

# Methylation Age

## Methylation Testing Report



**PRESENTED BY**

Teraster

**PRESENTED FOR**

Alan

# Unlocking Your Longevity with Teraster

Dear Friend,

Thank you for completing Your Methylation test. Your results are in - but before you celebrate or worry, know that we are here to support your journey to a longer, healthier life.

Longevity isn't just about adding years - it's about vitality, cognition, and well-being. Methylation testing acts as a biological timekeeper, reflecting how your body ages beyond just the years you've lived.

This test deciphers those changes, offering insights into your biological age and overall health. With this knowledge, you can take proactive steps toward a healthier, longer life with us by your side.

# Proprietary Highlights

Our DNA methylation test leads the industry with:



## 1. Comprehensive Coverage

Analyzes hundreds of thousands of biologically significant DNA methylation sites, providing a complete epigenetic profile.



## 2. Advanced AI Models

Utilizing computational biology and artificial intelligence, we develop highly precise mathematical models to deliver in-depth interpretations of your DNA methylation data.



## 3. Robust Data Support

Based on tens of thousands of samples and millions of data points, our model undergoes rigorous training and validation to ensure accurate biological age prediction and risk assessments



## 4. 360° Aging Assessment

Our test provides a multi-dimensional analysis—from biological age, organ aging, and immune status to telomere length. By incorporating lifestyle factors such as smoking, alcohol consumption, environmental pollution, and sleep stress, we offer a precise assessment of your current health deterioration.

The Aging Test helps you better understand your health, detect potential issues early, and provides scientific support for personalized health management. Regular testing (every 6 months) allows you to track your aging trajectory and identify risks of health decline in time.

Let's unlock your life code and embark on a new chapter of health management together!

\* Please note that this report is for reference only and does not replace professional medical diagnosis. If you have any health concerns, please consult a healthcare professional.

# Your Test Summary

## Your Biological Age

 29.5



## Achievements to celebrate :

### Gut Biological Age

Your digestive system is healthy, absorbing nutrients and eliminating waste effectively.

### Lungs Biological Age

Your lungs are full of vitality, fueling you with fresh energy.



## Areas to Focus on :

### Musculoskeletal system Biological Age High

Hormonal changes may affect bone density and muscle strength. Increase strength training and calcium intake.

### Immune system Biological Age High

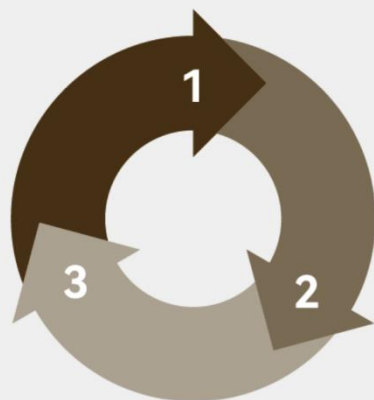
Stress, lack of rest, or poor diet may weaken immunity. Maintain a balanced lifestyle for better immune defense.



# Biological Age



# Aging Assessment



## 1 Epigenetic Clock

Based on large-scale population methylation data modeling, the epigenetic clock is calculated.

## 2 Telomere Length Evaluation

Telomere length is measured based on DNA methylation detection.

## 3 Immunity Assessment

Evaluation includes immune balance indices, three major immune functions, and immune cell ratios.

With advancements in science and technology, aging is no longer just a concept tied to calendar or time. Aging is quantified and evaluated as a biological manifestation. This report provides a comprehensive overview of aging characteristics from three core dimensions: Epigenetic Clock, Telomere Length Evaluation, and Immunity Assessment.

## 1. Epigenetic Clock

By analyzing biological age, aging acceleration, and health vitality indices, this assessment conducts a comprehensive evaluation of your body. It further explores deeper levels, including the cardiovascular system, metabolic system, and five major organ systems, to establish a comprehensive biological aging profile.

## 2. Telomere Length Evaluation

Telomere length, correlated with age and compared to peer groups, is assessed to understand the degree of cellular aging and the cellular age level of the actual population

## 3. Immune Function Assessment

This assessment analyzes the overall health status of the immune system, including immune balance indices, cell type ratios, and immune defense, surveillance, and repair functions. It provides a comprehensive reference for improving aging prevention strategies. DNA methylation detection helps us understand cellular and molecular mechanisms, assess an individual's immune aging state, and provide scientific guidance for health improvement and aging delay.

