

Autophagy (Functional)

Biohacker Report

REPORT CATEGORIES —



DETOX



LONGEVITY

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

Autophagy is your cells' essential cleaning and recycling system. Think of it as a sophisticated housekeeping service that removes damaged components, recycles nutrients, and maintains cellular health. This process is crucial for longevity, disease resistance, and overall health.

Efficient autophagy affects:

- Cellular repair and renewal
- Protection against aging
- Neural health and cognitive function
- Immune system effectiveness
- Response to exercise
- Metabolic health and flexibility

Genetics of Autophagy

This report analyzes key genetic variations that influence your autophagy efficiency. While these genes play important roles in cellular cleanup and maintenance, it's crucial to understand that autophagy is highly responsive to lifestyle factors. Diet, exercise, sleep quality, and fasting practices can significantly impact how these genes express themselves.

Core Autophagy Machinery: *ATG16L1* (rs2245214, rs2241880) is essential for forming autophagosomes, with variants affecting protein stability. *ATG2B* (rs3759601) controls autophagosome size and formation, while *ATG7* (rs1864183) acts as a key enzyme for autophagy pathways. *ATG4B* (rs11235604) processes essential LC3 proteins for membrane formation.

Autophagy Construction Team: *ATG5* and *ATG12* work together like a construction crew, building the compartments (autophagosomes) needed for cellular cleanup. They're essential partners in coordinating the recycling process.

Cellular Recognition and Traffic Control: *NOD2* (rs2066844) acts as a bacterial sensor, triggering cleanup responses when it detects bacterial components. *APOE* is a traffic controller, particularly important in brain cells' waste clearance and maintenance.

This machinery is highly responsive to lifestyle factors like diet, exercise, sleep, and fasting, which can significantly influence how these genes express themselves.

Your genetic predispositions in these areas can help inform lifestyle and dietary choices that support optimal cellular cleanup and renewal.



Predisposed to less efficient autophagy based on 10 genetic variants we looked at

Your top variants that most likely impact your genetic predisposition:

GENE	SNP	GENOTYPE
ATG10	rs1864183	TT
ATG2B	rs3759601	GG
ATG16L1	rs2241880	GG
APOE	rs7412	CC
PRDM1	rs2245214	GC
ATG5	rs510432	CT
ATG12	rs26538	CT
APOE	rs429358	TT
NOD2	rs2066844	CC
ATG16L2	rs11235604	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	Alpha-Lipoic Acid	600 mg	2	Coenzyme Q10 (CoQ10)	100 mg
3	Glutamine	5 g	4	Apples	
5	Glutathione supplements		6	N-acetylcysteine (NAC)	1200 mg
7	Dietary Antioxidants		8	Dietary Protein	
9	Probiotics	30 billion CFU	10	Essential Amino Acids (EAA)	10 g

1



Alpha-Lipoic Acid

IMPACT

1 / 5

EVIDENCE

1 / 5

How to implement

Take 600-1800 mg of alpha-lipoic acid daily, preferably with a meal to enhance absorption.

TYPICAL STARTING DOSE

600 mg

Description

[Alpha-lipoic acid](#) is a natural antioxidant found in almost every cell in your body. People use alpha-lipoic acid to help with issues like skin aging, weight loss, and high blood sugar [\[R, R, R\]](#).

People use alpha-lipoic acid to help with [\[R, R, R, R\]](#):

- Complications of high blood sugar
- Skin aging
- Weight loss
- Carpal tunnel syndrome

How it helps

Alpha-Lipoic Acid supports autophagy by providing potent antioxidant protection that reduces oxidative stress, thus promoting cellular repair and maintenance. This enhances cellular health, facilitating more efficient autophagic processes.

2



Coenzyme Q10 (CoQ10)

IMPACT1 / 5

EVIDENCE1 / 5

How to implement

Take a 100 mg Coenzyme Q10 (CoQ10) supplement once daily with a meal that contains fat for better absorption.

TYPICAL STARTING DOSE

100 mg

Description

Coenzyme Q10 (CoQ10) is a naturally occurring antioxidant that plays a crucial role in cellular energy production. It is often taken as a supplement to support heart health, improve energy levels, and provide antioxidant protection, especially for individuals with certain medical conditions or as they age.

