

TLR4 (Inflammation)

Gene Report

REPORT CATEGORY —



INFLAMMATION &
AUTOIMMUNITY

Sample Client

Report date: 15 January 2026

Table of Contents

03 How this works

- 04 Impact
- 05 Evidence
- 06 Some things to keep in mind

07 Introduction

08 Your genetics

09 Your recommendations

18 Next Steps

- 18 Your Lab Results

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

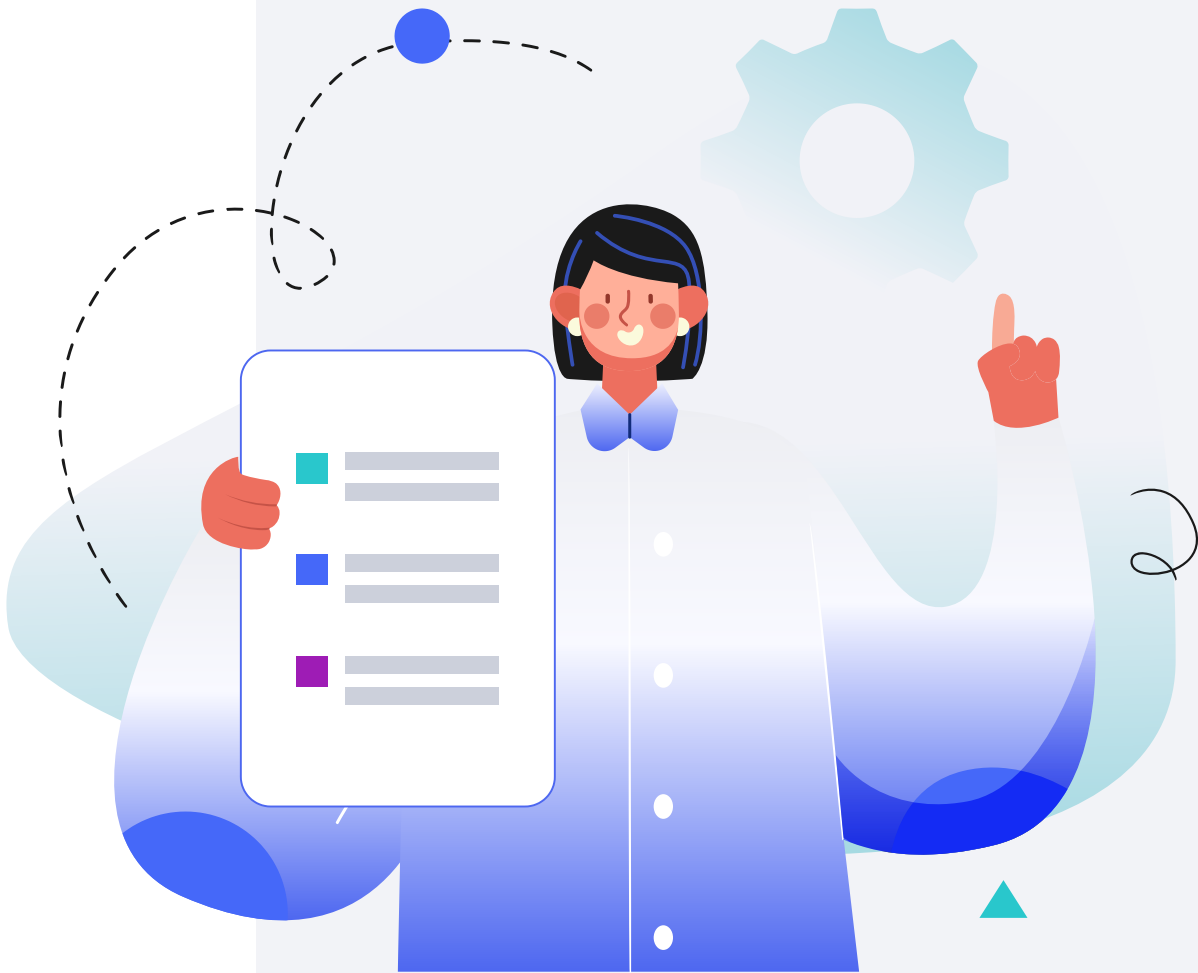
Male

HEIGHT

5ft 5" 165cm

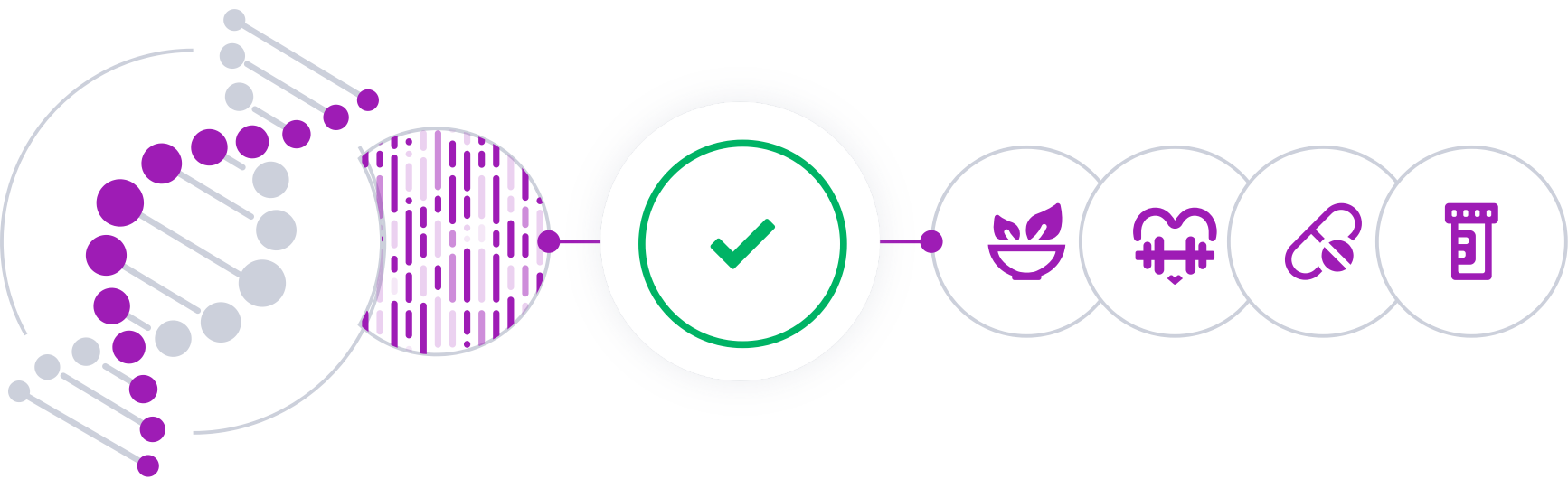
WEIGHT

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.

