Kit number: XXXXX	ID subject: XX/XXXX

	**DNA WELLNESS TEST REPORT**	MAGISNAT OMICS LLC Atlanta Tech Park 107 Technology Parkway Suite 993 PEACHTREE CORNERS, GA 30092

DNA WELLNESS TEST REPORT

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Dear John,

Thank you for choosing to take the MAGISNAT DNA Wellness test.

Below, you will find the report that we have prepared for you. We trust that the insights on your genetic makeup provided in there will be a powerful tool to better know yourself and improve your overall well-being, making the most out of your individuality.

We encourage you to take the time to review this report thoroughly and discuss the findings with your healthcare provider.

Thank you for entrusting us with your genetic information, and we hope that this report will be valuable in guiding your journey towards a healthier and happier life.

Sincerely,

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Personal Information

SUBJECT INFORMATION	
First name	**Last name**
Date of Birth	**Place of birth**
ZIP Code	**City**
Mailing address	**State**
Telephone	**E-mail**

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Summary

SCIENTIFIC GLOSSARY

When discussing genetics, it's often necessary to use many technical terms, and there's no way to avoid it if we want to maintain accuracy in explanations. That's why we have compiled a scientific glossary - to enable everyone to understand without getting overwhelmed.

Anyway, it is important to emphasize that our scientific glossary does not aim to be exhaustive and is not intended to replace the advice provided by your healthcare provider. Professional medical support is essential for a proper interpretation of genetic data and for developing a personalized health and wellness plan.

- **Allele:** An allele is one of the different forms of a specific gene. The differences among alleles arise from small changes in the DNA sequence and can lead to changes in the characteristic controlled by the gene itself.
- **Chromosome:** The chromosome is the structure in which the DNA is organized in the nucleus of the cells. Humans have 23 pairs of chromosomes, with one copy coming from the mother and one copy from the father.
- **Dietary supplement**: A dietary supplement is a product that contains one or more dietary ingredients, such as vitamins, minerals, herbs, amino acids, enzymes, or other substances, intended to supplement the diet. These supplements are available in various forms, including pills, capsules, tablets, powders, or liquids.
- **DNA**: DNA stands for Deoxyribonucleic Acid. It is the macromolecule containing the information to build the organism. It is made up of 4 different nucleotides (Adenine, Cytosine, Guanine and Thymine). The human DNA have 3 billion nucleotide base pairs.
- **Gene**: A gene is a segment of a chromosome that occupies a given locus on it and codes for a protein, each one with a specific function: some build the structure of our cells, some respond to signaling molecules, some catalyze reactions (these are called enzymes), and so on.
- **Genomics**: Genomics is a field of biology that focuses on the study of an organism's entire genome, which is the complete set of its genetic material. It involves the comprehensive analysis of genes, their functions, interactions, and variations within and between populations.
- **Genotype**: The genotype is the genetic makeup of an organism, then the combination of alleles presents in an individual's DNA at a particular locus on a chromosome. The

genotype represents the specific genetic information that an organism inherits from its parents.

- **Heterozygosity**: Heterozygosity refers to having two different alleles at a specific genetic locus. If an individual has one copy of the "A" allele and one copy of the "B" allele for a certain gene (AB genotype), they are said to be heterozygous for that gene.
- **Homozygosity**: Homozygosity refers to having two identical alleles at a specific genetic locus. If an individual has two copies of the "A" allele for a certain gene (AA genotype), they are said to be homozygous for that gene.
- **Macronutrient**: Macronutrients are essential nutrients that are required by the body in large quantities to maintain proper functioning, growth, and overall health. These nutrients provide the necessary energy and building blocks needed for various physiological processes. The three primary macronutrients are: carbohydrates, lipids (fat), and proteins.
- **Micronutrient**: Micronutrients are essential nutrients required by the body in smaller quantities but are equally important for maintaining overall health and supporting various physiological functions. Micronutrients include two main groups: vitamins and minerals.
- **Mutation:** A mutation is a change or alteration in the DNA sequence of a gene. The main mutation types include base substitutions, deletions, or insertions.
- **Nutritional deficiency**: Nutritional deficiency, also known as malnutrition, refers to a condition in which the body does not receive enough macronutrients or micronutrients, which are needed to support proper growth, development, and overall health.
- **Phenotype**: The phenotype is any observable trait arising from a complex interplay between a given genotype and environmental factors. Examples of phenotypes are height, eye color and blood type.
- **rsID number**: rsID numbers are identifiers used by researchers to name different SNPs.
- **SNPs (Single Nucleotide Polymorphism)**: A SNP, or single nucleotide polymorphism, is a mutation in one of the nucleotide bases composing DNA and found in more than 1% of the population.

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How to read this report

The report is divided in two parts:

- Subject Data Analysis
- Genetic Data Analysis

In the **Subject Data Analysis** part, the information gathered in the optional questionnaire is analyzed from the perspective of the guidelines provided by the most prominent US and global health organizations and/or on the scientific literature. The answers you gave in the questionnaire are reported with a color code with respect to the guidelines: in green when you align with them, in orange when you need some adjustment, in red when you are completely missing them. Moreover, you will find a brief description of the guidelines and relative references. In any case, remember that guidelines are intended for the general population and represent only an indication. Before taking any action, it is advisable to consult your healthcare provider.

In the **Genetic Data Analysis** part, you will find insights about the characteristic under analysis, followed by a table listing the genes and polymorphisms considered for that characteristic. After this introductive session, you will find your results in tabular form. Here, the color code uses the same rational as above: in green we report polymorphism with a beneficial outcome *(e.g.,* increased enzyme function), in orange when the outcome is a slight increase in the risk (*e.g.*, reduced enzyme function), in red when the outcome is a higher increase in the risk (*e.g.*, enzyme loss of function). Finally, you will find the section recommendations, in which the outcome of the polymorphism is treated in more details. In any case, remember that this information is intended to be discussed with your healthcare provider.

Please note: in this sample report genomic coordinates are not reported. These will be available in the actual report.

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Subject Data Analysis

(This part is available only if you complete the optional questionnaire)

First Part: Subject Information and Body Measurements

- From your weight and height data, your BMI is calculated to be 28.03. According to this value, you are classified as overweight[1]. After consulting with your healthcare provider and perhaps with the assistance of professionals, you may consider starting a weight loss journey. Your overall health could greatly benefit from it!
- Your waist circumference is below the risk threshold. Typically, a waist circumference above 102 cm (40 inches) for men or 88 cm (35 inches) for women is associated with a higher risk of developing obesity-related issues.[2]
- The waist-to-hip ratio is a value used to assess the distribution of body fat between the waist and hip regions and can be used to assess the risk of developing obesity-related conditions. The risk thresholds are set at 0.9 for men and 0.85 for women.[3] Your waist-to-hip ratio is calculated to be 0.83 and is below the risk threshold.
- Neck circumference is another anthropometric measurement that can be used as an indicator of health risks. Generally, a neck circumference greater than 40 cm (15.7 inches) in men and 35 cm (13.8 inches) in women may suggest an increased risk.[4] Your neck circumference is below the risk thresholds.

Second Part: Subject Lifestyle

[1] Duell, Eric J et al. "Vitamin C transporter gene (SLC23A1 and SLC23A2) polymorphisms, plasma vitamin C levels, and gastric cancer risk in the EPIC cohort." *Genes & nutrition* vol. 8,6 (2013): 549-60.

[2] Guest, Nanci S et al. "Sport Nutrigenomics: Personalized Nutrition for Athletic Performance." *Frontiers in nutrition* vol. 6 8. 19 Feb. 2019.

[3] Guest, Nanci S et al. "Sport Nutrigenomics: Personalized Nutrition for Athletic Performance." *Frontiers in nutrition* vol. 6 8. 19 Feb. 2019.

[4] World Health Organization. (2000). Obesity: Preventing and managing the global epidemic. Report of a WHO consultation. Geneva, Switzerland: World Health Organization.

- good to hear that you do not smoke and are not exposed to passive smoke. Well, the only advice we can give you is... don't start![5,6]
- By consuming 6 standard drinks per week (approximately 1 drink per day on average), you are considered a moderate drinker. This category includes men who consume up to 2 standard drinks per day and women who consume up to 1 standard drink per day. However, please be cautious about binge drinking. Avoid concentrating your weekly alcohol consumption in one sitting, as it can significantly harm your health. In any case, we encourage you to consider the potential health benefits of reducing or eliminating alcohol consumption.[7,8]
- Your sleep appears to be adequate in both quantity and quality, at least based on the provided data: you sleep for 8 hours per day, have a regular sleep pattern, and experience restful and fairly continuous sleep. However, remember to always monitor your sleep and give this aspect the attention and time it deserves.[9,10]
- Your daily water intake is 2.5 liters, which is very close to our estimated daily water requirement for you (based on your body weight and activity level) of approximately 3 liters. Consider slightly increasing your water consumption if you notice any signs of mild dehydration.[11,12]

Third Part: Eating habits

[5] Naureen, Zakira et al. "Genetic test for the personalization of sport training." *Acta bio-medica : Atenei Parmensis* vol. 91,13-S e2020012. 9 Nov. 2020.

[6] Food and Agriculture Organization of United Nations (FAO): "Food-based dietary guidelines - United States of America": https://www.fao.org/nutrition/education/food-dietary-guidelines/regions/countries/united-states-of-america/en/

[7] Micheletti C et al., Nutrigenomics: SNPs correlated to vitamins metabolism. La Clinica Terapeutica (2023).

[8] Ramos-Lopez, Omar et al. "Guide for Current Nutrigenetic, Nutrigenomic, and Nutriepigenetic Approaches for Precision Nutrition Involving the Prevention and Management of Chronic Diseases Associated with Obesity." *Journal of nutrigenetics and nutrigenomics* vol. 10,1-2 (2017): 43-62.

[9] Ji, Yu et al. "Genetic factors associated with iron storage in Australian blood donors." *Blood transfusion = Trasfusione del sangue* vol. 16,2 (2018): 123-129.

[10] Zhang, Li-Qin et al. "Relation of JAGGED 1 and collagen type 1 alpha 1 polymorphisms with bone mineral density in Chinese postmenopausal women." *International journal of clinical and experimental pathology* vol. 7,10 7142-7. 15 Sep. 2014.

[11] Dubovyk, Yevhen I et al. "G-1639A but Not C1173T *VKORC1* Gene Polymorphism Is Related to Ischemic Stroke and Its Various Risk Factors in Ukrainian Population." *BioMed research international* vol. 2016 (2016): 1298198.

[12] Dhuli K et al., Nutrigenomics: SNPs correlated to minerals metabolism. La Clinica Terapeutica (2023).

- According to the table above, we estimate that you are eating about 2,408 calories per day. From the physical activity questionnaire, we have estimated a daily energy requirement of approximately 2,250 calories per day. While these are just estimates, this data may suggest an imbalanced diet. We recommend discussing this with your healthcare provider to consider a meal plan that suits your needs and/or an increase in physical activity.

