ULTAGENOMICS

DECODE YOUR DNA. GUIDE YOUR HEALTH.

Epigenetic Health

EPIGENETIC REPORT

6	10	45
Reports	Results	Genes Involved

Demo Client
Prepared for

November 4, 2026
Report Date

BEFORE YOU BEGIN

How to read this report

WHAT THIS REPORT MEASURES

Your DNA sequence does not change, but how strongly each gene is switched on or off can. One of the main switches is DNA methylation: small chemical tags on DNA that help control gene activity.

Methylation patterns shift with age, diet, sleep, stress, exercise and environment, so they give a snapshot of how your body is responding right now. Unlike a genetic test, these results can change over time.

HOW RESULTS ARE RATED

OPTIMAL	Among the strongest results for this marker. The goal is to protect what is already working.
FAVORABLE	Better than typical. A positive sign, with room to keep building.
TYPICAL	In the expected range for your age. The focus is prevention.
NEEDS SUPPORT	Below the ideal range. The best place to focus first.

Each result also shows the original laboratory rating (for example Good or Below average) so it can be matched to the lab report.

GOOD EXPRESSION HAMPERED

Gene Involvement pages rate each gene as Good expression (working as expected) or Hampered expression (activity may be lower than ideal, with suggested support listed where the lab provides it).

HOW THIS REPORT IS ORGANIZED

1. **SUMMARY**
   Your ages, every result on one page, and a combined action plan.
2. **RESULT CARDS**
   One page per result: what it may mean, what to do and the genes involved.
3. **THE DETAILS**
   The laboratory's full interpretation, the science and the Gene Involvement pages.
4. **APPENDIX**
   Background on each test and how the algorithms were built.

WHAT THIS REPORT CAN AND CANNOT TELL YOU

This report is educational and is not a diagnosis. Methylation results describe tendencies, not certainties, and reflect a single sample.

Discuss results with a licensed healthcare provider before starting supplements, changing medications or making major lifestyle changes, especially with existing medical conditions.

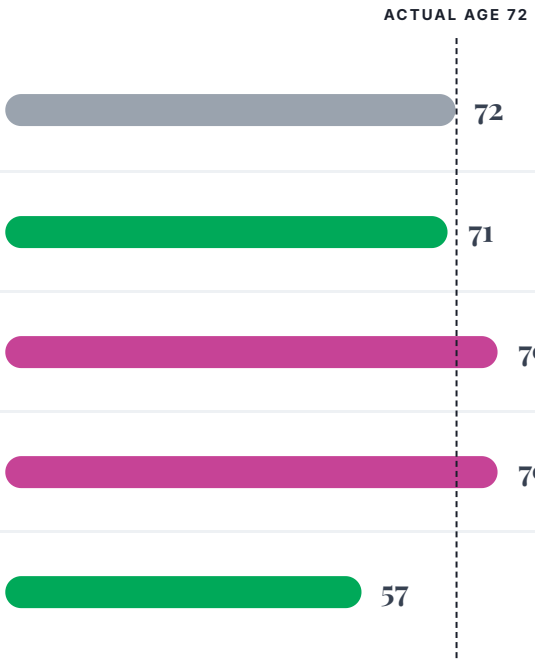
Values, ratings and interpretations are reported by the testing laboratory. Plain-language summaries are provided by Toolbox Genomics.

SUMMARY · YOUR AGES

1 Your ages at a glance

BIOLOGICAL AGES COMPARED WITH YOUR ACTUAL AGE

Shorter bar = younger



ACTUAL AGE Years since birth	72	
BIOLOGICAL AGE Whole body (MethylPace)	71	1 YR YOUNGER
HEARING AGE Hearing	79	7 YRS OLDER
EYE AGE Eyes and vision	79	7 YRS OLDER
MEMORY AGE Memory	57	15 YRS YOUNGER

PACE OF AGING

FAVORABLE

0.986 About **12 months** of biological aging for every 12 months that pass.



0.4 · SLOWER | 1.0 · EXPECTED | 1.9 · FASTER

WHAT THIS MAY MEAN

- Your biological age and memory age read younger than your actual age.
- Your hearing age and eye age read older than your actual age, the best place to focus.
- Strongest result: memory age, 15 years younger.

Epigenetic ages describe how your cells are behaving now, not a fixed fate. They can shift with diet, sleep, activity and stress.

SUMMARY · ALL RESULTS

2 Results at a glance

4 NEEDS SUPPORT
- Hearing Age
- Eye Age
- Immunoscore
- EpiVitality

1 TYPICAL
- Anti Inflammation

4 FAVORABLE
- MethylPace
- Memory Age
- Pro Inflammation
- Overall Inflammation

1 OPTIMAL
- Muscle Degeneration

RESULT	YOUR RESULT	RATING	IN PLAIN TERMS	PAGE
BIOLOGICAL AGE METHYLPACE	71 vs 72 Pace of aging 0.986	FAVORABLE Lab: Good	This is a positive sign that current habits may be supporting healthy aging.	6
BODY AGE HEARING AGE	79 vs 72	NEEDS SUPPORT Lab: Below average	This suggests your hearing system may be under extra strain, and targeted habits may help slow that trend.	9
BODY AGE EYE AGE	79 vs 72	NEEDS SUPPORT Lab: Below average	This suggests your eyes and visual system may be under extra strain, and targeted habits may help slow that trend.	13
BODY AGE MEMORY AGE	57 vs 72	FAVORABLE Lab: Great	This suggests memory and brain function may be aging a little slower than expected, which is a good sign.	16
INFLAMMATION ANTI INFLAMMATION	Average Balance gauge	TYPICAL Lab: Average	Your ability to calm inflammation looks about average.	19
INFLAMMATION PRO INFLAMMATION	Great Balance gauge	FAVORABLE Lab: Great	Your inflammation "on switch" looks better controlled than average.	21
INFLAMMATION OVERALL INFLAMMATION	Great Balance gauge	FAVORABLE Lab: Great	Your overall inflammation balance looks very good, with low signs of ongoing inflammatory activity.	23
IMMUNE BALANCE IMMUNOSCORE	850 / 1000	NEEDS SUPPORT Lab: Below average	Your immune-related methylation reads below the ideal range.	26
STRESS RESILIENCE EPIVITALITY	14.5 / 50	NEEDS SUPPORT Lab: Substantially reduced	Your methylation at these resilience markers is substantially reduced.	28
MUSCLE HEALTH MUSCLE DEGENERATION	220.8 / 300	OPTIMAL Lab: Fantastic	Your muscle-related methylation looks excellent.	31

SUMMARY · WHAT TO DO

3 Your action plan

FOCUS HERE FIRST

The results with the most room to improve, with the lab's first suggested steps.

HEARING AGE — NEEDS SUPPORT

- [ ] Limit exposure to loud noise and wear earplugs or earmuffs in noisy environments.
- [ ] Follow the 60/60 rule for headphones: volume at or below 60% for no more than 60 minutes at a time.

EYE AGE — NEEDS SUPPORT

- [ ] Eat leafy greens such as kale or spinach daily for lutein and zeaxanthin, and consider a lutein and zeaxanthin supplement if intake is low, after discussing it with a healthcare provider.
- [ ] Eat fatty fish such as salmon or sardines at least twice weekly, or consider a fish oil supplement for DHA.

IMMUNOSCORE — NEEDS SUPPORT

- [ ] Increase intake of foods rich in folate, vitamin B12 and choline to support methylation.
- [ ] Prioritize a mineral-rich diet and drink enough water throughout the day.

EPIVITALITY — NEEDS SUPPORT

- [ ] Take vitamin D3, 3,000 to 5,000 IU nightly.
- [ ] Take a methylated B-complex each morning with food.

KEEP DOING WHAT IS WORKING

These results are already strong. Current habits appear to be supporting them.

MethylPace	FAVORABLE	Memory Age	FAVORABLE
Pro Inflammation	FAVORABLE	Overall Inflammation	FAVORABLE
Muscle Degeneration	OPTIMAL		

NUTRIENTS THAT COME UP MOST

Number of results (out of 10) where the lab suggests each one.

