

HLA-DRB1 (Autoimmunity)

Gene Report

REPORT CATEGORY —



INFLAMMATION &
AUTOIMMUNITY

Sample Client

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DISCLAIMER

This report does not diagnose this or any other health conditions. Please talk to a healthcare professional if this condition runs in your family, you think you might have this condition, or you have any concerns about your results.

Personal information

NAME

Sample Client

SEX AT BIRTH

Male

HEIGHT

5ft 5" 165cm

WEIGHT

137lb 62kg



How this works

Our Wellness Reports analyze how your DNA influences your health.
We then use this analysis to give you personalized risk estimates and recommendations.



Similarly, our Trait Reports look at how your DNA influences your traits.



Your DNA is like an instruction manual — it contains a lot of information.
You can think of it as a blueprint for your body.

Genetic variants are parts of DNA that differ from person to person. Some can make you more vulnerable to certain health issues, while others may influence traits such as eye color.



We use artificial intelligence and machine learning to analyze all this information.
We then summarize your results as a risk score or display it on a gauge.

In total, we analyze up to 83 million genetic variants.

When we give a risk score, the risk icon tells you if you are at a higher or lower risk compared to other people:



Genotype color info:

AA

You don't have any risk alleles

AA

You have 1 risk allele

AA

You have 2 risk alleles

Your risk is also displayed as a percentile. This will tell you how your risks compare to our sample population. The lower your percentile number, the lower your risk. The "50th percentile" would be an average risk.

Similarly, the gauge tells you your relative risk score compared to our sample population, or it indicates a specific trait or haplotype you are more likely to have based on your genetic variants.

When applicable, we also list top evidence-based recommendations that may help lower your risk. The focus is on recommendations that may be of benefit to you, based on your genetics.

Our recommendations come in four categories: lifestyle, diet, supplements and drugs.
The following icons tell you which category a recommendation falls into:



Our team of scientists also ranks each recommendation.
We rank based on impact and the strength of evidence in the medical literature.

Impact shows how strongly a recommendation will affect your health in a certain area.
Evidence is how much scientific support there is for the recommendation. Rankings are from 1 to 5 (low to high):



Impact

Impact scores range from 1-5. These scores reflect how much of an effect each recommendation can have. An impact score of 5 predicts the biggest effect.

When a recommendation affects something we can measure, we use those measurements to assign the impact score. For example, a recommendation that decreases cholesterol by 20% will have a higher impact score than one that decreases it by 5%.

Some recommendations affect things that we cannot directly measure, like stress or mood. For these, the impact score is based on how well they work relative to other recommendations and standard treatments. The best ones get the highest scores.

If there is a lot of research that shows a recommendation works especially well for your genotype, the impact score gets increased.

Recommendation Evidence

- 5 / 5
- Recommendations that are considered effective and generally recommended by experts and medical bodies.
-
- 4 / 5
- Recommendations that are considered likely effective and that have multiple independent meta-analyses and a great many studies supporting them.
-
- 3 / 5
- Recommendations that are considered possibly effective and have many studies supporting them
-
- 2 / 5
- Recommendations that have insufficient evidence, with two or several clinical trials supporting them, or many studies but with ambiguous results.
-
- 1 / 5
- Recommendations that have insufficient evidence, with a single clinical trial, or with many studies most of which didn't find support for the recommendation.
-
- 0 / 5
- No evidence in humans.

Genotype-specific Evidence

- High-quality
- Direct evidence that a recommendation helps more in people with your gene variant (many clinical trials, a few large clinical trials, or a meta-analysis).
- Medium-quality
- Direct evidence that a recommendation helps more in people with your gene variant (a few clinical trials or one large clinical trial).
- Low-quality
- Direct evidence that a recommendation helps more in people with your gene variant (a single clinical trial or more trials with inconsistent results).
- Indirect
- A recommendation may help more in people with your gene variant because it targets a specific gene or protein affected by your variant (e.g., MTHFR, dopamine).
- In theory
- A recommendation may help more in people with your gene variant because it targets a specific mechanism affected by your variant (e.g., inflammation, oxidative stress).