# Biological Age

A Comprehensive Assessment of Individual Aging



## Key Highlights of This Chapter

- \* Biological Age provides a static perspective, reflecting the true aging status of the body
- \* Aging Acceleration Factor offers a dynamic view, revealing changes in the rate of aging
- \* LifeSpark Score serves as a relative benchmark, comparing an individual's health status with peers

Aging is a natural process that everyone experiences, but its speed and impact vary from person to person. Lifestyle and environmental factors dynamically influence DNA methylation, and adverse influences can trigger abnormal methylation, activating pro-inflammatory genes and suppressing DNA repair genes. This can accelerate cellular decline in the short term. By monitoring these indicators, we can scientifically manage aging, slow its progression, and maintain overall health and vitality

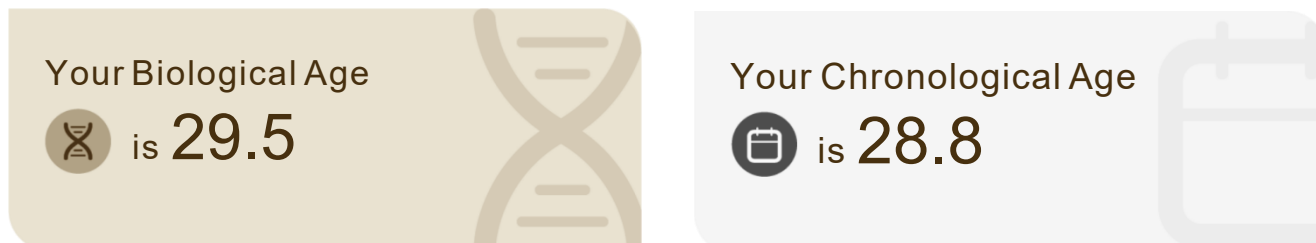
## Epigenetic clock-Quantifying the Aging process

The Epigenetic Clock estimates biological age by analyzing gene expression and DNA methylation patterns. Unlike traditional chronological age, it focuses on methylation levels in specific genomic regions that change with aging. By tracking these methylation levels, the Epigenetic Clock provides a precise measure of biological age, offering a more accurate assessment than calendar age.

Understanding Your Biological Age Is the First Step Toward a Healthier Life.

# Biological Age

Biological age measures an individual's true physiological state and health level, providing insight into the body's biological aging process.



## Biological age and chronological age :

Chronological age simply measures the time passed since birth, while biological age reflects how well your body is aging based on physiological and biochemical markers. If your biological age exceeds your chronological age or

shows signs of accelerated aging, there's no need to be alarmed. This is not irreversible. With positive lifestyle changes and targeted health interventions, you can significantly improve your health and potentially reverse aging trends.

The biological age is dynamic and can be improved. Regular assessments are a valuable tool for monitoring your health progress over time.

## Your Biological age and chronological age

sample collection Date	chronological Age	Biological Age	Age Deviation
2025/04/29	28.8	29.5	0.7

## scientific Basis

DNA methylation, a key epigenetic modification, acts as a sensitive biomarker for tracking the aging process and overall health. It is thus an essential tool for aging evaluation and health monitoring. As individuals age, specific

genes undergo predictable methylation changes that are closely linked to cellular function, gene expression, and the biological processes of aging.

By analyzing tens of thousands of DNA methylation samples, we have identified multiple methylation sites highly correlated with biological age and developed a high-precision predictive model. Through rigorous training and

validation, this model ensures accurate biological age estimation and reliable health risk assessment.

## Biological Age

# Aging Acceleration Factor

The Aging Acceleration Factor is an indicator that measures the extent to which an individual's aging rate deviates from the normal trend based on chronological age. It reflects the overall condition of genetic, environmental and cellular health factors, revealing whether the aging process has accelerated or decelerated.

Your Aging Acceleration Factor is



**1.02** Aging Faster

## What is AAF?

The Aging Acceleration Factor (AAF) measures how rapidly or slowly a person is aging relative to their chronological age. It integrates data from various physiological, metabolic, and DNA epigenetic markers to assess the body's overall health, functional status, and cellular condition. This index quantifies the extent of deviation between biological and chronological age

$$AAF = 1 + \frac{\delta H}{CA}$$

- AAF represents the aging acceleration factor, indicating the current aging rate of an individual. CA refers to chronological age, and BA refers to biological age.
- $\delta$  represents the absolute difference between biological age and chronological age, calculated as  $\delta = |CA - BA|$ .
- H is an indicator function, define as:

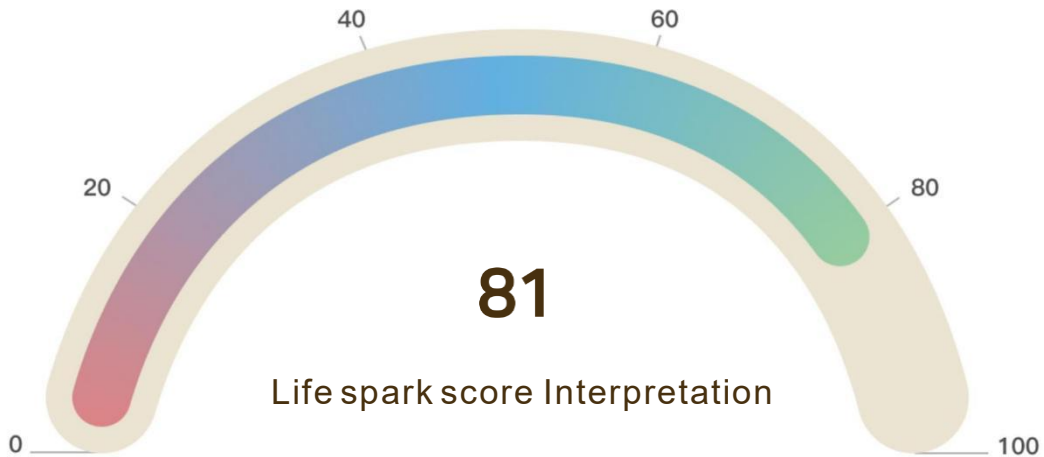
$$H = \begin{cases} 1, & BA > CA \\ -1, & BA \leq CA \end{cases}$$

- When the AAF is greater than 1, it indicates that an individual's biological age exceeds their chronological age, signifying an accelerated aging process. This may be associated with unhealthy lifestyle choices, underlying health conditions, or exposure to adverse environmental factors.
- When the AAF equals 1, it suggests that the individual's biological age aligns with their chronological age, reflecting a normal physiological aging process.
- When the AAF is less than 1, it implies that the individual's biological age is lower than their chronological age, indicating a slower aging process. This may result from a healthy lifestyle, favorable genetic predisposition, or a beneficial living environment.

Biological Age

# LifeSpark Score

The LifeSpark Score measures an individual's health and vitality relative to peers of the same age, assessing their ability to maintain a high level of well-being throughout the aging process. A higher score indicates better health and vitality, while a lower score may suggest potential declines associated with aging.



## LifeSpark Score Interpretation :

Your LifeSpark Score is in line with your peers.

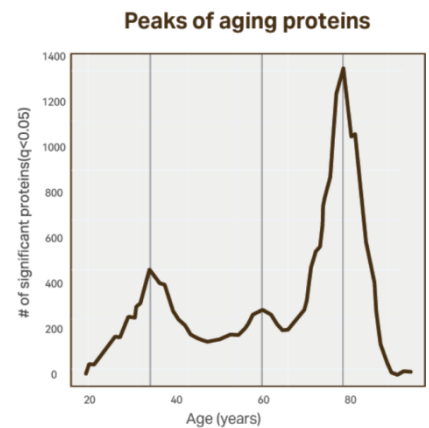
This suggests that your overall health status is at an average level. Continuing good lifestyle habits—such as a balanced diet, regular exercise, and sufficient sleep—will reinforce your health and enhance vitality.

## Key Acceleration Points of Human Aging :

Aging does not occur at a constant rate with age. Research has identified three key acceleration points in human aging: 34, 60, and 78 years old.

A study published in Nature Medicine by a research team from Stanford University revealed that we do not age gradually but instead experience three significant aging “cliffs” over a lifetime.

By analyzing the plasma proteomics of over 4,000 individuals across different age groups, researchers found distinct biomarkers in the fourth, seventh, and eighth decades of life. These shifts in blood proteins reflect biological pathway changes, providing insights into age-related diseases and genomic-proteomic differences. The study suggests that human aging follows a stepwise pattern, with notable aging thresholds occurring at approximately 34, 60, and 78 years old. These points mark significant physiological shifts, indicating key phases of biological aging.



# Conclusion on Biological Age

The aging process is far more complex than the mere passage of time. It involves both genetic programming and the influence of environmental factors, lifestyle choices, and molecular changes. Biological Age serves as a quantifiable measure of this process, offering a more accurate reflection of an individual's overall health status compared to the chronological age. It is closely linked to chronic disease risk, longevity, and lifestyle influences.