Folate / methylfolate	7
Choline	7
Omega-3 (EPA/DHA)	7
Vitamin B12	6
B-complex / B6	6
Vitamin D3	6
Magnesium	4

HABITS THAT COME UP MOST

Exercise and strength training	7
Hydration	6
Avoiding smoke and toxins	6
Limiting alcohol	5
Sleep	4

RETEST — Retest in about 6 to 12 months to see whether changes are moving these results.

RESULT CARD · METHYLPACE

FAVORABLE

4 MethylPace

Biological age and pace of aging

YOUR RESULT

Lab rating: **Good**

72	→	71	0.986
ACTUAL AGE		BIOLOGICAL AGE	PACE OF AGING

1 YEAR YOUNGER

NEEDS SUPPORT | TYPICAL | **FAVORABLE** | OPTIMAL

UNDERSTANDING WHAT THIS MAY MEAN

Your biological age reads 1 year younger than your actual age, and your pace of aging is 0.986, roughly 12 months of biological aging per calendar year. This is a positive sign that current habits may be supporting healthy aging.

Lab summary: Your methylation profile is currently more favorable than your chronological age, which suggests your body's methylation-related processes are in relatively good shape.

WHAT TO DO

- [ ] Continue a diet rich in antioxidant foods such as berries, leafy greens, fatty fish, nuts and seeds, avocados, olive oil, tomatoes and dark chocolate (at least 70% cocoa).
- [ ] Include nutrients that support the methylation cycle: folate as 5-MTHF, vitamin B12, choline and betaine, which also help lower homocysteine.
- [ ] Maintain regular physical activity, including resistance training at least twice per week.
- [ ] Consider retesting in 12 to 24 months to confirm the pace of aging remains below 1.0.

Full interpretation on page 7.

GENES THIS TEST LOOKS AT

CHGA · OTUD7A · PRLHR · ZYG11A · GPR158 · ELOVL2 · LHFPL4

The lab does not provide a per-gene rating for this test. Gene roles are described in the details.

ABOUT THIS TEST

Estimates how old your body is biologically, and how fast it is aging each year, from methylation at 10 key aging genes.

4 MethylPace

What does it mean?

Individuals with a biological age below their chronological age and a pace of aging under 1.0 are aging more slowly than expected. A biological age 1 year younger than chronological age, with a pace of 0.986, corresponds to roughly 12 months of biological aging per calendar year.

This pattern suggests that current diet, activity, sleep and stress habits are supporting healthy methylation. It is important to maintain these habits, since methylation patterns can shift over time with lifestyle, illness and environmental exposures.

Recommendations

- [ ] Continue a diet rich in antioxidant foods such as berries, leafy greens, fatty fish, nuts and seeds, avocados, olive oil, tomatoes and dark chocolate (at least 70% cocoa).
- [ ] Include nutrients that support the methylation cycle: folate as 5-MTHF, vitamin B12, choline and betaine, which also help lower homocysteine.
- [ ] Maintain regular physical activity, including resistance training at least twice per week.
- [ ] Consider retesting in 12 to 24 months to confirm the pace of aging remains below 1.0.

How the score works

Biological age is compared with chronological age using population data from roughly 8,000 individuals. A biological age below chronological age suggests slower aging, and a biological age above it suggests accelerated aging.

Pace of aging combines methylation data with chronological age to show the rate of aging year over year, adjusted for life stage. A value of 1.0 means aging at the expected rate.

- 0.8 to 0.9: a slowdown of about 10 months of biological aging per 12 months.
- 0.5 to 0.8: a more marked slowdown of about 3 to 6 months less aging per year.
- 0.4 or below: a substantial slowdown, around 6 months of aging per year.
- 1.0 to 1.3: faster than average aging that is often influenced by lifestyle.
- 1.4 to 1.8: substantial acceleration, where interventions may be considered.
- 1.9 or higher: near-doubling, where one year may equal about two years of biological aging.

Validation

MethylPace has been studied in cohorts of 3,902 to 8,000 participants, with an R^2 of 0.8 across four studies and a mean absolute error of 0.0193. In one comparison, an excellent-health cohort and a fatigue cohort differed by 11.7 years ($p = 4.1 \times 10^{-152}$).

It was validated in a 2024 clinical study published in Antioxidants, further developed in a 2025 study published in DNA, and has been studied in relation to alcohol use, pregnancy, sports performance and injury.

Gene information

MethylPace is built on 10 genes with strong age-related methylation changes. CHGA supports hormone and neurotransmitter release and is linked to cardiovascular aging and stress. OTUD7A regulates protein turnover and DNA repair. PRLHR influences energy balance and metabolism. ZYG11A regulates the cell cycle and protein turnover. GPR158 influences cognition and the stress response. ELOVL2 elongates fatty acids and is one of the strongest known biomarkers of aging. LHFPL4 supports synaptic function. Three additional genes are analyzed without individual annotations.

Conditions and traits

The reported studies link the following factors with a higher biological age:

- Type 2 diabetes: 4 to 7.2 years
- Smoking 5 or more cigarettes per day: 4 to 6 years
- Very high alcohol intake: 3 to 8 years
- High daily stress: 2.9 to 5 years
- Fatigue: 2 to 4.5 years
- Heart disease: 1 to 3.3 years
- High daily pain: 1.2 to 3 years
- Chronic high blood sugar: 2.2 years

4 MethylPace

continued

The following factors are linked with a lower biological age:

- Lycopene or a tomato-rich diet: 2.6 to 5 years
- High-quality omega-3 intake: 1 to 3 years
- 30 minutes of activity per day: 1.9 years
- Methylfolate in divided doses: 1.8 years
- Resistance training more than twice per week: 1.5 years
- Vitamin D3 in divided doses: 1.2 years
- Social connection: 1.1 years

These associations come from population studies and should be interpreted with caution for any one individual.

RESULT CARD · BODY AGE · RESULT 1 OF 3

NEEDS SUPPORT

5 Hearing Age

Age of your hearing system

YOUR RESULT

Lab rating: **Below average**

72
ACTUAL AGE

→

79
HEARING AGE

7 YEARS OLDER

NEEDS SUPPORT | TYPICAL | FAVORABLE | OPTIMAL

UNDERSTANDING WHAT THIS MAY MEAN

Your Hearing age reads 7 years older than your actual age. This suggests your hearing system may be under extra strain, and targeted habits may help slow that trend.

Lab summary: Your Hearing Age test indicates that below average methylation can negatively impact hearing, and you should avoid loud noises to prevent hearing loss.

WHAT TO DO

- [ ] Limit exposure to loud noise and wear earplugs or earmuffs in noisy environments.
- [ ] Follow the 60/60 rule for headphones: volume at or below 60% for no more than 60 minutes at a time.
- [ ] Schedule a baseline audiology exam and regular follow-up testing to detect changes early.
- [ ] Support cardiovascular health through aerobic exercise and blood pressure management, which maintains blood flow to the inner ear.
- [ ] Stay well hydrated to support inner ear fluid balance.

+5 more steps in the details on page 10.

KEY GENES

3 good · 12 hampered

GENE	SUGGESTED SUPPORT	EXPRESSION
ASNS		HAMPERED
ATP8A2		HAMPERED
CLIP4		HAMPERED
GSTO2		HAMPERED
L3MBTL4		HAMPERED
NFAT5		HAMPERED
PDE1C		HAMPERED
PRX		HAMPERED
RAB31		HAMPERED
RBPMS		HAMPERED

+5 more. Full Gene Involvement on page 11.

ABOUT THIS TEST

Compares methylation at genes linked to age-related hearing loss with typical patterns for your age.

5 Hearing Age

What does it mean?

Individuals with a Hearing Age above their chronological age have below-average methylation at genes that support inner ear fluid regulation, blood flow to the cochlea, inflammation control and the neural processing of sound. A Hearing Age 7 years older than chronological age suggests greater susceptibility to age-related hearing changes and to damage from external stressors such as noise.

This result does not mean hearing loss is present or certain. It does make protective habits more important, since limiting noise, supporting cardiovascular health, staying hydrated and avoiding smoking all reduce added strain on the inner ear. Regular hearing tests help catch changes while they are still manageable.