[Coenzyme Q10](#) (CoQ10) is a compound that helps enzymes work better. By doing so, CoQ10 helps improve [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#):

- Energy levels
- Antioxidant protection
- Heart health
- Muscle strength
- Blood sugar control

The amount of CoQ10 made by your body decreases as you get older. Luckily, you can also get it from food or supplements. Good sources of CoQ10 include [\[R\]](#), [\[R\]](#):

- Organ meats
- Fatty fish
- Whole grains

How it helps

Coenzyme Q10 supports autophagy by enhancing mitochondrial function and energy metabolism, allowing cells to efficiently recycle damaged components. Its antioxidant properties also protect cells from oxidative stress, promoting overall cellular health and longevity.

3



Glutamine

IMPACT

1 / 5

EVIDENCE

1 / 5

How to implement

Take 5 to 10 grams of glutamine powder, mixed with water or another beverage, daily. It can be divided into two servings, one in the morning and the other in the evening. This supplementation is generally considered safe for long-term use, but it's best to consult with a healthcare provider for personalized advice.

TYPICAL STARTING DOSE

5 g

Description

Glutamine is an amino acid that plays a role in various bodily functions, including immune support and gut health. It may help with muscle recovery and overall well-being, particularly for individuals engaging in strenuous exercise.

L-glutamine is an amino acid produced by the body. Its levels may decrease during periods of stress or illness. It is important for protein and energy production, and helps control kidney pH balance [\[R\]](#).

Some people take L-glutamine as a supplement to help with [\[R\]](#):

- Gut health
- Immunity
- Exercise recovery and muscle performance
- Brain health

How it helps

Glutamine supplementation enhances gut health and immune function, which are critical for maintaining cellular integrity and optimizing autophagy. By supporting these foundational systems, glutamine indirectly promotes efficient autophagic processes essential for cellular homeostasis.

4



Apples

IMPACT

1 / 5

EVIDENCE

1 / 5

How to implement

Incorporate at least one whole apple into your daily diet, either as a snack or part of your meals, ensuring to eat them consistently every day for an ongoing period to derive potential health benefits.

Description

Apples are a nutritious fruit known for their fiber content and antioxidant-rich skin. They support overall health by aiding digestion, reducing the risk of chronic diseases, and promoting heart health.

Apples (*Malus domestica Borkh.*) are one of the most widely consumed fruits in the world. They have a high nutritional value and content of antioxidants [\[R\]](#), [\[R\]](#).

Eating apples is associated with a lower risk of [\[R\]](#), [\[R\]](#):

- Heart disease
- Asthma
- Diabetes

How it helps

Apples aid autophagy due to their high antioxidant content, which reduces oxidative stress in cells. This cellular environment fosters effective autophagic processes, enhancing cellular repair and regeneration.

5



Glutathione supplements

IMPACT

1 / 5

EVIDENCE

1 / 5

How to implement

Take glutathione supplements orally, usually in pill or powder form, with a recommended dose ranging from 500mg to 1000mg daily, divided into two doses. It's best taken on an empty stomach or as directed by a healthcare professional. Continuous use is advised for sustained benefits, but consulting with a healthcare provider for personalized advice and duration is important.

Description

Glutathione (GSH) is your body’s strongest antioxidant. It has an enormous capacity to combat [oxidative stress](#) and neutralize harmful free radicals. Chemically speaking, glutathione is a tripeptide made up of 3 amino acids [\[R\]](#):

- [Glutamate](#)
- **Cysteine**
- [Glycine](#)

Low glutathione levels have been linked to cognitive decline, age-related disease, and general mortality among the elderly [\[R, R\]](#).

People take glutathione supplements to help with:

- Oxidative stress and detox
- Immune system support
- Skin aging and damage
- Exercise recovery
- Chronic diseases such as type 2 diabetes, Alzheimer's disease, Parkinson's disease, or COPD

How it helps

Glutathione supplements enhance cellular detoxification by reducing oxidative stress, which is crucial for the effective functioning of autophagy. The antioxidant properties of glutathione support cellular health, facilitating the clearance of damaged organelles and proteins.

