

Covid-19 Assistance

Based on your DNA data



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Introduction

COVID-19 caused by the novel Coronavirus, SARS-CoV-II, is the third known zoonotic disease caused by the Coronavirus family, after severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS). The mortality rate due to COVID-19 is between 2 to 5%, which is lower than that of MERS and SARS. However, SARS CoV-II is highly transmissible. The World Health Organization (WHO) declared the outbreak of this novel Coronavirus as a Global pandemic on 12th March 2020.

A significant aspect of this infectious disease is that there have been considerable differences in the extent of the disease manifestation. Some people may suffer from acute respiratory distress, while some others may remain asymptomatic. This variability in symptoms may be explained in part by the virulence of the viral strain causing the infection, hormone, immunity levels, underlying health conditions, and genes.

An understanding of genetic susceptibility will help in tailoring prophylactic measures to likely lower the risk of infection.

Some Key genetic facts associated with COVID-19 disease severity

- 73% of COVID-19 patients who required intensive care support in France were men. This may be because women have two X chromosomes, and so have two copies of TLR7, a key gene associated with improving immunity against viruses.
- People with A blood group had a higher likelihood of acquiring COVID-19 than other blood groups, with people with O blood group associated with the least risk. Blood groups are genetically inherited.
- 38% of disease prevalence variability has been associated with ACE1 D gene frequency, according to preliminary data from 25 countries.
- Individuals with HLA-B*46:01 were found to be associated with likely higher severity of infection when compared with others
- 32-48% of antibody response to viral infections are inherited

This report includes four sections that compare various aspects of support towards COVID19. In the first, we profile genes that are associated with increased severity to COVID19, and in the second part, we look at genetic association with nutritional traits that may affect COVID19 severity. The third aspect of the report focuses on genetic influence on drug therapy, while the genetics of the gut microbiome is highlighted in the last section.

We hope that this report will help you understand your body better and to align your care, diet, and therapy to your genetic type to get the best support. Please note that the report is based on preliminary studies and is meant only for educational purposes. This report should be interpreted only by a medical practitioner.

How to read your report

Human health is a complex interplay between genetics and the environment (lifestyle, diet, activity, stress and other factors). Your genes, training, diet and lifestyle, all play a vital role in your well-being.

This report is presented in a user friendly language and format. The following tips will help you get the best information value out of the report.

1. The word *likely* is used often in the report. What does it mean?

People generally know that high cholesterol can lead to heart conditions. However, there are individuals with high cholesterol who do not develop heart disease. Similarly, smoking can lead to lung disease, but not always. Hence, certain genetic parameters can lead to certain outcomes but other factors may modify the outcome. *likely* means, it is more likely that one will see the outcome, but other factors may modify it.

2. What does the term *average* mean in the report?

Average implies neither high nor low, rather an intermediate outcome. For example, average likelihood of weight gain is an intermediate level between high and low likelihood. Average can also be understood in the context of *normal* or *typical* or *moderate*

3. How do I know which result is applicable to me?

Only results with a check mark ✓ or ▲ are applicable to you, the others are not applicable. All possible outcomes are provided in the table to provide a context to your outcome.

4. Where did the information contained in the report come from?

The genetic markers that are used in this report are based on scientific studies published in international journals. A list of references is available for you to read on our web blog.

5. Some sentences are colored in green and others in red, why?

Attributes that are advantageous in nutritional well-being are indicated in green and those that are not advantageous are in red. Moderate or Neutral outcomes are indicated in black.

6. In the vitamins and Micro Nutrient section, what does normal intake indicate?

Normal intake refers to the Recommended Dietary Allowance (RDA) of the specific vitamin or mineral.

Your Outcomes

Trait Name	Your Result	Outcomes
Genetic Risk Of Severe Covid-19 Genetic variation in severity of COVID-19 Learn more		Average likelihood of experiencing severe COVID19
		Low likelihood of experiencing severe COVID19
		Higher likelihood of experiencing severe COVID19
Vitamin D Needs Genetic variation in vitamin d needs Learn more		Moderately increase vitamin D intake
		Maintain normal Vitamin D intake
		Significantly increase vitamin D intake
Vitamin C Needs Genetic variation in vitamin c needs Learn more		Moderately increase vitamin C intake
		Maintain normal Vitamin C intake
		Significantly increase vitamin C intake
Vitamin A Needs Genetic variation in vitamin a needs Learn more		Moderately increase vitamin A intake
		Maintain normal Vitamin A intake
		Significantly increase vitamin A intake
Zinc Needs Genetic variation in zinc needs Learn more		Moderately increase Zinc intake
		Maintain normal Zinc intake
		Significantly increase Zinc intake
Selenium Needs Genetic variation in selenium needs Learn more		Moderately increase Selenium intake
		Maintain normal Selenium intake
		Significantly increase Selenium intake