Recommendations

- [ ] Limit exposure to loud noise and wear earplugs or earmuffs in noisy environments.
- [ ] Follow the 60/60 rule for headphones: volume at or below 60% for no more than 60 minutes at a time.
- [ ] Schedule a baseline audiology exam and regular follow-up testing to detect changes early.
- [ ] Support cardiovascular health through aerobic exercise and blood pressure management, which maintains blood flow to the inner ear.
- [ ] Stay well hydrated to support inner ear fluid balance.
- [ ] Stop smoking and avoid secondhand smoke.
- [ ] Include omega-3 rich foods such as fatty fish and flaxseed, or discuss an omega-3 supplement with a healthcare provider.
- [ ] Avoid inserting cotton swabs or other objects into the ear canal.
- [ ] Consider auditory training to strengthen listening skills, and sound therapy or cognitive behavioral therapy if tinnitus is present.
- [ ] Discuss methylation-supporting nutrition and supplements with a healthcare provider.

The science

Hearing Age is inferred from methylation at genes involved in vascular maintenance, oxidative stress control, tissue repair and nerve signaling in the auditory system.

These patterns are compared with those typical for the individual's age group.

Methylation consistent with healthy aging suggests preserved support for blood flow to the cochlea, hair cell resilience and auditory nerve function. Noise acts as a mechanical stressor that raises oxidative and excitotoxic injury, which is why noise limits and breaks are central to prevention.

Hearing and aging

Age-related hearing loss (presbycusis) is the most common form of adult hearing loss. Comparing methylation at hearing-related genes with age-group averages offers insight into how the auditory system is aging, although methylation does not explain every aspect of hearing decline.

Gene information

The panel covers genes tied to auditory maintenance, neural signaling and cellular stress. Examples include GSTO2 (detoxification that protects auditory cells from oxidative damage), PRX (myelin of the auditory nerve), CLIP4 (structure of auditory hair cells), PDE1C (hair cell signaling), NFAT5 (inner ear fluid balance) and RAB31 (neurotransmitter release in the auditory pathway). Individual gene results appear in Gene Involvement.

5 Hearing Age Gene Involvement

ASNS

HAMPERED

Role in Aging. Plays a role in amino acid biosynthesis and response to nutrient stress. Nutritional deficiencies can contribute to age-related hearing loss (ARHL).

Impact on Hearing. Impaired asparagine synthesis could affect cochlear cells' survival during aging.

ATP8A2

HAMPERED

Role in Aging. Maintains membrane lipid asymmetry and neuronal health. Declining membrane integrity is associated with neurodegenerative diseases.

Impact on Hearing. Deterioration in neuronal cell function in the cochlea or auditory nerve may exacerbate ARHL.

CLIP4

HAMPERED

Role in Aging. Associated with cytoskeletal dynamics, which are critical for cellular maintenance and signaling.

Impact on Hearing. Cytoskeletal dysregulation could weaken cochlear support cells, affecting hearing during aging.

GSTO2

HAMPERED

Role in Aging. Encodes a glutathione S-transferase involved in detoxification and redox balance, protecting against oxidative stress.

Impact on Hearing. Reduced detoxification capacity with age increases oxidative damage to cochlear cells, leading to ARHL.

L3MBTL4

HAMPERED

Role in Aging. Likely involved in chromatin remodeling and epigenetic regulation. Epigenetic changes accumulate with age.

Impact on Hearing. Epigenetic dysregulation in auditory cells may impair their function during aging.

NFAT5

HAMPERED

Role in Aging. Regulates cellular osmotic stress. Cellular stress tolerance decreases with age.

Impact on Hearing. Osmotic imbalances can damage cochlear hair cells, particularly in aging individuals.

PDE1C

HAMPERED

Role in Aging. Modulates cyclic nucleotide signaling, crucial for cell signaling and survival.

Impact on Hearing. Dysregulated signaling in cochlear cells may impair their function and survival with age.

PRX

HAMPERED

Role in Aging. Critical for myelin maintenance in peripheral nerves. Myelin degeneration is a hallmark of aging.

Impact on Hearing. Degeneration of auditory nerve myelin may exacerbate hearing loss in older adults.

RAB31

HAMPERED

Role in Aging. Involved in vesicle trafficking, essential for intracellular transport.

Impact on Hearing. Aging-related deficits in trafficking could disrupt cochlear cell maintenance.

RBPMS

HAMPERED

Role in Aging. Functions in RNA binding and regulation, crucial for protein synthesis and cellular health.

Impact on Hearing. Age-related RNA dysregulation could impair protein synthesis in cochlear cells.

5 Hearing Age Gene Involvement

continued

SP9

HAMPERED

Role in Aging. A transcription factor that could influence cell development and differentiation.

Impact on Hearing. Declining regenerative capacity of auditory cells during aging could worsen ARHL.

TOR3A

HAMPERED

Role in Aging. Plays a role in protein processing and stress responses.

Impact on Hearing. Aging-related protein aggregation in cochlear cells may impair function and lead to hearing loss.

AMDHD1

GOOD EXPRESSION

Role in Aging. Involved in amino acid metabolism, which influences protein homeostasis. Dysregulation may accelerate aging processes.

Impact on Hearing. Protein misfolding or degradation related to amino acid metabolism could impair cochlear cells over time.

DDX60L

GOOD EXPRESSION

Role in Aging. Involved in RNA processing and immune responses. Chronic inflammation can accelerate aging.

Impact on Hearing. Pro-inflammatory environments in the cochlea may contribute to ARHL.

ST8SIA2

GOOD EXPRESSION

Role in Aging. Encodes an enzyme involved in neural development and plasticity.

Impact on Hearing. Reduced plasticity in the auditory system may contribute to impaired adaptive responses in hearing as we age.

RESULT CARD · BODY AGE · RESULT 2 OF 3

NEEDS SUPPORT

6 Eye Age

Age of your eyes and visual system

YOUR RESULT

Lab rating: **Below average**

72
ACTUAL AGE

→

79
EYE AGE

7 YEARS OLDER

NEEDS SUPPORT | TYPICAL | FAVORABLE | OPTIMAL

UNDERSTANDING WHAT THIS MAY MEAN

Your Eye age reads 7 years older than your actual age. This suggests your eyes and visual system may be under extra strain, and targeted habits may help slow that trend.

Lab summary: Your Eye Age test suggests emerging eye health concerns due to below-average methylation, which may benefit from nutritional intervention.

WHAT TO DO

- [ ] Eat leafy greens such as kale or spinach daily for lutein and zeaxanthin, and consider a lutein and zeaxanthin supplement if intake is low, after discussing it with a healthcare provider.
- [ ] Eat fatty fish such as salmon or sardines at least twice weekly, or consider a fish oil supplement for DHA.
- [ ] Include vitamin A-rich foods such as liver, carrots and sweet potatoes several times per week, and avoid high-dose vitamin A supplements without medical guidance.
- [ ] Include daily vitamin C (citrus, bell peppers) and regular vitamin E (nuts, seeds) and zinc sources (oysters, beef, pumpkin seeds); test for zinc deficiency before supplementing.
- [ ] Schedule a comprehensive eye exam at least annually and keep prescriptions current.

+4 more steps in the details on page 14.

KEY GENES

3 good · 4 hampered

GENE	SUGGESTED SUPPORT	EXPRESSION
DDO		HAMPERED
DNAH9		HAMPERED
EIF1AY		HAMPERED
FAM176B		HAMPERED
DAZL		GOOD
EFHC2		GOOD
FOXP3		GOOD

Full Gene Involvement on page 15.

ABOUT THIS TEST

Compares methylation at genes linked to visual aging (retina, lens and optic nerve health) with typical patterns for your age.

6 Eye Age

What does it mean?

Individuals with an Eye Age above their chronological age have below-average methylation at genes linked to eye health, a pattern associated with an increased likelihood of emerging eye health concerns. Pathways involved in retinal protection, antioxidant defense and nutrient transport may be working less robustly than expected for age.

This does not diagnose an eye condition, but it signals that proactive steps may help preserve visual function. Targeted nutrition, routine eye exams to catch early glaucoma, macular degeneration or cataract changes, and control of blood pressure, cholesterol and blood sugar are the main levers. Existing visual symptoms or chronic conditions should be evaluated by an eye care professional before major changes or new supplements.