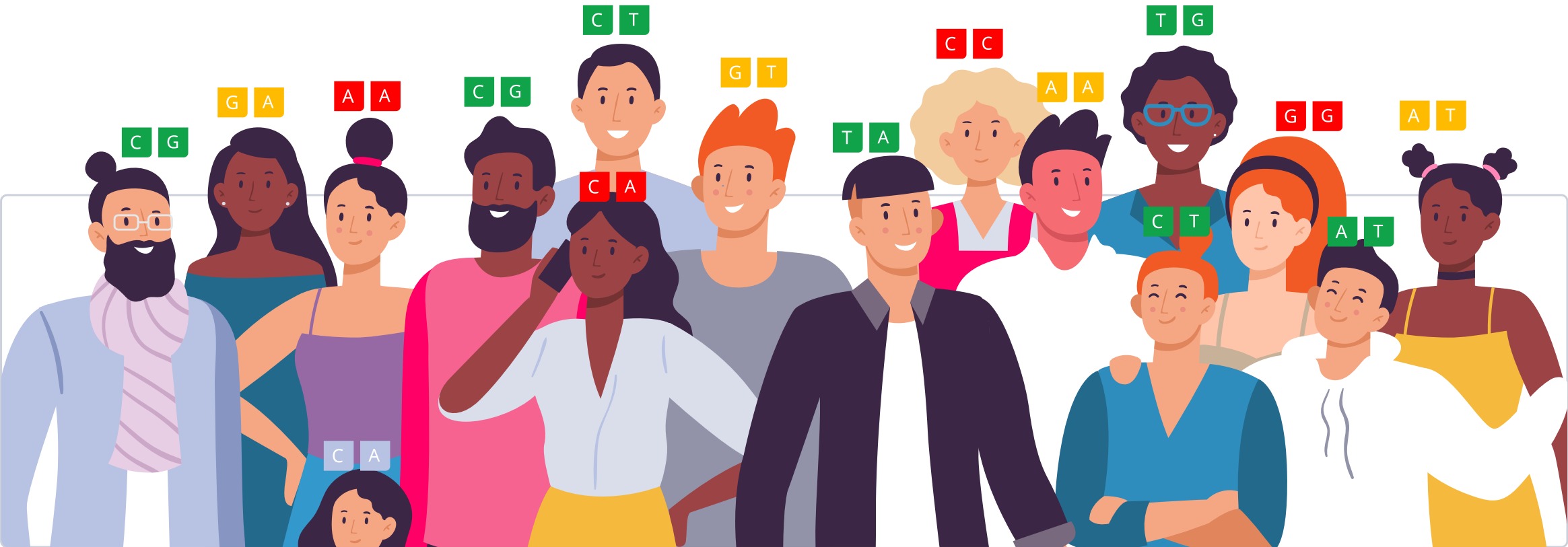


Similarly, our Trait Reports look at how your DNA influences your traits.



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

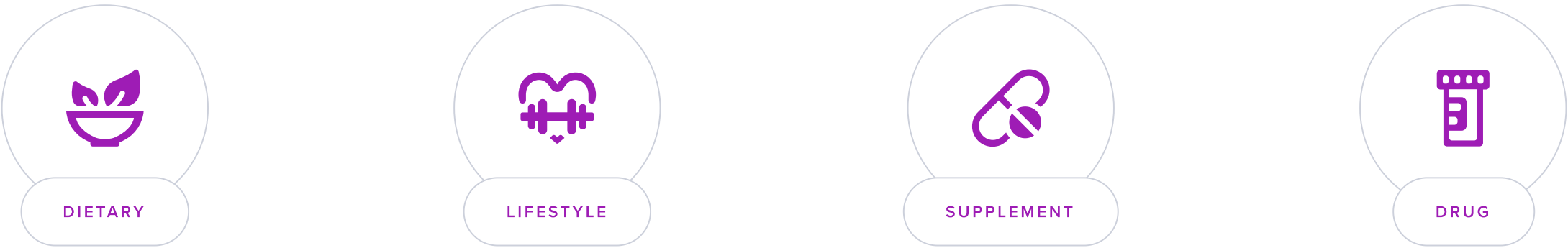
You have 2 risk alleles

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 [TLR4](#) gene codes for toll-like receptor 4. This protein jump-starts the innate immune response, which is a mechanism our bodies have for fighting pathogens we have never encountered before [\[R\]](#).

TLR4 recognizes foreign compounds on the surface of invading pathogens (usually bacteria) and activates the immune response. As part of this process, it increases inflammation through [NF-κB](#) and cytokines like [IL-1](#) and [IL-12](#) [\[R\]](#), [\[R\]](#).

TLR4 exerts its effects through interactions with other genes, including [MYD88](#), [CCL5](#), and [TICAM1](#) [\[R\]](#).

TLR4 Genetics

The most well-researched TLR4 variant is [rs4986791](#). Its minor ‘T’ allele is believed to increase TLR4 activation based on its pro-inflammatory effects [\[R\]](#).

This variant has been associated with an increased risk of:

- Crohn’s disease and severe childhood [IBD](#) [\[R\]](#), [\[R\]](#)
- Rheumatoid arthritis [\[R\]](#)
- Alzheimer’s disease [\[R\]](#)
- Septic shock [\[R\]](#)
- Asthma [\[R\]](#)
- Tuberculosis [\[R\]](#)
- Gum disease [\[R\]](#)
- Glaucoma [\[R\]](#)
- Cancer [\[R\]](#), [\[R\]](#)

However, this variant has also been linked to:

- [Acne](#) severity [\[R\]](#)
- Coronary artery disease risk [\[R\]](#)
- Type 2 diabetes risk [\[R\]](#)
- Susceptibility to HIV infection [\[R\]](#)

The other well-researched variant is [rs4986790](#). Its ‘G’ allele is believed to increase the amount of TLR4 produced and has been associated with an increased risk of [\[R\]](#)

- [PTSD](#) [\[R\]](#)
- Atopic dermatitis [\[R\]](#)
- Type 2 diabetes [\[R\]](#)
- Glaucoma [\[R\]](#)
- Age-related macular degeneration [\[R\]](#)
- Urinary tract infections [\[R\]](#)
- [Helicobacter pylori](#) infection [\[R\]](#)
- Hepatitis C infection [\[R\]](#)
- Septic shock [\[R\]](#)
- Cancer [\[R\]](#), [\[R\]](#)