Trait Name	Your Result	Outcomes
Response To Bcg Vaccine Genetic variation in response to BCG vaccine Learn more		Moderately likely to respond to BCG vaccine
		Less Likely to respond to BCG vaccine
		Likely to respond to BCG vaccine
Response To Hydroxychloroquine Genetic variation in response to hydroxychloroquine Learn more		Moderately likely to respond to hcqs
		Less Likely to respond to hcqs
		Likely to respond to hcqs
Response To Lopinavir And Ritonivir Genetic variation in response to Lopinavir and ritonivir Learn more		Less Likely to respond to lop-rit
		Likely to respond to lop-rit
		Likely to have lower growth of Bifidobacterium
Tendency For Growth Of Bifidobacterium Sp Genetic variation in growth of Bifidobacterium Sp Learn more		Likely to have better growth of Bifidobacterium
		Likely to have slightly better growth of Bifidobacterium



Genetic Risk Of Severe Covid-19

Average likelihood of experiencing severe COVID19

The recent pandemic of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has shown clinical variation in COVID19 severity, which may also be due to differences in host genetic factors. Understanding the genetic architecture of host response to viruses provides new insight into managing the spread of the disease. Research studies have shown that genetic variants associated with host cell entry, production of cytokines, and immune response are associated with the severity of the infection. It has been shown that individuals with the HLA-B*46-01 allele were associated with higher infection severity during the 2003 SARS outbreak. The SARS-CoV-2 infection may also have a significant association with the genetics of the host. Research studies conducted using UK Biobank (UKB) data have identified certain genetic factors. People of certain genetic types have a higher risk of severe COVID19 symptoms when exposed to the virus.

Recommendations:

You have a moderate genetic tendency to exhibit severe COVID-19 symptoms. It is important to maintain personal hygiene and avoid the risk of infection with SARS-CoV-2, irrespective of genetic factors associated with COVID19 disease severity. Here are some WHO recommended guidelines to follow to limit the risk

- Cover your nose and mouth when you or anyone else sneezes
- Move 2 m away from anyone who sneezes or coughs
- Wear a mask
- Do not touch your eyes, nose or mouth with unwashed hands
- Do not share objects like phones, towels or even pens
- Wash your hands often with soap and water for at least 20 seconds. Use an alcohol-based hand sanitizer that contains at least 60% alcohol if soap and water are not available.
- Throw used tissues into the trash
- Clean and disinfect frequently touched objects and surfaces.
- Thoroughly cook meat and eggs
- No unprotected contact with live wild and field animals

Genes Analyzed: ACE2, HLA-DRB1*1501, HLA-DQA1*01:02, HLA-B27



Vitamin D Needs

Moderately increase vitamin D intake

Vitamin D is essential for the absorption of Calcium from the intestine and enhances immunity. Research studies have shown a protective role of vitamin D against respiratory infections. Vitamin D mediated mechanisms lower viral replication while increasing anti-inflammatory cytokines and lowering pro-inflammatory cytokines that may result in inflammation-mediated pneumonia. Our body can synthesize Vitamin D from cholesterol when the skin is exposed to adequate amounts of sunlight. Preliminary studies have shown a significant association between vitamin D deficiency and increased severity of COVID-19. People of a certain genetic type need more Vitamin D in their diet.