Recommendations

- [ ] Eat leafy greens such as kale or spinach daily for lutein and zeaxanthin, and consider a lutein and zeaxanthin supplement if intake is low, after discussing it with a healthcare provider.
- [ ] Eat fatty fish such as salmon or sardines at least twice weekly, or consider a fish oil supplement for DHA.
- [ ] Include vitamin A-rich foods such as liver, carrots and sweet potatoes several times per week, and avoid high-dose vitamin A supplements without medical guidance.
- [ ] Include daily vitamin C (citrus, bell peppers) and regular vitamin E (nuts, seeds) and zinc sources (oysters, beef, pumpkin seeds); test for zinc deficiency before supplementing.
- [ ] Schedule a comprehensive eye exam at least annually and keep prescriptions current.
- [ ] Follow the 20-20-20 rule during near work and use glare-free lighting.
- [ ] Wear sunglasses that block 100% of UVA and UVB rays outdoors.
- [ ] Keep blood pressure, cholesterol and blood sugar well controlled with the healthcare team, stay active and maintain a healthy weight.
- [ ] Avoid smoking and limit alcohol to reduce oxidative damage and optic nerve risk.

The science

Eye Age is a hypomethylation-based clock built from more than 300 genes linked to vision and aging, including genes involved in neurotransmission, retinal health, cellular stress responses, ciliary function and epigenetic control.

Balanced methylation is associated with stable regulation of antioxidant protection and structural integrity in eye tissues. Markers linked to vascular health help explain why blood pressure, cholesterol, exercise and weight matter for the retina and optic nerve, which depend on a steady supply of oxygen and nutrients.

Vision and aging

Vision commonly declines with age through genetic, structural and metabolic changes. Common age-related changes include presbyopia (from about age 40), dry eye (often after 50), cataracts and vitreous detachment (more common after 60), glaucoma, macular degeneration, diabetic retinopathy, reduced contrast sensitivity and slower adjustment between light and dark. Eye Age gives a broad view of visual aging but does not diagnose or predict these conditions.

Gene information

Examples of analyzed genes include DDO (D-aspartate metabolism and retinal signaling), DNAH9 (ciliary movement in photoreceptor cells), GABRE and GLRA4 (inhibitory signaling in visual processing), HTR2A (a serotonin receptor in the retina), KCNJ8 (retinal electrical activity), NAB1 (eye-related gene networks), NLGN4Y (synaptic signaling) and RNASEH2C (DNA repair).

GENE INVOLVEMENT · BODY AGE · 3 GOOD, 4 HAMPERED

6 Eye Age Gene Involvement

DDO — HAMPERED

Role in Aging. DDO regulates D-aspartate, which can influence oxidative stress and neuronal health. Oxidative stress is a key factor in aging.

Impact on Eye Health. Accumulated oxidative damage may contribute to age-related eye diseases like macular degeneration and cataracts.

DNAH9 — HAMPERED

Role in Aging. Dynein proteins are essential for ciliary function, and ciliary dysfunction has been linked to accelerated cellular aging.

Impact on Eye Health. Defective ciliary function can impair retinal health, as seen in ciliopathies, contributing to conditions like retinitis pigmentosa with age.

EIF1AY — HAMPERED

Role in Aging. EIF1AY impacts protein synthesis, a process critical for maintaining cellular health during aging.

Impact on Eye Health. Impaired protein homeostasis can contribute to age-related cataracts or retinal dysfunction.

FAM176B — HAMPERED

Role in Aging. Its full function is unclear and under study, but uncharacterized proteins may play roles in mitochondrial or metabolic aging.

Impact on Eye Health. Potential links to metabolic aging processes could indirectly affect the retina.

DAZL — GOOD EXPRESSION

Role in Aging. Germline maintenance genes interact with cellular aging mechanisms.

Impact on Eye Health. Indirect effects through general cellular senescence over time.

EFHC2 — GOOD EXPRESSION

Role in Aging. Calcium signaling, which EFHC2 may influence, plays a crucial role in cellular aging and neurodegeneration.

Impact on Eye Health. Dysregulated calcium homeostasis can lead to retinal degeneration and age-related eye diseases.

FOXP3 — GOOD EXPRESSION

Role in Aging. FOXP3 regulates immune tolerance and suppresses chronic inflammation, which accelerates aging (inflammaging).

Impact on Eye Health. Immune dysregulation can lead to autoimmune uveitis, dry eye disease, and age-related macular degeneration (AMD).

RESULT CARD · BODY AGE · RESULT 3 OF 3

FAVORABLE

7

Memory Age

Age of memory and brain function

YOUR RESULT

Lab rating: **Great**

72
ACTUAL AGE

→

57
MEMORY AGE

15 YEARS YOUNGER

NEEDS SUPPORT | TYPICAL | **FAVORABLE** | OPTIMAL

UNDERSTANDING WHAT THIS MAY MEAN

Your Memory age reads 15 years younger than your actual age. This suggests memory and brain function may be aging a little slower than expected, which is a good sign.

Lab summary: Your methylation status is great, indicating optimal gene function and balanced biochemical processes supporting brain health, so maintain your current lifestyle habits.

WHAT TO DO

- [ ] Combine regular aerobic exercise with strength training at least twice weekly.
- [ ] Include mind-body practices such as yoga or Tai Chi, or activities that combine movement, learning and social contact, such as dance.
- [ ] Keep the brain challenged by learning a new language, instrument or complex hobby, and by using puzzles or memory techniques such as active recall.
- [ ] Prioritize regular social interaction and a daily mindfulness or meditation practice.
- [ ] Follow a Mediterranean-style diet with olive oil, nuts, fatty fish, berries, leafy greens, legumes and whole grains, and include eggs for choline and B vitamins.

+3 more steps in the details on page 17.

KEY GENES

9 good · 0 hampered

GENE	SUGGESTED SUPPORT	EXPRESSION
MAD1L1		GOOD
EPHA2		GOOD
ADCY3		GOOD
ENC1		GOOD
COL21A1		GOOD
DYNC1H1		GOOD
TSPAN4		GOOD
UBA5		GOOD
ACE2		GOOD

Full Gene Involvement on page 18.

ABOUT THIS TEST

Compares methylation at memory-related genes, validated with cognitive testing in more than 3,000 people, with typical patterns for your age.

7 Memory Age

What does it mean?

Individuals with a Memory Age below their chronological age have above-average methylation at memory-related genes. This pattern suggests that genes important for synaptic function, neuronal maintenance and plasticity are expressed at levels consistent with efficient cognitive processes, giving a favorable epigenetic context for cognitive health.

This is not a guarantee of future outcomes, since health status, environment and behavior continue to influence methylation across the lifespan. Regular exercise, cognitively and socially engaging activities, a Mediterranean-style diet, and good sleep and stress management are the best-supported ways to maintain this advantage.

Recommendations

- [ ] Combine regular aerobic exercise with strength training at least twice weekly.
- [ ] Include mind-body practices such as yoga or Tai Chi, or activities that combine movement, learning and social contact, such as dance.
- [ ] Keep the brain challenged by learning a new language, instrument or complex hobby, and by using puzzles or memory techniques such as active recall.
- [ ] Prioritize regular social interaction and a daily mindfulness or meditation practice.
- [ ] Follow a Mediterranean-style diet with olive oil, nuts, fatty fish, berries, leafy greens, legumes and whole grains, and include eggs for choline and B vitamins.
- [ ] Limit sugary drinks, trans fats, refined carbohydrates and alcohol.
- [ ] If dietary intake is low, consider omega-3s (EPA and DHA), B vitamins, vitamin D, phosphatidylserine, creatine or acetyl-L-carnitine after discussing them with a healthcare provider.
- [ ] Choose third-party tested supplements, and treat them as support for diet and lifestyle rather than a replacement.

The science

Memory Age compares methylation at memory-related genes with age-group averages.

In the brain, methylation at CpG sites switches genes on or off and regulates synaptic plasticity, neurotransmission and the long-term potentiation that underlies learning.

Methylation patterns shift during memory formation and consolidation. Aberrant methylation, particularly hypermethylation of neuroprotective and synaptic genes, has been linked to memory impairment in Alzheimer's disease, schizophrenia and depression.

