

CHDH (Choline)

Gene Report

REPORT CATEGORIES —



NUTRITION



LIVER HEALTH

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 [CHDH gene](#) codes for choline dehydrogenase, an enzyme that turns choline into betaine. In this reaction, choline supplies a methyl group needed for [homocysteine](#) clearance, as well as the production of [methionine](#) & [SAM-e](#) [[R](#), [R](#)].

At the same time, the body uses choline to make [phosphatidylcholine](#), if the [PEMT](#) enzyme can't produce enough on its own. Phosphatidylcholine is crucial for fat metabolism, liver protection, nerve function, and other important functions [[R](#), [R](#)].

CHDH Variants and Choline Needs

A study identified two [CHDH](#) variants associated with liver and muscle damage when dietary choline was restricted to <50 mg/day [\[R\]](#):

- [rs9001](#): those with the rare 'G' allele were 5x less likely to develop signs of choline deficiency
- [rs12676](#): those with the 'A' allele were 20x more likely to develop signs of choline deficiency

That said, the above study included only 57 subjects [\[R\]](#).

Other authors have noticed that people with the protective SNP, rs9001-G, use more choline for phosphatidylcholine production, and less for betaine production. On the contrary, rs12676-A favors the transformation of choline to betaine [\[R\]](#), [\[R\]](#).

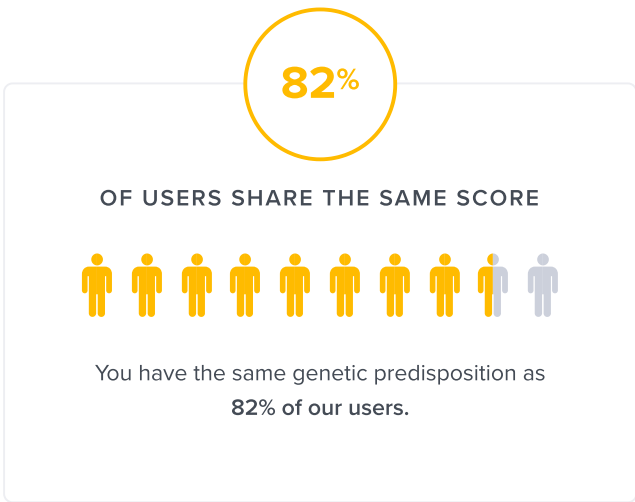
Variants that favor betaine production may deplete choline stores and impair phosphatidylcholine synthesis. In the absence of dietary choline, this effect can contribute to organ damage due to choline deficiency [\[R\]](#).

The rs12676-A variant may also be linked to breast cancer [\[R\]](#).



TYPICAL GENETICS

Likely typical CHDH genetics based on the genetic variants we looked at



Your top variants that most likely impact your genetic predisposition:

GENE	SNP	GENOTYPE
CHDH	rs9001	TT
CHDH	rs12676	CC

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	Dietary Choline	2	Choline Supplements 425 mg
3	Betaine (TMG) 500 mg	4	SAM-e 400 mg

Dietary Choline

IMPACT

5 / 5

EVIDENCE

5 / 5

How to implement

Increase your intake of choline-rich foods such as eggs, beef liver, chicken liver, fish, peanuts, and dairy products. Aim for an adult intake of about 425 mg to 550 mg of choline per day through these food sources, as part of your regular diet.

Description

Choline is an essential nutrient that supports brain function, nerve signaling, and liver health. It is involved in neurotransmitter synthesis and cell membrane structure.

How it helps

Focus on getting enough [choline](#) from food to improve your choline status. As long as you do, your problematic SNPs won't have that much of an impact. In people with a variant associated with low choline levels, reintroducing choline into a diet reversed the signs and symptoms of organ damage in most patients [R].

The recommended daily intake is 550 mg for men and 425 mg for non-pregnant women, with an upper limit of 3,500 mg/day [R].