Recommendations:

You may have a genetic tendency for moderately low vitamin D levels. Meet your daily requirements for Vitamin D to ensure sufficient levels and to maintain immunity. Measure serum Vitamin D level, if below normal even after meeting RDA requirements; consult a physician. Here are some ways to increase Vitamin D levels, if your blood levels are low

- **Ensure a balanced exposure to sunlight:** The sun's UV radiation is one of the best ways to maintain Vitamin D levels. However, excessive exposure to sunlight should be avoided. People with darker skin need to spend a longer time under the sun as melanin may affect vitamin D production.
- **Eat Vitamin D rich foods:** Seafood is rich in vitamin D, though the amount of vitamin D varies between species of seafood. Wild salmon is associated with higher levels of vitamin D. Other sources of vitamin D include mushrooms, egg yolks, and fortified foods.
- **Include calcium-rich foods:** Including calcium-rich foods in the diet to improve the absorption of vitamin D. Calcium rich food sources are chia seeds, beans, lentils, almonds, spinach, tofu, milk & milk products, eggs, mushrooms, and ragi.
- **Vitamin D Supplements:** Though you have a genetic risk for moderately low vitamin D levels, check blood levels and with your nutritionist before taking vitamin D supplement

Genes Analyzed: NADSYN1, CYP2R1, GC2, CYP27B1, GC, GC1, VDR



Vitamin C Needs

Maintain normal Vitamin C intake

Vitamin C is a potent antioxidant and is essential for enhanced immunity. Research studies have shown an association between vitamin C deficiency and pneumonia. Administration of vitamin C may help in preventing and relieving symptoms of flu, while it may also help in lowering the duration of the common cold. Similarly, vitamin C supplementation may help in supporting immune responses among people who are deficient and at risk of COVID-19. People of a certain genetic type need more Vitamin C in their diet due to lower levels in the body.

Recommendations:

You may have a genetic tendency for normal vitamin C levels. Meet your daily requirements for Vitamin C to ensure sufficient levels and to maintain immunity. Measure serum Vitamin C level, if below normal even after meeting RDA requirements, consult a physician. We cannot produce vitamin C, and so, we have to consume vitamin C rich foods regularly. Vitamin C rich foods include agathi, cabbage, coriander leaves, drumstick leaves, capsicum, guava, green chillies, orange, and broccoli

Genes Analyzed: SLC23A1



Vitamin A Needs

Moderately increase vitamin A intake

Vitamin A is required for clear vision, healthy skin, and enhanced immunity. Vitamin A deficiency is associated with a higher risk of viral infections with lower immune response. Vitamin A has been known to support immune functions like apoptosis, antibody production, and improving the function of T cells, B cells, and macrophages. Animal sources provide Vitamin A in the form of retinol. In contrast, some plant sources provide the precursor of Vitamin A in the form of carotenes, which in turn must be converted to retinol. People of a certain genetic type need more Vitamin A in their diet due to less efficient conversion of carotenoids to retinol.

Recommendations:

You may have a genetic tendency to have moderately low vitamin A levels. Meet your daily requirements for Vitamin A to ensure sufficient levels and to maintain immunity. Measure serum Vitamin A level, if below normal even after meeting RDA requirements, consult a physician. Vitamin A is fat-soluble and is absorbed better into the bloodstream when eaten with fat. Here are some sources of vitamin A and provitamin A

- **Include foods rich in vitamin A:** Beef liver, cod liver oil, salmon, king Mackerel, cheese, tuna, butter, and hard-boiled egg are a few food sources rich in vitamin A
- **Intake of Provitamin A rich fruits:** Your genetic report indicates that you may be moderately less efficient at converting provitamin A to vitamin A. Mango, papaya, grapefruit, watermelon, cantaloupe, apricot, tangerine, and guava are some of the fruits that are rich in provitamin A
- **Intake of Provitamin A rich vegetables:** Your genetic report indicates that you may be moderately less efficient at converting provitamin A to vitamin A. Sweet potato, collards, kale, carrot, turnip greens, red pepper and spinach are some of the vegetables that are rich in provitamin A.
- **Include Supplements:** Your genetic report indicates that you may be moderately less efficient at converting provitamin A to vitamin A. If you are a vegan, you may need to eat plenty of fruits and vegetables or take supplements. However, consult your nutritionist before taking Vitamin A supplements

Genes Analyzed: BCM01, CYP26B1, BCMO12, BCMO11, BCMO1, PKD1L21, PKD1L2



Zinc Needs

Significantly increase Zinc intake

Zinc plays a vital role in the proper functioning of the immune system, cell division, cell growth, and in the breakdown of carbohydrates. Zinc is also essential for the senses of taste and smell. This micronutrient is associated with most enzymatic functions and is essential for normal function and development of cells that regulate nonspecific immunity. Zinc is also associated with the development of acquired immunity, with deficiency impairing antiviral immunity. People of a certain genetic type need more Zinc in their diet due to lower levels in the body.