How the test was built

The analysis draws on genes linked to perceived memory performance in more than 3,000 individuals and was validated with cognitive testing against individuals with known cognitive disease. It has three parts: a Polymethylgenic Score (how well methylation patterns may protect cognitive health), Memory Age (methylation-based age compared with chronological age) and gene scores (Good or Hampered expression).

Gene information

Examples include EPHA2 (synaptic plasticity), ADCY3 (cAMP signaling for memory formation), ENC1 (neuronal development), DYNC1H1 (transport within neurons), UBA5 (protein turnover needed for synaptic plasticity), TSPAN4 (synapse formation) and ACE2, which is best known for blood pressure regulation but is emerging as relevant to cognition.

7 Memory Age Gene Involvement

ACE2
GOOD EXPRESSION

The ACE2 gene, which encodes the angiotensin-converting enzyme 2 (ACE2) protein, is primarily known for its role in the renin–angiotensin system (RAS), where it helps regulate blood pressure by modulating levels of angiotensin II. However, emerging research suggests that ACE2 also plays a role in cognitive functions, including memory, through several mechanisms.

ADCY3
GOOD EXPRESSION

This gene encodes an enzyme, adenylate cyclase 3, which is involved in the production of cyclic AMP (cAMP). cAMP is a critical secondary messenger in many signaling pathways, including those in the brain that underlie memory formation.

COL21A1
GOOD EXPRESSION

This gene encodes a collagen protein. While collagens are typically structural proteins, changes in extracellular matrix components can influence neuronal function, possibly affecting memory.

DYNC1H1
GOOD EXPRESSION

This gene encodes a component of dynein, a motor protein that is essential for intracellular transport, including in neurons. Proper function of neuronal transport is critical for memory processes.

ENC1
GOOD EXPRESSION

ENC1 is involved in neuronal development. Genes involved in neuronal differentiation and development often have implications in learning and memory.

EPHA2
GOOD EXPRESSION

Eph receptors and their ligands (ephrins) are important in neuronal development and synaptic plasticity, which are crucial for memory formation and retention.

MAD1L1
GOOD EXPRESSION

This gene is involved in cell cycle regulation and has been implicated in various psychiatric disorders, which can have secondary effects on cognitive functions, including memory.

TSPAN4
GOOD EXPRESSION

TSPAN4: Tetraspanins, like TSPAN4, are involved in various cellular processes, including those in the brain, and could have roles in the formation or modulation of synapses, which are crucial for memory.

UBA5
GOOD EXPRESSION

This gene is involved in the ubiquitin–proteasome system, which is important for protein degradation. This system is crucial for synaptic plasticity and memory.

RESULT CARD · INFLAMMATION · RESULT 1 OF 3

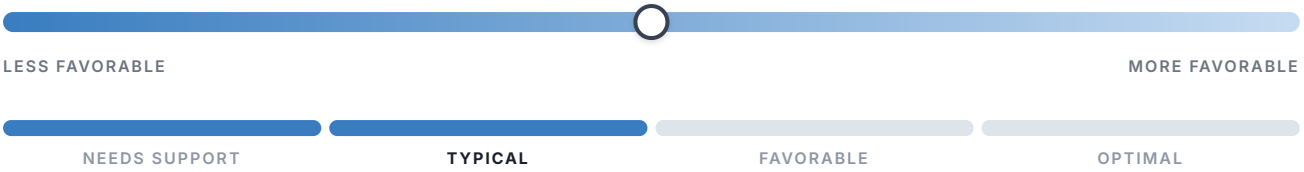
TYPICAL

8 Anti Inflammation

How well your body switches inflammation off

YOUR RESULT

Lab rating: **Average**



UNDERSTANDING WHAT THIS MAY MEAN

Your ability to calm inflammation looks about average. Everyday habits such as sleep, diet and activity may have a meaningful influence here.

Lab summary: Your Anti Inflammation test results indicate that average methylation in your anti-inflammation score could signal health risks, including symptoms like failure to heal from musculoskeletal injuries, chronic weakness and fatigue post-infection, and chronic headaches.

WHAT TO DO

- [ ] Review this result with a healthcare provider, who may consider labs such as CRP, ESR, vitamin D, thyroid function and a CBC.
- [ ] Follow an anti-inflammatory diet rich in omega-3s, vegetables, fruits and whole grains, and reduce processed foods and added sugars.
- [ ] Build physical performance with a graded program of low-impact aerobic work and progressive resistance training.
- [ ] Use physiotherapy or targeted rehabilitation for slow-healing musculoskeletal injuries.
- [ ] Aim for 7 to 9 hours of consistent sleep and practice daily stress reduction.

+2 more steps in the details on page 20.

KEY GENES

4 good · 7 hampered

GENE	SUGGESTED SUPPORT	EXPRESSION
SLC9A1	Magnesium, Zinc	HAMPERED
DDX3X	Vitamin D, B Vitamins (B6, B12, Folate)	HAMPERED
PPARA	Omega-3 Fatty Acids (EPA/DHA), Niacin (Vitamin B3), Coenzyme Q10 (CoQ10)	HAMPERED
C7orf10		HAMPERED
DAPK2	Resveratrol, Curcumin, Omega-3 Fatty Acids	HAMPERED
EP400NL	Folate (Vitamin B9) and Vitamin B12, SAM-e, Polyphenols (e.g., EGCG, curcumin)	HAMPERED
PPAPDC1A	Omega-3 Fatty Acids, Choline, Vitamin E	HAMPERED
CNRIP1		GOOD
GNA12		GOOD
EVPL		GOOD

+1 more. Shared across the Inflammation report. Full Gene Involvement on page 25.

ABOUT THIS TEST

Looks at genes that help the body calm and resolve inflammation once it has done its job.

8 Anti Inflammation

What does it mean?

Individuals with average anti-inflammatory methylation fall near the population median, reflecting neither robust anti-inflammatory activity nor pronounced suppression of these pathways. Compared with a stronger anti-inflammatory profile, this is associated with a modestly increased likelihood of slower healing after musculoskeletal injuries, prolonged fatigue after infections, chronic headaches and a gradual decline in physical performance.

These associations are probabilistic rather than certain, and methylation is one layer of regulation that interacts with age, health conditions, medications and lifestyle. Because the score can change over time with diet, activity, sleep and infection control, it is worth reviewing alongside clinical history and lab work.

Recommendations

- [ ] Review this result with a healthcare provider, who may consider labs such as CRP, ESR, vitamin D, thyroid function and a CBC.
- [ ] Follow an anti-inflammatory diet rich in omega-3s, vegetables, fruits and whole grains, and reduce processed foods and added sugars.
- [ ] Build physical performance with a graded program of low-impact aerobic work and progressive resistance training.
- [ ] Use physiotherapy or targeted rehabilitation for slow-healing musculoskeletal injuries.
- [ ] Aim for 7 to 9 hours of consistent sleep and practice daily stress reduction.
- [ ] Treat unresolved or chronic infections promptly, and avoid smoking and excess alcohol.
- [ ] Consider omega-3, vitamin D or magnesium after discussing them with a healthcare provider, and retest in 3 to 6 months after changes.

The science

The algorithm reads methylation at markers linked to immune signaling, inflammatory resolution and tissue repair. A favorable pattern is associated with reduced strain on pathways involved in chronic disease, pain signaling and musculoskeletal repair, and with faster recovery across muscle, vascular and nervous systems.

How the score works

The body produces anti-inflammatory agents that limit inflammation once it has done its job. This control matters because inflammation is part of healing, tissue regeneration and growth after injury. When control fails, inflammation can become chronic or lead to inappropriate immune responses such as allergies, and some genetic factors make this control harder.

Gene information

Genes in this result include DDX3X (innate immunity and NF-κB signaling), PPARA (lipid metabolism and suppression of pro-inflammatory cytokines), MTCH1 (mitochondrial function and apoptosis), PPAPDC1A (lipid signaling), DAPK2 (clearance of cells that sustain chronic inflammation), EP400NL (chromatin remodeling and DNA repair) and EVPL (skin and epithelial barrier integrity).

RESULT CARD · INFLAMMATION · RESULT 2 OF 3

FAVORABLE

9 Pro Inflammation

How strongly your body switches inflammation on

YOUR RESULT

Lab rating: **Great**



UNDERSTANDING WHAT THIS MAY MEAN

Your inflammation "on switch" looks better controlled than average. Soreness and injury-related inflammation may settle relatively quickly.