The best food sources of choline include [\[R\]](#), [\[R\]](#):

- Beef liver: 356 mg per serving (3 oz)
- Eggs: 147 mg per serving (1 large egg)
- Chicken breast: 72 mg per serving (3 oz)
- Codfish: 71 mg per serving (3 oz)

If you are [vegan](#) or vegetarian and have the ‘bad’ *CHDH* variants, consider taking a supplement. Decent plant-based choline sources include [[R](#),[R](#)]:

- [Shiitake](#) mushrooms: 58 mg per serving (½ cup)
- [Quinoa](#): 42.5 mg per serving (1 cup)
- Broccoli: 31.3 mg per serving (½ cup)
- Peanuts: 18.3 mg per serving (1 oz)

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Choline Supplements

IMPACT

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EVIDENCE

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How to implement

Take choline supplements at a dosage of 425 mg to 550 mg daily, depending on age and gender, with a glass of water. It is best to consume choline supplements with a meal for optimal absorption. Continue this regimen daily as part of your dietary supplement routine.

TYPICAL STARTING DOSE

425 mg

Description

Choline is an essential nutrient that plays a crucial role in various bodily functions, including brain health, liver function, and metabolism. Incorporating choline-rich foods into your diet supports cognitive function and overall nutritional well-being.

[Choline](#) is a nutrient required for optimal health. Although the body makes some, we need to get choline from our diets to avoid deficiency [\[R\]](#).

It plays key roles in supporting [\[R\]](#), [\[R\]](#):

- DNA production
- Cell structure and function
- Brain, nerve, and heart health

Eggs and beef liver are the best sources of choline. If you can’t meet your daily requirements with food, consider taking a choline supplement such as [\[R\]](#):

- [Phosphatidylcholine](#) (PC)
- [Citicoline](#) (CDP-choline)
- [Alpha-GPC](#)
- [Lecithin](#)

They all supply choline, but each one has unique health perks you may prefer. Check out our posts on different choline-containing supplements to find out which one suits you best.

How it helps

If you can’t get enough choline from food, consider taking a supplement. Available forms include:

- [Phosphatidylcholine](#)
- [Citicoline](#) (CDP-choline)
- [Lecithin](#)
- [Alpha-GPC](#)

3



Betaine (TMG)

IMPACT3 / 5

EVIDENCE3 / 5

How to implement

To take Betaine (TMG) as a supplement, consume 500-2000 mg daily, preferably with a meal to enhance absorption. It is recommended to start at the lower end of the dosage range and adjust based on personal tolerance and effectiveness. This supplement can be taken indefinitely for ongoing support of heart health and liver function.

TYPICAL STARTING DOSE

500 mg

Description

Betaine is a compound found in various foods and used in dietary supplements for its potential to support liver health and contribute to healthy homocysteine levels.

How it helps

In the absence of dietary betaine, your body will produce it from choline, which may amplify your genetic risk for choline deficiency. To prevent this, consume a variety of betaine-rich foods such as [\[R\]](#):

- Liver meats
- Quinoa
- Beets
- Wheat germ
- Spinach

Please note: Doses above 4 g/day may increase LDL and triglyceride levels. TMG supplementation can cause a person’s urine and sweat to smell fishy [\[R\]](#), [\[R\]](#).

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SAM-e

IMPACT

3 / 5

EVIDENCE

3 / 5

How to implement

Take 400-1600 mg of SAM-e as a supplement daily, preferably on an empty stomach to enhance absorption. It is often recommended to start with low dosage and observe how your body responds over a few weeks, adjusting as necessary under the guidance of a healthcare provider.

TYPICAL STARTING DOSE
400 mg

Description

[SAM-e](#) is a chemical that helps maintain liver and brain health. Your body makes SAM-e from the amino acid *methionine*, but it’s also available as a supplement [\[R\]](#).

SAM-e supplementation may help with:

- Joint pain [\[R\]](#)
- Liver disease [\[R\]](#)
- Depression [\[R\]](#)

Please note: *SAM-e may not be safe for people with a bipolar disorder. It may also interact with 5-HTP, St. John’s wort, and different medications. Combining it with antidepressants can be dangerous and even life-threatening. Never take SAM-e supplements without consulting your doctor [\[R\]](#), [\[R\]](#), [\[R\]](#).*

How it helps

[SAM-e](#) enables phosphatidylcholine production via the [PEMT](#) enzyme. Thus, it may compensate for lower choline levels and prevent choline deficiency [\[R\]](#), [\[R\]](#).

SAM-e can also help with fatty liver, which is the most common sign of choline deficiency [\[R\]](#).