Some things to keep in mind:

- Genetics doesn’t play a considerable role in a condition or a trait.
- There is not enough research available to estimate a genetic predisposition.
- There are technical limitations to estimating or presenting a genetic predisposition.
- The topic is sensitive, and a genetic predisposition should only be estimated and presented by a healthcare professional.

Introduction

The *human leukocyte antigen (HLA)* system is a group of human genes encoding the major histocompatibility complex (MHC) proteins. HLAs are proteins or antigens on the surface of [white blood cells](#). They help flag and remove external agents that may harm the body or cause infections [\[R\]](#).

The HLA system has three groups or classes; HLA-DRB1 belongs to class II. These receptors present outside peptides (antigens) to T-helper cells, triggering the immune response to attack and neutralize them [\[R\]](#).

The [HLA-DRB1](#) gene encodes the beta chain, which merges with the alpha chain to form the HLA-DR receptor. Hundreds of DRB1 variants can change the structure and activity of this receptor and thus impact the immune response. Some of them have been associated with [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#):

- [IBD](#)
- Multiple sclerosis
- Sarcoidosis

HLA-DRB1

Genetics

HLA-DRB1 plays vital roles by controlling the immune response against pathogens. It presents pathogenic peptides to white blood cells, enabling their removal. However, specific variants of this receptor may mistakenly flag our own peptides and thus contribute to autoimmune inflammation. This phenomenon is known as “molecular mimicry” and may lead to autoimmunity [\[R\]](#), [\[R\]](#), [\[R\]](#).

For instance, the ‘G’ allele at [rs2395185](#) marks the allele HLA-**DRB1*1101** and is linked to a higher expression of the *HLA-DRB1* and *DQA1* genes. This variant has been associated with higher rates of ulcerative colitis in several studies, as well as with type 1 diabetes. On the bright side, it also predicts a better response to anti-[TNF](#) treatment [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

Another polymorphism, [rs9271366](#), marks HLA-**DRB1*1502** and may have a role in IBD by changing the HLA-DR structure. Its ‘G’ allele has been associated with higher rates of ulcerative colitis in different populations [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

Finally, the ‘C’ allele of [rs3763313](#) is associated with 19% higher rates of Crohn’s disease, according to a meta-analysis of three studies and over 15,000 European subjects. Another meta-analysis with nearly 9.5K European participants linked the same allele with ulcerative colitis. This variant has also been associated with an increased risk of tuberculosis. In contrast, it may be protective against dilated cardiomyopathy [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

One of the earliest observed genetic associations with [Graves' disease](#) (autoimmune hyperthyroidism) refers to a so-called "DR3-DQ2" haplotype (a group of genetic variants). It includes three alleles — **DRB1*0301**, **DQB1*0201**, and **DQA1*0501** — and correlates with more than doubled GD rates. **DRB1*0301** is likely the lead variant responsible for the association with Graves’ disease [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

Studying its connection with other autoimmune conditions, scientists have identified a “tag” SNP for DRB1*0301: the “T” allele at [rs2187668](#) [\[R\]](#).



Likely typical HLA-DRB1 genetics based on 4 genetic variants we looked at

Your top variants that most likely impact your genetic predisposition:

GENE	SNP	GENOTYPE
HLA-DQA2	rs2395185	TG
/	rs9271366	AG
HLA-DRB1	rs2516049	CT
HLA-DRB5	rs3763313	AA
HLA-DQA1	rs2187668	CC

The number of "risk" variants in this table doesn't necessarily reflect your overall result.

The above haplotype is among the crucial genetic factors of [celiac disease](#) in European descendants, confirming a strong connection between gluten intolerance and autoimmune thyroid conditions. Other associated conditions include [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#):

- Systemic lupus erythematosus (SLE)
- Type 1 diabetes
- Idiopathic membranous nephropathy (kidney disease)

A study of over 39,000 participants found a SNP in the HLA-DRB1 gene slightly associated with low [thyroid hormones](#). People with the “C” allele at [rs2516049](#) had 15% higher rates of hypothyroidism. The same SNP is also associated with [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#):

- Epstein-Barr virus infection
- Asthma
- Ulcerative colitis

Your Recommendations

Your recommendations are prioritized according to the likelihood of it having an impact for you based on your genetics, along with the amount of scientific evidence supporting the recommendation.