Lab summary: Your Pro Inflammation test shows great methylation, suggesting low pro-inflammatory markers and a reduced risk of health issues.

WHAT TO DO

- [ ] Continue a Mediterranean-style diet rich in vegetables, fatty fish, nuts and olive oil.
- [ ] Maintain intake of methylation-supporting nutrients (folate, B12, B6 and betaine) through food, or supplements as advised by a healthcare provider.
- [ ] Prioritize 7 to 9 hours of quality sleep each night.
- [ ] Train with progressive overload and schedule regular rest days.
- [ ] Avoid routine NSAID use around training unless medically necessary, since it can blunt beneficial adaptation.

+2 more steps in the details on page 22.

KEY GENES

4 good · 7 hampered

GENE	SUGGESTED SUPPORT	EXPRESSION
SLC9A1	Magnesium, Zinc	HAMPERED
DDX3X	Vitamin D, B Vitamins (B6, B12, Folate)	HAMPERED
PPARA	Omega-3 Fatty Acids (EPA/DHA), Niacin (Vitamin B3), Coenzyme Q10 (CoQ10)	HAMPERED
C7orf10		HAMPERED
DAPK2	Resveratrol, Curcumin, Omega-3 Fatty Acids	HAMPERED
EP400NL	Folate (Vitamin B9) and Vitamin B12, SAM-e, Polyphenols (e.g., EGCG, curcumin)	HAMPERED
PPAPDC1A	Omega-3 Fatty Acids, Choline, Vitamin E	HAMPERED
CNRIP1		GOOD
GNA12		GOOD
EVPL		GOOD

+1 more. Shared across the Inflammation report. Full Gene Involvement on page 25.

ABOUT THIS TEST

Looks at genes that switch inflammation on in response to injury, infection or exercise.

9 Pro Inflammation

What does it mean?

Individuals with this result have methylation in the range associated with reduced expression of pro-inflammatory markers, indicating a lower baseline inflammatory tendency. This is linked with a reduced likelihood of chronic inflammation-related conditions that contribute to cardiovascular disease, metabolic dysregulation and some degenerative processes.

Lower inflammation is also associated with less delayed-onset muscle soreness, fewer exercise-related injuries and quicker recovery between sessions. Regular activity, an anti-inflammatory diet, good sleep and stress management help maintain this profile.

Recommendations

- [ ] Continue a Mediterranean-style diet rich in vegetables, fatty fish, nuts and olive oil.
- [ ] Maintain intake of methylation-supporting nutrients (folate, B12, B6 and betaine) through food, or supplements as advised by a healthcare provider.
- [ ] Prioritize 7 to 9 hours of quality sleep each night.
- [ ] Train with progressive overload and schedule regular rest days.
- [ ] Avoid routine NSAID use around training unless medically necessary, since it can blunt beneficial adaptation.
- [ ] Reduce training intensity or volume at the first signs of persistent soreness or joint pain.
- [ ] Maintain a healthy weight, stay hydrated and limit processed foods, added sugars and trans fats.

The science

The algorithm compares methylation at markers tied to inflammatory signaling, tissue repair and exercise response with the expected range. An average pattern suggests these regions are behaving typically, with no major disruption in the pathways involved in connective tissue integrity and recovery.

How the score works

A healthy immune response starts with a strong pro-inflammatory phase to deal with infection or injury, then shifts into resolution so healing can proceed.

Chronic or excessive inflammation can contribute to tissue degeneration, muscle wasting and bone loss, and persistently high pro-inflammatory cytokines are linked with cardiovascular disease, atherosclerosis, diabetes and autoimmune disorders.

Body fat is also a source of inflammatory cytokines, so higher body fat can raise systemic inflammation.

Gene information

Genes in this result include CNRIP1, which interacts with the CB1 cannabinoid receptor that helps modulate pain and inflammation; SLC9A1, which regulates intracellular pH and cell volume during tissue damage; and GNA12, a G protein whose signaling can increase pro-inflammatory cytokines and affect pain perception.

RESULT CARD · INFLAMMATION · RESULT 3 OF 3

FAVORABLE

10

Overall Inflammation

Your overall inflammation balance

YOUR RESULT

Lab rating: **Great**



UNDERSTANDING WHAT THIS MAY MEAN

Your overall inflammation balance looks very good, with low signs of ongoing inflammatory activity. Keeping current habits steady and retesting in 12 to 24 months may be all that is needed.

Lab summary: Your overall inflammation control is great, indicating very low pro-inflammatory markers and stable health, with no dietary or supplement interventions necessary at this time.

WHAT TO DO

- [ ] Maintain current eating, movement and recovery habits.
- [ ] Avoid unnecessary dietary or supplement changes aimed at inflammation.
- [ ] Consider retesting in 12 to 24 months, or sooner if health circumstances change significantly.

Full interpretation on page 24.

KEY GENES

4 good · 7 hampered

GENE	SUGGESTED SUPPORT	EXPRESSION
SLC9A1	Magnesium, Zinc	HAMPERED
DDX3X	Vitamin D, B Vitamins (B6, B12, Folate)	HAMPERED
PPARA	Omega-3 Fatty Acids (EPA/DHA), Niacin (Vitamin B3), Coenzyme Q10 (CoQ10)	HAMPERED
C7orf10		HAMPERED
DAPK2	Resveratrol, Curcumin, Omega-3 Fatty Acids	HAMPERED
EP400NL	Folate (Vitamin B9) and Vitamin B12, SAM-e, Polyphenols (e.g., EGCG, curcumin)	HAMPERED
PPAPDC1A	Omega-3 Fatty Acids, Choline, Vitamin E	HAMPERED
CNRIP1		GOOD
GNA12		GOOD
EVPL		GOOD

+1 more. Shared across the Inflammation report. Full Gene Involvement on page 25.

ABOUT THIS TEST

Combines anti- and pro-inflammatory markers into one overall inflammation balance.

10 Overall Inflammation

What does it mean?

Individuals with this result show very strong inflammatory control, with very low pro-inflammatory activity and a stable immune state. Inflammation does not appear to be a current biological concern.

Because the pattern already reflects well-regulated balance, dietary or supplement changes aimed at lowering inflammation are not indicated, and maintaining the current routine is the most appropriate approach.

Recommendations

- [ ] Maintain current eating, movement and recovery habits.
- [ ] Avoid unnecessary dietary or supplement changes aimed at inflammation.
- [ ] Consider retesting in 12 to 24 months, or sooner if health circumstances change significantly.

The science

Cytokine signaling integrates input from immune receptors, redox status and tissue stress. A profile with very low inflammatory drive suggests restrained NF-κB activity, limited cytokine amplification and efficient shutdown of immune signaling once a threat has passed. The algorithm weighs inflammatory markers against the expected range rather than an absolute cutoff.

How the score works

Inflammation is a vital defense that protects against infection and supports tissue repair, but uncontrolled inflammation can contribute to tissue degeneration and disease. The response is governed by a balance between pro-inflammatory cytokines, which drive inflammation, and anti-inflammatory cytokines, which keep it in check.

