels of copper may occur with too much zinc supplementation (popular in the prevention and treatment of colds), dietary deficiencies and in some cases because of genetic influences.

NUTRIENTS

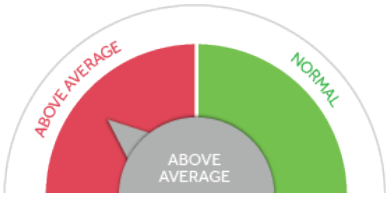
COPPER TENDENCY

In one widespread analysis of more than 12,000 adults, genetic variations accounted for 5 percent of variation in blood copper levels. That's a small percentage, but can be significant when considering a trace mineral. Surveys also suggest that while true deficiency isn't common, many people don't get enough copper in their diet and taking high amounts of zinc, iron or vitamin C can cause an unfavorable copper blood levels.

Our analysis investigated which genotype for these genes was present in your DNA. Your rating of NORMAL or BELOW AVERAGE reflects whether your genotype included those that carried a risk for having low levels of this essential mineral.

IRON TENDENCY

WHAT YOUR GENES SAY ABOUT YOU:



Our analysis indicates that your genetic profile exhibits characteristics that make you likely to have ABOVE AVERAGE blood iron levels. That may be a cause for concern, as high iron levels have been linked to a wide array of diseases including heart disease, cancer, diabetes, infections, arthritis, and neurodegenerative disorders. In one study published in the journal Circulation, scientists found that men with genetic mutations that cause slightly elevated iron levels had a 2.3-fold increase in heart attack risk. Other research has found that women carrying the same high-iron storage genetic disposition were also at a higher risk for heart disease. Older adults, particularly Caucasians, should be particularly mindful of this genetic predisposition as research shows they may already be at risk for storing excessive amounts of iron. Among the 1,106 white adults ages 67 to 96 in the Framingham Heart Study, 13 percent had high iron stores.

Your genetic profile indicates that you are likely to have ABOVE AVERAGE blood iron levels – a hereditary condition called hemochromatosis.

This can be cause for concern because iron overload is hard on your organs and has been linked to a long list of chronic conditions and diseases. It's important to pay attention to your iron levels and iron intake, especially if you eat a lot of foods, such as meat, poultry and fish, that are rich in easily absorbed heme iron.

SUCCESS STRATEGIES

Even mild forms of hemochromatosis can be harmful, especially long term. Your physician can screen your iron levels with a series of blood tests that measure your hemoglobin and hematocrit levels, as well as your serum iron (the amount of iron in your blood); serum ferritin (the amount of the protein that helps store iron), and transferrin levels (total iron-binding capacity. Your doctor can work with you on strategies, such as chelation therapy, to keep your iron levels in check. Here are some diet and lifestyle modifications that may help as well.

RELATED GENES / SNPs

TRF2, HFE, HFE, TMPRSS6

The genes and their associated SNPs included in this category have been shown to have significant associations with a person's blood iron levels.

Iron is a well-known essential nutrient that most of us associate with energy. That's because along with regulating cell growth and other metabolic functions, iron is vital for producing hemoglobin, a protein your red blood cells use to deliver oxygen throughout your body. Without enough oxygen, all your metabolic functions suffer. On the flip side, too much iron is toxic and can be equally, if not more damaging than having too little and may cause organ damage and raise your risk for diabetes, heart attack, neurodegenerative conditions like Alzheimer's and cancer. Many factors influence your iron levels including diet, gender, age, and activity level. In premenopausal women, the primary cause of

NUTRIENTS

IRON TENDENCY

Lean toward meatless meals. Animal foods are not only some of the best sources of iron, but also contain the most easily absorbed type of iron— heme iron. Plant foods, on the other hand, contain non-heme iron, which is less bioavailable in the body. If you're genetically predisposed to iron overload, eat meat more sparingly.

Avoid ironware. Cast iron pots and pans leech a lot of the mineral into your food as you cook. Choose other types of non-iron based cookware instead.

Give blood. Donating blood not only helps save other lives, it could help improve your health and extend yours if you are prone to high levels of iron. Becoming a regular blood donor can be an easy way to lower and control your levels of iron. If you have high iron, talk to your doctor about this option.

IRON-RICH FOODS TO INCLUDE IN YOUR DIET:

Spirulina, liver, grass-fed beef, lentils, dark chocolate, sardines, black beans, pistachios, raisins

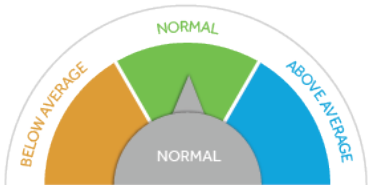
iron deficiency is heavy menstrual bleeding as blood loss means iron loss. High levels of physical activity— especially if it's particularly long and/or strenuous also may lead to a decline in iron levels, especially in women. Vegans and vegetarians also may be at risk for low iron levels, as the iron in plant-based foods (non-heme iron) is harder for the body to absorb than iron from animal sources (heme iron). Older adults, again especially women, generally need less iron to maintain healthy stores than men.

Your genes also may play a role, particularly in the tendency for above normal iron levels. Research has found that certain gene mutations may impact how much iron your body absorbs and recycles, creating borderline or high levels of iron in circulation. At the extreme end is a genetic disorder called hemochromatosis, which occurs in about 10 percent of white people of Northern European ancestry. People with this condition absorb three to four times as much iron from food as those without these genetic mutations. Other mutations can leave you susceptible to a more mild form of hemochromatosis, leading to accumulating slightly higher than average stores of iron.

Our analysis investigated which genotype for these genes was present in your DNA. Your rating of NORMAL or ABOVE AVERAGE reflects whether your genotype included those alleles that were found to lead to a tendency of having normal or high levels of this essential mineral.

MAGNESIUM TENDENCY

WHAT YOUR GENES SAY ABOUT YOU:



Our analysis indicates that your genetic profile exhibits characteristics that make you likely to have a NORMAL blood magnesium level. That's good news because magnesium plays an essential role in hundreds of biochemical processes including regulating blood sugar, blood pressure, muscle contraction and heart rhythm. As we age, our body 's ability to absorb magnesium decreases, so it's important to eat plenty of magnesium-rich foods to maintain healthy levels of this essential mineral.

Your genetic profile indicates that you are likely to have NORMAL blood levels of magnesium.

You can maintain those healthy blood levels of this essential mineral by eating plenty of magnesium-rich foods and avoiding those that deplete it.

SUCCESS STRATEGIES

Maintain healthy blood magnesium levels by including magnesium-rich foods in your daily diet. Good sources include dark leafy greens, nuts and seeds, fatty fish, avocado, beans, whole grains, yogurt, soy foods and bananas. If you like dark chocolate, you're in luck. One 2-ounce chunk delivers about a quarter of your daily needs. Drink alcohol and coffee in moderation, as both of those can lower magnesium levels by blocking absorption and increasing excretion. Also, skip the soda. Sugary sodas are also linked to lowered magnesium levels.

Though too much magnesium from your diet doesn't pose a problem because your kidneys simply eliminate it in your urine, it is possible to overdo it from supplements and other sources. Overuse of laxatives or antacids can lead to high levels, which can cause diarrhea, nausea and abdominal cramping.

RELATED GENES / SNPs

MUC1, SHROOM3, TRPM6, DCDC5, ATP2B1, MDS1

The genes and their associated SNPs that are included in this category have been shown to have significant associations with a person's blood magnesium levels.

Magnesium doesn't get much attention in mainstream nutrition circles, but it should. The mineral plays a critical role in blood sugar control, muscle contractions and heart rhythm and is involved in more than 300 biochemical reactions in your body.

Some medical experts have recently dubbed magnesium deficiency the "invisible deficiency" because it's very difficult to pinpoint as the most common symptoms such as fatigue and muscle cramping are common side effects of many conditions. It's also very common. Studies show that only about a quarter of US adults get the 320 mg (women) to 420 mg (men) they need.

Though only about 1 percent of your magnesium is found in your blood, low

NUTRIENTS

MAGNESIUM TENDENCY

MAGNESIUM-RICH FOODS TO INCLUDE IN YOUR DIET:

Spinach, pumpkin seeds, yogurt, almonds, black beans, figs, banana, black beans

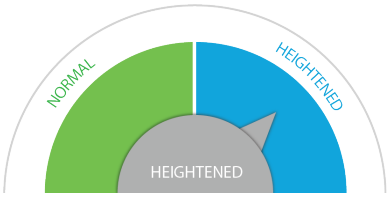
serum magnesium levels have been associated with multiple chronic diseases such as diabetes, heart disease and high blood pressure. Though low magnesium is generally a condition that occurs over time due to habitually low magnesium intake, high intakes of alcohol, soda and caffeine, and/or taking medications that interfere with its absorption can also cause levels to dip. There's also a genetic influence. Research shows that serum magnesium concentrations are about 27% heritable.

In one study of 15,366 men and women, researchers identified six gene variations that were associated with blood magnesium levels. These findings echoed those of another study that found these gene associations in both Caucasian and African American populations. The effects were most pronounced in postmenopausal women and/or people with low insulin levels.

Our analysis investigated which genotype for these genes was present in your DNA. Your rating of BELOW AVERAGE, NORMAL or ABOVE AVERAGE reflects whether your genotype included those that carried a risk of having low levels of this essential mineral or whether you were likely to have adequate levels.

OMEGA LEVELS

WHAT YOUR GENES SAY ABOUT YOU:



Our analysis indicates that your genetic profile exhibits characteristics that make you likely to have heightened levels of omega-3 and omega-6 fatty acids. This is good news because your body cannot make these essential fatty acids and many adults do not meet the dietary recommended amount. Keep in mind, however, that excessive omega- 6, in combination with low consumption of omega- 3, can set the stage for inflammation and cardiovascular health risk. Although your genotype is one that easily converts the foods you eat to these EFAs, you should regularly consume foods rich in omega-3 fatty acids to ensure you have optimum plasma levels.

Your genetic profile indicates you are likely to have HEIGHTENED levels of omega-3 and omega-6 fatty acids.

You should choose foods that provide adequate amounts of omega-3 fatty acids to ensure you have the right balance of these EFAs for supportive health.

Both omega-3 and omega-6 fatty acids are essential for heart health. Because your body cannot make them itself, you need to consume adequate amounts through your diet to maintain plasma levels for effective utilization of these nutrients.

Omega-3 fatty acids, found in fatty fish, flaxseeds, and walnuts are essential for brain development and heart health. Omega-3 fatty acids assist in reducing triglycerides, inflammation, and preventing the production of VLDL. Omitting saturated fats for omega-3 fatty acids is a great way to start lowering triglycerides; maximizing intake of polyunsaturated fats; and increasing nutrient density

.

Omega-6 fatty acids, found in vegetable oils like soybean, safflower, and corn are also essential; yet omega-6 fatty acids can increase inflammation. Excessive omega-6, in combination with low consumption of omega-3, can be harmful to your well-being. Although you might be someone genetically inclined to have

RELATED GENES / SNPs

FADS1, ELVOL2

The genes and associated SNPs included in this category have been shown to have significant associations with the levels of omega-6 and omega-3 fatty acids found in your body (categorized under polyunsaturated fats).

Omega-3 and omega-6 are also known as essential fatty acids (EFA), meaning your body cannot synthesize them on its own; you need to consume them, and then your body converts them into usable forms in your tissues. These essential fatty acids make up important parts of your cell membranes, assist with tissue growth and repair, wound healing as well as help regulate blood pressure and inflammation in the body. Omega-3 fatty acids are important anti-inflammatories and are associated with better metabolic and cardiovascular health.

Not only is your diet a clear determinant of EFA levels but your DNA also plays a role in the metabolism and subsequent tissue

OMEGA LEVELS

normal levels, you should still take additional steps to consume the essential fatty acids you need.

SUCCESS STRATEGIES

Most Americans eat adequate amounts of omega- 6 fatty acids because they are commonly found in vegetable oils (corn, safflower, and cottonseed oil) as well as mayonnaise and many salad dressings. To ensure an adequate balance of omega- 3 and omega- 6 fatty acids, here's some easy-to-follow suggestions:

Eat more fish. The American Heart Association and USDA both recommend consuming at least two, 3.5-ounce servings of fatty fish each week. Most Americans eat a fraction of that amount. Your best choices for high amounts of omega-3s are mackerel, salmon, herring, oysters, and sardines.

Snack on walnuts. Walnuts are an excellent source of omega-3s. They're also rich in fiber, so make a filling snack and a nice substitute for peanuts in trail mix.

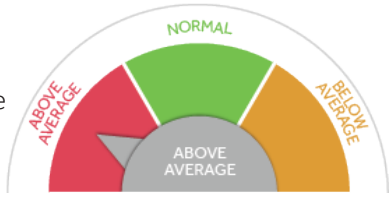
Change salad dressings and condiments. Make your own salad dressing with walnut, flaxseed, or grapeseed oil. Sprinkle chia seeds on your salads and sides for added omega-3s.

levels of these fatty acids. Genome-wide association studies indicate that your genes, particularly FADS1 and ELVOL2, influence the activity of enzymes that convert these essential fatty acids in your body; as a result, variants of these genes have been associated with plasma levels of omega-3 and omega-6 in adult populations. That means that your dietary needs may be higher or lower to achieve optimum essential fatty acid levels, depending upon your variants of these genes.

Our analysis investigated which genotype for these genes was present in your DNA. Your rating of NORMAL or HEIGHTENED reflects whether your genotypes included those that carried the likelihood of having normal omega-3 and omega-6 levels or higher than normal omega-3 and omega-6 levels.

PHOSPHORUS TENDENCY

WHAT YOUR GENES SAY ABOUT YOU:



Our analysis indicates that your genetic profile exhibits characteristics that make you likely to have ABOVE AVERAGE blood serum phosphorus levels. That may be a cause for concern because excess phosphorus has been linked to heart disease in numerous studies, including the landmark Framingham Heart Study. Each 0.5 mg/dL above normal levels is associated with a 15% greater risk of cardiovascular events [Did advisory mean above normal?]. Even having phosphorus levels on the high end of normal —or greater than or equal to 3.5 mg/dL—appear to increase your heart disease risk.

Your genetic profile indicates that you are likely to have ABOVE AVERAGE blood serum levels of phosphorus.

This is cause for concern because even high-normal levels can double your risk for heart disease. Excess phosphorus also increases your risk for kidney disease and osteoporosis. Because the American diet can be very high in phosphorus—especially if you eat a lot of packaged and processed foods—it's important to take steps to minimize unhealthy sources of phosphorus, since you are already at elevated risk genetically.

One 17-year study of more than 3,000 healthy middle aged men and women found that those who had serum phosphorus concentrations in the top quartile of the normal range (greater than or equal to 3.5 mg/dL) had a two-fold higher risk of heart failure than their peers in the lowest quartile (less than 2.9 mg/ dL). Elevated phosphorus harms your heart on a few fronts. It hinders your ability to make vitamin D, which increases the calcification in your heart's blood vessels. It also leads to mineral buildup in your vessels, which causes blockages and cardiovascular problems. It also may increase inflammation in the body, which raises heart disease risk. Excess phosphorus levels also harm your teeth and bones, as when phosphorus levels are high, your body pulls calcium from your bones into your bloodstream to restore balance. The resultant high levels of calcium in your blood can exacerbate your heart disease risk as well.

RELATED GENES / SNPs

ALPL, CSTA, IHPK3, PDE7B, C12orf4, IP6K3

The genes and their associated SNPs included in this category have been shown to have significant associations with a person's serum phosphorus levels.

Though it's a mineral that doesn't get much media attention, phosphorus is essential for survival. In fact, phosphorus is found in every cell of your body, makes up 1 percent of your total weight, and is second only to calcium in its abundance in the human body. The most visible evidence of phosphorus' role in your health is your teeth and bones, which the mineral helps form and maintain. It is also essential for energy production. It activates energy-producing B-vitamins and helps the body make ATP, a molecule you use to store energy. It's vital for healthy heart, kidney, muscle, and nerve function.

Your body works to maintain a normal, healthy range of phosphorus—2.5 to 4.5 milligrams per deciliter in your blood (though

NUTRIENTS

PHOSPHORUS TENDENCY

SUCCESS STRATEGIES

Phosphorus is an essential nutrient and prevalent in a well-rounded healthy, whole food diet, so there is no need to curtail any healthy eating habits to keep this mineral in check. However, many food additives are sources of inorganic phosphorus (phosphates), which are very easily absorbed by the body and may wreak havoc on your health, especially if you're already genetically inclined to high serum phosphate levels. A simple blood test will tell you if your levels are high normal or above normal. If high phosphorus is a concern, dietary changes may help.