According to the guidelines for a correct diet promoted by the Food and Agriculture Organization of United Nations (FAO)[13]:

- You are consuming the right amount of fruits and vegetables, which according to dietary guidelines is at least 5 servings per day (normal portions). Keep it up! Additionally, we recommend following the seasonality to have a variety of fresh produce.
- Cereals, pasta, rice, grains, and bread are important sources of fibers and complex carbohydrates. The recommended intake is about 6 servings (normal portions) per day. Currently, you are consuming approximately 4 servings per day, which is slightly below the recommended amount. If you are not following a specific meal plan guided by a specialist, you may consider increasing the consumption of these foods to meet the daily recommendation.
- Dairies are another important component of a balanced diet. One should consume 3 servings per day (normal portions) of milk, yogurt, or cheese, preferably opting for low-fat or fat-free options. Currently, you are consuming less than 2 servings of dairies per day. If you are not intolerant and not following specific meal plans guided by a specialist, you may consider increasing the amount of dairies in your diet.
- One should eat 2 servings per day of protein sources (normal portion), preferring fish, lean meat, poultry, eggs, and legumes. Currently, you are consuming enough protein sources. Keep it up!
- Talking about condiments, the subject should consume about 3 servings per day, preferring vegetable oils. A normal portion is considered a tablespoon. Currently, you are consuming about 2 servings per day of condiments. If you are not following a

[13] Santiago, Catalina et al. "The K153R polymorphism in the myostatin gene and muscle power phenotypes in young, non-athletic men." *PloS one* vol. 6,1 e16323. 20 Jan. 2011.

specific meal plan under the guidance of a specialist, consider adding some healthy condiments (such as olive oil) to your dishes.

- Food is not just nourishment, and we shouldn't consume only "healthy" food; no food should be demonized. However, we should limit high-calorie and low-satiety foods. You are on the right track: consuming foods like pizza, hamburgers, or fried foods 2 times a week is okay. The same goes for having 3 servings of dessert per week and 2 sugary drinks. You can do even better, though: try to reduce a bit more, and your body will thank you.

Fourth Part: Food Allergies

- Good to hear that you don't have any food allergies. In any case, always monitor your health status, and if you notice any suspicious symptoms, reach out to your healthcare provider, who will consider whether it's appropriate to conduct a test to check for the possibility of developing an allergy.

Fifth Part: Physical Activity

The ACSM (American College of Sports Medicine) published physical activity guidelines[14], which are summarized as follows:

1. At least 150-300 minutes of moderate-intensity aerobic activity OR 75-150 minutes of high-intensity aerobic activity per week
2. At least two resistance training sessions per week (using weights, resistance bands, or body weight).

According to the gathered information:

- With 120 minutes of moderate aerobic activity, you are not meeting the recommended level of aerobic activity. It just takes a little extra effort: consider

[14] Huxley, R., Mendis, S., Zheleznyakov, E., Reddy, S., & Chan, J. (2009). Body mass index, waist circumference and waist:hip ratio as predictors of cardiovascular risk—a review of the literature. European Journal of Clinical Nutrition, 64(1), 16–22.

gradually incorporating sessions of moderate or high-intensity aerobic activity, or increasing the duration of the ones you already do, with the help of a professional if needed.

- Two weekly sessions of resistance training are just what you need according to the guidelines. You are doing a great job, keep it up!

The Metabolic Equivalent of Task (MET) is a measure estimating how much energy is consumed doing an activity compared to rest. With 2160 MET-min/week you are classified as moderately active. This is good, but with a little more effort, you can do even better!

Vitamins metabolism

Vitamin A

Vitamin A is a fat-soluble vitamin essential for maintaining healthy vision, supporting the immune system, and promoting proper growth and development in the body. Its primary functions include playing a crucial role in maintaining healthy skin, supporting reproductive health, and contributing to the formation and maintenance of various tissues and organs.

Vitamin A is a general term that covers several different forms of the vitamin. Animal food sources mainly provide a preformed vitamin A (ready to use), called retinol. Instead, plants contain carotenes that are precursor to vitamin A. The most common form, beta-carotene, shows up in abundance in carrots and other orange-colored foods. An enzyme in the intestine breaks down beta-carotene, also forming retinol.

The Recommended Daily Intake of vitamin A for adults is 900 mcg RAE (3,000 IU) per day, while for pregnant and lactating women it is 1,300 mcg RAE (4,333 IU) per day (https://www.fda.gov/media/99069/download).

Analyzed Genes and Polymorphisms[15]:

Gene	Gene Function	SNP
BCO1	**Beta-Carotene Oxygenase 1**. Key enzyme in beta-carotene metabolism to vitamin A. It catalyzes the cleavage of beta-carotene into two retinal molecules, an active form of vitamin A.	Locus1
		Locus1
		Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	G/G	Lower beta-carotene conversion into retinal molecules.[16]
Locus1	A/A	Typical.

[15] Donato K et al., Nutrigenomics: SNPs correlated to physical activity, chiropractic treatment, sleep and mood. La Clinica Terapeutica (2023).

[16] Centers for Disease Control and Prevention (CDC): www.cdc.gov/alcohol/faqs.htm

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Locus1	C/C	Typical.

Recommendations:

The BCO1 gene encodes the enzyme Beta-Carotene Oxygenase 1, which is responsible for converting beta-carotene into retinal, a biologically active form of vitamin A. The presence of the Locus1 polymorphism in two copies (homozygosity) has been associated with a reduced conversion of beta-carotene into retinal. This means that individuals with this genetic variant may have lower levels of retinal, which could affect their overall vitamin A status.

Based on these results, your healthcare provider may recommend you monitor your vitamin A levels, increase the consumption of vitamin A-rich foods, do periodic checkups to detect deficiencies early, and/or consider a vitamin A supplement.

Vitamin B12

Vitamin B12 is a water-soluble vitamin belonging to the B-complex group. It is crucial for organism development, formation of healthy red blood cells, and DNA and myelin synthesis.

Vitamin B12 is found in a wide range of foods of animal origin, such as meat, fish, eggs, milk and its derivatives.

The Recommended Daily Intake of vitamin B12 for adults is B12 is 2.4 mcg per day, while for pregnant and lactating women it is 2.8 mcg per day (https://www.fda.gov/media/99069/download).

Analyzed Genes and Polymorphisms[17]:

Gene	Gene Function	SNP
FUT2	**Fucosyltransferase 2**. Enzyme modifying glycoproteins and glycolipids (components of the cell membrane) which are involved in the absorption and utilization of vitamin B12.	Locus1
		Locus2
CUBN	**Cubilin**. Endocytic receptor which plays a role in vitamins metabolism by facilitating their uptake.	Locus3
MTRR	**Methionine synthase reductase**. Enzyme involved in the regulation of a critical pathway for the metabolism of the amino acid methionine by providing electrons to regenerate the cofactor, vitamin B12.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	G/A	Greater risk for low serum vitamin B12 levels, but only when the diet is low in bioavailable sources of vitamin B12.[18]
Locus2	A/A	Typical.
Locus3	G/G	Typical.

[17] Maltese, Paolo Enrico et al. "Molecular foundations of chiropractic therapy." *Acta bio-medica : Atenei Parmensis* vol. 90,10-S 93-102. 30 Sep. 2019.

[18] Koonrungsesomboon, Nut et al. "The impact of genetic polymorphisms on CYP1A2 activity in humans: a systematic review and meta-analysis." *The pharmacogenomics journal* vol. 18,6 (2018): 760-768.

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Locus1	A/A	Typical.

Recommendations:

The FUT2 gene encodes the enzyme fucosyltransferase 2, which plays a role in the modification of certain molecules, including those related to the absorption and utilization of vitamin B12. The Locus1 polymorphism in one copy (heterozygosity) has been associated with a higher likelihood of having lower vitamin B12 levels in the blood. Anyway, these is strictly related to the vitamin B12 intake: you are at risk only when you don't eat enough food containing bioavailable vitamin B12.

Based on these results, your healthcare provider may recommend you monitor your vitamin B12 levels, increase the consumption of vitamin B12-rich foods, do periodic checkups to detect deficiencies early, and/or consider a vitamin B12 supplement.

Vitamin B6

Vitamin B6 is a water-soluble vitamin belonging to the B-complex group. As primary function, vitamin B6 acts as a coenzyme supporting various enzymes primarily involved in amino acid metabolism.

Vitamin B6 is widely distributed in foods, but it is found especially in meat, fish, lightly refined grains, legumes, and nuts.

The Recommended Daily Intake of vitamin B6 for adults is 1.3 mcg per day, but in pregnant and breastfeeding women it is increased to 2.0 mcg per day (https://www.fda.gov/media/99069/download).

Analyzed Genes and Polymorphisms[19]:

Gene	Gene Function	SNP
ALPL	**Alkaline Phosphatase**. Enzyme metabolizing various phosphate compounds and playing a key role in skeletal mineralization and adaptive thermogenesis.	Locus1
CBS	**Cystathionine beta-synthase**. Enzyme involved in cysteine metabolism and in detoxification reactions.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	T/T	Typical.
Locus1	G/G	Risk of increased homocysteine, responsive to vitamin B6.[20]

Recommendations:

The CBS gene encodes the enzyme cystathionine beta-synthase, which plays a crucial role in the metabolism of homocysteine. The Locus1 polymorphism in two copies (homozygosity)

[19] Renda, Giulia et al. "Genetic determinants of cognitive responses to caffeine drinking identified from a double-blind, randomized, controlled trial." *European neuropsychopharmacology : the journal of the European College of Neuropsychopharmacology* vol. 25,6 (2015): 798-807.

[20] Wang, Thomas J et al. "Common genetic determinants of vitamin D insufficiency: a genome-wide association study." *Lancet (London, England)* vol. 376,9736 (2010): 180-8.

has been associated with a reduced efficiency in metabolizing homocysteine. As a result, individuals with this genetic variant may have higher homocysteine levels in their blood, which is toxic for our body. Anyway, by providing sufficient vitamin B6, it may help support the proper breakdown of homocysteine and contribute to maintaining healthier levels in the body.

Based on these results, your healthcare provider may recommend you monitor your vitamin B6 levels, increase the consumption of vitamin B6-rich foods, do periodic checkups to detect deficiencies early, and/or consider a vitamin B6 supplement.

Vitamin B9

Vitamin B9, also known as folate or folic acid, is part of the B vitamins and is particularly important during periods of frequent cell division and growth, such as fetal development, infant growth, and pregnancy. In fact, it is essential for the synthesis and modification of DNA and RNA. Moreover, it is crucial for red blood cells formation.

Vitamin B9 is contained in liver, green leafy vegetables, milk, fruits, and cereals.

The Recommended Daily Intake of vitamin B9 for adults is 400 mcg DFE per day, but while for pregnant and lactating women it is 600 mcg DFE per day (https://www.fda.gov/media/99069/download).