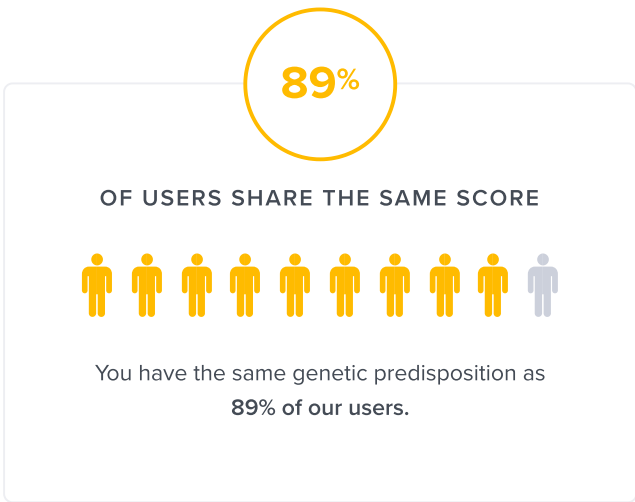
However, this has also been associated with a reduced acne severity [\[R\]](#).

Both variants are usually inherited together, so you will most likely carry either both or neither of them.



TYPICAL ACTIVITY

Likely typical TLR4 activity based on the genetic variants we looked at



Your top variants that most likely impact your genetic predisposition:

GENE	SNP	GENOTYPE
TLR4	rs4986791	CC
TLR4	rs4986790	AA

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

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	Exercise At Least One Hour a Day	1 hour	
2	Probiotics	30 billion CFU	
3	Omega-3 (Fish Oil)	2000 mg	
4	Curcumin	500 mg	
5	N-acetylcysteine (NAC)	1200 mg	
6	Green Tea	400 mg	
7	Cruciferous Vegetables		
8	Maintain Optimal Vitamin D Levels	1000 iu	

1



Exercise At Least One Hour a Day

IMPACT

4 / 5

EVIDENCE

4 / 5

How to implement

Dedicate a minimum of 60 minutes to moderate-intensity activities such as brisk walking, swimming, or cycling. Do this most days of the week, aiming for at least 5 days to optimize benefits.

TYPICAL STARTING DOSE

1 hour

Description

[Exercise](#) can do wonders for your health. It can help you lose weight, improve your heart health, boost your mood, and more [\[R\]](#).

There are many ways you can be active. You can walk, run, swim, dance, or play team sports. **Everything counts, and it's never too late to start!**

Try to get at least **60 minutes of moderate physical activity on most days**, including walking. **Getting a mix of cardio (min 150 min/day) and strength training (min 2 times a week) may be optimal.**

How it helps

Exercise has been found to reduce TLR4 expression in humans and animals. Moderate exercise may be more beneficial for this purpose than short bursts of high-intensity exercise, which may produce more inflammation [\[R\]](#).

Regular, moderate exercise may reduce inflammation in people of all ages. Both strength training and cardio may help. You can also combine both training types [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

Exercise may also reduce inflammation linked to chronic health conditions. These include [\[R\]](#), [\[R\]](#):

- Type 2 diabetes
- Heart disease

Regular aerobic exercise may lower TNF-alpha levels in multiple populations, including:

- Overweight and obese children and adolescents [\[R\]](#)
- Patients with type 2 diabetes or metabolic syndrome [\[R\]](#), [\[R\]](#), [\[R\]](#)
- Older subjects [\[R\]](#)
- People with mild cognitive impairment or dementia [\[R\]](#)
- Breast cancer survivors [\[R\]](#)

Aerobic exercise may be more effective than other types of exercise.

Note that inflammation may briefly increase after intense exercise, such as running or cycling [\[R\]](#), [\[R\]](#), [\[R\]](#).

2



Probiotics

IMPACT

3 / 5

EVIDENCE

3 / 5

How to implement

Take a probiotic supplement containing 10 billion or more live cultures once daily, preferably with a meal or as directed by the packaging or a healthcare provider.

TYPICAL STARTING DOSE
30 billion CFU

Description

Probiotics are live beneficial bacteria and yeasts that can support gut health and digestive function when consumed as supplements or found in fermented foods like yogurt and sauerkraut. They may be beneficial to gut health, immune function, blood sugar, and mood.

[Probiotic bacteria](#) are “good” bacteria found mainly in the large intestine. They support your body and mind by [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#):

- Maintaining gut health
- Supporting a healthy immune system
- Improving your mood
- Helping to maintain healthy blood sugar

Prebiotics are certain types of fiber and other complex carbs that serve as food for gut bacteria. **They support gut health by helping boost the activity and growth of “good” bacteria** [\[R\]](#), [\[R\]](#).