Can the cola. There are plenty of reasons to cool your cola habit. Here's another: cola drinks contain phosphoric acid and have been linked to poor bone health, likely because of the phosphorus causing calcium to be leached from the skeleton. The Framingham Osteoporosis Study of more than 2,500 adults found that women who regularly drank cola daily had 3.7% lower bone mineral density at the hip than those who rarely drank them or drank other non-cola beverages.

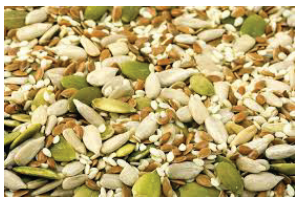
Limit processed foods. Phosphate additives are used as stabilizers, flavor enhancers, moisture binders, leavening and stabilizers in literally hundreds of processed foods, frozen foods, fast foods and packaged meats. In fact, there are more than 45 different phosphate-containing food additives on the market. You can find them listed under names like sodium phosphate, calcium phosphate and phosphoric acid. Limit processed and fast foods and read your labels to know how many phosphate containing food additives you're consuming.

Eat a moderate protein diet. Since phosphorus is most prevalent in high protein foods like meat, adhering to a healthy, moderate protein diet where 25% of your calories come from protein (as opposed to a high protein diet) may be a healthier choice to keep phosphorus levels within a healthy range.

lab ranges can vary). What you don't store in your bones gets excreted through your urine. Most people fall within that normal range but depending on your diet and certain health conditions such as diabetes, heavy alcohol intake, and/or eating disorders, phosphorus deficiency or excess can occur—both of which can have serious health consequences. Even within the normal range, having higher amounts of phosphorus also can pose some health risks, particularly heart disease.

Emerging research also shows that your genotype may influence your serum phosphorus levels. One large-scale study of more than 16,000 men and women found that variations in these key genes had a significant impact on your serum phosphorus levels.

Our analysis investigated which genotype for these genes was present in your DNA. Your rating of BELOW AVERAGE, NORMAL or ABOVE AVERAGE reflects whether your genotype included those alleles that carry a risk of having low or high levels of this essential mineral, or whether you were likely to have adequate levels.



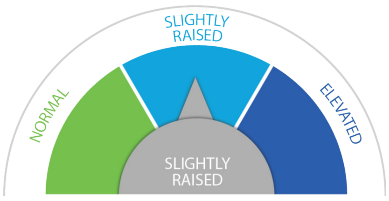
PHOSPHORUS-RICH FOODS TO INCLUDE IN YOUR DIET:

Seeds, cheese, fish, shellfish, nuts, pork, beef and veal, low fat dairy

POLYUNSATURATED FATTY ACID TENDENCY

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits characteristics that give you the likelihood of having SLIGHTLY RAISED PUFA blood levels. Your genetic profile indicates that your body is likely efficient in converting and metabolizing the fatty acids you need. Health benefits of PUFAs include cardiovascular health and lower mortality.



Your genetic profile indicates that you are likely to have SLIGHTLY RAISED blood levels of PUFAs.

We recommend that you continue to eat PUFA-rich foods—especially in lieu of those that are high in saturated fats or refined carbohydrates—to maintain blood levels that help lower your cholesterol, as well as coronary artery or heart disease risk.

SUCCESS STRATEGIES

A tall and growing body of research indicates that the healthiest, longest-living people on the planet follow PUFA-rich diets such as the much-hailed Mediterranean diet, as well as the Japanese diet, which has recently been found to reduce the risk of mortality from all causes by 15 percent among those who follow it most closely. It appears especially good at decreasing risk for heart disease and stroke. Not surprisingly, the diet, which contains ample amounts of fish, soy foods and vegetables, is also rich in PUFAs. Common references, for implementing more EFAs into one's diet, are the dietary guidelines in Mediterranean and Japanese cultures. The Mediterranean diet is frequently promoted for heart health, yet a recent study published in the British Medical Journal found that a close adherence to Japanese dietary guidelines is associated with a lower risk of death from all causes, particularly heart disease and stroke. The men and women who participated in the study closely followed the standard Japanese diet that is rich in PUFAS through intake of fish, soy, and vegetables. Over the study's 15-year span, participants who were highly dedicated to Japanese dietary guidelines had a 15% lower mortality rate.

RELATED GENES / SNPs

FADS1-2

The gene and its associated SNP that is included in this category has been shown in studies to have significant associations with a person's blood levels of polyunsaturated fatty acids (PUFAs).

Your body requires a certain amount of fat to perform all of its vital biological functions that includes producing certain hormones, absorbing fat-soluble nutrients like vitamins A, D, E and K, and maintaining your body's internal temperature. Remember how omega- 3 and omega-6 fatty acids fall under the category of polyunsaturated fatty acids? This means polyunsaturated fatty acids are also essential fats that must be consumed through diet.

Naturally, polyunsaturated fats are found in plants like nuts, seeds, vegetable oils and seafood. Like omega-3 and omega- 6 fatty acids, polyunsaturated fatty acids are also considered heart healthy. Research shows a strong association between the levels of PUFAs in the blood and the status of a person's health. In a 16-year analysis

POLYUNSATURATED FATTY ACID TENDENCY

The American Heart Association supports a diet that gets about 5 to 10 percent of its energy from PUFAs, like linoleic acid (LA), to reduce cardiovascular disease risk. You can maintain healthy levels by eating more nuts and seeds, using olive, flax or canola oil for drizzling on salads and side dishes. The US government also recommends increasing intake of foods rich in omega-3 fatty acids to balance the ratio of omega-6 to omega-3 fatty acids. Strive to eat 8 ounces of fish each week or increase consumption of flaxseed, walnuts, Brussels sprouts, or cauliflower to improve levels of protective omega-3 fatty acids.

of 2,700 older men and women, those with the highest omega-3 PUFA levels had a mortality rate 27 percent lower compared to candidates with lower PUFA levels. After age 65, those with the highest blood levels of PUFA lived an average of 2.2 years longer vs. those with the lowest levels of PUFA.

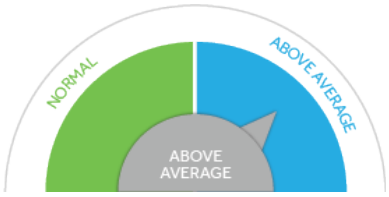
The level of PUFAs in your bloodstream is largely determined by what you eat since your body cannot make its own. There is also some genetic influence on blood PUFA levels. Large scale meta-analysis gene studies have found a strong correlation between variations of the FADS1-2 genes and concentrations of PUFAs, particularly omega-3 fatty acid alpha-linolenic acid (ALA) and omega-6 fatty acid linoleic acid (LA). Both, ALA and LA have been linked to lower cholesterol levels, as well as reduced risk for coronary artery and heart disease.

Our analysis investigated which genotype for this gene was present in your DNA. Your rating of NORMAL, SLIGHTLY RAISED or ELEVATED reflects the level of circulating PUFAs that are likely to be present in your blood.

SELENIUM TENDENCY

WHAT YOUR GENES SAY ABOUT YOU:

Your genetic profile indicates that you are likely to have ABOVE AVERAGE blood levels of selenium. That's generally good news because selenium plays a key role in many critical biological processes including immunity, reproduction, thyroid function and general cellular function. Though uncommon, it's possible to get too much of this essential mineral, which can lead to selenium toxicity. As someone who is genetically prone to above average levels, there's no need to supplement your diet with additional selenium.



Your genetic profile indicates that you are likely to have ABOVE AVERAGE blood levels of selenium.

We recommend that you continue to maintain healthy levels of this essential mineral by eating a diet rich in grains, fish, lean meats and vegetables, while being mindful of not going overboard with very high selenium foods.

SUCCESS STRATEGIES

The average daily selenium intake among Americans is 108.5 mcg, according to the National Health and Nutrition Examination Survey (NHANES). So most of us get more than enough through our daily diet and there is no need to supplement.

People who are genetically inclined to above average selenium levels should approach very high selenium foods, especially Brazil nuts, with a measure of caution. Just one ounce (about 6 to 8 nuts) of Brazil nuts delivers a whopping 544 micrograms of selenium, so eating them often could easily result in toxicity, which causes brittle hair and nails, as well as nausea, diarrhea, rashes, fatigue and irritability.

RELATED GENES / SNPs

DMGDH

The gene and its associated SNPs that are included in this category have been shown to have significant associations with a person's blood levels of selenium.

Selenium is an essential mineral that plays multiple roles in maintaining good health. It works as an antioxidant with other nutrients such as vitamin E in the body to fend off free radical damage; it is vital to immune system function, male fertility and sperm health, and thyroid hormone metabolism.

Low levels of selenium have been shown to increase your risk for auto-immune disorders such as thyroid disease and psoriasis, infections and maybe even certain cancers.

Selenium is found across the dietary spectrum from seafood and meat to grains (and grain-based foods) and nuts, seeds and leafy greens. Adults need about 55 micrograms of the mineral a day and most

NUTRIENTS

SELENIUM TENDENCY

SELENIUM-RICH FOODS TO INCLUDE I N YOUR DIET:

Brazil nuts, yellowfin tuna, halibut, sardines, grass-fed beef, turkey, beef liver

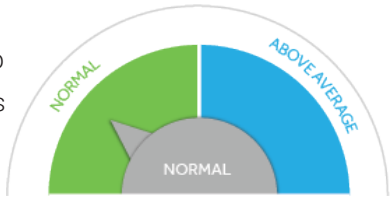
Americans get enough through a balanced diet. Selenium is found in the soil. So how much you get from your food depends on the mineral content of the soil in which the plants you, and the animals you eat, are grown. Selenium is destroyed in food processing, so eating a diet high in refined foods can put you at risk for lower selenium levels. Blood selenium levels also are influenced by genetic factors.

In one widespread analysis of more than 12,000 adults, genetic variations accounted for four percent of variation in blood selenium levels with minor alleles at this SNP increasing the average blood levels. That's a small percentage, but can be significant when considering a trace mineral. It's also possible to have too much of a good thing. Selenium is toxic in very high doses, which can cause GI distress, fatigue, hair loss and fingernail discoloration.

Our analysis investigated which genotype for this gene was present in your DNA. Your rating of NORMAL or ABOVE AVERAGE reflects the selenium levels that are likely to be present in your blood.

ZINC TENDENCY

WHAT YOUR GENES SAY ABOUT YOU:



Our analysis indicates that your genetic profile exhibits characteristics that give you the likelihood of having NORMAL blood zinc levels. That's good news because adequate levels of zinc help keep your immunity strong and can help protect you from both acute diseases like colds and infections as well as chronic conditions like heart disease and diabetes. Remember that genetics play just one role in your blood level zinc status and its still important to get enough of this essential mineral in your daily diet, especially if you're among the groups, like older adults and vegetarians, who may have a tendency to have a lower than adequate daily zinc intake.

Your genetic profile indicates that you are likely to have NORMAL blood levels of zinc.

We recommend eating a diet rich in foods that are good sources of this essential mineral to continue getting the minimum 8 to 11 mg of zinc you need each day to maintain the zinc blood levels you need for strong immunity and healthy cellular function.

SUCCESS STRATEGIES

Since our bodies don't store zinc, we need to eat adequate amounts in our diet every day. Most Americans do. However, a sizable percentage of the population falls short. National nutritional surveys show that up to 45 percent of adults over the age of 60 fall below the recommended amount. Vegetarians and vegans are also at risk for marginal amounts because zinc found in plant foods is harder for the body to absorb. In fact, some experts recommend that vegetarians aim to get 50% more zinc than the recommended dietary allowance to ensure their body gets the amounts it needs.

For meat eaters, getting adequate amounts of zinc is easy, especially if you also like shellfish. Just three ounces of oysters delivers 74 mg, far and away more than any other food source. Other zinc-rich foods include lobster , crab, pork and chicken (dark meat especially). Zinc is also found in yogurt, baked beans, cashews, oatmeal, milk, kidney beans, almonds, chickpeas and fortified

RELATED GENES / SNPs

CA1, PPCDC, LINC01420

The genes and their associated SNPs that are included in this category have all been shown to have significant associations with a person's blood levels of zinc.

Zinc is an essential trace element that plays a key role in immune function, protein synthesis, wound healing, insulin function, reproduction, thyroid function, blood clotting, growth, taste, vision and smell. After iron, it's the most common mineral in the body and is found in every cell.

You don't need much zinc to perform all these functions. The recommended dietary allowance for adults is just 8 mg (women) to 11 mg (men). But you do need zinc in your daily diet because the body doesn't store it.

Zinc deficiency hinders immune function and has been associated with cardiovascular disease and diabetes. Though outright deficiency is uncommon in industrialized countries like America, there is evidence that

NUTRIENTS

ZINC TENDENCY

If you eat little or no meat, consider taking a multivitamin as a form of insurance for days when your diet may fall short. Getting zinc in a multivitamin is preferable to taking it alone, as too much zinc on its own can cause copper levels to drop. Multivitamins contain the right balance of both.

ZINC-RICH FOODS TO INCLUDE IN YOUR DIET:

Lamb, pumpkin seeds, chickpeas, cashews, mushrooms, spinach, yogurt

relative zinc deficiency and marginal zinc levels may be somewhat common among certain populations, particularly among older people as well as vegetarians, since red meat and poultry provide the majority of zinc in the American diet and zinc from plant sources is slightly harder for the body to absorb. Taking too much zinc, which can happen when people supplement the mineral—a popular practice for staving off cold infections—can cause toxicity. Upper limits for intake are 34 mg for women and 40 mg for men.

Genetics can influence a person's zinc blood levels. In one widespread analysis of more than 12,000 adults, genetic variations accounted for 8 percent of the variation in blood zinc levels. Our analysis investigated which genotype for these genes was present in your DNA. Your rating of,NORMAL or ABOVE AVERAGE reflects the zinc levels that are likely to be present in your blood.

SUMMARY

How much should I exercise?

Physical activity is a key component of maintaining optimal health. Certain genes can play a role in your response to what you eat and how you exercise.

Exercise has long been associated with maintaining a healthy body weight. However, at Lemond Nutrition, we like to highlight the non-weight benefits that have an immediate impact on each day of your life. Physical activity helps manage stress, improves mood, and has a direct effect on sleep quality. There is no coincidence that there is an epidemic of both sleep issues and lack of physical activity among Americans. It is a chicken or egg scenario.

There are two major things you should know about exercising to maintain your setpoint weight range:

1. Any regular exercise can help with achieving your setpoint weight range in combination with a balanced diet. If you have a certain genotype, you may experience a greater or lesser response compared to others, but your response still depends on the type and amount of exercise that you do.

   Cardiovascular exercises such as walking, running, cycling or swimming improve blood flow to all areas of your body including your brain, heart and other organ systems. You can exercise harder at a higher intensity, or you can keep your intensity easier and exercise at a moderate pace, but for longer sessions.

2. Muscle matters, too. It keeps you strong, energizes you and helps maintain strong immunity. You may have a certain genotype that makes you muscular, or that makes you more or less strong, but your muscle response to both eating and exercise will still be affected by the type and amount of exercise that you do.

   It is very important to include exercise that helps to strengthen muscle. If you exercise, especially if you do resistance training (lift weights), you can prevent or minimize the loss of muscle mass that can occur with excessive cardiovascular exercise..

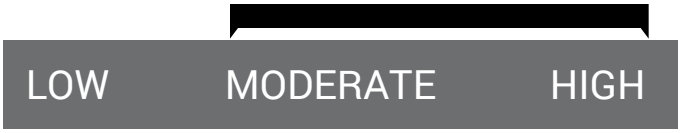
EXERCISE

SUMMARY

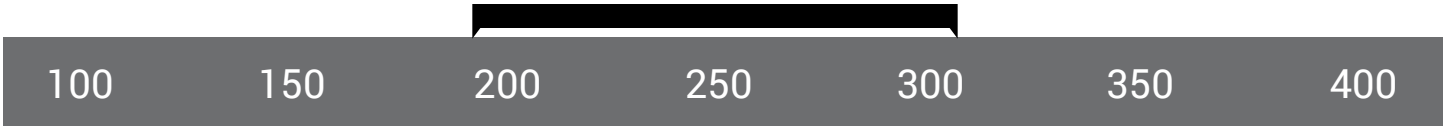
CARDIO EXERCISE

FREQUENCY (days per week)

INTENSITY



DURATION (minutes per week)



Do cardio for at least 200-300 min on at least 3-4d per week at a moderate-to-vigorous intensity. You can experience greater results by exercising more and/or harder.