Analyzed Genes and Polymorphisms[21]:

Gene	Gene Function	SNP
MTHFR	**Methylenetetrahydrofolate reductase**. Enzyme involved in the conversion of vitamin B9 into its biologically active form.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	A/A	Enzyme function decreased by 70-80%.[22]

Recommendations:

The MTHFR gene encodes the enzyme methylenetetrahydrofolate reductase, which is responsible for converting folate in its biologically active form. This active form is essential for various biochemical reactions, including the metabolism of homocysteine. The Locus1 polymorphism in two copies (homozygosity) has been associated with a reduction of the enzyme functioning of 70-80%. As a result, individuals with this genetic variant may have higher homocysteine levels in their blood. Moreover, this polymorphism has crucial importance during pregnancy and breastfeeding, since folate is essential for proper fetal development.

[21] Micheletti C et al., Nutrigenomics: SNPs correlated to vitamins metabolism. La Clinica Terapeutica (2023).

[22] Patillon, Blandine et al. "Positive selection in the chromosome 16 VKORC1 genomic region has contributed to the variability of anticoagulant response in humans." *PloS one* vol. 7,12 (2012): e53049.

Based on these results, your healthcare provider may recommend you monitor your vitamin B9 levels, increase the consumption of vitamin B9-rich foods, do periodic checkups to detect deficiencies early, and/or consider a vitamin B9 supplement.

Vitamin C

Vitamin C (also known as ascorbic acid) is involved in metabolism and electron transfer, and it is an essential source of physiological antioxidant involved in the regeneration of other antioxidants inside the body. Vitamin C also functions as a cofactor and antioxidant and assists non-heme iron supply through the intestine. Genetics play a role in how vitamin C is absorbed, transported, and used by the body.

Foods rich in Vitamin C are citrus fruits, tomatoes, potatoes, red and green peppers, kiwifruit, broccoli, strawberries, Brussels sprouts, and cantaloupe.

The Recommended Daily Intake of vitamin C for adults is 90 mg per day for men, while for pregnant and lactating women it is 120 mg per day (https://www.fda.gov/media/99069/download).

Analyzed Genes and Polymorphisms[23]:

Gene	Gene Function	SNP
SLC23A1	**Sodium-dependent vitamin C transporter 1**. Sodium/ascorbate cotransporter. Mediates electrogenic uptake of vitamin C.	Locus1
SLC23A2	**Sodium-dependent vitamin C transporter** 1. Sodium/ascorbate cotransporter. Mediates electrogenic uptake of vitamin C.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	C/C	Typical.
Locus1	T/T	24% higher vitamin C in plasma.[24,25]

Recommendations:

[23] Dhuli K et al., Nutrigenomics: SNPs correlated to minerals metabolism. La Clinica Terapeutica (2023).

[24] American Cancer Society (ACS): www.cancer.org/cancer/cancer-causes/tobacco-and-cancer.html

[25] Malavolta, Marco et al. "LAV-BPIFB4 associates with reduced frailty in humans and its transfer prevents frailty progression in old mice." *Aging* vol. 11,16 (2019): 6555-6568.

.The gene SLC23A2 encodes the sodium-dependent vitamin C transporter 1, which is responsible for transporting vitamin C (ascorbic acid) into cells. The Locus1 polymorphism in two copies (homozygosity) has been correlated with higher concentrations of vitamin C in plasma (+24%). These can be beneficial for your body, since higher concentrations of vitamin C result in more efficient immune system and collagen synthesis, better antioxidant protection and iron absorption, and positively impacts the cardiovascular system. Anyway, keep in mind that other genetic, environmental, and lifestyle factors may counterbalance this observation.

Vitamin D

Vitamin D serves various important functions in the body, being crucial for bone health, immune function, muscle function, and cell growth and differentiation. Vitamin D is a fat-soluble vitamin stored in the liver, therefore it is not necessary to take it regularly through food, since the body releases it in small doses when its use becomes necessary.

Vitamin D comes in two forms: ergocalciferol, which is taken in through food (*e.g.,* fatty fish, cod liver oil, fortified dairy products or plant-based milk, eggs, and beef liver), and cholecalciferol, which is synthesized by our bodies.

The Recommended Daily Intake of vitamin D for adults is 800 IU (20 mcg), while for pregnant and lactating women it is 600 IU (15 mcg) per day (https://www.fda.gov/media/99069/download).

Analyzed Genes and Polymorphisms[26]:

Gene	Gene Function	SNP
GC	**Vitamin D-binding protein**. Protein binding vitamin D and its plasma metabolites to transport them to target tissues.	Locus1
		Locus2
		Locus3
CYP2R1	**Cytochrome P450 2R1**. Enzyme converting vitamin D into the active ligand for the vitamin D receptor.	Locus1
		Locus2
VDR	**Vitamin D receptor**. Receptor allowing the body to respond to vitamin D.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	A/C	Somewhat lower 25-hydroxyvitamin D (main circulating form) levels.[27,28]

[26] Micheletti C et al., Nutrigenomics: SNPs correlated to vitamins metabolism. La Clinica Terapeutica (2023).

[27] Grant, S F et al. "Reduced bone density and osteoporosis associated with a polymorphic Sp1 binding site in the collagen type I alpha 1 gene." *Nature genetics* vol. 14,2 (1996): 203-5.

[28] National Sleep Foundation (NSF): "How Much Sleep Do We Really Need?": https://www.sleepfoundation.org/how-sleep-works/how-much-sleep-do-we-really-need

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Locus2	T/T	Typical.
Locus3	C/C	Typical.
Locus1	G/G	Typical.
Locus2	G/G	More likely to have vitamin D insufficiency or deficiency.[29,30,31]
Locus1	A/G	Typical.

Recommendations:

The gene CYP2R1 encodes the cytochrome P450 2R1, which is involved in the conversion of vitamin D into its active form, calcitriol, in the liver. CYP2R1 performs the first modification, producing 25-hydroxyvitamin D. The Locus2 polymorphism in one copy (heterozygosity) has been associated with reduced enzyme activity, overall resulting in decreased production of active vitamin D.

The gene GC encodes the vitamin D-binding protein, which is responsible for binding and transporting vitamin D and its metabolites in the bloodstream. The Locus1 polymorphism in two copies (homozygosity) is associated with lower circulating levels of vitamin D-binding protein, which may result in reduced availability and transport of vitamin D in the body.

Based on these results, your healthcare provider may recommend you monitor your vitamin D levels, increase the consumption of vitamin D-rich foods and moderate sun exposure, do periodic checkups to detect deficiencies early, and/or consider a vitamin D supplement.

[29] Stocks, Tanja et al. "TFAP2B -dietary protein and glycemic index interactions and weight maintenance after weight loss in the DiOGenes trial." *Human heredity* vol. 75,2-4 (2013): 213-9.

[30] Wang, Danxin et al. "Regulatory polymorphism in vitamin K epoxide reductase complex subunit 1 (VKORC1) affects gene expression and warfarin dose requirement." *Blood* vol. 112,4 (2008): 1013-21.

[31] Raje, Nikita et al. "Genetic variation within the histamine pathway among patients with asthma--a pilot study." *The Journal of asthma : official journal of the Association for the Care of Asthma* vol. 52,4 (2015): 353-62.

Vitamin E

Vitamin E (or tocopherol) is a fat-soluble antioxidant that protects cell membranes from reactive oxygen species. Vitamin E is essential for correct growth and development, and efficient nervous and immune systems.

Vitamin E is widely found in oily fruits and plant-based oils, wheat seeds, cereals, nuts, and green leafy vegetables.

The Recommended Daily Intake of vitamin E for adults is 22.4 IU (15 mg) per day, while for pregnant and lactating women it is 28,4 IU (19 mg) per day (https://www.fda.gov/media/99069/download).

Analyzed Genes and Polymorphisms[32]:

Gene	Gene Function	SNP
SCARB1	**Scavenger receptor class B type 1**. Receptor facilitating the selective uptake of cholesterol from High-Density Lipoprotein (HDL) in the liver.	Locus1
CD36	**Platelet glycoprotein 4**. Membrane transporter of fatty acid.	Locus1
CYP4F2	**Cytochrome P450 4F2**. Enzyme involved in the metabolism of fatty acids and xenobiotics.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	A/A	Lower plasma vitamin E concentration.[33]
Locus1	G/G	Typical.
Locus1	C/C	Typical.

[32] Dhuli K et al., Nutrigenomics: SNPs correlated to minerals metabolism. La Clinica Terapeutica (2023).

[33] Lietz, Georg et al. "Single nucleotide polymorphisms upstream from the β-carotene 15,15'-monoxygenase gene influence provitamin A conversion efficiency in female volunteers." *The Journal of nutrition* vol. 142,1 (2012): 161S-5S.

Recommendations:

SCARB1 encodes the scavenger receptor class B type 1, which is critical in lipid metabolism, including the uptake of high-density lipoprotein (HDL) cholesterol and vitamin E. The Locus1 polymorphism in two copies (homozygosity) has been associated with an alteration in its activity, leading to decreased uptake or transport of vitamin E.

Based on these results, your healthcare provider may recommend you monitor your vitamin E levels, increase the consumption of vitamin E-rich foods, do periodic checkups to detect deficiencies early, and/or consider a vitamin E supplement.

Vitamin K

Vitamin K is a fat-soluble vitamin which ensures the proper functionality of specific proteins involved in calcium binding in bones and other tissues. It has also a crucial role in blood clotting (which avoid excessive bleeding) being the cofactors of enzyme involved in this process.

Vitamin K come in two forms: vitamin K1 (or phylloquinone) is widely distributed in plant-based foods, particularly leafy greens vegetable, while vitamin K2 (or menaquinone) is produced in the gut by specific bacteria and found in meat, cheese and fermented foods.

The Recommended Daily Intake of vitamin K for adults is 120 mcg per day, while for pregnant and lactating women it is 90 mcg per day (https://www.fda.gov/media/99069/download).

Analyzed Genes and Polymorphisms[34]:

Gene	Gene Function	SNP
VKORC1	**Vitamin K epoxide reductase complex subunit 1**. Protein involved in vitamin K metabolism. It recycles vitamin K epoxide back to its active form.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	C/T	Decreased protein activity and increased anticoagulant drugs sensitivity.[35,36,37,38]

Recommendations:

[34] He, Z et al. "NRF2 genotype improves endurance capacity in response to training." *International journal of sports medicine* vol. 28,9 (2007): 717-21.

[35] Kaiser, Rachel et al. "Brief Report: Single-nucleotide polymorphisms in VKORC1 are risk factors for systemic lupus erythematosus in Asians." *Arthritis and rheumatism* vol. 65,1 (2013): 211-5.

[36] Bonetti G et al., Nutrigenomics: SNPs correlated to lipid and carbohydrates metabolism. La Clinica Terapeutica (2023).

[37] Micheletti C et al., Nutrigenomics: SNPs correlated to vitamins metabolism. La Clinica Terapeutica (2023).

[38] Gkouskou, Kalliopi K et al. "Genotype-guided dietary supplementation in precision nutrition." *Nutrition reviews* vol. 79,11 (2021): 1225-1235.