6



N-acetylcysteine (NAC)

IMPACT

1 / 5

EVIDENCE

1 / 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

N-acetylcysteine (NAC) enhances glutathione levels, which is crucial for reducing oxidative stress and promoting cellular repair mechanisms involved in autophagy. By supporting these processes, NAC contributes to overall cellular health and function.

7



Dietary Antioxidants

IMPACT

1 / 5

EVIDENCE

1 / 5

How to implement

Incorporate foods rich in antioxidants, such as fruits (berries, oranges, plums), vegetables (spinach, kale, bell peppers), nuts (walnuts, almonds), and seeds (flaxseeds, chia seeds) into your daily meals. Aim for at least 5 servings of fruits and vegetables per day, ensuring a variety of colors to cover different antioxidants.

Description

Dietary antioxidants are compounds found in foods that help neutralize harmful molecules called free radicals, potentially reducing the risk of oxidative stress-related diseases and supporting overall health. Examples include vitamins C and E, beta-carotene, and polyphenols.

Our cells sometimes produce molecules called **reactive oxygen species (ROS)** [\[R\]](#).

High levels of ROS can cause [oxidative stress](#) and damage our cells. Oxidative stress plays a role in many health conditions, including [\[R\]](#):

- High blood sugar
- Type 2 diabetes
- Heart disease

Antioxidants are substances that help combat ROS [\[R\]](#).

Antioxidants are found in many plants. Good sources include [\[R\]](#), [\[R\]](#), [\[R\]](#):

- Fruits like tomatoes, berries, and pomegranates
- Vegetables like onions, spinach, and celery
- Chocolate
- Olive oil
- Wine

How it helps

Dietary antioxidants help mitigate oxidative stress by neutralizing free radicals, thereby promoting cellular health and enhancing the autophagy process. This supports the body's ability to remove damaged cells and improve overall functionality.

8



Dietary Protein

IMPACT

1 / 5

EVIDENCE

1 / 5

How to implement

Include a variety of protein sources such as meat, fish, eggs, dairy, beans, and nuts in your diet every day, aiming for at least 0.8 grams of protein per kilogram of body weight. For more active individuals or those looking to build muscle, increase intake to 1.2 to 2.0 grams per kilogram of body weight daily, spread out over all meals to maximize absorption.

Description

Protein is essential for building and repairing tissues, supporting muscle growth, and maintaining overall bodily functions. Adequate protein intake is crucial for overall health and well-being.

Foods that are high in protein include:

- Eggs
- Nuts
- Beef
- Chicken
- Fish
- Yogurt
- Tofu
- Pork
- Cottage cheese

How it helps

Incorporating dietary protein from plant sources can enhance autophagy by fostering a favorable cellular environment, promoting muscle maintenance and tissue repair. This balance aids in managing oxidative stress and supports overall cellular health, essential for efficient autophagy processes.

9



Probiotics

IMPACT

1 / 5

EVIDENCE

1 / 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

Probiotics enhance gut microbiota balance, which can improve cytokine production and immune modulation, facilitating autophagy and cellular repair processes. This supports overall cellular health and optimizes the body's ability to perform autophagic functions.

10



Essential Amino Acids (EAA)

IMPACT1 / 5

EVIDENCE1 / 5

How to implement

Take a supplement containing all nine essential amino acids, aiming for a total of 10-20 grams per day. This can be divided into 2-3 doses throughout the day, ideally around exercise sessions or with meals. Continue as long as you are seeking to enhance muscle recovery, growth, or overall protein intake.

TYPICAL STARTING DOSE

10 g

Description

Essential amino acids are crucial for building and repairing tissues, supporting immune function, and maintaining overall health. Obtaining these amino acids through a balanced diet or supplementation can promote muscle growth, better immune response, and overall well-being.

How it helps

Supplementing with essential amino acids enhances protein synthesis, promoting tissue repair and facilitating the autophagy process, which is vital for cellular health. This mechanism supports metabolic balance and optimizes cellular function.