STRENGTH TRAINING

Lift weights 2 to 3 days per week using weights that are heavy enough to challenge you at the end of each of 2 to 3 sets of 15-20 reps. If by the end of each set of repetitions, you feel like you could keep performing the exercise, the weight you are using is too light to provide a sufficient muscle-strengthening stimulus. As you near the end of the exercise, you should feel like the last 2 to 3 reps are difficult to complete while maintaining good form.

FAT LOSS RESPONSE TO CARDIO

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits an ENHANCED fat loss response to cardio. Your score reflects the fact that your genotype showed 'favorable' gene combinations. This means that, based on your genes, you likely would show a slightly higher fat loss response to a basic cardio exercise program than other genotypes. Thus you can expect to lose a usual to higher amount of body fat by participating in cardio exercise that is of a moderate-to-vigorous intensity.

Even though you may have an enhanced response to a lifestyle intervention, this doesn't mean that losing body fat and keeping it off will be effortless. Not everyone loses the same amount of body fat when they embark upon an exercise program. Genetic predisposition plays a role in fat loss, but other factors can also affect how much fat you lose. You can experience greater fat loss by exercising longer and/or at a higher intensity.

Your genetic profile indicates that your fat loss response to cardio is ENHANCED.

You should experience slightly more fat loss than other genotypes when performing cardio exercise 3-5 days per week for a total of 150-250 minutes. Examples of what this type of exercise plan would look like are either several exercise dance classes and an indoor cycling class per week, or 3-5 sessions in a week walking or climbing briskly on a treadmill or elliptical trainer for 50-60 minutes.

SUCCESS STRATEGIES

Your genetic profile predicts that you can expect a favorable fat-loss result from doing at least 150-250 minutes of cardio exercise 3-5 days per week, working out at a moderate-to-high intensity.

- If you want to see greater fat loss benefits from exercise, you should increase the length of time of your exercise session, and/or the intensity of your exercise session.

- Make sure to include muscle-strengthening moves such as squats, lunges

RELATED GENES / SNPs

ADRB2, LPL

The genes and their associated SNPs that are included in this category have been shown in a study to have significant associations with a person's ability to lose fat from a regular program of 3 days per week of cardio exercise. A large study investigating these genes put sedentary men and women on a 20-week cardio exercise program. The study volunteers exercised on a bike 3 times per week, starting at a moderate intensity for 30 minutes per session over the first few weeks. They built up to a longer, slightly harder workout that lasted 50 minutes for the last 6 of the 20 weeks.

Men in the study did not appear to have a different response based on their genotype. Women's fat loss was influenced by genotype, however. Women who carried the

FAT LOSS RESPONSE TO CARDIO

and upper body exercises with weight on at least 2 days per week.

- Begin your cardiovascular exercise session in a semi-fasted state; First thing in the morning or 3-5 hours since your last meal/caloric drink.

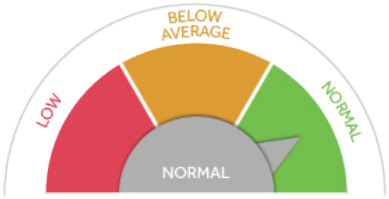
most 'favorable' genotypes lost slightly more fat in response to a cardio exercise program than those who did not carry these 'favorable' genotypes.

Our genetic analysis investigated which genotype for each of these genes was present in your DNA. Your rating of either NORMAL or ENHANCED reflects whether your genotypes included those that carried an enhanced fat loss response from a regular program of cardio exercise.

FITNESS RESPONSE TO CARDIO

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits a NORMAL fitness response to high-intensity exercise. Your score reflects the fact that your genotype showed few, if any, of the 'unfavorable' gene combinations. This means that you can expect to experience optimal cardiovascular benefits when you push yourself to higher intensities during cardio workouts.



Your genetic profile indicates that your fitness response to moderate-to-high-intensity cardio is NORMAL.

You are likely to experience improved cardiovascular fitness from high-intensity cardio. You will likely see greater gains from longer or more frequent workouts. For optimal fitness, you should incorporate resistance training as well.

SUCCESS STRATEGIES

All exercise is beneficial, but research shows that working at higher intensities can bring greater benefits. You appear to be primed to respond to high intensity exercise.

- Push a little harder for a little longer. Try High Intensity Interval Training (HIIT) where you intersperse maximal effort doing fast or hard cardio intervals or challenging resistance exercises with a recovery interval of lower-intensity cardio movement..
- The more intense your workout is, the more difficult it is. Tough workouts generally need recovery periods. If you are exercising five or more days per week, make sure to intersperse harder and easier workout days.

RELATED GENES / SNPs

AMPD1, APOE

The genes and associated SNPs included in this category have been shown to have significant associations with a person's response to moderate-to-high intensity exercise.

The optimal exercise plan must be accompanied with proper rest and gentle nutrition practices for optimum fitness level. This allows you to work harder and longer—and to continue to develop your levels of fitness.

Many factors play roles in being able to push hard without feeling overly fatigued when exercising. One reflection of fitness is oxygen capacity, also known as VO2 Max. As a person becomes fitter, their ability to take in more oxygen improves, which helps them to work out harder and longer. The greater one's VO2 Max, the more exercise they can handle since they can take in more oxygen that working muscles need during intense physical activity.

Several large studies investigating these

FITNESS RESPONSE TO CARDIO

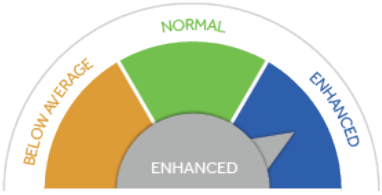
genes had sedentary men and women do cardio exercise 3 to 4 days per week for 5 to 6 months. They used a variety of cardio machines (bike, treadmill, rowing machine, step-climber, etc.) for up to 50 minutes. Those people with the 'unfavorable' genotype experienced smaller gains in their cardiovascular fitness from the training. They seemed to show a decreased ability to perform at higher effort levels, suggesting their optimal fitness response may be better achieved at a lower intensity of exercise.

Our analysis investigated which genotype for these genes was present in your DNA. Your rating of either NORMAL, BELOW AVERAGE OR LOW reflects whether your genotypes included those that carried a risk of reduced cardiovascular fitness response from moderate-to-higher intensity exercise.

BODY COMPOSITION RESPONSE TO STRENGTH TRAINING

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits an ENHANCED body composition response to muscle-strengthening exercise. Your score reflects the fact that your genotype showed the 'favorable' gene combinations. This means that, in addition to improvements in strength and muscle mass, you are likely to experience normalized weight status and a reduction in your body fat percentage from weight training.



Your genetic profile indicates that your body composition response to strength training is ENHANCED.

In addition to strength improvements, you are more likely to see reductions in your body fat percentage from weight training. Make sure to include resistance exercise two to three times a week.

SUCCESS STRATEGIES

Make sure to lift weights that are heavy enough to work at a moderate-to-hard intensity, performing 2 to 3 sets of 15 to 20 repetitions of each exercise. When the exercises become easy, add more weight to continue to obtain the benefits.

Due to your enhanced genotype, you do get more accomplished with every strength training session than another genotype might, which suggests you may want to take advantage of your genotype by incorporating interval-style strength training into your cardiovascular exercise days to take full advantage of your genetic advantage.

Incorporate cardio workouts on most days of the week, aiming to accumulate 150 to 300 minutes or more of physical activity per week.

See What You Should Know About Exercise and find ideas on how to maximize

RELATED GENES / SNPs

NRXN3, GNPDA2, LRRN6C, PRKD1, GPRC5B, SLC39A8, FTO, FLJ35779, MAP2K5, QPCTL-GIPR, NEGR1, LRP1B, MTCH2, MTIF3, RPL27A, SEC16B, FAIM2, FANCL, ETV5, TFAP2B

Body Composition refers to the proportion of muscle mass you have as well as the amount of body fat you have in relation to the muscle. The genes and their associated SNPs that are included in this category all have been shown to have significant associations with a person's ability to improve their body composition and decrease their body fat percentage from resistance exercise. Resistance training, or weight training, improves strength and the amount of muscle a person has. Weight training can also reduce the percentage, and sometimes the total amount, of body fat.

People with the more 'favorable' genotype in one large study improved more than just their strength and muscle mass from a year-long program of intense resistance training.

BODY COMPOSITION RESPONSE TO STRENGTH TRAINING

your workouts in the Exercise section of this portal.

Those with the more favorable genotype also experienced normalized weight status and body fat reduction from the resistance training. Those with the 'unfavorable' genotypes showed a decreased ability to normalize weight status and reduce body fat percentage by resistance training.

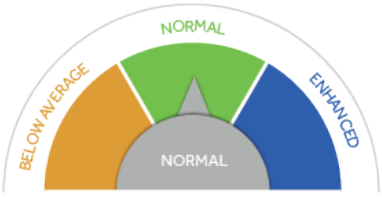
For everyone, it is very important to include resistance training in your routine. Resistance training can minimize or prevent that loss of muscle mass that occurs with aging and changes in your eating.

Our analysis investigated which genotype for these genes was present in your DNA. Your rating of either ENHANCED, NORMAL or BELOW AVERAGE reflects whether your genotypes included those that carried a risk of an enhanced or reduced HDL response to cardio exercise.

HDL RESPONSE TO CARDIO

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits a NORMAL HDL response to cardio exercise. Your score reflects the fact that your genotype showed a few of the 'unfavorable' gene combinations. This means that you can boost your HDL with cardio exercise, but likely only by a modest amount.



Your genetic profile indicates that your HDL response to cardio is NORMAL.

You may be able to boost your HDL response more by doing more cardio. Exercise at least 5 days per week and aim for longer sessions and/or higher intensities. Keep other cholesterol levels in check by eating plenty of beans, nuts and other plant foods.

SUCCESS STRATEGIES

You may be able to bump up your levels of HDL even more by working out for longer periods, more frequently or at higher intensities.

- Aim to perform cardio exercise at least four to five days per week.
- Include high exercise intensities. You should feel breathless and as if you are working out 'hard', or even 'very hard.' But work up gradually to working out at more intense levels.
- What you eat is crucial to help normalize all of your cholesterol levels. A diet high in fiber-filled plant foods and low in saturated animal fats will help lower your total cholesterol, LDL cholesterol and triglyceride values. Incorporate more beans, nuts, fruits and vegetables into your diet, as all have been shown to improve cholesterol levels.

RELATED GENES / SNPs

APOE

The gene and associated SNPs included in this category have been shown to have significant associations with a person's HDL cholesterol response to cardio exercise. HDL is a protein particle in the blood that carries cholesterol to the liver, helping to clear it from the blood. Excess cholesterol lingering in the blood can contribute to plaque that causes heart disease. So having higher levels of HDL is beneficial—which is why it's considered "good" cholesterol. Even one session of cardio exercise can boost HDL, and regular exercisers tend to have higher HDL.

This gene plays a role in the HDL response to cardio. One large study had men and women exercise for 30 to 50 minutes, 3 times a week for 5 months. Those people with the more "favorable" genotype experienced greater than average boosts to their HDL levels. Those with the 'unfavorable' genotype showed a decreased response: smaller increases in HDL.

Our analysis investigated which genotype for this gene was present in your DNA. Your rating of either ENHANCED, NORMAL or

EXERCISE

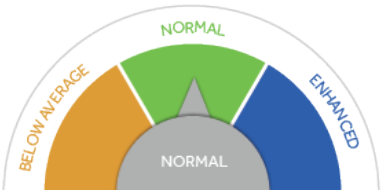
HDL RESPONSE TO CARDIO

BELOW AVERAGE reflects whether your genotypes included those that carried a risk of an enhanced or reduced HDL response to cardio exercise.

INSULIN SENSITIVITY RESPONSE TO CARDIO

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits a NORMAL insulin sensitivity to cardio exercise. Your score reflects the fact that your genotype showed some of the 'unfavorable' gene combinations. This means that, while you may see improvements in insulin sensitivity from cardio, they are more likely to be small. But you should be able to improve your insulin response with workouts that are done more often and at a higher intensity.



Your genetic profile indicates that your insulin sensitivity response to cardio is NORMAL.

Your improvement from 3 days a week of cardio exercise is likely to be small. You can maximize the effects by working out more often. Aim to exercise most days of the week and include both resistance training and higher-intensity cardio work during your workouts.

SUCCESS STRATEGIES

- Exercise frequently. The effects of exercise on glucose uptake are short-lived and the effects of a workout may wear off within two days of your last workout. Once or twice-a-week workouts aren't enough to reap this benefit from exercise. Do cardio on at least four to five days per week, but preferably on most, or all, days of the week for optimal results.

- The more in shape you are, the better your insulin response will be. That means if you stick to regular cardio exercise, you will fine tune your body's response and are likely to see long term improvements over time. It's important to identify habits you can adopt that help you to stick to your weekly workouts. Identify triggers that cause you to skip workouts and figure out how to overcome these obstacles.

- Resistance training has been shown to improve insulin sensitivity. Include some form of resistance training two to three times per week, targeting all the

RELATED GENES / SNPs

LIPC

The gene and associated SNPs included in this category have been shown to have significant associations with a person's insulin sensitivity in response to cardio exercise. Insulin is a hormone that plays a crucial role in delivering glucose, a form of sugar, in the blood to cells in the body that use it for energy. In a healthy person, cells are sensitive to this action of insulin and blood glucose levels are kept in their optimal range. If insulin sensitivity declines, a person may become insulin resistant. This keeps blood glucose levels high and diabetes can develop.

Even one session of exercise can improve insulin sensitivity. Exercise also helps keep blood glucose levels low because exercising muscles can absorb glucose without needing insulin to do so. Exercise over time can prevent diabetes—and it can help those who already have it.

This gene seems to play a role in the insulin sensitivity response to cardio. One large study had men and women perform cardio exercise at a moderate- to- high intensity

INSULIN SENSITIVITY RESPONSE TO CARDIO

major muscle groups as part of your weekly routine.

- Follow the nutrition suggestions in the other areas of this report and enhance weight loss from exercise by getting at least 200 to 300 minutes of moderate-to-high intensity cardio exercise per week.

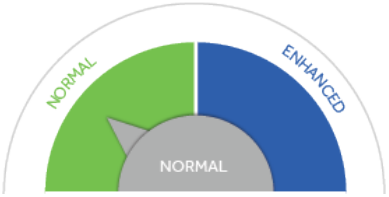
for 30 to 50 minutes, 3 times a week. Those people with the more 'favorable' genotype experienced greater than average improvements in their insulin sensitivity. Those with the 'unfavorable' genotype were less likely to improve their insulin sensitivity by exercise.

Our analysis investigated which genotype for this gene was present in your DNA. Your rating of either ENHANCED, NORMAL or BELOW AVERAGE reflects whether your genotypes included those that carried a risk of an enhanced or reduced insulin sensitivity response to cardio exercise.

GLUCOSE RESPONSE TO CARDIO

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits a NORMAL glucose response to cardio exercise. Your score reflects the fact that your genotype showed the 'unfavorable' gene combinations. This means that you are likely to experience smaller decreases in glucose from doing cardio exercise at least 2 to 3 times per week.



Your genetic profile indicates that your glucose response to cardio is NORMAL.

You are likely to experience minimal decreases in blood glucose from cardio exercise. However, you can boost your response by exercising 4 or more days per week, by working out at higher intensities and by adding resistance training to your routine.

SUCCESS STRATEGIES

Increasing the amount and intensity of exercise you do will help to improve your glucose regulation. Perform cardio on five or more days a week.

And rather than just performing moderate-intensity workouts, after you are fit enough to push a little harder, include more high-intensity minutes into your cardio workouts. Aim to work at an intensity level that leaves you slightly breathless and that feels 'hard.' After a few minutes, recover by continuing to move at an easier pace. Then pick up the intensity for a harder interval, again followed by an easier recovery interval.