The gene VKORC1 encodes the vitamin K epoxide reductase complex subunit 1, which is responsible for the recycling of vitamin K epoxide back to its active form. This is essential for the activation of vitamin K-dependent clotting factors in the blood clotting process. The Locus1 polymorphism in one copy (heterozygosity) has been associated to decreased protein activity. This may result in less efficiency in the blood clotting process and increased sensibility to anticoagulant drugs.

Based on these results, your healthcare provider may recommend you monitor your vitamin K levels, increase the consumption of vitamin K-rich foods, do periodic checkups to detect deficiencies early, and/or consider a vitamin K supplement.

Choline

Choline (sometimes referred to as vitamin J) is a component of phospholipids, that make up the cell membrane, and the neurotransmitter acetylcholine, which is involved in numerous physiological processes, including muscle movement, autonomic nervous system functions, learning, memory, and attention. Moreover, choline is essential for muscle and liver health.

The main dietary sources of choline are egg yolks, meat, seafood, dairy products, legumes, nuts, and seeds. Anyway, choline is produced in low quantity by the body.

The Recommended Daily Intake of choline for adults is 550 mg per day (https://www.fda.gov/media/99069/download).

Analyzed Genes and Polymorphisms[39]:

Gene	Gene Function	SNP
PEMT	**Phosphatidylethanolamine N-methyltransferase**. Enzyme playing a crucial role in the biosynthesis of phosphatidylcholine, a critical component for membrane structure.	Locus1
		Locus2

Your Results:

SNP	Alleles	Outcome
Locus1	G/G	Increased risk of organ dysfunction with low choline diet; lower betaine levels with inadequate choline intake.[40,41,42]
Locus2	C/C	Typical.

Recommendations:

[39] Donato K et al., Nutrigenomics: SNPs correlated to physical activity, chiropractic treatment, sleep and mood. La Clinica Terapeutica (2023).

[40] ACSM's Guidelines for Exercise Testing and Prescription, 10th Edition. American College of Sports Medicine.

[41] Chmurzynska, Agata et al. "PEMT rs12325817 and PCYT1A rs7639752 polymorphisms are associated with betaine but not choline concentrations in pregnant women." *Nutrition research (New York, N.Y.)* vol. 56 (2018): 61-70.

[42] Centers for Disease Control and Prevention (CDC): "Sleep and Sleep Disorders": https://www.cdc.gov/sleep/index.html

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The gene PEMT encodes the phosphatidylethanolamine N-methyltransferase, an enzyme involved in the synthesis of phosphatidylcholine, which is an important component of cell membrane, particularly in liver, lungs and brain. The polymorphism Locus1 in two copies (homozygosity) has been associated to an increased risk of organ dysfunction with low choline diet. Moreover, lower betaine levels were observed with inadequate choline intake. Betaine is a metabolite of choline and plays several important functions in the body, including supporting methylation and maintaining liver health.

Based on these results, your healthcare provider may recommend you monitor your choline levels, increase the consumption of choline-rich foods, do periodic checkups to detect deficiencies early, and/or consider a choline supplement.

Minerals metabolism

Calcium

Calcium is an extremely important mineral for our body, essential for the good health of bones and teeth, muscle function and nerve transmission.

Foods rich in calcium include dairy products, leafy green vegetables, almonds, fortified plant-based milk, salmon and sardines.

The Recommended Daily Intake of calcium for adults is 1,300 mg per day (https://www.fda.gov/media/99069/download).

Analyzed Genes and Polymorphisms[43]:

Gene	Gene Function	SNP
COL1A1	**Collagen Type I Alpha 1 Chain**. Main component of type I collagen, the fibrillar collagen found in most connective tissues, including bones, tendons, cartilage, and skin.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	A/A	Lower bone mineral density.[44,45,46]

Recommendations:

[43] Childs, Emma et al. "Association between ADORA2A and DRD2 polymorphisms and caffeine-induced anxiety." *Neuropsychopharmacology : official publication of the American College of Neuropsychopharmacology* vol. 33,12 (2008): 2791-800.

[44] Hon, Yuen Yi et al. "Endogenous histamine and cortisol levels in subjects with different histamine N-methyltransferase C314T genotypes : a pilot study." *Molecular diagnosis & therapy* vol. 10,2 (2006): 109-14.

[45] Bonetti G et al., Nutrigenomics: SNPs correlated to lipid and carbohydrates metabolism. La Clinica Terapeutica (2023).

[46] Guest, Nanci S et al. "Sport Nutrigenomics: Personalized Nutrition for Athletic Performance." *Frontiers in nutrition* vol. 6 8. 19 Feb. 2019.

The gene COL1A1 encodes the collagen type I alpha 1 chain, which is a crucial component of collagen, providing strength and flexibility to bones and other connective tissues. The Locus1 polymorphism in two copies (homozygosity) has been associated to a reduced bone mineral density, which makes bone more susceptible to fractures, especially in postmenopausal women.

Based on these results, your healthcare provider may recommend you monitor your calcium levels, increase the consumption of calcium-rich foods, do periodic checkups to detect deficiencies early, and/or consider a calcium supplement.

Iron

Iron is one of the most abundant minerals in the body. It is a key component of hemoglobin and myoglobin, participates in the activity of many enzymes, and the body needs it to produce some hormones and connective tissue. When the body absorbs more iron than it needs for immediate use, excess iron is stored as ferritin in the cells, particularly in the liver, spleen, and bone marrow. Both iron deficiency and excess can result in health risk.

The foods richest in iron are liver, meat and fish, legumes, cereals, nuts, and dark green leafy vegetables.

The Recommended Daily Intake of iron for adults is 18 mg per day, while for pregnant and lactating women it is 27 mg per day (https://www.fda.gov/media/99069/download).

Analyzed Genes and Polymorphisms[47]:

Gene	Gene Function	SNP
SLC17A1	**Sodium-dependent phosphate transport protein 1**. Transport protein for sodium-dependent phosphate intake playing a crucial role in neurotransmission.	Locus1
HFE	**Hemojuvelin or High Fe (iron) protein**. Protein involved in the regulation of iron homeostasis in the body by controlling iron absorption from the diet and the maintenance of iron levels in the bloodstream.	Locus1
TMPRSS6	**Transmembrane protease serine 6 or Matriptase-2**. Protein playing a critical role in the regulation of iron homeostasis in the body.	Locus1
BTBD9	**BTB (Broad-Complex, Tramtrack, and Bric-a-Brac) domain-containing protein 9**. Protein implicated in various cellular processes and involved in neuronal signaling and synaptic function.	Locus1
TFR2	**Transferrin receptor protein 2**. Transferrin receptor, involved in iron absorption.	Locus1

[47] Micheletti C et al., Nutrigenomics: SNPs correlated to vitamins metabolism. La Clinica Terapeutica (2023).

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TF	**Transferrin**. Transferrin, main iron transport protein in blood.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	T/T	Higher ferritin.[48]
Locus1	G/G	Typical.
Locus1	G/G	Typical.
Locus1	A/G	Higher ferritin.[49]
Locus1	A/A	Typical.
Locus1	A/A	Higher ferritin.[50,51,52]

Recommendations:

The gene SLC17A1 encodes a sodium-dependent phosphate transport protein 1, playing a crucial role in neurotransmission. The polymorphism Locus1 in two copies (homozygosity) has been associated with higher ferritin levels.

The gene BTBD9 encodes the BTB (Broad-Complex, Tramtrack, and Bric-a-Brac) domain-containing protein 9 (BTBD9), a protein implicated in various cellular processes and involved in neuronal signaling and synaptic function. The polymorphism Locus1 in one copy (Heterozygosity) has been associated with higher ferritin levels.

[48] Niforou, Aikaterini et al. "Genetic Variants Shaping Inter-individual Differences in Response to Dietary Intakes-A Narrative Review of the Case of Vitamins." *Frontiers in nutrition* vol. 7 558598. 1 Dec. 2020.

[49] Singh, Monica et al. "A haplotype derived from the common variants at the -1997G/T and Sp1 binding site of the COL1A1 gene influences risk of postmenopausal osteoporosis in India." *Rheumatology international* vol. 33,2 (2013): 501-6.

[50] Xu, Kuanfeng et al. "Association between rs13266634 C/T polymorphisms of solute carrier family 30 member 8 (SLC30A8) and type 2 diabetes, impaired glucose tolerance, type 1 diabetes--a meta-analysis." *Diabetes research and clinical practice* vol. 91,2 (2011): 195-202.

[51] Donato K et al., Nutrigenomics: SNPs correlated to physical activity, chiropractic treatment, sleep and mood. La Clinica Terapeutica (2023).

[52] Guest, Nanci S et al. "Sport Nutrigenomics: Personalized Nutrition for Athletic Performance." *Frontiers in nutrition* vol. 6 8. 19 Feb. 2019.

The gene TF encodes transferrin, the main iron transport protein in blood. It binds to iron and facilitates its transport from the sites of absorption or storage to the areas where it is needed. The polymorphism Locus1 in two copies (homozygosity) has been associated to higher ferritin levels.

Based on these results, your healthcare provider may recommend you monitor your ferritin levels and do periodic checkups to detect excess early.

Magnesium

Magnesium is an essential element in the body involved in several processes, such as DNA and RNA synthesis, protein synthesis, and glucose metabolism. Moreover, it is critical for skeletal composition, synaptic transmission, muscle function and heart function, and for an efficient immune system.

Magnesium-rich foods include legumes, nuts, cocoa, whole grains, some spices, sweet fruits, and green leafy vegetables.

The Recommended Daily Intake of magnesium for adults is 420 mg per day, while for pregnant and lactating women it is 400 mg per day (https://www.fda.gov/media/99069/download).

Analyzed Genes and Polymorphisms[53]:

Gene	Gene Function	SNP
TRPM6	**Transient receptor potential cation channel subfamily M member 6**. Ion receptor protein with crucial role in maintaining the magnesium homeostasis.	Locus1
		Locus2
CNNM2	**Cyclin M2 or Cyclin and CBS domain divalent metal cation transport mediator 2**. Protein involved in magnesium transport and metabolism.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	C/C	Typical.
Locus2	T/T	Typical.
Locus1	T/T	Typical.

Recommendations:

[53] Fabozzi, Gemma et al. "Personalized Nutrition in the Management of Female Infertility: New Insights on Chronic Low-Grade Inflammation." *Nutrients* vol. 14,9 1918. 3 May. 2022.

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Your magnesium levels do not appear to be influenced by your genetic makeup based on the analyzed polymorphisms, but other genetic, environmental, and lifestyle factors may have a negative influence.

Selenium

Selenium is a very important mineral for the overall well-being of the body as it helps in performing many basic functions, from reproduction to fighting infections, and it has antioxidant properties. It is also crucial for proper thyroid, muscle, and reproductive system functioning. Finally, it is essential for bones, hairs, and nails health.

The foods richest in selenium are fish, shellfish, red meat, poultry, dairy products, and cereals.

The Recommended Daily Intake of selenium is 55 mcg per day, while for pregnant and lactating women it is 70 mcg per day (https://www.fda.gov/media/99069/download).