10 Inflammation Gene Involvement

C7orf10 — HAMPERED

Potential supplements to improve expression: Coenzyme Q10 (CoQ10): Boosts mitochondrial and metabolic function Magnesium: General metabolic enhancer B-complex vitamins: Support enzymatic activity in metabolism

DAPK2 — HAMPERED

SUGGESTED SUPPORT

- **Resveratrol:** Modulates apoptotic pathways and may influence kinase activity
- **Curcumin:** Reduces inflammation and supports cell survival mechanisms
- **Omega-3 Fatty Acids:** Anti-inflammatory effects
- **Vitamin D3:** Regulates immune- and apoptosis-related genes

DDX3X — HAMPERED

SUGGESTED SUPPORT

- **Vitamin D:** Influences genes involved in cellular growth and differentiation
- **B Vitamins (B6, B12, Folate):** Support DNA methylation and genomic stability

EP400NL — HAMPERED

SUGGESTED SUPPORT

- **Folate (Vitamin B9) and Vitamin B12:** Support DNA repair and methylation
- **SAM-e:** Acts as a methyl donor in epigenetic regulation
- **Polyphenols (e.g., EGCG, curcumin):** Modulate chromatin structure

PPAPDC1A — HAMPERED

SUGGESTED SUPPORT

- **Omega-3 Fatty Acids:** Improve lipid signaling and reduce inflammation
- **Choline:** Supports lipid metabolism
- **Vitamin E:** Antioxidant support for lipid structures
- **Berberine:** Regulates lipid pathways and metabolism

PPARA — HAMPERED

SUGGESTED SUPPORT

- **Omega-3 Fatty Acids (EPA/DHA):** Activate PPARA and improve fatty acid metabolism
- **Niacin (Vitamin B3):** Influences lipid metabolism and energy homeostasis
- **Coenzyme Q10 (CoQ10):** Supports mitochondrial energy metabolism

SLC9A1 — HAMPERED

SUGGESTED SUPPORT

- **Magnesium:** Supports cellular ion transport
- **Zinc:** Essential for ion exchange and cellular signaling

CNRIP1 — GOOD EXPRESSION

No action recommended by the lab.

EVPL — GOOD EXPRESSION

No action recommended by the lab.

GNA12 — GOOD EXPRESSION

No action recommended by the lab.

MTCH1 — GOOD EXPRESSION

No action recommended by the lab.

RESULT CARD · IMMUNOSCORE

NEEDS SUPPORT

11 Immunoscore

Immune regulation and barrier defense

YOUR RESULT

Lab rating: **Below average**



Scores methylation across genes involved in immune regulation and barrier defense, out of 1,000. The lab rates 850 to 900 as below average.

NEEDS SUPPORT | TYPICAL | FAVORABLE | OPTIMAL

UNDERSTANDING WHAT THIS MAY MEAN

Your immune-related methylation reads below the ideal range. This may mean immune regulation is less steady than it could be. Nutrients that feed methylation (folate, B12 and choline), sleep and hydration may help.

Lab summary: Your Immunoscore indicates that your methylation is below average, which weakens your immune response and reduces your body's ability to fight infections.

WHAT TO DO

- [ ] Increase intake of foods rich in folate, vitamin B12 and choline to support methylation.
- [ ] Prioritize a mineral-rich diet and drink enough water throughout the day.
- [ ] Exercise regularly and keep a consistent sleep schedule.
- [ ] Avoid heavy metals, pesticides and cigarette smoke, which can disrupt methylation.
- [ ] Support stomach acid production and tissue barriers, the body's first lines of defense against pathogens.

+1 more steps in the details on page 27.

GENES THIS TEST LOOKS AT

PCDHGA1 | CDH22 | OR10K2 | ATP4B

The lab does not provide a per-gene rating for this test. Gene roles are described in the details.

11 Immunoscore

What does it mean?

Individuals with a below-average Immunoscore have methylation patterns that may provide less support for a balanced, responsive immune system. This may reduce resistance to bacterial, viral and fungal challenges and make immune regulation less steady. Scores between 850 and 900 are also associated with a tendency toward abnormal immune activation.

The test covers genes involved in cell signaling and barrier protection, so support for methylation, hydration and tissue barriers is the focus. Steady habits are generally more helpful here than extremes.

Recommendations

- [ ] Increase intake of foods rich in folate, vitamin B12 and choline to support methylation.
- [ ] Prioritize a mineral-rich diet and drink enough water throughout the day.
- [ ] Exercise regularly and keep a consistent sleep schedule.
- [ ] Avoid heavy metals, pesticides and cigarette smoke, which can disrupt methylation.
- [ ] Support stomach acid production and tissue barriers, the body's first lines of defense against pathogens.
- [ ] Discuss frequent infections or signs of autoimmunity or inflammation with a healthcare provider.

The science

Methylation shapes which immune genes are accessible during cell development, activation and tolerance. When methylation is below the expected range, the algorithm infers weaker control over genes needed for T-cell and B-cell maturation, barrier maintenance and pathogen defense.

Epigenetic silencing of immune surveillance pathways is also relevant to tumor biology, as it can allow abnormal cells to escape immune recognition.

Gene information

Key genes include PCDHGA1 (neuroimmune signaling and inflammatory regulation), CDH22 (epithelial adhesion and barrier integrity), OR10K2 (sensing of microbial signals that can modulate local immunity) and ATP4B (stomach acid production, an early defense against harmful microbes).

RESULT CARD · EPIVITALITY

NEEDS SUPPORT

12 EpiVitality

Resilience to inflammation and stress

YOUR RESULT

Lab rating: **Substantially reduced**



An age-independent score of physiological resilience from three highly significant methylation sites, out of 50.

NEEDS SUPPORT | TYPICAL | FAVORABLE | OPTIMAL

UNDERSTANDING WHAT THIS MAY MEAN

Your methylation at these resilience markers is substantially reduced. This suggests a stronger tendency toward immune overactivity and systemic inflammation, and a lower reserve for handling stress or infection. Targeted supplements and diet changes are the main levers.

Lab summary: Your EpiVitality test suggests substantial hypomethylation, which increases your risk for autoimmune conditions and heightened systemic inflammation, but this can be addressed by following the recommended supplement and diet changes.

WHAT TO DO

- [ ] Take vitamin D3, 3,000 to 5,000 IU nightly.
- [ ] Take a methylated B-complex each morning with food.
- [ ] Take omega-3, 1,000 to 2,000 mg five days per week.
- [ ] Take creatine monohydrate, 5 g daily, and alpha-GPC, 400 to 800 mg in the morning six days per week.
- [ ] Take lycopene, 15 to 50 mg daily with a meal, ideally a tomato-based one.

+5 more steps in the details on page 29.

KEY GENES

GENE	SUGGESTED SUPPORT	EXPRESSION
AFAP1	Vitamin D3 > 1000 IU per day, Methylfolate 10–30 mg per day	SEE NOTES
INTERGENE	Limit pollution exposure, Avoid smoking and passive smoke, Reduce stress levels	SEE NOTES
RNASEH2C		SEE NOTES

Full Gene Involvement on page 30.

12 EpiVitality

What does it mean?

Individuals with substantially reduced EpiVitality methylation show hypomethylation patterns that track with a tendency toward immune overactivity, higher systemic inflammation and reduced physiological resilience. This profile is associated with an increased risk of autoimmune-type reactions, a baseline of low-grade inflammation and a lower reserve for handling stress or infection, even when few symptoms are present.

In daily life this may show up as feeling run down after infections or slower recovery from stress. Lowering inflammation, supporting methylation and strengthening gut-immune function may reduce the chance that these tendencies become clinical problems. Tracking markers such as CRP, vitamin D, B12 and folate with a healthcare provider, and watching for new autoimmune symptoms, allows early intervention.

Recommendations

- [ ] Take vitamin D3, 3,000 to 5,000 IU nightly.
- [ ] Take a methylated B-complex each morning with food.
- [ ] Take omega-3, 1,000 to 2,000 mg five days per week.
- [ ] Take creatine monohydrate, 5 g daily, and alpha-GPC, 400 to 800 mg in the morning six days per week.
- [ ] Take lycopene, 15 to 50 mg daily with a meal, ideally a tomato-based one.
- [ ] Consider fisetin for 3 consecutive days each month with a high-fat meal, at about 20 mg per kg of body weight.
- [ ] Consider L-glutamine, 5 to 15 g in water 3 to 4 times per week, and whey protein isolate, 20 to 40 g per serving 3 or more times per week, to support gut and muscle.
- [ ] Follow a low glycemic, Mediterranean-style diet with methyl-donor foods (eggs, beets, leafy greens, liver, cruciferous vegetables), fermented foods and prebiotic fiber.
- [ ] Limit ultra-processed foods, alcohol, trans fats, seed oils such as soybean oil and chronic calorie surplus.
- [ ] Review doses with a qualified practitioner before starting, especially with existing medications, and monitor CRP periodically.

The science

The algorithm maps methylation at these three sites to pathways involved in inflammatory signaling and immune regulation. Slightly reduced methylation suggests gene expression control may be less stable than optimal.

Nutrient status and diet quality influence one-carbon metabolism, antioxidant defense and detoxification. Supporting these pathways can help stabilize epigenetic control and lower the chance that minor changes develop into longer-term immune or inflammatory strain.