- Incorporate resistance training to enhance your blood glucose response.
- What you eat also affects your blood glucose level. Increase the amount of fiber you eat by eating more whole plant foods at every meal. But make sure that these foods are unprocessed so that you obtain more nutrients and experience a lower glycemic response from the food.

RELATED GENES / SNPs

PPARG

The gene and associated SNPs included in this category have been shown to have significant associations with a person's glucose response to cardio exercise. Glucose is one of the body's main sources of energy and it comes from the breakdown of carbohydrates in the diet. Brain and nerve cells, as well as red blood cells, exclusively use glucose for energy. That's why blood glucose is maintained at constant levels—so that all the cells in the body that need it can access it. If blood glucose levels rise and stay high, eventually insulin resistance and diabetes can develop. Exercise helps regulate blood glucose levels because every session of exercise uses glucose in the muscle for energy, and the blood glucose supply is then tapped into to replenish the muscle reserves. This gene seems to play a role in the glucose response to cardio and appears to be a reliable indicator of whether exercise will have beneficial effects on insulin resistance. Several studies involved a variety of individuals, both diabetics and non-diabetics, performing regular cardio for 2 to 3 days per week for up to 5 months. Those people with the more 'favorable' genotype experienced

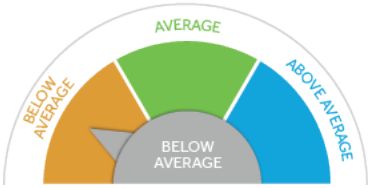
GLUCOSE RESPONSE TO CARDIO

greater-than- average clearance of blood glucose. Those with the 'unfavorable' genotype showed a decreased response, or smaller drop in glucose levels. People with this genotype also had a decreased weight-loss ability—they loss less weight compared to people with different genotypes.

Our analysis investigated which genotype for this gene was present in your DNA. Your rating of either ENHANCED or NORMAL reflects whether your genotypes included those that carried a risk of an enhanced or reduced glucose response to cardio exercise.

TRIGLYCERIDE RESPONSE TO CARDIO

WHAT YOUR GENES SAY ABOUT YOU:



Our analysis indicates that your genetic profile exhibits characteristics that give you a BELOW AVERAGE triglyceride response to cardiovascular exercise. That means you are less likely to see your levels of these harmful blood fats drop (and in some people they tick upward) in response to regular aerobic exercise training. While that is discouraging, it doesn't mean you should stop or not start exercising. You may need to employ other exercise intensities and other lifestyle and/or medical interventions to bring your triglyceride levels into a healthy range if they are elevated.

Your genetic profile indicates that you are at risk for a BELOW AVERAGE triglyceride response to regular cardiovascular exercise.

If a blood test shows your triglyceride levels are elevated, we recommend that you continue getting at least 150 minutes a day of physical activity a week for good general health and employ other exercise, lifestyle and/or medical interventions to reduce them to healthy levels.

SUCCESS STRATEGIES

Everybody should aim for at least 150 minutes of physical activity a week for good general health. People who are genetically less inclined to see improved blood fat levels from regular cardio can benefit from taking other healthy lifestyle measures, as well.

Step it up. The American Heart Association currently recommends at least 150 minutes per week of moderate exercise like walking, swimming and biking at a pace where you can easily converse, or 75 minutes a week of vigorous exercise where you're exerting yourself enough to be breathing harder and can only speak in short sentences—or a combination of both. Some research suggests that vigorous exercise may do a better job of clearing blood fats and lowering triglyceride levels than moderate activity. Include short 5 to 10 minute bursts of

RELATED GENES / SNPs

CYYR1, GLT8D2, RBFOX1, ZNF385D

The genes and associated SNPs in this category have been shown to have significant associations with a person's triglyceride level response to cardiovascular exercise.

Triglycerides are a type of fat that your body uses for energy. You store them in your fat cells and they circulate in your bloodstream. When you have more triglycerides than you're burning, you end up with elevated levels, which are harmful to your body and can cause hardening of the arteries and heart disease.

A simple blood test can tell you your levels, which should fall into a healthy range:

Normal is less than 150 mg/dl.
Borderline-high is 150 to 199.
High is 200 to 499.
Very high is 500 or higher.

Regular aerobic exercise is one of the most

TRIGLYCERIDE RESPONSE TO CARDIO

harder paced effort into your regular workouts, or devote two sessions a week to vigorous activity.

Lose weight. If you are overweight, losing even just 5 to 10 pounds can help lower triglyceride levels, according to research.

Eat more healthy fats. The type of fat you eat can greatly impact your triglyceride levels. Omega-3 fatty acids like those found in fatty fish like salmon and mackerel are particularly beneficial. Eat fish at least twice a week. Also opt for foods rich in heart healthy monounsaturated fats and polyunsaturated omega-3 fatty acids like olive oil, nuts, and avocado over meats and foods high in saturated fats whenever possible.

Limit sugary and refined foods. Simple carbs like foods made with white flour and sugar are known to raise triglyceride levels.

Watch your alcohol intake. Too much alcohol taxes your liver and can lead to high triglyceride levels. If your levels are high, stick to one drink a day or eliminate alcohol entirely.

effective methods for lowering triglycerides, since your body breaks down fat to fuel activities like walking, biking and swimming. Research shows that, on average, exercise training helps reduce triglyceride levels between 4 to 38 mg/dL. As that range indicates, however, there is a lot of individual variation in how well any given person's triglyceride levels improve from a standard exercise program. It's become clear that genetics play a large role in that regard.

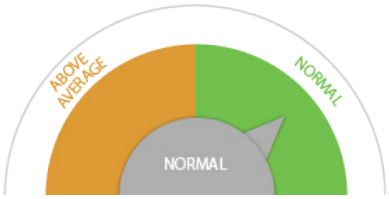
In fact, in a study of 478 men and women wh o were put on a 20-week endurance training program, variations of these four genes statistically explained 100% of the genetic effect of triglycerides' response to cardiovascular exercise. The good news is that, on average, triglyceride levels decreased over the course of the study. However, those with more favorable genetic variations enjoyed greater reductions while those with higher risk variations actually saw increased levels.

Our analysis investigated which genotype for these genes was present in your DNA. Your rating of BELOW AVERAGE, NORMAL or ABOVE AVERAGE reflects whether your genotype carried more or less favorable variations for lowering your triglyceride levels through cardiovascular exercise. This knowledge can help you create a more effective exercise plan to improve your heart health.

SKIN AGING

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits characteristics that give you a NORMAL likelihood of developing age spots. That means your skin is likely to develop some spots overtime, but you aren't at a particularly high risk for early or excessive discoloration.



Your genetic profile indicates that you are likely to have a NORMAL level of skin aging as evidenced by age spots.

Because chronic, prolonged sun exposure is an independent risk for age spots, we recommend that you help maintain a healthy, youthful looking skin complexion by taking precautions to minimize sun damage and its symptoms.

SUCCESS STRATEGIES

Sun exposure as well as genetics are the culprits behind age spots. Since you're at an average risk for these patchy discolorations, you'll want to practice sun smart strategies to avoid or minimize spots.

Use sunscreen. Consistent sunscreen use is your best protection against future age spots. Wear a sunscreen of at least SPF 30 and with 4 star UVA protection to minimize short and long term skin damage. Reapply every two hours, more often if you've been swimming and/or sweating. Be especially vigilant if you're going to be out for any length of time between the peak sun hours of 10 a.m. and 3 p.m.

Protect high damage zones. Your face, head (if your hair is thinning), forearms and hands are the areas that spots are most likely to appear because they see the most sun. Use an umbrella to seek shade at the beach and pool. Wear a broad brimmed hat and a light, but tightly woven cover-up when you're out for long periods of time in strong sunlight.

RELATED GENES / SNPs

IRF4, SPATA33, RALY/ASIP, BNC2

The genes and their associated SNPs included in this category have been shown in studies to have significant associations with a person's susceptibility to visible symptoms of skin aging, particularly lentigines, pigmented patches of skin more commonly called "age spots."

Lentigines are brown lesions that form on the skin from chronic sun exposure and other factors. They generally appear on the face, hands, forearms and upper chest. Though they take years to develop, these tan or brown spots seemingly appear out of nowhere and are very common in adults over the age of 50. Though age spots are harmless, people may not like the way they look and often turn to bleaching creams or other dermatological treatments to fade them.

Age spots are primarily caused by years of prolonged sun exposure as melanin becomes concentrated in small patches. Unsurprisingly, fair skinned people are more at risk for age spots. Age spots are also caused by an underlying genetic component

HEALTHY AGING

SKIN AGING

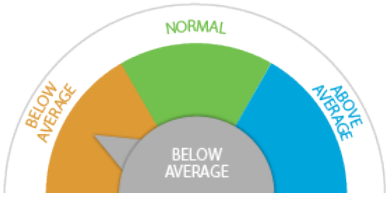
Treat spots early. If you should notice some spots, you can diminish their appearance by using an over-the-counter fade cream. Look for one that contains hydroquinone, glycolic acid or kojic acid. Use only as directed and be aware that some of these products, particularly those containing hydroquinone, may cause temporary skin irritation.

that is independent of melanin production, however, according to a study of more than 2,800 men and women of North European ancestry, which identified four genes with strong associations to age spots that were at least partially independent of skin color. Women also seem to be at a higher risk, though those findings are inconclusive and the reasons why are still unclear.

Our analysis investigated which genotype for these genes was present in your DNA. Your rating of either NORMAL or ABOVE AVERAGE indicates the likelihood that you will develop age spots over time.

SLEEP DURATION

WHAT YOUR GENES SAY ABOUT YOU:



Our analysis indicates that your genetic profile exhibits characteristics that make you likely to get a BELOW AVERAGE amount of sleep per night. That means you are more likely to be at risk for short sleep duration related health risks such as weight gain, heart disease and diabetes. The good news is that the majority of factors that influence sleep duration are well within your control and by practicing good sleep hygiene you can get more rest and reap the many health benefits associated with regularly getting a good night's rest.

Your genetic profile indicates that you may be likely to get BELOW AVERAGE hours of sleep per night

You will be more likely to get the recommended 7 to 8 hours of restorative sleep each night if you implement lifestyle, behavior and diet habits that are conducive to good sleep.

SUCCESS STRATEGIES

Sleep has such a powerful effect on health, we recommend that you make improving yours a priority. Good sleep hygiene can nudge the needle in a positive direction and ensure you get more of the restorative sleep you need.

Check your caffeine habit. Caffeine is the most widely used drug in the world and used moderately has many mental and physical performance benefits. It's easy to overdo, however, especially late in the day. Caffeine works by binding to your brain's nerve receptors, speeding them up, which triggers your pituitary glands to secrete adrenaline. Hence the energy buzz. The half-life of caffeine is about six hours, so if your last mug is at 4 p.m., by 10 p.m., you still have a shot of espresso's worth flowing through your system, which research shows can reduce your sleep by an hour. Have your last cup at before 4, so you can wind down and fall asleep more easily.

Go easy on evening alcohol. That nightcap may make you feel drowsy initially, but

RELATED GENES / SNPs

ABCC9, LOC101927400, DRD2

The genes and their associated SNPs that are included in this category have been shown to have significant associations with sleep duration.

Sleep is essential for physical and psychological health. Research shows that sleep plays a critical role in immunity, metabolism, learning, memory and a host of vital functions. Getting too little sleep (6 hours or less) doesn't just make you feel drowsy and irritable during the day, but also has been linked with an increased risk for heart disease, diabetes, poor cognitive function, getting sick and weight gain. Research shows that adults sleeping 5 or fewer hours a night have 55% greater odds of becoming obese.

Research also shows that Americans currently average 6.8 hours of sleep a night, with 26 percent averaging 6 hours or less and 14 percent averaging 5 hours or less. Many factors, including age, gender, lifestyle, diet, caffeine and alcohol consumption, occupation, light exposure and general health

SLEEP DURATION

too much alcohol close to bedtime disrupts your sleep architecture. Alcohol within an hour of bedtime lengthens your non-REM sleep and shortens your REM sleep during the first half of the night, so you are in more wakeful territory longer. As your liver clears the ethanol from your bloodstream, your body can go into a bit of withdrawal during the second half of the night, making you restless and more likely to toss and turn. Stick to one or two drinks and avoid alcohol an hour or two before bedtime.

Dim the lights—and electronics. Too much light exposure late in the evening suppresses your melatonin—a hormone produced in the pineal gland of the brain that is critical for your natural sleep-wake cycle—so your body temperature doesn't dip and your body doesn't get the signals that it is time to start the stages of sleep. That includes your smartphone or tablet, which also emit blue wavelength light, which has been shown to be especially harmful to circadian rhythm function. Dim the lights and shut down all electronics 30 minutes before you want to be asleep. Also consider downloading a blue light-filtering app if you must be on your device at night.

Set the stage for sleep. Humans sleep best in cool, dark, quiet conditions. Set your thermostat to between 60 and 67 degrees for the optimum ambient sleeping temperature. Consider black out curtains if outside light enters your bedroom. Earplugs or white noise machines can block out disruptive noise.

Calm your mind. A busy brain is an awake brain because problem-solving beta waves aren't conducive to deep sleep. If your brain races with worries at night, consider keeping a bedside journal to jot down your concerns with notes to address them the following day. Mind calming practices such as repeating mantras and meditation also can calm beta brain wave activity so you can drift into slower alpha, theta, and deep sleep delta wave activity.

Consider a natural sleep aid. If sleep stubbornly eludes you despite practicing otherwise smart sleep hygiene, one of these natural sleep aids may help:

- Montmorency tart cherry juice concentrate: Tart cherry juice is high in the sleep-promoting chemical melatonin. Research finds that older adults drinking it before bed slept better and longer. Try a glass 30 minutes before bedtime.

influence how much (or little) sleep we get each night. Your genes may also play a role in sleep duration.

Studies show the inheritability of sleep duration to be anywhere between 9 and 44 percent. Variations in the genes, or alleles, listed above have been shown to influence sleep duration, with each allele increasing or decreasing sleep by 3 to 4 minutes. Compared to other factors, genes may not move the needle on sleep in a giant way, but even small amounts of additional sleep if you are typically a short sleeper can improve your well-being. Consider that research shows just a 10-minute nap is sufficient for significantly improving alertness and cognitive performance for more than two hours, and just three minutes of stage 2 sleep (the stage where we drift off and become less aware of our surroundings) has recuperative benefits and you'll appreciate how key every minute of sleep is to your well-being.

Trending your sleep duration in a healthy direction may also set the stage for improved sleep hygiene and better sleep duration long term, which may trigger a cascade of further genetic outcomes. One British study reported that there are approximately 500 genes that are affected by sleep duration. When volunteers who typically slept 7 ½ hours shaved an hour off their nightly rest, the genes associated with inflammation, immune response, stress, diabetes and risk of cancer became more active. The opposite occurred when the volunteers who typically slept 6 ½ hours added an hour of sleep.

Our analysis investigated which genotype of each of these 5 genes was present in your DNA. Your rating of NORMAL, BELOW AVERAGE, or ABOVE AVERAGE reflects whether your genotypes include those that carried a risk of reduced healthy sleep duration.

SLEEP DURATION

- Valerian Root (tea or capsules): In one study on valerian extract, volunteers given 400 mg of valerian extract before bed experienced improved sleep, including better sleep quality, than those taking a placebo. Other research found using the same valerian extract dose found that it helped volunteers fall asleep faster.

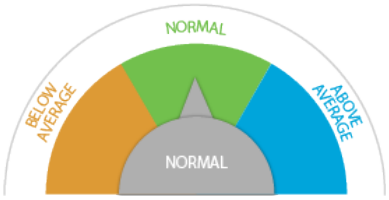
- Melatonin: The sleep hormone is available in supplement form and even small doses, 0.3 – 1.0 mg 30 minutes before bed, can be effective for falling asleep. Melatonin can have a “hangover” effect, however, and leave you feeling groggy in the morning.

HEALTHY AGING

LONGEVITY

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits characteristics that give you a NORMAL likelihood of extreme longevity. That means you may be more likely to live into your 90s and 100s. It's important to remember, however, that genes are only one of many factors that contribute to a long lifespan. Your lifestyle, diet, exercise habits and other behaviors have been shown in numerous studies to have a major impact on lifespan and longevity.



Your genetic profile indicates that you have a NORMAL likelihood of extreme longevity.