Analyzed Genes and Polymorphisms[54]:

Gene	Gene Function	SNP
SELENOP	**Selenoprotein**. Protein that plays a crucial role in the transport and metabolism of selenium.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	T/T	Lower serum selenium levels.[55,56]

Recommendations:

The gene SELENOP encodes for selenoprotein, a protein responsible for delivering selenium to different tissues and organs, ensuring its availability for essential functions. The polymorphism Locus1 in two copies (homozygosity) has been associated with lower serum selenium levels.

[54] Niforou, Aikaterini et al. "Genetic Variants Shaping Inter-individual Differences in Response to Dietary Intakes-A Narrative Review of the Case of Vitamins." *Frontiers in nutrition* vol. 7 558598. 1 Dec. 2020.

[55] https://www.ncbi.nlm.nih.gov/clinvar/RCV000379069.1/

[56] Kaftalli J et al., Nutrigenomics: SNPs correlated to food preferences and susceptibility. La Clinica Terapeutica (2023).

Based on these results, your healthcare provider may recommend you monitor your selenium levels, increase the consumption of selenium-rich foods, do periodic checkups to detect deficiencies early, and/or consider a selenium supplement.

Zinc

Zinc is a mineral that is part of numerous enzymatic complexes and is necessary for the proper functioning of many hormones, including insulin, growth hormone, and sex hormones.

Zinc is present in various foods: fish and meat, grains, legumes, nuts, and seeds.

The Recommended Daily Intake is 11 mg per day for men, while for pregnant and lactating women it is 13 mg per day (https://www.fda.gov/media/99069/download).

Analyzed Genes and Polymorphisms[57]:

Gene	Gene Function	SNP
SLC30A8	**Zinc transporter 8**. Protein playing a crucial role in the regulation of zinc homeostasis within insulin-secreting pancreatic cells.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	T/T	Lower zinc levels, increased glucose levels in blood.[58,59]

Recommendations:

The gene SLC30A8 encodes the zinc transporter 8, a protein needed for the intake of zinc in pancreatic cells, where it is crucial for insulin production. The polymorphism Locus1 in two copies (homozygosity) has been associated with lower zinc levels, which may result also in an impairment of insulin levels.

[57] Micheletti C et al., Nutrigenomics: SNPs correlated to vitamins metabolism. La Clinica Terapeutica (2023).

[58] Niforou, Aikaterini et al. "Genetic Variants Shaping Inter-individual Differences in Response to Dietary Intakes-A Narrative Review of the Case of Vitamins." *Frontiers in nutrition* vol. 7 558598. 1 Dec. 2020.

[59] Kaftalli J et al., Nutrigenomics: SNPs correlated to food preferences and susceptibility. La Clinica Terapeutica (2023).

Based on these results, your healthcare provider may recommend you monitor your zinc levels, increase the consumption of zinc-rich foods, do periodic checkups to detect zinc deficiencies and/or excess of glucose early, and/or consider a zinc supplement.

Carbohydrates metabolism

Carbohydrates metabolism is very important for overall health and wellbeing. Indeed, carbohydrates are ingested and absorbed as simple sugars from the intestine to the systemic circulation. Then, they arrive at organs such as the brain and muscles, where they are used or stored as energy sources. These processes are finely tuned by insulin, and hormone secreted by pancreas. Thus, carbohydrate metabolism and insulin levels can highly influence blood glucose levels, which in turn is crucial in human health.

The main sources of carbohydrates are grains, fruits, vegetables, legumes, dairies, sugar, and sweets.

Analyzed Genes and Polymorphisms[60]:

Gene	Gene Function	SNP
ADIPOQ	**Adiponectin**. Hormone playing a role in insulin sensitivity and glucose metabolism	Locus1
LEP	**Leptin**. Hormone produced by adipose tissue and involved in the regulation of energy balance and body weight.	Locus1
LEPR	**Leptin receptor**. It binds leptin and, in concert with it, regulates energy metabolism and body weight.	Locus1
KCNJ11	**Potassium Voltage-Gated Channel Subfamily J Member 11**. It plays a critical role in glucose-induced insulin secretion in pancreatic cells.	Locus1
AMY1A	**Alpha-Amylase 1A**. Protein involved in the first steps of digestion of carbohydrates in saliva.	Locus1
UCP2	**Uncoupling Protein 2**. Protein present in the mitochondria and involved in energy equilibrium.	Locus1

[60] Guest, Nanci S et al. "Sport Nutrigenomics: Personalized Nutrition for Athletic Performance." *Frontiers in nutrition* vol. 6 8. 19 Feb. 2019.

UCP3	**Uncoupling Protein 3**. Protein present in the mitochondria and involved in energy equilibrium.	Locus1
PPARG	**Peroxisome Proliferator-Activated Receptor Gamma**. Receptor that regulates fatty acid deposition and glucose metabolism.	Locus1
PYGM	**Glycogen Phosphorylase (muscle form)**. Enzyme involved in glycogen metabolism, a macromolecule that serves as storage for glucose.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	C/C	Typical.
Locus1	A/A	Risk of high BMI and insulin resistance.[61]
Locus1	G/G	Typical.
Locus1	C/C	Typical.
Locus1	G/G	Typical.
Locus1	C/C	Typical.
Locus1	G/G	Typical.
Locus1	C/C	Typical.
Locus1	G/G	Typical.

Recommendations:

The gene LEP encodes leptin, a hormone primarily produced in the adipose tissue and acts on the hypothalamus in the brain to suppress appetite and increase energy expenditure. The polymorphism Locus1 in two copies (homozygosity) was associated with risk of high BMI and insulin resistance, a condition in which the body don't respond correctly to insulin.

[61] Zhang, Li-Qin et al. "Relation of JAGGED 1 and collagen type 1 alpha 1 polymorphisms with bone mineral density in Chinese postmenopausal women." *International journal of clinical and experimental pathology* vol. 7,10 7142-7. 15 Sep. 2014.

Based on these results, your healthcare provider may recommend you maintain a healthy lifestyle with a balanced diet and constant physical activity and undergo periodic checks of weight, glucose levels, and other metabolic parameters.

Lipids metabolism

Lipids are the energy reserves of animals and perform various functions, such as maintenance of body temperature, whilst being the key constituents of cell membranes and serving as chemical messengers. The human body requires various types of useful lipid fat to maintain the healthy functions of its parts. Balancing lipid levels in the blood is an important part of staying healthy. Augmented lipids easily deposit to the walls of blood vessels, and the growing fatty scale causes a health risk.

The main sources of lipids are oils, nuts and seeds, fatty fish, poultry and meat, eggs, dairy product, and avocado.

Analyzed Genes and Polymorphisms[62]:

Gene	Gene Function	SNP
FADS1	**Fatty acid desaturase 1**. Enzyme involved in the desaturation of polyunsaturated fats.	Locus1
FTO	**Fat mass and obesity-associated protein**. Protein involved in the control of body weight and energy metabolism.	Locus1
APOA2	**Apolipoprotein A-II**. Component of lipoproteins, present in the blood and playing a crucial role in lipid transport in the body.	Locus1
APOA5	**Apolipoprotein A-V**. Component of lipoproteins, present in the blood and playing a crucial role in lipid transport in the body.	Locus1
APOC3	**Apolipoprotein C-III**. Component of lipoproteins, present in the blood and playing a crucial role in lipid transport in the body.	Locus1
LIPC	**Hepatic lipase**. Enzyme breaking down triglycerides and phospholipids present in high-density lipoproteins (HDL).	Locus1

[62] Donato K et al., Nutrigenomics: SNPs correlated to physical activity, chiropractic treatment, sleep and mood. La Clinica Terapeutica (2023).

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TFAP2B	**Transcription factor AP-2 beta**. Transcription factor regulating genes that control cell growth, differentiation, apoptosis (programmed cell death).	Locus1
PCSK9	**Proprotein convertase subtilisin/kexin type 9**. Enzyme playing a critical role in the regulation of cholesterol levels in the bloodstream.	Locus1
		Locus2
		Locus3
LPL	**Lipoprotein lipase**. Enzyme playing a crucial role in the breakdown of triglycerides present in circulating lipoproteins.	Locus1
		Locus2
UCP1	**Uncoupling protein 1**. Protein playing a significant role in thermogenesis, a process by which the body generates heat in response to cold environments or other stimuli.	Locus1
ELOVL2	**Fatty acid elongase 2**. Protein involved in the synthesis of very long polyunsaturated fatty acids (VLC-PUFAs), which have several critical roles in our body.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	T/T	Typical.
Locus1	A/A	Risk for high BMI, but not associated with problems related to

		obesity; better response to high-protein diets.[63,64,65]
Locus1	A/A	Typical.
Locus1	G/G	32% increase in triglyceride levels.
	A/G	16% increase in triglyceride levels.
	A/A	Typical.
Locus1	C/C	Typical.
Locus1	A/A	Typical.
Locus1	A/A	Better response to high-protein diets for weight management.[66,67]
Locus1	G/G	Typical.
Locus2	C/C	Typical.
Locus3	A/A	Typical.
Locus1	C/C	Typical.
Locus2	A/A	Typical.
Locus1	T/T	Typical.
Locus1	T/T	Typical.

Recommendations:

The gene FTO encodes the fat mass and obesity-associated protein, which is known to be involved in the control of body weight and energy metabolism. The polymorphism Locus1 in two copies (homozygosity) has been associated to a higher BMI, but interestingly not associated with obesity-related problems. Moreover, this polymorphism has been associated with a higher response to high-protein diets in weight loss.

[63] Karunasinghe, Nishi et al. "Serum selenium and single-nucleotide polymorphisms in genes for selenoproteins: relationship to markers of oxidative stress in men from Auckland, New Zealand." *Genes & nutrition* vol. 7,2 (2012): 179-90.

[64] Ataie-Jafari, A., Namazi, N., Djalalinia, S., *et al.* (2018). Neck circumference and its association with cardiometabolic risk factors: a systematic review and meta-analysis. Diabetology & Metabolic Syndrome, 10(1).

[65] Guest, Nanci S et al. "Sport Nutrigenomics: Personalized Nutrition for Athletic Performance." *Frontiers in nutrition* vol. 6 8. 19 Feb. 2019.

[66] Dhuli K et al., Nutrigenomics: SNPs correlated to minerals metabolism. La Clinica Terapeutica (2023).

[67] Singh, Monica et al. "A haplotype derived from the common variants at the -1997G/T and Sp1 binding site of the COL1A1 gene influences risk of postmenopausal osteoporosis in India." *Rheumatology international* vol. 33,2 (2013): 501-6.

The gene TFAP2B encodes the transcription factor AP-2 beta, which is a transcription factor regulating genes that control cell growth, differentiation, and apoptosis. Particularly, it influences the development and function of adipocytes and may have implications for metabolic processes related to energy balance. The polymorphism Locus1 in two copies (homozygosity) has been associated with higher response to high-protein diets in weight loss.

Based on these results, your healthcare provider may recommend you monitor your weight and other metabolic parameters, and a high-protein diet if you want to lose or maintain your weight, as part of healthy lifestyle, with balanced diet and constant physical activity.