Recommendations:

You may have a genetic tendency for low zinc levels. Meet your daily requirements for Zinc to ensure sufficient levels and to maintain immunity. Since you have a genetic tendency for lower Zinc levels, measure serum Zinc, if below normal even after meeting RDA requirements, consult a physician. Here are some ways to increase Zinc levels, if your blood levels are low

- **Increase intake of Zinc-rich foods:** Zinc-rich foods include meat, shellfish, legumes, flax seeds, cashew nuts, kidney beans, pumpkin seeds, and watermelon seeds.
- **Factors affecting Zinc uptake:** Since you have a genetic tendency for lower absorption of Zinc, you may lower the risk of other factors reducing uptake. Alcohol abuse, the presence of digestive diseases like ulcerative colitis and Crohn's disease, and surgery to the stomach or intestine may affect the uptake of Zinc.
- **Include Supplements:** Your genetic report indicates that you may be less efficient at absorbing Zinc. If you are a vegan, you may need to eat plenty of nuts, as mentioned earlier, and seeds or take supplements. However, consult your nutritionist before taking Zinc supplements.

Genes Analyzed: CA1, NBDY, IIG, MT1A



Selenium Needs

Maintain normal Selenium intake

Selenium is an integral part of the body's defense against viral infection through the synthesis of antioxidant enzymes. The deficiency of Selenium is associated with increased susceptibility to viral infections. Selenium is bound to organic molecules and forms an essential group of proteins called Selenoprotein. Selenoproteins are important in the antioxidant defense systems, which include superoxide dismutase (SOD), vitamin E, catalase (CAT), glutathione (GSH), carotenoids, and ascorbic acid. People of a certain genetic type may benefit from selenium supplementation and may need more Selenium in their diet due to lower levels in the body.

Recommendations:

You may have a genetic tendency for normal selenium levels. Meet your daily requirements for Selenium to ensure sufficient levels and to maintain immunity. Measure serum selenium level, if below normal even after meeting RDA requirements, consult a physician. The mineral may be destroyed during food processing, so whole foods are a better source. Selenium rich foods like brazil nuts, yellowfin tuna, turkey, chicken, white button mushrooms, and brown rice.

Genes Analyzed: CBS



Response To BCG Vaccine

Moderately likely to respond to BCG vaccine

Bacillus Calmette-Guerin (BCG) is widely used against Tuberculosis but is known to provide only partial and inconsistent immunity. The discrepancy in immunity levels between individuals may be due to different BCG vaccine strains, prior exposure to environmental mycobacteria, and host genetics. Research studies have shown that host genetic factors play an essential role in immunity after BCG vaccination. Human Toll-Like Receptors (TLR) recognize pathogen-associated molecular patterns (PAMPs), which leads to the activation of signaling cascades that initiate an innate immune response against microbial infection. Certain genes in the TLR pathway are associated with immunity post-BCG vaccination. SARS-CoV-2 is a single-stranded positive-sense RNA virus, and since the BCG vaccine has been shown to lower the severity of infections like yellow fever and mengovirus caused by viruses of similar structure, controlled clinical trials are being carried out to understand its effect on immunity against COVID19. People of certain genetic types may have increased immunity to certain viral infections post BCG vaccination.

Recommendations:

You have a moderate genetic tendency to respond to BCG vaccine. Currently, the genetic response to BCG as a vaccine for certain other disease conditions has been documented, and the information is used to identify the likely response when used for COVID-19. Please consult your physician before making any changes to drug protocols.

Genes Analyzed: TLR11, TLR12



Response To Hydroxychloroquine

Moderately likely to respond to hcqs

Hydroxychloroquine is an immunomodulatory drug which has been shown to be associated with blocking viral entry into host cells. A systematic review conducted provided support for the use of chloroquine and hydroxychloroquine among patients with COVID-19. Multiple clinical trials are currently being conducted to identify the effect of hydroxychloroquine. The drug is currently in use for other diseases/conditions, and certain research studies have shown that people of certain genetic types have a better response to this drug than others.

Recommendations:

You have a moderate genetic tendency to respond to hydroxychloroquine treatment. Currently, the genetic response to hydroxychloroquine as a treatment for malaria and systemic lupus erythematosus have been documented, and this information is used to identify likely response when used for COVID-19. Please consult your physician before making any changes to drug protocols.