You can make the most of your advantageous genetic profile by adopting healthy lifestyle behaviors that will help you avoid the common chronic diseases that can shorten your lifespan regardless of genetic profile.

SUCCESS STRATEGIES

"Good genes" contribute to longevity, but lifestyle plays a major role. You still need to take care of your health and practice lifestyle, diet and exercise behaviors that will maximize your genetic potential.

Eat well & exercise. Exercising two to four times a week increases the likelihood you will live to 90, regardless of your genes. Likewise, it is important to maintain a healthy weight, which means complementing regular physical activity with a balanced diet.

Watch your "sugars." Blood sugar and insulin sensitivity appear to be inexorably linked to longevity. The FOXO gene is a key component of the insulin pathway, as well as human longevity. Research shows that long-lived men exhibit several biological markers that indicate greater insulin sensitivity along with a favorable FOXO3A GG genotype. Other studies suggest that consuming high amounts of sugar and the subsequent insulin response "turns off" genes associated with longevity. Having diabetes resulted in an 86 percent increase in the risk of dying

RELATED GENES / SNPs

FOXO3, APOC1 (APOE-CI-CII)

The genes and their associated SNPs that are included in this category have been shown to have significant associations with a person's likelihood of extreme longevity—living into one's 90s or 100s.

To live a long, healthy life is a very common human goal. Life expectancy from birth hovers in the mid- to late- 70s for men and the early to mid-80s for women around the world. For those who reach age 65, life expectancy is above average. For decades, scientists have studied human lifespan and why some people live 100 years and beyond while others fall short. The answers are, of course, complex and multifactorial, including geography, culture, lifestyle and much more.

Genetics are also known to play a key role, especially in our later years. The genetic contribution to longevity in humans overall has been widely estimated to be about 25 percent. The older you get, the more genes come into play. Scientists now know that genetic factors have an increasing impact,

LONGEVITY

before 90 in a study published in the Archives of Internal Medicine study.

Eliminate processed, white flour, high sugar foods from your diet as much as possible. Instead eat a balanced, high fiber, primarily plant food diet that is known to help maintain healthy blood sugar levels.

Keep your heart healthy. High blood pressure is a major health risk and can shorten your lifespan. Know your numbers and maintain a healthy blood pressure level of 120/80.

Don't smoke. Nobody has to tell you that. But don't.

particularly after 60 and profoundly from age 85 onwards.

A growing body of research on thousands of the "oldest of the old," those in their 90s and 100s, show that these two genes and their alleles are strongly associated with one's likelihood for extreme longevity, while other gene mutations appear to reduce that likelihood by up to 50 percent. Interestingly, previous research has shown that long-lived families carry as many genetic mutations that put them at risk for disease as the general population. These other gene variants just appear to promote healthy aging and protect them from disease.

Our analysis investigated which genotype for this gene was present in your DNA. Your rating of BELOW AVERAGE, NORMAL or ABOVE AVERAGE reflects whether or not your genotype included that those increase your likelihood to live into your 90s or 100s.

HEALTHY AGING

MENTAL ACUITY

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your gene profile exhibits characteristics that make you at a SLIGHTLY ABOVE AVERAGE risk for mental acuity decline with age. That means you are slightly more likely to experience age-related problems with memory and brain function. The good news is that there are many lifestyle and behavioral factors that impact your brain health and cognitive ability. You can minimize decline and build and protect your brain's health and sharpen your mind with a healthy diet and regular physical and mental exercise.

Your genetic profile indicates that you are at a SLIGHTLY ABOVE AVERAGE risk for mental acuity decline with age.

Minimize the impact of those genes and protect and build your brain with physical and mental exercises that will help you maintain healthy cognitive function as you get older.

SUCCESS STRATEGIES

Everyone is concerned about declining mental sharpness with age because it is essential to our independence, physical well being and simple joy of life. Adopting a lifestyle that includes regular physical exercise, continual learning and cognitive stimulation, and a diet that is high in essential nutrients has been shown to be the most effective means for preserving and even enhancing your cognitive function at any age.

Eat like a Mediterranean. Protect your brain health by eating a traditional Mediterranean diet that is rich in olive oil, fish, vegetables, beans, nuts, fruits, whole grains, and is low in refined sugars and meat. This diet has been shown to be the best for brain health because it is high in anti-inflammatory monounsaturated fats, which protect your arteries (your brain needs good circulation) and your general health. One Columbia University study that tracked

RELATED GENES / SNPs

APOE, BDNF

The genes and their associated SNPs that are included in this category have been shown to have significant associations with age-related mental acuity decline.

Brain-derived neurotropic factor (BDNF) is a protein that helps you grow new brain cells and helps keep your existing neurons alive. It's vital for learning, short and long term memory and higher thinking. It is encoded by the BDNF gene. It also appears to be an important marker of cognitive health and memory in women (though for reasons not yet clear, the association is not strong in men).

One study of 369 older adults, average age of about 73, found that women who had one of two minor variations of this gene had an increased risk of poorer cognitive performance (memory and perceptual speed, how quickly your brain interprets and organizes information) as compared with

HEALTHY AGING

MENTAL ACUITY

the eating habits of nearly 2,000 men and women for close to five years found that those who most closely followed a Mediterranean style diet showed a 28 percent lower risk of mild cognitive impairment compared to those who did not follow Mediterranean eating patterns. Moderate consumption of alcohol, particularly wine, that is a hallmark of this diet may have its own protective effect against mental acuity decline.

Go for fish. You'll already be eating fish if you follow a Mediterranean diet, but it bears emphasis. Seafood and freshwater fish are especially good for your brain. Fatty fish, like wild salmon, herring, sardines, and anchovies are especially rich in the omega-3 fatty acid DHA, which is highly concentrated in the brain. Eat at least two 4 ounce servings of fatty fish each week to boost your omega-3 levels and protect your cognitive health.

Get at least 30 minutes of physical activity a day. Exercise is essential for brain health. When you exercise you dramatically increase the production of neurotropins such as BDNF, which promotes stem cell division and new brain cell formation, effectively doubling or tripling the production of neurons. In one study, researchers had 59 sedentary adults either start an aerobic exercise program (brisk walking) or remain sedentary for 6 months. After just three months, scans showed that the exercisers had built their brains so that they had the volume of people three years younger. One meta analysis of 15 studies that included more than 33,000 men and women followed for up to 12 years showed that people with the highest levels of physical activity were 38 percent less likely to show signs of mental acuity decline over time compared to their peers who did very little activity. It only takes 30 minutes a day to reap potent brain benefits.

Exercise your brain. Every task you perform stimulates a vast network of billions of neurons connected by trillions of synapses within your brain. When you perform novel or challenging tasks such as learning a new language, playing chess, solving puzzles and even intricate physical tasks like ballroom dancing, you engage new pathways, stimulate neurogenesis, and build what you could call a cognitive reserve. Challenge and exercise your brain daily to delay the onset of and/or reduce the impact of age related mental acuity decline.

Make sleep a priority. When you sleep, your glymphatic system—a network of water channels in the brain—become active and shuttles waste, which would otherwise build up and damage brain cells, out of your brain. Too little sleep long term is bad for brain health. Get 7 to 8 hours a night.

their peers who carried major forms of the gene. The more minor variations of these genes they carried, the greater their risk of decreased cognitive function, especially regarding memory and perceptual speed. Other research shows that the interaction of BDNF with another genotype (APOE4) increases the likelihood and magnitude of mental auity decline.

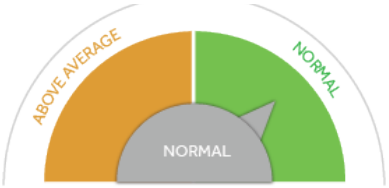
It can be scary to hear that you're at a higher risk for mental acuity decline. Remember, however, that gene science is still relatively very young and there are a great many factors that impact your brain health and cognitive functioning beyond genetic predisposition. Likewise, there are myriad steps you can take to help maintain healthy brain function as you age. Knowing that you may be at above average risk genetically gives you time to take those steps early to protect your brain later in life.

Our analysis investigated which genotype for these genes was present in your DNA. Your rating of LOWER, SLIGHTLY ABOVE AVERAGE, or ABOVE AVERAGE reflects whether your genotypes included those that carried a risk for more or less mental acuity decline with age.

SYSTEMIC INFLAMMATION

WHAT YOUR GENES SAY ABOUT YOU:

Our analysis indicates that your genetic profile exhibits characteristics that give you a likelihood of having NORMAL systemic inflammation levels. That means your CRP levels are likely to fall in a normal range. That's good news because chronically elevated inflammation levels take a toll on your organs and pave the way for diseases like diabetes and heart disease. Of course, genes are only one factor in systemic inflammation. You still need to follow a balanced diet, train intelligently, and maintain a healthy weight.



Your genetic profile indicates that you are inclined to have NORMAL systemic inflammation levels.

You can maximize the beneficial effects of your genes by eating an anti-inflammatory diet and training consistently, including rest and recovery days after strenuous workouts, competitions and races, and training blocks.

SUCCESS STRATEGIES

Normal CRP levels vary from laboratory to laboratory, but generally there are no or very low levels of CRP detectable in the blood. According to the American Heart Association, you are at a low risk for developing heart disease if your CRP levels are less than 1.0 mg/L; your risk is considered average if your levels are between 1.0 mg/L and 3.0 mg/L, and your risk is high if your levels are higher than 3.0mg/L. Simple, healthy lifestyle practices go a long way in keeping systemic inflammation levels in a low, healthy range. Maintaining a healthy weight is one of the best ways to keep systemic inflammation in check, since carrying excess fat, especially metabolically active abdominal fat, can induce chronic low-grade inflammation.

The good news for you as an active person is that regular physical activity, which can help you maintain a healthy weight, is one of the best "anti-inflammatories"

RELATED GENES / SNPs

CRP, APOC1 (APOE-CI-CII), HNF1A

The genes and their associated SNPs that are included in this category have been shown to have significant associations with a person's systemic inflammation levels. That's low-level inflammation we don't see, which left unchecked, can damage our blood vessels and lead to many serious chronic diseases like heart disease, diabetes, stroke, neurodegenerative diseases like Alzheimer's, and some cancers. Chronic inflammation also hinders recovery from exercise and training and harms performance.

Doctors use C-reactive protein (CRP) levels as a general marker of systemic inflammation. CRP is a protein found in your blood plasma that binds to the surface of dead or dying cells and certain bacteria to clear them from your body. When there's a lot of cellular damage to clean up, CRP levels rise. Unsurprisingly, high CRP levels have been linked to a higher risk of mortality.

There are many culprits behind systemic

SYSTEMIC INFLAMMATION

there is. Regular exercise has been shown to reduce inflammation by up to 60 percent. In a 10-year study of nearly 4,300 men and women, British researchers found that those who got 2 ½ hours of moderate exercise a week had significantly lower CRP levels than those who were less physically active. Those who began exercising regularly during the study had lower inflammation levels by the end.

It's important to note that exercise often causes some degree of inflammation. A long, hard and/or intense training session is a form of stress that initiates an inflammatory response, which is part of the adaptation process that generates muscle and makes you stronger and fitter as your body rebuilds. If you constantly train hard without adequate rest, such as doing high intensity CrossFit workouts every single day or training for long endurance events like marathons, ultras, and long distance triathlons, you raise your risk for chronic inflammation. Also, research suggests that sporadic intense exercising, such as being a "weekend warrior," can increase inflammation and weaken immunity, rather than bolster it.

Your favorable genotype may help protect you from chronic inflammation that can result from too much intense exercise without adequate rest and inconsistent training, but you should still aim to follow healthy, consistent training practices that include a mix of high intensity training days interspersed with adequate recovery days. Avoid slogging through workouts when you're feeling fatigued.

Eating a Mediterranean-style diet that is rich in inflammation-lowering polyunsaturated omega-3 fatty acids also helps keep CRP levels low. Build your diet around plant foods and eat lots of vegetables and fruits with moderate amounts of lean protein and healthy fats. Avoid eating fried foods, fast foods, and foods that are high in sugar, as they can raise inflammation. If you drink, do so in moderation. Too much is bad for you, but research shows that moderate amounts, such as a drink a day, lowers your CRP levels more than totally abstaining. It's not a reason to start drinking, of course. But good news for those who enjoy alcohol in moderation.

inflammation, including autoimmune diseases, being overweight (especially if you carry your excess fat in your abdomen, where it is most metabolically active), poor fitness, a diet that is high in sugar and other inflammatory foods, sleep deprivation, as well as exposure to secondhand smoke and other pollutants.

CRP is also significantly influenced by genetics. Researchers estimate that the heritability of CRP levels is up to 40 percent. In a recent genome wide association analysis of more than 82,700 men and women, scientists identified a half a dozen genetic variations that were significantly associated with CRP levels. When they ranked the study participants according to their at-risk CRP genetic makeup, those in the highest gene score group had an average CRP level that was more than double the average level of those in the lowest gene score group.

Our analysis investigated which genotype for this gene was present in your DNA. Your rating of NORMAL or, ABOVE AVERAGE reflect whether or not your genotype include those that increase your risk for elevated systemic inflammation levels.

LINKS TO RELATED STUDIES:

FOOD - PROTEIN UTILIZATION

Int J Obes (Lond). 2018 Sep;42(9):1565-1573. doi: 10.1038/s41366-018-0046-9. Epub 2018 Feb 26. PMID: 29568104; PMCID: PMC6109621.

Gut-microbiome-related LCT genotype and 2-year changes in body composition and fat distribution: the POUNDS Lost Trial

https://pubmed.ncbi.nlm.nih.gov/29568104

Heianza Y, Sun D, Ma W, et al.

Diabetes. 2012 Nov;61(11):3005-11. doi: 10.2337/db11-1799. Epub 2012 Aug 13. Erratum in: Diabetes. 2013 Feb;62(2):662. Smith, Steven R [added]; Bray, George A [added]. PMID: 22891219; PMCID: PMC3478519.

FTO genotype and 2-year change in body composition and fat distribution in response to weight-loss diets: the POUNDS LOST Trial

https://pubmed.ncbi.nlm.nih.gov/22891219

Zhang X, Qi Q, Zhang C, et al.

FOOD - FAT UTILIZATION

Clin Genet. 2005 Aug;68(2):152-4. doi: 10.1111/j.1399-0004.2005.00463.x. PMID: 15996212.

A polymorphism in the apolipoprotein A5 gene is associated with weight loss after short-term diet

https://pubmed.ncbi.nlm.nih.gov/15996212

Aberle J, Evans D, Beil FU, Seedorf U.

J Mol Med (Berl). 2007 Feb;85(2):119-28. doi: 10.1007/s00109-006-0147-0. Epub 2007 Jan 9. PMID: 17211608.

APOA5 gene variation modulates the effects of dietary fat intake on body mass index and obesity risk in the Framingham Heart Study

https://pubmed.ncbi.nlm.nih.gov/17211608

Corella D, Lai CQ, Demissie S, et al.

Am J Clin Nutr. 2010 Feb;91(2):472-9. doi: 10.3945/ajcn.2009.27947. Epub 2009 Dec 23. PMID: 20032493.

TCF7L2 rs7903146-macronutrient interaction in obese individuals' responses to a 10-wk randomized hypoenergetic diet

https://pubmed.ncbi.nlm.nih.gov/20032493

Grau K, Cauchi S, Holst C, et al.

Diabetes. 2010 Mar;59(3):747-50. doi: 10.2337/db09-1050. Epub 2009 Dec 22. PMID: 20028944; PMCID: PMC2828665.

Gene variants of TCF7L2 influence weight loss and body composition during lifestyle intervention in a population at risk for type 2 diabetes

https://pubmed.ncbi.nlm.nih.gov/20028944

Haupt A, Thamer C, Heni M, et al.

Circulation. 2006 May 2;113(17):2062-70. doi: 10.1161/CIRCULATIONAHA.105.577296. Epub 2006 Apr 24. PMID: 16636175.

Dietary intake of n-6 fatty acids modulates effect of apolipoprotein A5 gene on plasma fasting triglycerides, remnant lipoprotein concentrations, and lipoprotein particle size: the Framingham Heart Study

https://pubmed.ncbi.nlm.nih.gov/16636175

Lai CQ, Corella D, Demissie S, et al.

LINKS TO RELATED STUDIES:

J Biol Chem. 2001 Oct 26;276(43):39679-84. doi: 10.1074/jbc.M105713200. Epub 2001 Aug 3. PMID: 11487582.