Food preferences and susceptibility

Food allergies and intolerances

Food allergies occur when the body's immune system reacts to certain proteins in food. Food allergic reactions vary in severity from mild symptoms, involving hives and lip swelling, to severe, life-threatening symptoms, often called anaphylaxis, that may involve fatal respiratory problems and shock.

Food sensitivities and intolerances are more common than food allergies and they are not related to the response of the immune system. In this case, a food triggers an adverse reaction in your body since you are totally or partially unable to digest or metabolizing it. Food sensitivities and intolerances can manifest in many ways, as they can involve different systems and organs. Common symptoms include gastrointestinal issues, headaches, migraines, skin problems, fatigue, joint pain, and mood changes.

Analyzed Genes and Polymorphisms[68]:

Gene	Gene Function	SNP
LCT	**Lactase**. Enzyme which breaking down lactose, the main sugar in mammalian milk.	Locus1
ADH1B	**Alcohol Dehydrogenase 1B**. Enzyme metabolizing alcohol (ethanol) in the liver and producing acetaldehyde.	Locus1
ALDH2	**Aldehyde Dehydrogenase 2**. Enzyme required for clearance of cellular acetaldehyde, a toxic byproduct of alcohol metabolism, and formaldehyde, a toxic byproduct of some metabolic process and environmental pollutant and environmental pollutant.	Locus1
FLG	**Filaggrin**. Essential structural protein found in the outermost layer of the skin, called the stratum corneum. It plays a crucial role in maintaining the skin's barrier function and hydration.	Locus1

[68] Medori M C et al., Nutrigenomics: SNPs correlated to detoxification, antioxidation and longevity. La Clinica Terapeutica (2023).

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HNMT	**Histamine N-methyltransferase**. Enzyme responsible of degrading histamine and in regulating the airway response to histamine.	Locus1
HLA-DQA1	**Human Leukocyte Antigen-DQA1**. Part of a cell surface protein playing a crucial role in the immune system, by presenting antigens to helper T cells.	Locus1
		Locus2
HLA-DQB1	**Human Leukocyte Antigen-DQB1**. Part of a cell surface protein playing a crucial role in the immune system, by presenting antigens to helper T cells.	Locus1
IL-13	**Interleukin 13**. Signaling protein playing a key role in the immune system and part of the interleukin family of cytokines. It is involved in regulating various immune responses, particularly those related to allergic and inflammatory reactions.	Locus1
		Locus2
		Locus3
IL-18	**Interleukin 18**. Signaling protein playing a key role in the immune system and part of the interleukin family of cytokines. It is involved in epithelial barrier repair and immune responses.	Locus1
IL-4	**Interleukin** 4. Signaling protein playing a key role in the immune system and part of the interleukin family of cytokines. It is involved in regulating antibody production, hematopoiesis and inflammation, and immune responses.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	A/A	Production of lactase also in adulthood.
Locus1	G/G	Typical.
Locus1	G/G	Typical.

Locus1	G/G	Typical.
Locus1	T/T	Reduced histamine degradation.[69,70]
Locus1	C/C	Typical.
Locus2	T/T	Typical.
Locus1	C/T	1.7-fold increase of the relative risk of peanut allergy in Caucasians.[71]
Locus1	G/G	Typical.
Locus2	C/C	Typical.
Locus3	C/C	Typical.
Locus1	C/C	Typical.
Locus1	C/C	Increased risk of food allergies in conjunction with vitamin D deficiency (most common genotype in Caucasians).[72]

Recommendations:

The gene HNMT encodes the histamine N-methyltransferase, an enzyme responsible of degrading histamine, a biologically active compound involved in immune response, inflammation, and regulation of respiratory pathways. The polymorphism Locus1 in two copies (homozygosity) has been associated with a reduced enzyme activity, with consequent increase in histamine levels.

The gene HLA-DQA1 encodes the human leukocyte antigen-DQB1, a protein that is part of a cell surface protein playing a crucial role in the immune system, by presenting antigens to helper T cells. The polymorphism Locus1 in one copy (heterozygosity) has been associated with a 1.7-fold increased risk of peanut allergy in Caucasians.

[69] Sadat-Ali, Mir et al. "Genetic influence on circulating vitamin D among Saudi Arabians." *Saudi medical journal* vol. 37,9 (2016): 996-1001.

[70] Naureen, Zakira et al. "Genetic test for the personalization of sport training." *Acta bio-medica : Atenei Parmensis* vol. 91,13-S e2020012. 9 Nov. 2020.

[71] Grant, S F et al. "Reduced bone density and osteoporosis associated with a polymorphic Sp1 binding site in the collagen type I alpha 1 gene." *Nature genetics* vol. 14,2 (1996): 203-5. doi:10.1038/ng1096-203.

[72] Méplan, Catherine et al. "Relative abundance of selenoprotein P isoforms in human plasma depends on genotype, se intake, and cancer status." *Antioxidants & redox signaling* vol. 11,11 (2009): 2631-40.

The gene IL-4 encodes the interleukin 4, a cytokine, which is a type of small protein that plays a key role in the immune system. It is involved in regulating both innate and adaptive immunity, and it has diverse effects on various immune cells. The polymorphism Locus1 in two copies (homozygosity), the most common genotype in Caucasians, has been associated with an increased risk of food allergies in presence of a vitamin D deficiency.

Based on these results your healthcare provider may suggest you avoid histamine-rich foods (*e.g.,* aged cheeses, fermented products, processed meats, and certain alcoholic beverages) and you undergo regular checkups to promptly identify the onset of allergies. Moreover, since your allergy risk is may be related to vitamin D deficiency, he may recommend you monitor your levels of this micronutrient.

Tyramine intolerance

Tyramine is a biogenic amine naturally found at trace levels in the human body. Symptoms related to tyramine intolerance are headaches, migraines, palpitations, fluctuations in blood pressure, sweating, and digestive disturbances. Reduced enzyme activity in just one gene is not likely to cause you a whole lot of problems with high tyramine foods, since there are multiple ways your body can break it down, but reduced activity in a couple of genes theoretically could cause problems with tyramine metabolism.

Tyramine-rich foods are typically fermented foods or foods close to spoiling. These include aged cheeses, cured meats, fermented products like sauerkraut and soy sauce, certain alcoholic beverages, and certain types of fruits (e.g., bananas, avocados, and figs).

Analyzed Genes and Polymorphisms[73]:

Gene	Gene Function	SNP
MAOA	**Monoamine oxidase A**. Enzyme involved in the regulation of neurotransmitters (such as serotonin, norepinephrine, and dopamine), essential for maintaining normal mood, emotions, and cognitive functions.	Locus1

[73] Micheletti C et al., Nutrigenomics: SNPs correlated to vitamins metabolism. La Clinica Terapeutica (2023).

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FMO3	**Flavin-containing monooxygenase 3**. Hepatic enzyme catalyzing the oxygenation of a wide variety of nitrogen- and sulfur-containing compounds, including drugs and dietary compounds.	Locus1
		Locus2
		Locus3
CYP2D6	**Cytochrome P450 2D6**. Enzyme member of the cytochrome P450 superfamily. It catalyzes many reactions involved in drug metabolism and synthesis of cholesterol, steroids and other lipids.	Locus1
		Locus2
		Locus3

Your Results:

SNP	Alleles	Outcome
Locus1	G/G	Typical.
Locus1	G/G	Typical.
Locus2	TG/TG	Typical.
Locus3	G/G	Typical.
Locus1	C/T	Typical.
Locus2	A/A	Typical.
Locus3	G/G	Typical.

Recommendations:

Your tyramine tolerance does not appear to be influenced by your genetic makeup, accordingly to the polymorphisms analyzed. However, this does not necessarily mean that

you are not tyramine intolerant, as other factors may be involved. If you experience any suspicious symptoms, don't hesitate to consult your healthcare provider.

Taste

Taste is one of the most prominent determinants influencing our food choices, although other characteristics come into play in this aspect (*i.e.,* personal experiences, cultural influences, health benefits). Moreover, the perception of taste is influenced by our genetic: our genes are responsible, at least partially, for how much we experience tastes (*e.g.*, bitter, sour, sweet, or salty) and what are our preferences.

Analyzed Genes and Polymorphisms[74]:

Gene	Gene Function	SNP
TAS2R38	**Taste receptor type 2 member 38**. Receptor in the perception of a wide range of bitter compounds.	Locus1
		Locus2
TAS1R2	**Taste receptor type 1 member 2**. Receptor involved in the detection of chemical stimuli involved in sensory perception of sweet taste.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	A/G	Able to taste some bitter.
Locus2	C/T	Probably can taste bitter.
Locus1	T/T	Typical.

Recommendations:

Your genetic makeup, in accordance with the analyzed polymorphisms, appears not to influence your taste. However, this does not mean necessarily that you don't have preferences towards bitter or sweet: other genetic, lifestyle, or environmental factors may impact your preferences.

[74] Micheletti C et al., Nutrigenomics: SNPs correlated to vitamins metabolism. La Clinica Terapeutica (2023).

Detoxification, antioxidation, and longevity

Detoxification and antioxidation

Detoxification is a set of processes aimed at managing acute intoxication and withdrawal, which means cleansing the blood from toxins. The body eliminates toxins through the liver, kidneys, intestines, lungs, lymphatic system, and skin during a body detox. However, when these systems are compromised, impurities aren't properly filtered, and the body is adversely affected.

Antioxidation includes several processes that aim to protect cells and tissues from oxidative damage caused by free radicals, highly reactive and unstable molecules generated as byproducts of normal cellular metabolism or introduced from external sources such as pollution, cigarette smoke, and certain foods. When this mechanism is unbalanced, a condition called oxidative stress occurs, which has been linked to aging and various health conditions.

Analyzed Genes and Polymorphisms[75]:

Gene	Gene Function	SNP
SOD2	**Superoxide Dismutase 2**. Enzyme found in the mitochondria. It is an important enzyme for reducing oxidative stress in cells.	Locus1
AS3MT	**Arsenic (+3 oxidation state) methyltransferase**. Enzyme playing a crucial role in the metabolism of arsenic in the body.	Locus1
CYP1A2	**Cytochrome P450 1A2**. Enzyme member of the cytochrome P450 superfamily. It catalyzes many reactions involved in drug metabolism and synthesis of cholesterol, steroids and other lipids.	Locus1
		Locus2

[75] Hong, Xiumei et al. "Genome-wide association study identifies peanut allergy-specific loci and evidence of epigenetic mediation in US children." *Nature communications* vol. 6 6304. 24 Feb. 2015.

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ADORA2A	**Adenosine A2a receptor**. Receptor protein activated by the binding of adenosine. It determines vasodilation, anti-inflammatory effect, neurotransmitter modulation, cardiovascular protection.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	C/C	Typical.
Locus1	G/G	Typical.
Locus1	G/G	Typical.
Locus2	A/A	Faster metabolism of caffeine.[76,77]
Locus1	T/T	No increase in anxiety from caffeine (in average amount).[78,79,80]

Recommendations:

The gene CYP1A2 encodes the cytochrome P450 1A2, an enzyme part of the cytochrome P450 superfamily, which are involved in the metabolism of many drugs and other compounds. The polymorphism Locus2 in two copies (homozygosity) has been associated with a faster metabolism of caffeine, which means that it is degraded more quickly and remain less time in your organism.