Prebiotics are also added to foods and supplements. Common prebiotic ingredients are [\[R\]](#), [\[R\]](#):

- Oligo-fructose
- Oligo-galactose
- [Inulin](#)

Mixtures of probiotics and prebiotics are known as **synbiotics** [\[R\]](#).

How it helps

Certain probiotic strains reduced TLR4 activation in animal studies. In rats with gut inflammation, a blend of *B. longum*, *L. bulgaricus*, and *S. thermophilus* decreased inflammation while blocking TLR4. *L. jensenii* had a similar effect in pigs [\[R\]](#), [\[R\]](#).

Clinical research proposes that many types of [probiotics](#) may significantly reduce proinflammatory cytokines [\[R\]](#), [\[R\]](#).

Probiotics may reduce inflammation by supporting “good” gut bacteria. The types of probiotics studied include [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#):

- [Lactobacillus casei](#)
- [L. acidophilus](#)
- [L. rhamnosus](#)
- [L. salivarius](#)
- [Bifidobacterium animalis](#)
- [B. longum](#)

They may also help when used with prebiotics (food for probiotic bacteria) [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

Probiotics may also reduce inflammation linked to chronic health conditions [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

3



Omega-3 (Fish Oil)

IMPACT3 / 5

EVIDENCE3 / 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

Fish oil was found to significantly decrease the production of TLR4 in mouse placenta [\[R\]](#).

[Omega-3](#) fatty acids (EPA and DHA) have potent anti-inflammatory effects. They can suppress a range of inflammatory cytokines [\[R\]](#), [\[R\]](#), [\[R\]](#).

Supplementation with **omega-3s from fish (1.7-4.2 g/day for 6-24 weeks)** may help reduce low-grade inflammation [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

Omega-3s may also reduce inflammation linked to chronic health conditions [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

Please note: *Fish oil can interact with blood thinners (like aspirin, Plavix, and Coumadin). Consult your doctor before taking fish oil* [\[R\]](#).

4



Curcumin

IMPACT

2 / 5

EVIDENCE

3 / 5

How to implement

Take a 500 mg curcumin supplement daily with food. To enhance absorption, take it with a meal that contains fats or oils since curcumin is fat-soluble.

TYPICAL STARTING DOSE
500 mg

Description

Curcumin is a compound found in turmeric known for its anti-inflammatory and antioxidant properties. It has been studied for its potential to reduce inflammation, support joint health, and contribute to overall well-being.

[Turmeric](#) is a yellow spice from India. It may reduce inflammation and [oxidative stress](#) [R].

The most important active compound in turmeric is **curcumin**. People use curcumin for [R, R, R, R, R, R]:

- Joint pain
- Hay fever
- Mood
- High blood sugar
- Gut health
- Liver health

How it helps

[Curcumin](#) is a popular anti-inflammatory compound that comes from turmeric. In mouse and cell studies, this compound blocked TLR4 and improved the symptoms of TLR4-induced gut inflammation [R].

Curcumin (1-2.4 g/day for 4-8 weeks) may reduce inflammatory markers. The effects may be stronger in people with a higher degree of inflammation. However, some studies found no benefits [R, R, R].

Note that curcumin is hard to absorb. Look for supplements with *bioavailable* curcumin, which is easier to absorb. Combining it with [piperine](#) (a compound in black pepper) may also help [R, R].

Please note: *curcumin may interfere with iron absorption due to its iron-chelating properties, potentially exacerbating anemia or making it harder to manage. If you have anemia, consult your healthcare provider before using curcumin or turmeric supplements* [R, R, R].

5



N-acetylcysteine (NAC)

IMPACT2 / 5

EVIDENCE3 / 5

How to implement

Take 600 mg of N-Acetylcysteine (NAC) supplement daily with water. It can be taken at any time of the day, but try to take it at the same time each day for best results.

TYPICAL STARTING DOSE

1200 mg

Description

NAC is a supplement that contains a form of the amino acid cysteine, a protein building block that your body uses to make the antioxidant glutathione. It is used for its potential antioxidant properties and its ability to support lung, gut, and mental health.

[N-acetylcysteine](#) (NAC) is converted to cysteine in the body. Cysteine is a protein building block (amino acid) that helps make the antioxidant glutathione [\[R\]](#).

People take NAC to potentially support [\[R\]](#), [\[R\]](#):

- Mental health
- Ovarian health and pregnancy outcomes
- Lung health
- Gut health

How it helps

NAC was found to significantly decrease TLR4 production in human cells [\[R\]](#).