The polymorphism at codon 54 of the FABP2 gene increases fat absorption in human intestinal explants

https://pubmed.ncbi.nlm.nih.gov/11487582

Levy E, Ménard D, Delvin E, et al.

Diabetes. 2002 Aug;51(8):2581-6. doi: 10.2337/diabetes.51.8.2581. PMID: 12145174.

Association of the Pro12Ala polymorphism in the PPAR-gamma2 gene with 3-year incidence of type 2 diabetes and body weight change in the Finnish Diabetes Prevention Study

https://pubmed.ncbi.nlm.nih.gov/12145174

Lindi VI, Uusitupa MI, Lindström J, et al.

Am J Clin Nutr. 2012 Nov;96(5):1129-36. doi: 10.3945/ajcn.112.038125. Epub 2012 Oct 3. PMID: 23034957; PMCID: PMC3471200.

TCF7L2 genetic variants modulate the effect of dietary fat intake on changes in body composition during a weight-loss intervention

https://pubmed.ncbi.nlm.nih.gov/23034957

Mattei J, Qi Q, Hu FB, Sacks FM, Qi L.

Hum Mol Genet. 2003 Nov 15;12(22):2923-9. doi: 10.1093/hmg/ddg318. Epub 2003 Sep 23. PMID: 14506127.

Interaction between a peroxisome proliferator-activated receptor gamma gene polymorphism and dietary fat intake in relation to body mass

https://pubmed.ncbi.nlm.nih.gov/14506127

Memisoglu A, Hu FB, Hankinson SE, et al.

Am J Clin Nutr. 2014 Feb;99(2):392-9. doi: 10.3945/ajcn.113.072066. Epub 2013 Dec 11. PMID: 24335056; PMCID: PMC3893729.

Variants in glucose- and circadian rhythm-related genes affect the response of energy expenditure to weight-loss diets: the POUNDS LOST Trial

https://pubmed.ncbi.nlm.nih.gov/24335056

Mirzaei K, Xu M, Qi Q, et al.

Journal of Lipid Research. 2000;41(12):2002–2008. doi:10.1016/s0022-2275(20)32361-0.

Effects of an Ala54Thr polymorphism in the intestinal fatty acid-binding protein on responses to dietary fat in humans

https://doi.org/10.1016/S0022-2275(20)32361-0

Pratley RE, Baier L, Pan DA, et al.

Clin Genet. 2003 Feb;63(2):109-16. doi: 10.1034/j.1399-0004.2003.00026.x. PMID: 12630956.

The PPAR-gamma P12A polymorphism modulates the relationship between dietary fat intake and components of the metabolic syndrome: results from the Québec Family Study

https://pubmed.ncbi.nlm.nih.gov/12630956

Robitaille J, Després JP, Pérusse L, Vohl MC.

J Nutr. 2011 Mar;141(3):380-5. doi: 10.3945/jn.110.130344. Epub 2011 Jan 5. PMID: 21209257; PMCID: PMC3040902.

APOA5 gene variation interacts with dietary fat intake to modulate obesity and circulating triglycerides in a Mediterranean population

https://pubmed.ncbi.nlm.nih.gov/21209257

Sánchez-Moreno C, Ordovás JM, Smith CE, Baraza JC, Lee YC, Garaulet M.

LINKS TO RELATED STUDIES:

Am J Clin Nutr. 2007 Jan;85(1):102-8. doi: 10.1093/ajcn/85.1.102. PMID: 17209184.

FABP2 Ala54Thr genotype is associated with glucoregulatory function and lipid oxidation after a high-fat meal in sedentary nondiabetic men and women

https://pubmed.ncbi.nlm.nih.gov/17209184

Weiss EP, Brandauer J, Kulaputana O, et al.

Circulation. 2013 Mar 26;127(12):1283-9. doi: 10.1161/CIRCULATIONAHA.112.000586. Epub 2013 Feb 27. PMID: 23446828; PMCID: PMC3860590.

Genetic determinant for amino acid metabolites and changes in body weight and insulin resistance in response to weight-loss diets: the Preventing Overweight Using Novel Dietary Strategies (POUNDS LOST) trial

https://pubmed.ncbi.nlm.nih.gov/23446828

Xu M, Qi Q, Liang J, et al.

FOOD - CARB UTILIZATION

Hum Mol Genet. 2013 May 1;22(9):1895-902. doi: 10.1093/hmg/ddt032. Epub 2013 Jan 30. PMID: 23372041; PMCID: PMC3612009.

Novel locus including FGF21 is associated with dietary macronutrient intake

https://pubmed.ncbi.nlm.nih.gov/23372041

Chu AY, Workalemahu T, Paynter NP, et al.

Cell Rep. 2018 Apr 10;23(2):327-336. doi: 10.1016/j.celrep.2018.03.070. PMID: 29641994; PMCID: PMC5912948.

A Common Allele in FGF21 Associated with Sugar Intake Is Associated with Body Shape, Lower Total Body-Fat Percentage, and Higher Blood Pressure

https://pubmed.ncbi.nlm.nih.gov/29641994

Frayling TM, Beaumont RN, Jones SE, et al.

Diabetes Care. 2016 Nov;39(11):1909-1914. doi: 10.2337/dc16-1111. Epub 2016 Aug 31. PMID: 27581055; PMCID: PMC5079612.

Macronutrient Intake-Associated FGF21 Genotype Modifies Effects of Weight-Loss Diets on 2-Year Changes of Central Adiposity and Body Composition: The POUNDS Lost Trial

https://pubmed.ncbi.nlm.nih.gov/27581055

Heianza Y, Ma W, Huang T, et al.

Mol Nutr Food Res. 2011 Feb;55(2):328-35. doi: 10.1002/mnfr.201000235. Epub 2010 Sep 7. PMID: 20824664.

The insulin sensitivity response is determined by the interaction between the G972R polymorphism of the insulin receptor substrate 1 gene and dietary fat

https://pubmed.ncbi.nlm.nih.gov/20824664

Marín C, Pérez-Martínez P, Delgado-Lista J, et al.

Circulation. 2011 Aug 2;124(5):563-71. doi: 10.1161/CIRCULATIONAHA.111.025767. Epub 2011 Jul 11. PMID: 21747052; PMCID: PMC3171189.

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

https://pubmed.ncbi.nlm.nih.gov/21747052

Qi Q, Bray GA, Smith SR, Hu FB, Sacks FM, Qi L.

LINKS TO RELATED STUDIES:

Am J Clin Nutr. 2013 Jun;97(6):1395-402. doi: 10.3945/ajcn.112.052183. Epub 2013 May 1. PMID: 23636237; PMCID: PMC3652928.

Genome-wide meta-analysis of observational studies shows common genetic variants associated with macronutrient intake

https://pubmed.ncbi.nlm.nih.gov/23636237

Tanaka T, Ngwa JS, van Rooij FJ, et al.

FOOD SENSITIVITY - LACTOSE INTOLERANCE

Nat Genet. 2002 Feb;30(2):233-7. doi: 10.1038/ng826. Epub 2002 Jan 14. PMID: 11788828.

Identification of a variant associated with adult-type hypolactasia

https://pubmed.ncbi.nlm.nih.gov/11788828

Enattah NS, Sahi T, Savilahti E, Terwilliger JD, Peltonen L, Järvelä I.

Am J Hum Genet. 2004 Jun;74(6):1102-10. doi: 10.1086/421050. Epub 2004 Apr 20. PMID: 15106124; PMCID: PMC1182074.

The T allele of a single-nucleotide polymorphism 13.9 kb upstream of the lactase gene (LCT) (C-13.9kbT) does not predict or cause the lactase-persistence phenotype in Africans

https://pubmed.ncbi.nlm.nih.gov/15106124

Mulcare CA, Weale ME, Jones AL, et al.

FOOD SENSITIVITY - SENSITIVITY TO SATURATED FAT

J Nutr. 2011 Dec;141(12):2219-25. doi: 10.3945/jn.111.143826. Epub 2011 Nov 2. PMID: 22049296; PMCID: PMC3223879.

A high intake of saturated fatty acids strengthens the association between the fat mass and obesity-associated gene and BMI

https://pubmed.ncbi.nlm.nih.gov/22049296

Corella D, Arnett DK, Tucker KL, et al.

Arch Intern Med. 2009 Nov 9;169(20):1897-906. doi: 10.1001/archinternmed.2009.343. PMID: 19901143; PMCID: PMC2874956.

APOA2, dietary fat, and body mass index: replication of a gene-diet interaction in 3 independent populations

https://pubmed.ncbi.nlm.nih.gov/19901143

Corella D, Peloso G, Arnett DK, et al.

Int J Obes (Lond). 2011 May;35(5):666-75. doi: 10.1038/ijo.2010.187. Epub 2010 Oct 26. PMID: 20975728; PMCID: PMC3030929.

Association between the APOA2 promoter polymorphism and body weight in Mediterranean and Asian populations: replication of a gene-saturated fat interaction

https://pubmed.ncbi.nlm.nih.gov/20975728

Corella D, Tai ES, Sorlí JV, et al.

Clin Nutr. 2016 Aug;35(4):907-11. doi: 10.1016/j.clnu.2015.06.008. Epub 2015 Jul 16. PMID: 26210798.

APOA II genotypes frequency and their interaction with saturated fatty acids consumption on lipid profile of patients with type 2 diabetes

https://pubmed.ncbi.nlm.nih.gov/26210798

Noorshahi N, Sotoudeh G, Djalali M, et al.

LINKS TO RELATED STUDIES:

PLoS One. 2012;7(8):e43390. doi: 10.1371/journal.pone.0043390. Epub 2012 Aug 20. PMID: 22916254; PMCID: PMC3423356.
Effects of rs7903146 variation in the Tcf7l2 gene in the lipid metabolism of three different populations
https://pubmed.ncbi.nlm.nih.gov/22916254
Perez-Martinez P, Perez-Caballero AI, Garcia-Rios A, et al.

J Nutr Biochem. 2012 Mar;23(3):239-44. doi: 10.1016/j.jnutbio.2010.11.020. Epub 2011 May 2. PMID: 21543200.
Dietary saturated fat, gender and genetic variation at the TCF7L2 locus predict the development of metabolic syndrome
https://pubmed.ncbi.nlm.nih.gov/21543200
Phillips CM, Goumidi L, Bertrais S, et al.

J Nutr. 2012 May;142(5):824-31. doi: 10.3945/jn.111.153460. Epub 2012 Mar 28. PMID: 22457394.
High dietary saturated fat intake accentuates obesity risk associated with the fat mass and obesity-associated gene in adults
https://pubmed.ncbi.nlm.nih.gov/22457394
Phillips CM, Kesse-Guyot E, McManus R, et al.

FOOD SENSITIVITY - GLUTEN SENSITIVITY

Immunogenetics. 2009 Apr;61(4):247-56. doi: 10.1007/s00251-009-0361-3. Epub 2009 Mar 3. PMID: 19255754.
Cost-effective HLA typing with tagging SNPs predicts celiac disease risk haplotypes in the Finnish, Hungarian, and Italian populations
https://pubmed.ncbi.nlm.nih.gov/19255754
Koskinen L, Romanos J, Kaukinen K, et al.

Hum Immunol. 2009 Jan;70(1):55-9. doi: 10.1016/j.humimm.2008.10.018. Epub 2008 Nov 21. PMID: 19027045.
HLA-DQ and risk gradient for celiac disease
https://pubmed.ncbi.nlm.nih.gov/19027045
Megiorni F, Mora B, Bonamico M, et al.

PLoS One. 2008 May 28;3(5):e2270. doi: 10.1371/journal.pone.0002270. Erratum in: PLoS One. 2009;4(5) doi:10.1371/annotation/53480f56-4ef7-4877-ace7-e5892d392cce. PMID: 18509540; PMCID: PMC2386975.
Effective detection of human leukocyte antigen risk alleles in celiac disease using tag single nucleotide polymorphisms
https://pubmed.ncbi.nlm.nih.gov/18509540
Monsuur AJ, de Bakker PI, Zhernakova A, et al.

Clin Gastroenterol Hepatol. 2009 Sep;7(9):966-71. doi: 10.1016/j.cgh.2009.05.028. Epub 2009 Jun 23. PMID: 19500688.
Stratifying risk for celiac disease in a large at-risk United States population by using HLA alleles
https://pubmed.ncbi.nlm.nih.gov/19500688
Pietzak MM, Schofield TC, McGinniss MJ, Nakamura RM.

Proc Natl Acad Sci U S A. 2003 Oct 14;100(21):12390-5. doi: 10.1073/pnas.2135229100. Epub 2003 Oct 6. PMID: 14530392; PMCID: PMC218768.
The HLA-DQ2 gene dose effect in celiac disease is directly related to the magnitude and breadth of gluten-specific T cell responses
https://pubmed.ncbi.nlm.nih.gov/14530392
Vader W, Stepniak D, Kooy Y, et al.

LINKS TO RELATED STUDIES:

Nat Genet. 2007 Jul;39(7):827-9. doi: 10.1038/ng2058. Epub 2007 Jun 10. PMID: 17558408; PMCID: PMC2274985.
A genome-wide association study for celiac disease identifies risk variants in the region harboring IL2 and IL21
https://pubmed.ncbi.nlm.nih.gov/17558408
van Heel DA, Franke L, Hunt KA, et al.

FOOD SENSITIVITY - CAFFEINE METABOLISM

Hum Mol Genet. 2016 Dec 15;25(24):5472-5482. doi: 10.1093/hmg/ddw334. PMID: 27702941.
Genome-wide association study of caffeine metabolites provides new insights to caffeine metabolism and dietary caffeine-consumption behavior
https://pubmed.ncbi.nlm.nih.gov/27702941
Cornelis MC, Kacprowski T, Menni C, et al.

FOOD SENSITIVITY - CHOLESTEROL RESPONSE TO DIETARY FAT

J Nutr. 2015 Jun;145(6):1289-94. doi: 10.3945/jn.115.212514. Epub 2015 Apr 29. PMID: 25926410; PMCID: PMC4442119.
Dietary Fat Intake Modifies the Effect of a Common Variant in the LIPC Gene on Changes in Serum Lipid Concentrations during a Long-Term Weight-Loss Intervention Trial
https://pubmed.ncbi.nlm.nih.gov/25926410
Xu M, Ng SS, Bray GA, et al.

FOOD SENSITIVITY - INSULIN RESPONSE TO DIETARY FAT

J Nutr. 2015 May;145(5):977-82. doi: 10.3945/jn.115.210005. Epub 2015 Mar 11. PMID: 25761503; PMCID: PMC4408741.
Dietary Fat Modifies the Effects of FTO Genotype on Changes in Insulin Sensitivity
https://pubmed.ncbi.nlm.nih.gov/25761503
Zheng Y, Huang T, Zhang X, et al.

FOOD SENSITIVITY - RESPONSE TO MONOUNSATURATED FATS

Cardiovasc Diabetol. 2016 Jan 7;15:4. doi: 10.1186/s12933-015-0327-8. PMID: 26739996; PMCID: PMC4704407.
CLOCK gene variation is associated with incidence of type-2 diabetes and cardiovascular diseases in type-2 diabetic subjects: dietary modulation in the PREDIMED randomized trial
https://pubmed.ncbi.nlm.nih.gov/26739996
Corella D, Asensio EM, Coltell O, et al.

Am J Clin Nutr. 2009 Dec;90(6):1466-75. doi: 10.3945/ajcn.2009.27536. Epub 2009 Oct 21. PMID: 19846548; PMCID: PMC2777463.
CLOCK genetic variation and metabolic syndrome risk: modulation by monounsaturated fatty acids
https://pubmed.ncbi.nlm.nih.gov/19846548
Garaulet M, Lee YC, Shen J, et al.

LINKS TO RELATED STUDIES:

Obesity (Silver Spring). 2009 Mar;17(3):510-7. doi: 10.1038/oby.2008.583. Epub 2008 Dec 18. PMID: 19238139; PMCID: PMC2753535.

ADIPOQ polymorphisms, monounsaturated fatty acids, and obesity risk: the GOLDN study

https://pubmed.ncbi.nlm.nih.gov/19238139

Warodomwichit D, Shen J, Arnett DK, et al.