The gene ADORA2A encodes the adenosine A2A receptor, which binds adenosine, a neurotransmitter that acts as a central nervous system depressant, promoting relaxation. Caffeine binds to this receptor, preventing the binding of adenosine and promoting release of other neurotransmitters, such as dopamine and norepinephrine, which contribute to its

[76] Yang, Guang et al. "Systematic review and meta-analysis of the association between IL18RAP rs917997 and CCR3 rs6441961 polymorphisms with celiac disease risks." *Expert review of gastroenterology & hepatology* vol. 9,10 (2015): 1327-38.

[77] Eynon, Nir et al. "Interaction between SNPs in the NRF2 gene and elite endurance performance." *Physiological genomics* vol. 41,1 (2010): 78-81.

[78] Medori M C et al., Nutrigenomics: SNPs correlated to detoxification, antioxidation and longevity. La Clinica Terapeutica (2023).

[79] Kaftalli J et al., Nutrigenomics: SNPs correlated to food preferences and susceptibility. La Clinica Terapeutica (2023).

[80] Micheletti C et al., Nutrigenomics: SNPs correlated to vitamins metabolism. La Clinica Terapeutica (2023).

stimulating effects. The polymorphism Locus1 in two copies (homozygosity) has been associated with the absence of an increase in anxiety with the intake of moderate amounts of caffeine.

Even though your genetic makeup, according to the polymorphisms analyzed, seems to be advantageous regarding caffeine metabolism, remember that other genetic, environmental, and lifestyle factors may have a differente influence. We recommend you not to exceed its consumption to avoid adverse effects.

Longevity

Longevity refers to the state or quality of having a long duration of life or existence. It is the ability to live for an extended period, often beyond the average lifespan for a given population or species. Longevity is a concept commonly associated with human beings, where it refers to living to an advanced age, typically beyond 80 years. Uncovering the secrets of human longevity and healthy aging remains a primary challenge in the fields of biology and medicine, since comprehending the interplay between lifestyle and environmental factors, and genetics is hard. However, studying the genetic behind exceptional individuals' longevity and healthy aging offers invaluable biological insights.

Analyzed Genes and Polymorphisms[81]:

Gene	Gene Function	SNP
FOXO3	**Forkhead box protein O3**. Transcription factor regulating apoptosis and tumor suppression. It is also involved in nutrient sensing and the response to oxidative stress.	Locus1
BPIFB4	**Bactericidal/permeability-increasing fold-containing family B member 4**. Protein involved in host defense and immune responses.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	T/T	Typical.
Locus1	G/G	Variant observed in long-lived individuals. Better endothelial function. Less likely to be frail in old age.[82,83]

Recommendations:

The gene BPIFB4 encodes the bactericidal/permeability-increasing fold-containing family B member 4, a protein involved in host defense and immune response. It is expressed in various

[81] Dhuli K et al., Nutrigenomics: SNPs correlated to minerals metabolism. La Clinica Terapeutica (2023).

[82] Dossena, Marta et al. "New Insights for BPIFB4 in Cardiovascular Therapy." *International journal of molecular sciences* vol. 21,19 7163. 28 Sep. 2020.

[83] Bonetti G et al., Nutrigenomics: SNPs correlated to lipid and carbohydrates metabolism. La Clinica Terapeutica (2023).

tissues, including the respiratory tract, and has been found in mucus secretions, suggesting its potential role in protecting mucosal surfaces from microbial invasion. The polymorphism Locus1 in two copies (homozygosity) has been observed with higher frequency in long-lived individuals and has been associated with a better functioning of the endothelium, the single layer of cells that lines the inner surface of blood vessels, and a a reduced likelihood of frailty in old age.

The presence of this polymorphism is certainly good news! However, it is essential not to let your guard down: other genetic, environmental, and lifestyle factors also influence longevity. Lead a healthy and balanced lifestyle: with the help of genetics, it can enable you to have a longer and healthier life.

Physical activity and chiropractic treatment

Physical activity

WHO defines physical activity as "any bodily movement produced by skeletal muscles that requires energy expenditure". Then it refers to all movements performed by a person, including *e.g.,* work, hobbies, walk or cycle to transport. Physical activity has been widely demonstrated to improve general health and well-being, with no exceptions: both moderate- and vigorous-intensity physical activity are good for you. Among other things, it allows for maintaining a healthy body weight, improves mental health, and aids in preventing noncommunicable diseases. There are various methods to stay physically active: walking, cycling, engaging in sports, participating in active recreation and play.

Analyzed Genes and Polymorphisms[84]:

Gene	Gene Function	SNP
GABPB1	**GA-binding protein transcription factor subunit beta-1**. Transcription factor regulating various genes involved in energy metabolism, cellular respiration, and other essential cellular processes.	Locus1

[84] Zhang, Xiaomin et al. "FTO genotype and 2-year change in body composition and fat distribution in response to weight-loss diets: the POUNDS LOST Trial." *Diabetes* vol. 61,11 (2012): 3005-11.

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PPARA	**Peroxisome Proliferator-Activated Receptor Alpha**. Transcription factor regulating the expression of various genes involved in lipid metabolism and energy homeostasis	Locus1
PPARGC1A	**Peroxisome Proliferator-Activated Receptor Gamma Coactivator 1 Alpha**. Transcriptional coactivator regulating the expression of genes involved in energy metabolism, mitochondrial biogenesis, and adaptive thermogenesis.	Locus1
EPAS1	**Endothelial PAS Domain Protein 1**. Transcription factor regulating genes involved in the formation of new blood vessels, the production of red blood cells, glucose metabolism, and cell proliferation and survival.	Locus1
AMPD1	**Adenosine Monophosphate Deaminase 1**. Enzyme found in the skeletal muscles and playing a crucial role for movement, producing energy.	Locus1
CNR1	**Cannabinoid Receptor 1**. Receptor regulating various physiological processes, including pain sensation, mood, appetite, memory, and immune response.	Locus1
AGT	**Angiotensinogen**. Protein crucial for maintaining blood pressure, fluid balance, and electrolyte homeostasis.	Locus1
ACTN3	**Actinin Alpha 3**. Structural protein that is expressed in fast, type II fibers, where it plays an important role in the generation of explosive and powerful muscle contractions.	Locus1
BDKRB2	**Bradykinin Receptor B2**. Receptor that relaxes and widens blood vessels, leading to increased blood flow and decreased blood pressure	Locus1
MSTN	**Myostatin**. Protein involved in the control of growth and development of muscle tissues.	Locus1
VEGFA	**Vascular Endothelial Growth Factor A**. Signaling protein involved in the regulation of blood vessel formation and blood vessel permeability.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	A/A	Likely better in endurance sports and better aerobic capacity.[85,86,87]
Locus1	G/C	Typical.
Locus1	A/G	Typical.
Locus1	G/G	Typical.
Locus1	G/G	Typical.
Locus1	C/C	Typical.
Locus1	A/A	Typical.
Locus1	T/T	Non-functioning protein. More likely to be an endurance athlete than power athlete.[88]
Locus1	C/C	Typical.
Locus1	T/T	Typical muscle mass, better jumping ability.[89]
Locus1	C/C	Higher protein levels. Higher improvements in VO2max seen with aerobic training.[90]

Recommendations:

The gene GABPB1 encodes the GA-binding protein transcription factor subunit beta-1, a transcription factor modulating the expression of several genes involved in processes such as energy metabolism and cellular respiration. The polymorphism Locus1 in two copies (homozygosity) has been associated with better performances in endurance running and better aerobic capacity.

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[85] Institute of Medicine (US) Panel on Dietary Reference Intakes for Electrolytes and Water. (2004). Dietary reference intakes for water, potassium, sodium, chloride, and sulfate. National Academies Press (US).

[86] National Institute on Alcohol Abuse and Alcoholism (NIAAA): www.niaaa.nih.gov

[87] Guest, Nanci S et al. "Sport Nutrigenomics: Personalized Nutrition for Athletic Performance." *Frontiers in nutrition* vol. 6 8. 19 Feb. 2019.

[88] da Costa, Kerry-Ann et al. "Common genetic polymorphisms affect the human requirement for the nutrient choline." *FASEB journal : official publication of the Federation of American Societies for Experimental Biology* vol. 20,9 (2006): 1336-44.

[89] Hotta, Kikuko et al. "Variations in the FTO gene are associated with severe obesity in the Japanese." *Journal of human genetics* vol. 53,6 (2008): 546-553.

[90] Centers for Disease Control and Prevention (CDC): www.cdc.gov/tobacco/index.htm

The gene ACTN3 encodes the actinin alpha 3, a structural protein expressed in fast, type II fibers. It is crucial for the generation of explosive and powerful muscle contractions. The polymorphism Locus1 in two copies (homozygosity) has been associated to a loss of function of the enzyme and a predisposition towards endurance sports, rather than power sports.

The gene MSTN encodes myostatin, a protein involved in the control of growth and development of muscle tissues, acting as a negative regulator of muscle mass, meaning that it limits muscle growth. The absence of the polymorphism Locus1 has been associated to average muscle mass but has been associated to better jumping ability.

The gene VEGFA encodes the vascular endothelial growth factor A, a signaling protein involved in the regulation of blood vessel formation and blood vessel permeability. The polymorphism Locus1 in two copies (homozygosity) has been associated to higher protein levels and higher improvements in VO2 max seen with aerobic training.

Overall, your genetic makeup may give you an advantage in endurance sports and activities that require aerobic effort. However, this doesn't mean you should neglect strength training, for which it's recommended to dedicate at least two workouts per week. We advise you to seek guidance from a professional to plan your workouts and make the most of these observations.

Pain perception

Pain is a sensory and emotional experience that the body perceives when there is actual or potential tissue damage. While pain is an essential protection mechanism, the variations in pain perception among individuals make it so that for some individuals, it can become a problem, even disabling. Therefore, it is essential to recognize the individuality with which the sensation of pain manifests, which is likely to be due to a complex interplay among genitic, environmental and personal factors.

Analyzed Genes and Polymorphisms[91]:

Gene	Gene Function	SNP
SCN9A	**Sodium voltage-gated channel alpha subunit 9**. Protein essential for the generation and propagation of electrical signals neurons and muscle cells.	Locus1
NTRK1	**Neurotrophic receptor tyrosine kinase 1**. Protein essential for the development and survival of neurons, especially those that transmit information about sensations such as pain, temperature, and touch.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	A /A	Increased perception of pain.[92]
Locus1	G/G	Typical.

Recommendations:

The SCN9A encodes the sodium voltage-gated channel alpha subunit 9, a protein which generates and propagates electrical signals (called action potentials) in excitable cells *i.e.*, neurons and muscle cells. This protein is essential, among its several functions, for pain perception. The polymorphism Locus1 in two copies (homozygosity) has been associated with

[91] World Health Organization (WHO). (2011). Waist circumference and waist-hip ratio: Report of a WHO expert consultation.