You’ll likely find common healthy recommendations at the top of the list because they are often the most impactful and most researched.

DOSAGE		DOSAGE	
1	Dietary Vitamin D	2	Omega-3 (Fish Oil) 2000 mg
3	Avoid Food Triggers	4	Dietary Zinc
5	Black Seed (Black Cumin) 1000 mg		

1



Dietary Vitamin D

IMPACT

3 / 5

EVIDENCE

3 / 5

How to implement

Incorporate foods high in Vitamin D into your daily diet. Examples include fatty fish like salmon and mackerel, cheese, egg yolks, and fortified foods such as milk, orange juice, and cereals. Aim for at least three servings of these Vitamin D-rich foods per week.

Description

Your body needs [vitamin D](#) for strong bones. Vitamin D also plays a role in [\[R\]](#):

- Mood
- Immunity
- Heart health
- Blood sugar control

[Sunlight](#) is our main source of vitamin D. Experts recommend getting at least **5-15 minutes of midday sun, 2-3 times per week**. People with darker skin and those living at high latitudes may need longer periods of sun exposure [\[R, R\]](#).

Foods like fish, eggs, and fortified milk provide small amounts of vitamin D. **People lacking vitamin D should consider taking a supplement** [\[R\]](#).

Please note: *Experts recommend getting 600-800 IU of vitamin D per day. Medical bodies recommend against taking more than 4,000 IU per day* [\[R\]](#).

How it helps

Some research has suggested that UV light and [vitamin D](#) have beneficial effects on autoimmunity by suppressing the HLA class II inflammatory molecules [\[R, R, R, R\]](#).

Moderate [sun exposure](#) is the best way to get natural UV light and vitamin D, which both help suppress inflammation [\[R, R\]](#).

IBD is associated with [calcium](#) and vitamin D deficiencies and subsequent osteoporosis, which makes sun exposure critical. Vitamin D deficiency may increase IBD severity, so it's a vicious cycle [\[R, R, R, R, R\]](#).

Moderate sun exposure can suppress HLA class II receptors, reduce inflammation, and prevent vitamin D deficiency, which is common in IBD patients.

2



Omega-3 (Fish Oil)

IMPACT

3 / 5

EVIDENCE

3 / 5

How to implement

Take 1-2 g of omega-3 (fish oil) supplement daily, preferably with a meal to enhance absorption.

TYPICAL STARTING DOSE

2000 mg

Description

Omega-3 fatty acids are essential fats found in fatty fish like salmon, flaxseeds, and walnuts. They are known for their potential cardiovascular and brain health benefits, including reducing the risk of heart disease and supporting cognitive function.

[Omega-3 fatty acids](#) are some of the healthiest fats we can eat. They help lower inflammation and protect the heart, brain, and eyes. Our bodies produce less omega-3s than we need for optimal health, so it's important to get enough through food or supplements [\[R\]](#), [\[R\]](#), [\[R\]](#).

There are three major types of omega-3s: ALA, EPA, and DHA [\[R\]](#), [\[R\]](#).

Fatty fish are rich in EPA and DHA. They include [\[R\]](#):

- Salmon
- Tuna
- Herring
- Sardines

For optimal protection, try to get at least **two servings of fatty fish per week**. Fish oil supplements are available for those who don't eat fish regularly [\[R\]](#).

How it helps

In a study of 136 subjects, omega-3 fatty acids found in [fish oil](#) (EPA and DHA) were beneficial in those carrying the HLA class II risk alleles for autoimmunity. Omega-3s suppressed HLA-DRB1 in one animal study [\[R\]](#), [\[R\]](#).

High intake of fish oil omega-3s may be protective against the development of Crohn's disease [\[R\]](#).

It is unclear whether omega-3 supplementation can help with Crohn's disease that has already developed and progressed. However, multiple studies have suggested that omega-3s may help keep it in remission [\[R\]](#), [\[R\]](#).