NUTRIENTS - VITAMIN A TENDENCY

FASEB J. 2009 Apr;23(4):1041-53. doi: 10.1096/fj.08-121962. Epub 2008 Dec 22. PMID: 19103647.

Two common single nucleotide polymorphisms in the gene encoding beta-carotene 15,15'-monoxygenase alter beta-carotene metabolism in female volunteers

https://pubmed.ncbi.nlm.nih.gov/19103647

Leung WC, Hessel S, Méplan C, et al.

NUTRIENTS - VITAMIN B6 TENDENCY

Am J Hum Genet. 2009 Apr;84(4):477-82. doi: 10.1016/j.ajhg.2009.02.011. Epub 2009 Mar 19. Erratum in: Am J Hum Genet. 2009 May;84(5):712. PMID: 19303062; PMCID: PMC2667971.

Genome-wide association study of vitamin B6, vitamin B12, folate, and homocysteine blood concentrations

https://pubmed.ncbi.nlm.nih.gov/19303062

Tanaka T, Scheet P, Giusti B, et al.

PLoS One. 2013 May 16;8(5):e64343. doi: 10.1371/journal.pone.0064343. PMID: 23696881; PMCID: PMC3655956.

Imputation of variants from the 1000 Genomes Project modestly improves known associations and can identify low-frequency variant-phenotype associations undetected by HapMap based imputation

https://pubmed.ncbi.nlm.nih.gov/23696881

Wood AR, Perry JR, Tanaka T, et al.

NUTRIENTS - VITAMIN B9 – FOLATE TENDENCY

Gene. 2018 Oct 20;674:121-126. doi: 10.1016/j.gene.2018.06.080. Epub 2018 Jun 25. PMID: 29953918.

Identification of three novel loci of ALDH2 Gene for Serum Folate levels in a Male Chinese Population by Genome-Wide Association Study

https://pubmed.ncbi.nlm.nih.gov/29953918

Deng C, Tang S, Huang X, et al.

Proc Nutr Soc. 2014 Feb;73(1):47-56. doi: 10.1017/S0029665113003613. Epub 2013 Oct 17. PMID: 24131523.

MTHFR 677TT genotype and disease risk: is there a modulating role for B-vitamins?

https://pubmed.ncbi.nlm.nih.gov/24131523

Reilly R, McNulty H, Pentieva K, Strain JJ, Ward M.

LINKS TO RELATED STUDIES:

Am J Clin Nutr. 2018 Dec 1;108(6):1334-1341. doi: 10.1093/ajcn/nqy209. PMID: 30339177; PMCID: PMC6290363.

The 677C□T variant of MTHFR is the major genetic modifier of biomarkers of folate status in a young, healthy Irish population

https://pubmed.ncbi.nlm.nih.gov/30339177

Shane B, Pangilinan F, Mills JL, et al.

NUTRIENTS - VITAMIN B12 TENDENCY

Nat Genet. 2008 Oct;40(10):1160-2. doi: 10.1038/ng.210. Epub 2008 Sep 7. PMID: 18776911; PMCID: PMC2673801.

Common variants of FUT2 are associated with plasma vitamin B12 levels

https://pubmed.ncbi.nlm.nih.gov/18776911

Hazra A, Kraft P, Selhub J, et al.

Hum Mol Genet. 2012 Jun 1;21(11):2610-7. doi: 10.1093/hmg/dds062. Epub 2012 Feb 24. PMID: 22367966.

Genome-wide association study identifies novel loci associated with serum level of vitamin B12 in Chinese men

https://pubmed.ncbi.nlm.nih.gov/22367966

Lin X, Lu D, Gao Y, et al.

Hum Mol Genet. 2017 Jul 1;26(13):2589. doi: 10.1093/hmg/ddx156. Erratum for: Hum Mol Genet. 2017 Jul 1;26(13):2551-2564. PMID: 28481999; PMCID: PMC5886167.

GWAS identifies population-specific new regulatory variants in FUT6 associated with plasma B12 concentrations in Indians

https://pubmed.ncbi.nlm.nih.gov/28481999

Nongmaithem SS, Joglekar CV, Krishnaveni GV, et al.

Am J Hum Genet. 2009 Apr;84(4):477-82. doi: 10.1016/j.ajhg.2009.02.011. Epub 2009 Mar 19. Erratum in: Am J Hum Genet. 2009 May;84(5):712. PMID: 19303062; PMCID: PMC2667971.

Genome-wide association study of vitamin B6, vitamin B12, folate, and homocysteine blood concentrations

https://pubmed.ncbi.nlm.nih.gov/19303062

Tanaka T, Scheet P, Giusti B, et al.

NUTRIENTS - VITAMIN C TENDENCY

Am J Clin Nutr. 2010 Aug;92(2):375-82. doi: 10.3945/ajcn.2010.29438. Epub 2010 Jun 2. Erratum in: Am J Clin Nutr. 2013 Jul;98(1):253-4. PMID: 20519558; PMCID: PMC3605792.

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

https://pubmed.ncbi.nlm.nih.gov/20519558

Timpson NJ, Forouhi NG, Brion MJ, et al.

LINKS TO RELATED STUDIES:

NUTRIENTS - VITAMIN D TENDENCY

Nat Commun. 2018 Jan 17;9(1):260. doi: 10.1038/s41467-017-02662-2. PMID: 29343764; PMCID: PMC5772647.

Genome-wide association study in 79,366 European-ancestry individuals informs the genetic architecture of 25-hydroxyvitamin D levels

https://pubmed.ncbi.nlm.nih.gov/29343764

Jiang X, O'Reilly PF, Aschard H, et al.

PLoS Genet. 2019 Dec 16;15(12):e1008530. doi: 10.1371/journal.pgen.1008530. PMID: 31841498; PMCID: PMC6936875.

Genetic variation in GC and CYP2R1 affects 25-hydroxyvitamin D concentration and skeletal parameters: A genome-wide association study in 24-month-old Finnish children

https://pubmed.ncbi.nlm.nih.gov/31841498

Kämpe A, Enlund-Cerullo M, Valkama S, et al.

Am J Hum Genet. 2020 Mar 5;106(3):327-337. doi: 10.1016/j.ajhg.2020.01.017. Epub 2020 Feb 13. PMID: 32059762; PMCID: PMC7058824.

Genome-wide Association Study for Vitamin D Levels Reveals 69 Independent Loci

https://pubmed.ncbi.nlm.nih.gov/32059762

Manousaki D, Mitchell R, Dudding T, et al.

Front Genet. 2018 Mar 1;9:67. doi: 10.3389/fgene.2018.00067. PMID: 29545823; PMCID: PMC5838824.

Genome-Wide Association Study of Serum 25-Hydroxyvitamin D in US Women

https://pubmed.ncbi.nlm.nih.gov/29545823

O'Brien KM, Sandler DP, Shi M, Harmon QE, Taylor JA, Weinberg CR.

Lancet. 2010 Jul 17;376(9736):180-8. doi: 10.1016/S0140-6736(10)60588-0. Epub 2010 Jun 10. PMID: 20541252; PMCID: PMC3086761.

Common genetic determinants of vitamin D insufficiency: a genome-wide association study

https://pubmed.ncbi.nlm.nih.gov/20541252

Wang TJ, Zhang F, Richards JB, et al.

NUTRIENTS - VITAMIN E TENDENCY

J Nutr. 2012 May;142(5):866-71. doi: 10.3945/jn.111.156349. Epub 2012 Mar 21. PMID: 22437554; PMCID: PMC3327745.

Genome-wide association study identifies three common variants associated with serologic response to vitamin E supplementation in men

https://pubmed.ncbi.nlm.nih.gov/22437554

Major JM, Yu K, Chung CC, et al.

Hum Mol Genet. 2011 Oct 1;20(19):3876-83. doi: 10.1093/hmg/ddr296. Epub 2011 Jul 5. PMID: 21729881; PMCID: PMC3168288.

Genome-wide association study identifies common variants associated with circulating vitamin E levels

https://pubmed.ncbi.nlm.nih.gov/21729881

Major JM, Yu K, Wheeler W, et al.

LINKS TO RELATED STUDIES:

PLoS One. 2013 May 16;8(5):e64343. doi: 10.1371/journal.pone.0064343. PMID: 23696881; PMCID: PMC3655956.

Imputation of variants from the 1000 Genomes Project modestly improves known associations and can identify low-frequency variant-phenotype associations undetected by HapMap based imputation

https://pubmed.ncbi.nlm.nih.gov/23696881

Wood AR, Perry JR, Tanaka T, et al.

NUTRIENTS - CALCIUM TENDENCY

PLoS Genet. 2010 Jul 22;6(7):e1001035. doi: 10.1371/journal.pgen.1001035. PMID: 20661308; PMCID: PMC2908705.

Genome-wide meta-analysis for serum calcium identifies significantly associated SNPs near the calcium-sensing receptor (CASR) gene

https://pubmed.ncbi.nlm.nih.gov/20661308

Kapur K, Johnson T, Beckmann ND, et al.

PLoS Genet. 2013;9(9):e1003796. doi: 10.1371/journal.pgen.1003796. Epub 2013 Sep 19. PMID: 24068962; PMCID: PMC3778004.

Meta-analysis of genome-wide association studies identifies six new Loci for serum calcium concentrations

https://pubmed.ncbi.nlm.nih.gov/24068962

O'Seaghdha CM, Wu H, Yang Q, et al.

NUTRIENTS - COPPER TENDENCY

Hum Mol Genet. 2013 Oct 1;22(19):3998-4006. doi: 10.1093/hmg/ddt239. Epub 2013 May 29. PMID: 23720494; PMCID: PMC3766178.

Genome-wide association study identifies loci affecting blood copper, selenium and zinc

https://pubmed.ncbi.nlm.nih.gov/23720494

Evans DM, Zhu G, Dy V, et al.

NUTRIENTS - IRON TENDENCY

Nat Commun. 2014 Oct 29;5:4926. doi: 10.1038/ncomms5926. Erratum in: Nat Commun. 2015;6:6542. Häldin, Jonas [corrected to Hälldin, Jonas]. PMID: 25352340; PMCID: PMC4215164.

Novel loci affecting iron homeostasis and their effects in individuals at risk for hemochromatosis

https://pubmed.ncbi.nlm.nih.gov/25352340

Benyamin B, Esko T, Ried JS, et al.

Nat Genet. 2009 Nov;41(11):1173-5. doi: 10.1038/ng.456. Epub 2009 Oct 11. PMID: 19820699; PMCID: PMC3135421.

Common variants in TMPRSS6 are associated with iron status and erythrocyte volume

https://pubmed.ncbi.nlm.nih.gov/19820699

Benyamin B, Ferreira MA, Willemsen G, et al.

Science. 2008 May 23;320(5879):1088-92. doi: 10.1126/science.1157121. Epub 2008 May 1. PMID: 18451267; PMCID: PMC2430097.

The serine protease TMPRSS6 is required to sense iron deficiency

https://pubmed.ncbi.nlm.nih.gov/18451267

Du X, She E, Gelbart T, et al.

LINKS TO RELATED STUDIES:

Nat Genet. 2008 May;40(5):569-71. doi: 10.1038/ng.130. Epub 2008 Apr 13. PMID: 18408718; PMCID: PMC3104019.

Mutations in TMPRSS6 cause iron-refractory iron deficiency anemia (IRIDA)

https://pubmed.ncbi.nlm.nih.gov/18408718

Finberg KE, Heeney MM, Campagna DR, et al.

Hum Mol Genet. 2015 Jan 15;24(2):572-81. doi: 10.1093/hmg/ddu454. Epub 2014 Sep 15. PMID: 25224454; PMCID: PMC4334839.

Genome-wide admixture and association study of serum iron, ferritin, transferrin saturation and total iron binding capacity in African Americans

https://pubmed.ncbi.nlm.nih.gov/25224454

Li J, Lange LA, Duan Q, et al.

Nat Genet. 2004 Jan;36(1):77-82. doi: 10.1038/ng1274. Epub 2003 Nov 30. PMID: 14647275.

Mutations in HFE2 cause iron overload in chromosome 1q-linked juvenile hemochromatosis

https://pubmed.ncbi.nlm.nih.gov/14647275

Papanikolaou G, Samuels ME, Ludwig EH, et al.

Hum Mol Genet. 2011 Mar 15;20(6):1232-40. doi: 10.1093/hmg/ddq552. Epub 2010 Dec 28. PMID: 21208937; PMCID: PMC3043660.

Identification of a common variant in the TFR2 gene implicated in the physiological regulation of serum iron levels

https://pubmed.ncbi.nlm.nih.gov/21208937

Pichler I, Minelli C, Sanna S, et al.

Hum Mol Genet. 2017 May 15;26(10):1966-1978. doi: 10.1093/hmg/ddx082. PMID: 28334935; PMCID: PMC6075359.

Genome-wide association study of iron traits and relation to diabetes in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL): potential genomic intersection of iron and glucose regulation?

https://pubmed.ncbi.nlm.nih.gov/28334935

Raffield LM, Louie T, Sofer T, et al.

Haematologica. 2009 Jun;94(6):840-9. doi: 10.3324/haematol.2008.001867. Epub 2009 Apr 18. PMID: 19377077; PMCID: PMC2688576.

Matriptase-2 (TMPRSS6): a proteolytic regulator of iron homeostasis

https://pubmed.ncbi.nlm.nih.gov/19377077

Ramsay AJ, Hooper JD, Folgueras AR, Velasco G, López-Otín C.

Cell Metab. 2008 Dec;8(6):502-11. doi: 10.1016/j.cmet.2008.09.012. Epub 2008 Oct 30. PMID: 18976966; PMCID: PMC2648389.

The serine protease matriptase-2 (TMPRSS6) inhibits hepcidin activation by cleaving membrane hemojuvelin

https://pubmed.ncbi.nlm.nih.gov/18976966

Silvestri L, Pagani A, Nai A, De Domenico I, Kaplan J, Camaschella C.

Blood. 2010 Jan 7;115(1):94-6. doi: 10.1182/blood-2009-07-232496. Epub 2009 Oct 30. PMID: 19880490; PMCID: PMC2803694.

A genome-wide association analysis of serum iron concentrations

https://pubmed.ncbi.nlm.nih.gov/19880490

Tanaka T, Roy CN, Yao W, et al.

LINKS TO RELATED STUDIES:

NUTRIENTS - MAGNESIUM TENDENCY

PLoS Genet. 2010 Aug 5;6(8):e1001045. doi: 10.1371/journal.pgen.1001045. PMID: 20700443; PMCID: PMC2916845.

Genome-wide association studies of serum magnesium, potassium, and sodium concentrations identify six Loci influencing serum magnesium levels

https://pubmed.ncbi.nlm.nih.gov/20700443

Meyer TE, Verwoert GC, Hwang SJ, et al.

BMC Genet. 2015 May 29;16:56. doi: 10.1186/s12863-015-0219-7. PMID: 26058915; PMCID: PMC4462077.

Genetic loci for serum magnesium among African-Americans and gene-environment interaction at MUC1 and TRPM6 in European-Americans: the Atherosclerosis Risk in Communities (ARIC) study

https://pubmed.ncbi.nlm.nih.gov/26058915

Tin A, Köttgen A, Folsom AR, et al.

NUTRIENTS - OMEGA LEVELS

Genes Nutr. 2015 Nov;10(6):53. doi: 10.1007/s12263-015-0502-2. Epub 2015 Nov 19. PMID: 26584805; PMCID: PMC4653118.

A genome-wide association study of n-3 and n-6 plasma fatty acids in a Singaporean Chinese population

https://pubmed.ncbi.nlm.nih.gov/26584805

Dorajoo R, Sun Y, Han Y, et al.

Circ Cardiovasc Genet. 2014 Jun;7(3):321-331. doi: 10.1161/CIRCGENETICS.113.000208. Epub 2014 May 13. PMID: 24823311; PMCID: PMC4123862.

Genome-wide association study of plasma N6 polyunsaturated fatty acids within the cohorts for heart and aging research in genomic epidemiology consortium

https://pubmed.ncbi.nlm.nih.gov/24823311

Guan W, Steffen BT, Lemaitre RN, et al.

Hum Mol Genet. 2016 Mar 15;25(6):1215-24. doi: 10.1093/hmg/ddw002. Epub 2016 Jan 6. PMID: 26744325; PMCID: PMC4764197.