[92] Prior, Steven J et al. "DNA sequence variation in the promoter region of the VEGF gene impacts VEGF gene expression and maximal oxygen consumption." *American journal of physiology. Heart and circulatory physiology* vol. 290,5 (2006): H1848-55.

an increased perception of pain.

Based on these results, your healthcare provider may suggest you explore pain management and treatment strategies (*e.g.*, medications, physical therapy, relaxation techniques, and complementary therapies), avoid situations and activities that can worsen your pain sensation, and seek support, both from professional resources and from friends or family.

Sleep and mood

Sleep and mood are closely connected: poor or inadequate sleep can cause irritability and stress, while healthy sleep can enhance well-being. Not only does sleep affect mood, but mood and mental states can also affect sleep. Sleep is essential to the human brain and is regulated by genetics with many features conserved across species. Sleep is also influenced by health and environmental factor: to identify replicable genetic variants contributing to sleep may require accounting for these factors.

Analyzed Genes and Polymorphisms[93]:

Gene	Gene Function	SNP
GSK3B	**Glycogen Synthase Kinase 3 Beta**. Enzyme involved in glycogen metabolism, cellular division, proliferation, motility and survival.	Locus1
ADA	**Adenosine Deaminase**. Enzyme that prevents the accumulation of adenosine, that can interfere with normal cellular functions.	Locus1
NGF	**Nerve Growth Factor**. Important protein involved in the development and survival of nerve cells (neurons), especially those that transmit pain, temperature, and touch sensations.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	A/A	Typical.
Locus1	C/C	Typical.
Locus1	T/C	Typical.

Recommendations:

Your genetic makeup, in accordance with the analyzed polymorphisms, appears not to influence your sleep and mood. However, this does not mean that the quality and quantity of your sleep are adequate, nor that your mood is good: other genetic, lifestyle, or

[93] Guest, Nanci S et al. "Sport Nutrigenomics: Personalized Nutrition for Athletic Performance." *Frontiers in nutrition* vol. 6 8. 19 Feb. 2019.

environmental factors may negatively impact them. Do not overlook situations indicating low sleep quality or mood and consult your healthcare provider if needed.

Chiropractic treatment

Chiropractic is a discipline based on precise and controlled adjustments or manipulations aiming at treating mechanical disorders of the musculoskeletal system, particularly the spine. In fact, the central concept of chiropractic treatment is that proper alignment of the spine is crucial for overall health and well-being.

Analyzed Genes and Polymorphisms[94]:

Gene	Gene Function	SNP
CNTF	**Ciliary Neurotrophic Factor**. protein promoting neurotransmitter synthesis and neurite outgrowth in certain neuronal populations.	Locus1

Your Results:

SNP	Alleles	Outcome
Locus1	G/G	Better response to chiropractic treatment.

Recommendations:

The gene CNTF encodes the ciliary neurotrophic factor, a protein that plays a crucial role in the development, maintenance, and protection of certain nerve cells in the nervous system. The polymorphism Locus1 in two copies (homozygosity) a better response to the chiropractic treatment.

Based on these results, your healthcare provider may suggest you try chiropractic treatment to improve your well-being.

[94] Popkin, B. M., D'Anci, K. E., & Rosenberg, I. H. (2010). Water, hydration, and health. Nutrition reviews, 68(8), 439-458.

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Conclusions

Main results:

Class	SNP	Alleles	Outcome
Vitamin A	Locus1	G/G	Lower beta-carotene conversion into retinal molecules.
Vitamin B12	Locus1	G/A	Greater risk for low serum vitamin B12 levels, but only when the diet is low in bioavailable sources of vitamin B12.
Vitamin B6	Locus1	G/G	Risk of increased homocysteine, responsive to vitamin B6.
Vitamin B9	Locus1	A/A	Enzyme function decreased by 70-80%.
Vitamin C	Locus1	T/T	24% higher vitamin C in plasma.
Vitamin D	Locus1	A/C	Somewhat lower 25-hydroxyvitamin D (main circulating form) levels.
Vitamin D	Locus1	G/G	More likely to have vitamin D insufficiency or deficiency.
Vitamin E	Locus1	A/A	Lower plasma vitamin E concentration.
Vitamin K	Locus1	C/T	Decreased protein activity and increased anticoagulant drugs sensitivity.
Choline	Locus1	G/G	Increased risk of organ dysfunction with low choline diet; lower betaine levels with inadequate choline intake.
Calcium	Locus1	A/A	Lower bone mineral density.
Iron	Locus1	T/T	Higher ferritin.
Iron	Locus1	A/G	Higher ferritin.
Iron	Locus1	A/A	Higher ferritin.
Selenium	Locus1	T/T	Lower serum selenium levels.
Zinc	Locus1	T/T	Lower zinc levels, increased glucose levels in blood.
Carbohydrates	Locus1	A/A	Risk of high BMI and insulin resistance.
Lipids	Locus1	A/A	Risk for high BMI, but not associated with problems related to obesity; better response to high-protein

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			diets.
Lipids	Locus1	A/A	Better response to high-protein diets for weight management.
Food Allergies and intolerances	Locus1	T/T	Reduced enzyme activity and higher histamine levels.
Food Allergies and intolerances	Locus1	C/T	Increased relative risk of peanut allergy (1.7-fold) for Caucasians.
Food Allergies and intolerances	Locus1	C/C	Increased risk of food allergies in conjunction with vitamin D deficiency (most common genotype in Caucasians).
Detoxification and Antioxidation	Locus2	A/A	Faster metabolism of caffeine.
Detoxification and Antioxidation	Locus1	T/T	No increase in anxiety from caffeine (in average amount).
Longevity	Locus1	G/G	Variant observed in long-lived individuals. Better endothelial function. Less likely to be frail in old age.
Physical Activity	Locus1	A/A	Likely better in endurance sports and better aerobic capacity.
Physical Activity	Locus1	T/T	Non-functioning protein. More likely to be an endurance athlete than power athlete.
Physical Activity	Locus1	T/T	Typical muscle mass, better jumping ability.
Physical Activity	Locus1	C/C	Higher protein levels. Higher improvements in VO2max seen with aerobic training.
Pain Perception	Locus1	A /A	Increased perception of pain.
Chiropractic Treatment	Locus1	G/G	Better response to chiropractic treatment.

Your genetic makeup has been correlated to:

- Several modifications in the vitamins and minerals metabolism. Based on these results, your healthcare provider may recommend you monitor your vitamins and minerals levels, increase the consumption of vitamins- and minerals-rich foods, do periodic checkups to detect deficiencies early, and/or consider a vitamins and minerals supplements.
- A higher BMI and a better response to high-protein diets for weight loss and maintenance, as indicated by our algorithm.[95] Based on these results, your healthcare provider, may suggest you adopt a high-protein diet if you want to lose or maintain your weight.
- To predispositions for the development of food allergies and intolerances. Based on these results, your healthcare providers, may suggest you avoid triggering foods and do periodical checkups to detect the onset of new susceptibilities early.
- Good metabolism of caffein and longevity. These are good news, but remember: other genetic, lifestyle, and environmental factors may also have an influence on this characteristic.
- Better aerobic capacity and better response to aerobic training, which may give an advantage in endurance sports. However, this doesn't mean you should neglect strength training, for which it's recommended to dedicate at least two workouts per week. We advise you to seek guidance from a professional to plan your workouts and make the most of these observations.
- Higher pain perception. Based on these results, your healthcare provider may suggest you explore pain management and treatment strategies.
- Better response to chiropractic treatment. Based on these results, your healthcare provider may suggest you try chiropractic treatment to improve your well-being.

With this, our journey of discovering your genetic makeup comes to an end. It's essential to note that the genetic test does not need to be repeated since it remains constant over time. However, your healthcare provider may suggest other tests that can complement the information obtained from the DNA Wellness Test and can be repeated periodically to monitor your health and well-being. Some examples are our metabolomic and proteomic tests. For more details, please refer to our website (www.magisnat.com).

[95] Pichler, Irene et al. "Identification of a common variant in the TFR2 gene implicated in the physiological regulation of serum iron levels." *Human molecular genetics* vol. 20,6 (2011): 1232-40.

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DISCLAIMERS

The final results obtained by the Low-Risk General Wellness Test have not been evaluated by the Food and Drug Administration, and they are not intended to diagnose, treat, cure, or prevent any disease.

All information regarding the DNA Wellness Test is provided in good faith. While we have made every attempt to ensure that the information contained in this DNA Wellness Test is accurate to the best of our knowledge, we are not responsible for any errors or omissions or for the results obtained from the use of this information.

Before taking any action based on the information provided by the DNA Wellness Test, we urge you to consult with appropriate professionals as it is not a substitute for professional medical advice. In any case, we are not liable if you receive inadequate or even dangerous advice or recommendations for your health from third parties.

Genetic test results can have psychological implications, so it's important to be prepared for potential emotional distress or anxiety related to learning about health risks.

The use, any losses and/or damages incurred because of the use of the DNA Wellness Test, and the reliance of any information contained in this DNA Wellness Test are solely the responsibility of the user.

Any testimonials regarding the DNA Wellness Test are personal and are not representative of all users. We do not claim, and you should not assume that all users have the same experiences.

We make every effort to ensure the highest standards, the analysis for the DNA Wellness Test is performed in a CLIA (Clinical Laboratory Improvement Amendments)-certified laboratory and have validated the process to the best of our abilities. The sensitivity and specificity of the DNA Wellness Test are computed and may be consulted at this link. As a result, different tests may yield partially different results, also due to technical details. We do not assume any responsibility if such events were to occur.

Polymorphisms, due to a phenomenon known as pleiotropy, can be associated with multiple characteristics. For the purposes of the DNA Wellness Test, the considered polymorphisms are analyzed solely from the perspective of general well-being and are never associated with diseases or clinical conditions. The absence of this information should not be considered an omission but rather a specific directive. Similarly, the interpreted significance of these analyzed polymorphisms may vary in other contexts, potentially leading to unsought results and/or genetic discrimination. This could affect aspects like determining family relationships, potential health conditions, ethnic associations, and more. We are not responsible for any improper use of the information provided by the DNA Wellness Test.

The data collection and processing system is secure, and the DNA sample is discarded 180 days after the analysis. We are not liable for any data breaches resulting from cyber-attacks or rare events beyond the control of our standard security measures. If consent has been provided, the collected data, both genetic and non-genetic, may be used solely for the purpose of improving our test and conducting scientific research approved by the ethics committee. The information may be shared, in an anonymous and aggregated form, exclusively through publications in scientific journals or books, communications in medical courses/congresses, and theses as part of university and post-graduate training courses.

We make no warranty of any kind, expressed or implied, as to the accuracy, adequacy, validity, reliability, or completeness of the information regarding the DNA Wellness Test.

If you have any questions, concerns, or need support in understanding the test, please call our support team on +XXXXXXXXXX or email info@magisnat.com or visit our website www.magisnat.com.