3



Avoid Food Triggers

IMPACT3 / 5

EVIDENCE3 / 5

How to implement

Identify foods that trigger negative reactions in your body, such as digestive issues, allergies, or headaches, and eliminate them from your diet entirely. This may require keeping a food diary for a few weeks to observe patterns and might involve cutting out common triggers like dairy, gluten, soy, or certain additives. Continuously monitor and adjust your diet to avoid these triggers as long as the symptoms persist.

Description

Food triggers are specific substances or ingredients in one's diet that can exacerbate or induce adverse reactions, such as allergies, sensitivities, or digestive issues, often leading to symptoms like inflammation, bloating, or discomfort.

A "trigger" is something that prompts or worsens the symptoms of a health condition.

Food triggers can lead to a wide range of symptoms in people who are sensitive to them. These may include [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#):

- Gut problems
- Skin problems
- Migraines

How it helps

Dietary [lectins](#) may worsen inflammation in people sensitive to them. They increase the expression of HLA class II molecules, potentially worsening the effect of your variants [\[R\]](#), [\[R\]](#).

Preliminary research suggests that avoiding lectins may reduce the symptoms of autoimmune conditions in sensitive individuals. Still, more research is needed to clarify the possible connection between lectins and autoimmunity in humans [\[R\]](#).

According to research, the following foods may also be problematic for IBD patients and those at risk [\[R\]](#), [\[R\]](#), [\[R\]](#):

- FODMAPs
- Margarine and certain cooking oils (omega-6 PUFAs)
- Animal protein (excluding fish)
- Processed meat
- Alcohol

Elimination diets such as the [Lectin Avoidance Diet](#) may help identify and remove common food irritants that may be worsening autoimmunity in sensitive individuals [\[R\]](#), [\[R\]](#), [\[R\]](#).

4



Dietary Zinc

IMPACT2 / 5

EVIDENCE2 / 5

How to implement

Incorporate foods high in zinc, such as beef, poultry, seafood (especially oysters), beans, nuts, and whole grains, into your daily diet. Aim for the recommended dietary allowance of zinc, which is 11 mg per day for adult men and 8 mg per day for adult women.

Description

Dietary zinc is essential for the body. It helps our immune system fight off bacteria and viruses, plays a role in healing wounds, and is essential for our sense of taste and smell. Without enough zinc, these systems may not work as effectively as they should.

How it helps

[Zinc](#) deficiency may contribute to inflammation by stimulating MHC (HLA) class II molecules [\[R\]](#).

In a comprehensive study with over 170K women, increased zinc intake correlated with lower rates of Crohn’s disease but not ulcerative colitis. Food sources showed a stronger connection than zinc supplements [\[R\]](#).

In 1,000 IBD patients, zinc deficiency correlated with more frequent hospitalizations, surgeries, and complications [\[R\]](#).

5



Black Seed (Black Cumin)

IMPACT

1 / 5

EVIDENCE

1 / 5

How to implement

Take 1000 mg of black seed (black cumin) supplement daily, preferably split into two doses of 500 mg each, one in the morning and one in the evening.

TYPICAL STARTING DOSE

1000 mg

Description

Black seed, also known as black cumin or *Nigella sativa*, has been used for its potential health benefits in traditional medicine. It is believed to have anti-inflammatory, antioxidant, and immune-boosting properties.

[Black seed](#) (black cumin) and its oil are used in cooking and traditional medicine [\[R\]](#).

People use black seed for [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#):

- Asthma
- Allergies
- High blood sugar
- High blood pressure
- Joint pain

How it helps

[Black cumin](#) or black seed has well-known anti-inflammatory properties. Its active ingredient, thymoquinone, may reduce the expression of HLA class II receptors on immune cells [\[R\]](#).

The antioxidant and anti-inflammatory effects of black cumin are beneficial for a range of digestive disorders. It improved colitis in animals, but clinical trials are yet to confirm this [\[R\]](#), [\[R\]](#).

Next Steps

Remember, your genes only tell one important part of your health story!

Now that you've seen your DNA-based results for this health topic, let's take a look at other contributing factors.

Your lab results

Your lab results are impacted by the combined effect of your genes, environment and lifestyle.

Lab tests will give you the best picture of your current health status, while your genes provide insight into your health predispositions and which recommendations are best for you.