Genome-wide meta-analyses identify novel loci associated with n-3 and n-6 polyunsaturated fatty acid levels in Chinese and European-ancestry populations

https://pubmed.ncbi.nlm.nih.gov/26744325

Hu Y, Li H, Lu L, et al.

PLoS Genet. 2011 Jul;7(7):e1002193. doi: 10.1371/journal.pgen.1002193. Epub 2011 Jul 28. PMID: 21829377; PMCID: PMC3145614.

Genetic loci associated with plasma phospholipid n-3 fatty acids: a meta-analysis of genome-wide association studies from the CHARGE Consortium

https://pubmed.ncbi.nlm.nih.gov/21829377

Lemaitre RN, Tanaka T, Tang W, et al.

PLoS Genet. 2009 Jan;5(1):e1000338. doi: 10.1371/journal.pgen.1000338. Epub 2009 Jan 16. PMID: 19148276; PMCID: PMC2613033.

Genome-wide association study of plasma polyunsaturated fatty acids in the InCHIANTI Study

https://pubmed.ncbi.nlm.nih.gov/19148276

Tanaka T, Shen J, Abecasis GR, et al.

LINKS TO RELATED STUDIES:

NUTRIENTS - PHOSPHORUS TENDENCY

J Am Soc Nephrol. 2010 Jul;21(7):1223-32. doi: 10.1681/ASN.2009111104. Epub 2010 Jun 17. PMID: 20558539; PMCID: PMC3152230.

Common genetic variants associate with serum phosphorus concentration

https://pubmed.ncbi.nlm.nih.gov/20558539

Kestenbaum B, Glazer NL, Köttgen A, et al.

NUTRIENTS - POLYUNSATURATED FATTY ACID TENDENCY

Circ Cardiovasc Genet. 2014 Jun;7(3):321-331. doi: 10.1161/CIRCGENETICS.113.000208. Epub 2014 May 13. PMID: 24823311; PMCID: PMC4123862.

Genome-wide association study of plasma N6 polyunsaturated fatty acids within the cohorts for heart and aging research in genomic epidemiology consortium

https://pubmed.ncbi.nlm.nih.gov/24823311

Guan W, Steffen BT, Lemaitre RN, et al.

Hum Mol Genet. 2006 Jun 1;15(11):1745-56. doi: 10.1093/hmg/ddl117. Epub 2006 May 2. PMID: 16670158.

Common genetic variants of the FADS1 FADS2 gene cluster and their reconstructed haplotypes are associated with the fatty acid composition in phospholipids

https://pubmed.ncbi.nlm.nih.gov/16670158

Schaeffer L, Gohlke H, Müller M, et al.

PLoS Genet. 2009 Jan;5(1):e1000338. doi: 10.1371/journal.pgen.1000338. Epub 2009 Jan 16. PMID: 19148276; PMCID: PMC2613033.

Genome-wide association study of plasma polyunsaturated fatty acids in the InCHIANTI Study

https://pubmed.ncbi.nlm.nih.gov/19148276

Tanaka T, Shen J, Abecasis GR, et al.

NUTRIENTS - SELENIUM TENDENCY

Hum Mol Genet. 2013 Oct 1;22(19):3998-4006. doi: 10.1093/hmg/ddt239. Epub 2013 May 29. PMID: 23720494; PMCID: PMC3766178.

Genome-wide association study identifies loci affecting blood copper, selenium and zinc

https://pubmed.ncbi.nlm.nih.gov/23720494

Evans DM, Zhu G, Dy V, et al.

NUTRIENTS - ZINC TENDENCY

Hum Mol Genet. 2013 Oct 1;22(19):3998-4006. doi: 10.1093/hmg/ddt239. Epub 2013 May 29. PMID: 23720494; PMCID: PMC3766178.

Genome-wide association study identifies loci affecting blood copper, selenium and zinc

https://pubmed.ncbi.nlm.nih.gov/23720494

Evans DM, Zhu G, Dy V, et al.

LINKS TO RELATED STUDIES:

EXERCISE - FAT LOSS RESPONSE TO CARDIO

J Appl Physiol (1985). 2001 Sep;91(3):1334-40. doi: 10.1152/jappl.2001.91.3.1334. PMID: 11509533.

Evidence of LPL gene-exercise interaction for body fat and LPL activity: the HERITAGE Family Study

https://pubmed.ncbi.nlm.nih.gov/11509533

Garenc C, Pérusse L, Bergeron J, et al.

Obes Res. 2003 May;11(5):612-8. doi: 10.1038/oby.2003.88. PMID: 12740450.

Effects of beta2-adrenergic receptor gene variants on adiposity: the HERITAGE Family Study

https://pubmed.ncbi.nlm.nih.gov/12740450

Garenc C, Pérusse L, Chagnon YC, et al.

EXERCISE - FITNESS RESPONSE TO CARDIO

Metabolism. 2004 Jan;53(1):108-16. doi: 10.1016/j.metabol.2003.08.013. PMID: 14681851.

Association of apolipoprotein E polymorphism with blood lipids and maximal oxygen uptake in the sedentary state and after exercise training in the HERITAGE family study

https://pubmed.ncbi.nlm.nih.gov/14681851

Leon AS, Togashi K, Rankinen T, et al.

Physiol Genomics. 2003 Jul 7;14(2):161-6. doi: 10.1152/physiolgenomics.00165.2002. PMID: 12783984.

Associations between cardiorespiratory responses to exercise and the C34T AMPD1 gene polymorphism in the HERITAGE Family Study

https://pubmed.ncbi.nlm.nih.gov/12783984

Rico-Sanz J, Rankinen T, Joanisse DR, et al.

Metabolism. 2004 Feb;53(2):193-202. doi: 10.1016/j.metabol.2003.09.010. PMID: 14767871.

Apolipoprotein E genotype and changes in serum lipids and maximal oxygen uptake with exercise training

https://pubmed.ncbi.nlm.nih.gov/14767871

Thompson PD, Tsongalis GJ, Seip RL, et al.

EXERCISE - BODY COMPOSITION RESPONSE TO STRENGTH TRAINING

Int J Obes (Lond). 2015 Sep;39(9):1371-5. doi: 10.1038/ijo.2015.78. Epub 2015 Apr 30. PMID: 25924711; PMCID: PMC4564316.

High genetic risk individuals benefit less from resistance exercise intervention

https://pubmed.ncbi.nlm.nih.gov/25924711

Klimentidis YC, Bea JW, Lohman T, Hsieh PS, Going S, Chen Z.

LINKS TO RELATED STUDIES:

EXERCISE - HDL RESPONSE TO CARDIO

Metabolism. 2004 Jan;53(1):108-16. doi: 10.1016/j.metabol.2003.08.013. PMID: 14681851.

Association of apolipoprotein E polymorphism with blood lipids and maximal oxygen uptake in the sedentary state and after exercise training in the HERITAGE family study

https://pubmed.ncbi.nlm.nih.gov/14681851

Leon AS, Togashi K, Rankinen T, et al.

EXERCISE - INSULIN SENSITIVITY RESPONSE TO CARDIO

Am J Physiol Endocrinol Metab. 2005 Jun;288(6):E1168-78. doi: 10.1152/ajpendo.00467.2004. Epub 2005 Feb 1. PMID: 15687108.

Endurance training-induced changes in insulin sensitivity and gene expression

https://pubmed.ncbi.nlm.nih.gov/15687108

Teran-Garcia M, Rankinen T, Koza RA, Rao DC, Bouchard C.

Diabetes. 2005 Jul;54(7):2251-5. doi: 10.2337/diabetes.54.7.2251. PMID: 15983229.

Hepatic lipase gene variant -514C>T is associated with lipoprotein and insulin sensitivity response to regular exercise: the HERITAGE Family Study

https://pubmed.ncbi.nlm.nih.gov/15983229

Teran-Garcia M, Santoro N, Rankinen T, et al.

EXERCISE - GLUCOSE RESPONSE TO CARDIO

Diabetologia. 2005 Aug;48(8):1503-9. doi: 10.1007/s00125-005-1827-y. Epub 2005 Jun 29. PMID: 15986237.

Influence of Pro12Ala peroxisome proliferator-activated receptor gamma2 polymorphism on glucose response to exercise training in type 2 diabetes

https://pubmed.ncbi.nlm.nih.gov/15986237

Adamo KB, Sigal RJ, Williams K, Kenny G, Prud'homme D, Tesson F.

Metabolism. 2003 Feb;52(2):209-12. doi: 10.1053/meta.2003.50038. PMID: 12601634.

PPARgamma gene polymorphism is associated with exercise-mediated changes of insulin resistance in healthy men

https://pubmed.ncbi.nlm.nih.gov/12601634

Kahara T, Takamura T, Hayakawa T, et al.

Diabetologia. 2010 Apr;53(4):679-89. doi: 10.1007/s00125-009-1630-2. Epub 2009 Dec 31. PMID: 20043145; PMCID: PMC2840709.

Improvements in glucose homeostasis in response to regular exercise are influenced by the PPARG Pro12Ala variant: results from the HERITAGE Family Study

https://pubmed.ncbi.nlm.nih.gov/20043145

Ruchat SM, Rankinen T, Weisnagel SJ, et al.

LINKS TO RELATED STUDIES:

EXERCISE - TRIG RESPONSE TO CARDIO

Br J Sports Med. 2015 Dec;49(23):1524-31. doi: 10.1136/bjsports-2015-095179. Epub 2015 Oct 21. PMID: 26491034; PMCID: PMC4672639.

Genomic and transcriptomic predictors of triglyceride response to regular exercise

https://pubmed.ncbi.nlm.nih.gov/26491034

Sarzynski MA, Davidsen PK, Sung YJ, et al.

HEALTHY AGING - SKIN AGING

J Invest Dermatol. 2015 Jul;135(7):1735-1742. doi: 10.1038/jid.2015.62. Epub 2015 Feb 23. PMID: 25705849.

A Genome-Wide Association Study Identifies the Skin Color Genes IRF4, MC1R, ASIP, and BNC2 Influencing Facial Pigmented Spots

https://pubmed.ncbi.nlm.nih.gov/25705849

Jacobs LC, Hamer MA, Gunn DA, et al.

Cell. 2013 Nov 21;155(5):1022-33. doi: 10.1016/j.cell.2013.10.022. PMID: 24267888; PMCID: PMC3873608.

A polymorphism in IRF4 affects human pigmentation through a tyrosinase-dependent MITF/TFAP2A pathway

https://pubmed.ncbi.nlm.nih.gov/24267888

Praetorius C, Grill C, Stacey SN, et al.

HEALTHY AGING - SLEEP DURATION

Mol Psychiatry. 2013 Jan;18(1):122-32. doi: 10.1038/mp.2011.142. Epub 2011 Nov 22. PMID: 22105623.

A K(ATP) channel gene effect on sleep duration: from genome-wide association studies to function in Drosophila

https://pubmed.ncbi.nlm.nih.gov/22105623

Allebrandt KV, Amin N, Müller-Myhsok B, et al.

Hum Mol Genet. 2016 Jan 1;25(1):167-79. doi: 10.1093/hmg/ddv434. Epub 2015 Oct 13. PMID: 26464489; PMCID: PMC4690488.

Common variants in DRD2 are associated with sleep duration: the CARe consortium

https://pubmed.ncbi.nlm.nih.gov/26464489

Cade BE, Gottlieb DJ, Lauderdale DS, et al.

Mol Psychiatry. 2015 Oct;20(10):1232-9. doi: 10.1038/mp.2014.133. Epub 2014 Dec 2. PMID: 25469926; PMCID: PMC4430294.

Novel loci associated with usual sleep duration: the CHARGE Consortium Genome-Wide Association Study

https://pubmed.ncbi.nlm.nih.gov/25469926

Gottlieb DJ, Hek K, Chen TH, et al.

HEALTHY AGING - LONGEVITY

Rejuvenation Res. 2009 Apr;12(2):95-104. doi: 10.1089/rej.2008.0827. PMID: 19415983.

Association of the FOXO3A locus with extreme longevity in a southern Italian centenarian study

https://pubmed.ncbi.nlm.nih.gov/19415983

Anselmi CV, Malovini A, Roncarati R, et al.

LINKS TO RELATED STUDIES:

Aging Cell. 2013 Apr;12(2):184-93. doi: 10.1111/acel.12039. Epub 2013 Feb 6. PMID: 23286790; PMCID: PMC3725963.

Genome-wide linkage analysis for human longevity: Genetics of Healthy Aging Study

https://pubmed.ncbi.nlm.nih.gov/23286790

Beekman M, Blanché H, Perola M, et al.

J Gerontol A Biol Sci Med Sci. 2015 Jan;70(1):110-8. doi: 10.1093/gerona/glu166. Epub 2014 Sep 8. PMID: 25199915; PMCID: PMC4296168.

GWAS of longevity in CHARGE consortium confirms APOE and FOXO3 candidacy

https://pubmed.ncbi.nlm.nih.gov/25199915

Broer L, Buchman AS, Deelen J, et al.

Proc Natl Acad Sci U S A. 2009 Feb 24;106(8):2700-5. doi: 10.1073/pnas.0809594106. Epub 2009 Feb 5. PMID: 19196970; PMCID: PMC2650329.

Association of FOXO3A variation with human longevity confirmed in German centenarians

https://pubmed.ncbi.nlm.nih.gov/19196970

Flachsbart F, Caliebe A, Kleindorp R, et al.

Hum Mol Genet. 2009 Dec 15;18(24):4897-904. doi: 10.1093/hmg/ddp459. Epub 2009 Sep 29. PMID: 19793722; PMCID: PMC2790334.

Genetic association of FOXO1A and FOXO3A with longevity trait in Han Chinese populations

https://pubmed.ncbi.nlm.nih.gov/19793722

Li Y, Wang WJ, Cao H, et al.

Mech Ageing Dev. 2011 Jun-Jul;132(6-7):324-30. doi: 10.1016/j.mad.2011.06.008. Epub 2011 Jun 29. PMID: 21740922.

A genome-wide association study confirms APOE as the major gene influencing survival in long-lived individuals

https://pubmed.ncbi.nlm.nih.gov/21740922

Nebel A, Kleindorp R, Caliebe A, et al.

Aging Cell. 2010 Dec;9(6):1010-7. doi: 10.1111/j.1474-9726.2010.00627.x. Epub 2010 Oct 21. PMID: 20849522; PMCID: PMC2992870.

Replication of an association of variation in the FOXO3A gene with human longevity using both case-control and longitudinal data

https://pubmed.ncbi.nlm.nih.gov/20849522

Soerensen M, Dato S, Christensen K, et al.

Proc Natl Acad Sci U S A. 2008 Sep 16;105(37):13987-92. doi: 10.1073/pnas.0801030105. Epub 2008 Sep 2. PMID: 18765803; PMCID: PMC2544566.

FOXO3A genotype is strongly associated with human longevity

https://pubmed.ncbi.nlm.nih.gov/18765803

Willcox BJ, Donlon TA, He Q, et al.

HEALTHY AGING - MENTAL ACUITY

World J Biol Psychiatry. 2010 Sep;11(6):774-80. doi: 10.3109/15622971003797241. PMID: 20491609.

Effect of brain-derived neurotrophic factor Val66Met polymorphism and serum levels on the progression of mild cognitive impairment

https://pubmed.ncbi.nlm.nih.gov/20491609

Forlenza OV, Diniz BS, Teixeira AL, et al.

LINKS TO RELATED STUDIES:

Age (Dordr). 2012 Aug;34(4):1011-22. doi: 10.1007/s11357-011-9275-8. Epub 2011 Jun 22. PMID: 21695421; PMCID: PMC3682062.

Brain-derived neurotrophic factor (BDNF) gene: a gender-specific role in cognitive function during normal cognitive aging of the MEMO-Study?

https://pubmed.ncbi.nlm.nih.gov/21695421

Laing KR, Mitchell D, Wersching H, Czira ME, Berger K, Baune BT.

HEALTHY AGING - SYSTEMIC INFLAMMATION

Circulation. 2011 Feb 22;123(7):731-8. doi: 10.1161/CIRCULATIONAHA.110.948570. Epub 2011 Feb 7. PMID: 21300955; PMCID: PMC3147232.

Meta-analysis of genome-wide association studies in >80 000 subjects identifies multiple loci for C-reactive protein levels

https://pubmed.ncbi.nlm.nih.gov/21300955

Dehghan A, Dupuis J, Barbalic M, et al.