How the score works

Results are reported out of 50. Because the test is age-independent, the score is interpreted against the lab's resilience ranges rather than against age.

12 EpiVitality Gene Involvement

AFAP1

NOT RATED

The AFAP1 gene (Actin Filament Associated Protein 1) plays a key role in cell signaling, cytoskeletal dynamics, and inflammation. Its functions and clinical implications are increasingly recognized, especially in contexts like epigenetic regulation, immune response, and cell stress resilience.

SUGGESTED SUPPORT

- Vitamin D3 > 1000 IU per day
- Methylfolate 10–30 mg per day

INTERGENE

NOT RATED

SUGGESTED SUPPORT

- Limit pollution exposure
- Avoid smoking and passive smoke
- Reduce stress levels

RNASEH2C

NOT RATED

No action recommended by the lab.

RESULT CARD · MUSCLE DEGENERATION

OPTIMAL

13

Muscle Degeneration

Muscle repair, recovery and long-term muscle quality

YOUR RESULT

Lab rating: **Fantastic**



Scores methylation at genes tied to muscle repair, energy use and protein turnover, out of 300.

NEEDS SUPPORT | TYPICAL | FAVORABLE | **OPTIMAL**

UNDERSTANDING WHAT THIS MAY MEAN

Your muscle-related methylation looks excellent. This suggests strong support for muscle repair, recovery and long-term muscle quality.

Lab summary: Your fantastic methylation status is expected to reduce muscle degeneration, leading to improved recovery and physical performance.

WHAT TO DO

- [ ] Distribute 15 to 30 g of complete protein per meal to support muscle protein synthesis.
- [ ] Resistance train 2 to 3 times per week with gradual load progression, plus regular aerobic activity.
- [ ] Maintain adequate calories, hydration and 7 to 9 hours of sleep on a consistent schedule.
- [ ] Maintain intake of methyl donors such as folate, vitamin B12 and choline.
- [ ] Use vitamin D, omega-3, creatine, magnesium or a B-complex when diet or lab values indicate a need.

+1 more steps in the details on page 32.

GENES THIS TEST LOOKS AT

SLC2A1 · PDHX · ACOT2 · NMNAT2 · PSMC2 · USP2 · RPN1

The lab does not provide a per-gene rating for this test. Gene roles are described in the details.

13 Muscle Degeneration

What does it mean?

Individuals with this result have methylation patterns that strongly support muscle maintenance, repair and adaptation. This profile favors efficient protein synthesis, tissue resilience and recovery, with a lower risk of muscle degeneration and good preservation of muscle quality over time.

Current training appears well tolerated, with no sign of overtraining, and energy availability, protein intake, sleep and inflammation control all point to a strong recovery environment. A structured program with gradual progression is likely to be well supported.

Recommendations

- [ ] Distribute 15 to 30 g of complete protein per meal to support muscle protein synthesis.
- [ ] Resistance train 2 to 3 times per week with gradual load progression, plus regular aerobic activity.
- [ ] Maintain adequate calories, hydration and 7 to 9 hours of sleep on a consistent schedule.
- [ ] Maintain intake of methyl donors such as folate, vitamin B12 and choline.
- [ ] Use vitamin D, omega-3, creatine, magnesium or a B-complex when diet or lab values indicate a need.
- [ ] Avoid smoking and excess alcohol, which increase oxidative stress and muscle breakdown.

The science

Methylation controls how accessible muscle genes are for repair, turnover and contraction. Favorable patterns keep programs for satellite cell activity, neuromuscular stability, mitochondrial efficiency and protein synthesis active while restraining catabolic and inflammatory signals.

The net effect is less structural decay in fast-twitch fibers, less fat infiltration and better retention of muscle quality. Exercise and nutrition, including methyl donors, amino acids and adequate energy, are upstream inputs that can reshape these methylation patterns.

Gene information

Key genes include SLC2A1, PDHX, ACOT2 and NMNAT2, which support fuel use and ATP availability, and PSMC2, USP2 and RPN1, which regulate protein balance so turnover proceeds without excessive breakdown.

APPENDIX · BACKGROUND

A Background on each test

MethylPace

ABOUT THE METHYLPACE CLOCK

MethylPace measures biological aging through DNA methylation, the addition of methyl groups to DNA that regulates gene expression without changing the genetic code. Unlike chronological age, biological age reflects cellular health and how it has been shaped by stress, diet, exercise and environmental exposures.

The algorithm analyzed more than 850,000 CpG sites and selected those most strongly linked to aging ($P \leq 0.00001$). Hypermethylation provided the most accurate model, and the current version focuses on 10 primary genes that reflect the combined effects of genetics, lifestyle and environment on aging.

Body Age

ABOUT THE BODY AGE TEST

The Body Age test estimates the epigenetic age of three specific systems: hearing, vision and memory. Epigenetic age reflects the biological wear on a tissue rather than the number of years lived, and it can differ between systems in the same individual.

- Hearing Age reflects the effect of noise exposure, oxidative stress and inflammation on auditory health.
- Eye Age reflects retinal and optic nerve health, which is influenced by UV exposure, diet and metabolic health.
- Memory Age reflects cognitive function, with a focus on markers tied to neurodegenerative disease and the effects of diet, sleep and mental stimulation.

Each result compares methylation at genes linked to that system with typical patterns for the individual's age group, which can support earlier, targeted steps to protect sensory and cognitive function.

Inflammation

ABOUT THE INFLAMMATION TEST

Chronic inflammation is a major driver of aging and of conditions including cardiovascular disease, diabetes, neurodegenerative disorders and autoimmune disease. Unlike acute inflammation, which protects the body after injury or infection, chronic inflammation persists and can damage tissues over time.

This test evaluates methylation at genes involved in immune regulation, inflammatory pathways and oxidative stress. Methylation at these genes responds to diet, stress, physical activity and toxin exposure. The test reports three results: the ability to calm inflammation (Anti Inflammation), the tendency to trigger it (Pro Inflammation) and the balance between the two (Overall Inflammation).

Immunoscore

ABOUT THE IMMUNOSCORE

DNA methylation plays a central role in immune function. It switches immune genes on or off, guides how stem cells develop into T cells, B cells and macrophages, and supports immune memory, which allows a faster response to pathogens the body has encountered before.

- Cytokine production: hypermethylation of cytokine gene promoters can reduce cytokine production and dampen the immune response.
- Autoimmunity: hypomethylation of immune-related genes can lead to overexpression and immune attack on the body's own tissues.
- Infection: some viruses induce hypermethylation of antiviral genes to evade the immune system.
- Cancer: tumors often show methylation patterns that silence genes involved in immune surveillance.

EpiVitality

ABOUT EPIVITALITY

EpiVitality is a fourth-generation epigenetic test that measures DNA methylation at three highly significant CpG sites ($p = 10^{-5.18}$). Unlike age-based clocks, it is age-independent and reflects physiological resilience rather than biological age.

The test focuses on hypomethylation. Lower methylation at these sites is associated with higher inflammation, reduced stress resilience, greater pain sensitivity and immune-related conditions, including a documented association with fibromyalgia.

A Background on each test

continued

Muscle Degeneration

ABOUT THE METHYLATION ALGORITHMS

DNA methylation adds a methyl group to cytosine at CpG sites, which regulates gene expression without changing the DNA sequence. Methylation in a gene's promoter region generally silences that gene by blocking the binding of transcription factors. These patterns are essential for normal development and cell differentiation, and changes in them are associated with aging and with diseases such as cancer, cardiovascular disease and neurodegeneration.

HOW THE ALGORITHMS ARE BUILT

The lab's algorithms are built from large datasets of methylation profiles across a range of ages, measured with the Illumina EPIC array, which reads hundreds of thousands of CpG sites. Statistical and machine learning methods, such as LASSO regression and random forests, narrow these down to the most informative sites. Each model is trained on one part of the data and validated on another, using measures such as mean absolute error and R^2.

THE METHYLATION SCORE

The methylation score reflects the mean methylation, and therefore expression, of all genes in an algorithm. Each algorithm has eight possible outcomes, from very poor to fantastic, set by analyzing health outcomes and gene expression in the lab's datasets.