A meta-analysis of 28 studies concluded that supplementation with NAC lowers homocysteine (by 1.45 pg/mL), IL-8 (by 2.56 pg/mL), and MDA (by 1.44 μmol/L), and TNF-α and IL-6 after sensitivity analysis [\[R\]](#).

6



Green Tea

IMPACT

2 / 5

EVIDENCE

2 / 5

How to implement

Consume 400 mg of green tea extract daily. This can be taken in the form of capsules or tablets available that specify the amount of green tea extract. Ensure the supplement is taken according to the product's specific instructions, usually once a day with water.

TYPICAL STARTING DOSE

400 mg

Description

Tea is a beverage made by steeping the leaves of the *Camellia sinensis* plant in hot water. It comes in various types, including black, green, white, and herbal teas, and is known for its diverse flavors and potential health benefits due to antioxidants and other bioactive compounds.

[Green](#) and black tea are made from the same plant (*Camellia sinensis*). This plant is processed in different ways to make each type of tea [\[R\]](#) [\[R\]](#).

Tea contains antioxidants called **flavonoids**, which may help prevent [\[R\]](#) [\[R\]](#) [\[R\]](#) [\[R\]](#):

- Heart disease
- Cancer
- Diabetes

How it helps

In human cells, green tea compounds (including EGCG) were found to suppress the activity of TLR4 [\[R\]](#).

High green tea intake is associated with reduced CRP. Green tea may also reduce IL-6 levels [\[R\]](#) [\[R\]](#) [\[R\]](#) [\[R\]](#) [\[R\]](#).

However, not all studies found these same benefits for drinking green tea or supplementing with green tea extract [\[R\]](#) [\[R\]](#).

Multiple studies have observed significant reductions in levels of TNF after treatment with or consumption of EGCG [\[R\]](#) [\[R\]](#) [\[R\]](#).

Please note: polyphenols from green tea may bind to iron and form insoluble complexes, which reduces iron absorption in the gut. If you have anemia, consult your healthcare provider before using green tea [\[R\]](#).

7



Cruciferous Vegetables

IMPACT

2 / 5

EVIDENCE

2 / 5

How to implement

Incorporate a serving of cruciferous vegetables, such as broccoli, cauliflower, Brussels sprouts, kale, or cabbage, into at least one meal each day. A serving size is about a half cup cooked or one cup raw. Try to maintain this habit consistently over time for the best health outcomes.

Description

Cruciferous vegetables like broccoli, cauliflower, and kale are rich in vitamins, fiber, and antioxidants. Including them in your diet can promote overall health and may offer cancer-protective properties.

Cruciferous vegetables are a group of vegetables that belong to the Brassicaceae family. They are rich in fiber, vitamins, minerals, and other nutrients.

Some common cruciferous vegetables include broccoli, cauliflower, cabbage, kale, and brussels sprouts.

How it helps

Cruciferous vegetables, which include broccoli, kale, brussels sprouts, and other related plants, are rich in a compound called sulforaphane which has been found to block TLR4 [\[R\]](#).

Consumption of cruciferous and apiaceous vegetables was shown to significantly reduce circulating interleukin-6 (IL-6) levels, although it did not consistently affect CRP levels. The study found genotype-dependent responses, indicating that genetic factors may influence how people benefit from these vegetables [\[R\]](#).

8

Maintain Optimal Vitamin D Levels

IMPACT

1 / 5

EVIDENCE

2 / 5

How to implement

Check your vitamin D levels, they should ideally be in the 30-66 ng/mL range. If your levels are lower than that, take a vitamin D supplement, 1000-4000 IU daily, to reach an optimal range.

TYPICAL STARTING DOSE

1000 iu

Description

Vitamin D, often referred to as the "sunshine vitamin," can be synthesized by the skin when exposed to sunlight, as well as being found in fish, eggs, and fortified milk. It helps regulate calcium absorption, promoting strong bones and a healthy immune system. Vitamin D deficiency can lead to conditions like rickets in children and osteoporosis in adults.

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** [\[R\]](#).

How it helps

In a clinical trial on 44 obese people, supplementation with vitamin D decreased blood TLR4 levels [\[R\]](#).

Supplementation with vitamin D may lower TNF-alpha levels in both healthy people and those with poor glycemic control or cancer [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

However, it may not affect TNF-alpha levels in overweight/obese participants or those with CKD [\[R\]](#), [\[R\]](#).

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* [\[R\]](#).

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.