Genes Analyzed: TNF, MTHFR, II-10



Response To Lopinavir And Ritonavir

Less Likely to respond to lop-rit

The lopinavir-ritonavir combination of drugs has been used in the treatment of HIV infection. However, these drugs have shown promise in the treatment of COVID19. The inhibitory effects of cytochrome P450 in ritonavir help in increasing the half-life of Lopinavir, increasing the period of protease inhibitory action, thereby controlling HIV replication. Preliminary in-vitro studies have shown that the lopinavir/ritonavir combination may inhibit the replication of the novel Coronavirus. Certain case reports published by scientists from China, Thailand, and Japan have described the effectiveness of this combination in COVID-19. There are several clinical trials that are currently being conducted to identify the effectiveness, with some showing no benefit while others show promise. People of certain genetic types respond better to this combination of drugs than others.

Recommendations:

You have a low genetic tendency to respond to lopinavir-ritonavir treatment. Currently, the genetic response to lopinavir-ritonavir as a treatment for AIDS has been documented, and the information is used to identify likely response when used for COVID-19. Please consult your physician before making any changes to drug protocols

Genes Analyzed: CYP3A4, ABCB12, ABCB11



Tendency For Growth Of *Bifidobacterium Sp*

Likely to have slightly better growth of *Bifidobacterium*

Covid-19 is associated with severe pneumonia and progression to acute respiratory distress syndrome (ARDS), particularly among individuals who are immune-compromised and the elderly. Research studies have shown that gut microbiota may be associated with the pathogenesis of ARDS. It is speculated that a possible gut-lung connection may influence the clinical manifestation of COVID-19. It is estimated that nearly 60% of patients with COVID-19 show symptoms of gastrointestinal disturbance like diarrhea, vomiting, and nausea. *Bifidobacterium Sp* is a vital gut commensal that helps in digestion and prevents the colonization of pathogenic bacteria. People of certain genetic types have a higher tendency for improved growth of *Bifidobacterium*.

Recommendations:

You have a high genetic tendency to be conducive to the growth of *Bifidobacterium*. Though you have a high genetic tendency for higher growth of *Bifidobacterium*, environmental, diet, and lifestyle factors may affect growth. Here are a few ways to improve growth. The recommendations are based on preliminary studies. Please consult a medical practitioner before making any changes to your diet.

- **Consume Whey protein:** If you are not lactose intolerant, include protein extract of whey and pea. Consuming protein extracts of whey and pea has been shown to increase *bifidobacterium* growth in the gut. Whey also reduces the risk of growth of pathogenic bacteria *Bacteroides fragilis* and *Clostridium perfringens*
- **Consume a low-fat diet:** Consumption of a low-fat diet has been shown to increase the abundance of *Bifidobacterium*
- **Consume probiotics that contain *Bifidobacterium Sp*:** It has been shown that animal-based diet increased the abundance of bacteria that were associated with increased risk of intestinal bowel disease. This fluctuation of the gut microbiota caused by an animal-based diet may be restored by the consumption of probiotics that contain *Bifidobacterium Sp*.

Genes Analyzed: LCT1, LCT

Disclaimer

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Only full genome sequences are exhaustive. All other forms of genetic tests only provide a limited subset of genetic information that has been found to be relevant to specific conditions. Since this report is not generated by conducting a whole genome sequence test, the results reported are limited to a specific set of mutations known to be associated with specific conditions. Genetic information is also subject to revision based on the latest advances in scientific research. Therefore it is possible that the interpretation of results reported herein may vary or be altered subject to ongoing research. Sometimes, the interpretations may vary from company to company based on which studies are being given a higher preference compared to others.

Xcode's role is limited to providing results of genetic test and providing a broad set of general recommendations. More detailed recommendations that may be specific to you are to be made by qualified Professional Practitioners only. General guidelines provided in our report are for information purpose only and are meant to aid your Professional Practitioner to render the relevant professional or medical advice and treatment. While assessing your genetic parameters and providing the report and recommendations, we do not consider your past or existing health conditions and or any medication taken by you (either in the past or currently), even if you may have provided us with such information. Our report and the recommendations therein are to be acted upon in consultation with a medical or other health and wellness professional practitioner.

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