DNA methylation is one of the most extensively studied and stable biomarkers of aging. As individuals age, specific genomic sites undergo predictable methylation changes, affecting gene expression, inflammation, metabolism, and immune homeostasis. Research has shown that epigenetic aging clocks can effectively predict the risk of cardiovascular diseases, diabetes, cancer, and neurodegenerative disorders.

Biological age assessment not only reveals an individual's aging trajectory but also helps evaluate the impact of lifestyle and health interventions. Studies indicate that healthy habits, such as a Mediterranean diet, regular exercise, quality sleep, and stress management, can slow down epigenetic aging. Conversely, factors like smoking, chronic inflammation, and environmental pollution may accelerate biological aging.

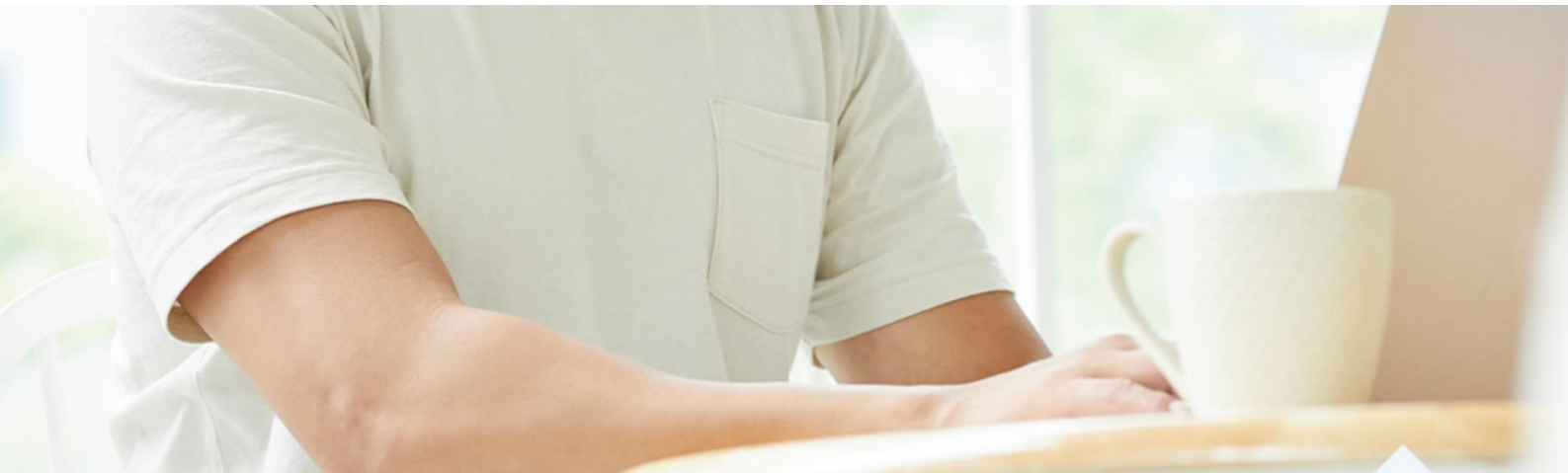
With advancements in epigenetic research, our understanding of aging plasticity will continue to grow. Biological age is not only a health metric but also a key reference for anti-aging strategies. Through scientific health management, individuals can proactively optimize their aging trajectory, slow down the aging process, and move toward a longer, healthier life.

# Organ Age



# Organ Age

## A Multi-Dimensional Approach to Health Insights



### Key Highlights of This Chapter

This report evaluates the biological age of five major organs—heart, brain, kidneys, liver, and lungs—along with five key physiological systems, including the musculoskeletal system (bones & muscles), metabolic system, vascular system, gut microbiome, and immune system.

When it comes to aging, we often simplify it into a single number. However, this “one-size-fits-all” approach fails to capture the complexity of the human body. The Organ Age Report moves beyond traditional biological age assessments by offering a granular analysis of key organs and systems. This multi-dimensional perspective helps uncover potential health risks and early signs of aging, enabling a more precise understanding of one’s overall well-being.

### Decoding the Aging Trajectory of Organs

Aging is a complex and multi-faceted process, impacting various organs and systems at different rates. Due to lifestyle, environmental, and genetic factors, the pace of aging varies across different body parts. As organ function declines, specific gene expression patterns shift, with DNA methylation playing a crucial regulatory role. By analyzing an individual’s DNA methylation profile, we can provide targeted insights for localized antiaging strategies and precision health management.

A progressive journey from a holistic view to in-depth insights, laying a scientific foundation for precision health management.

# Systemic Organs Biological Age

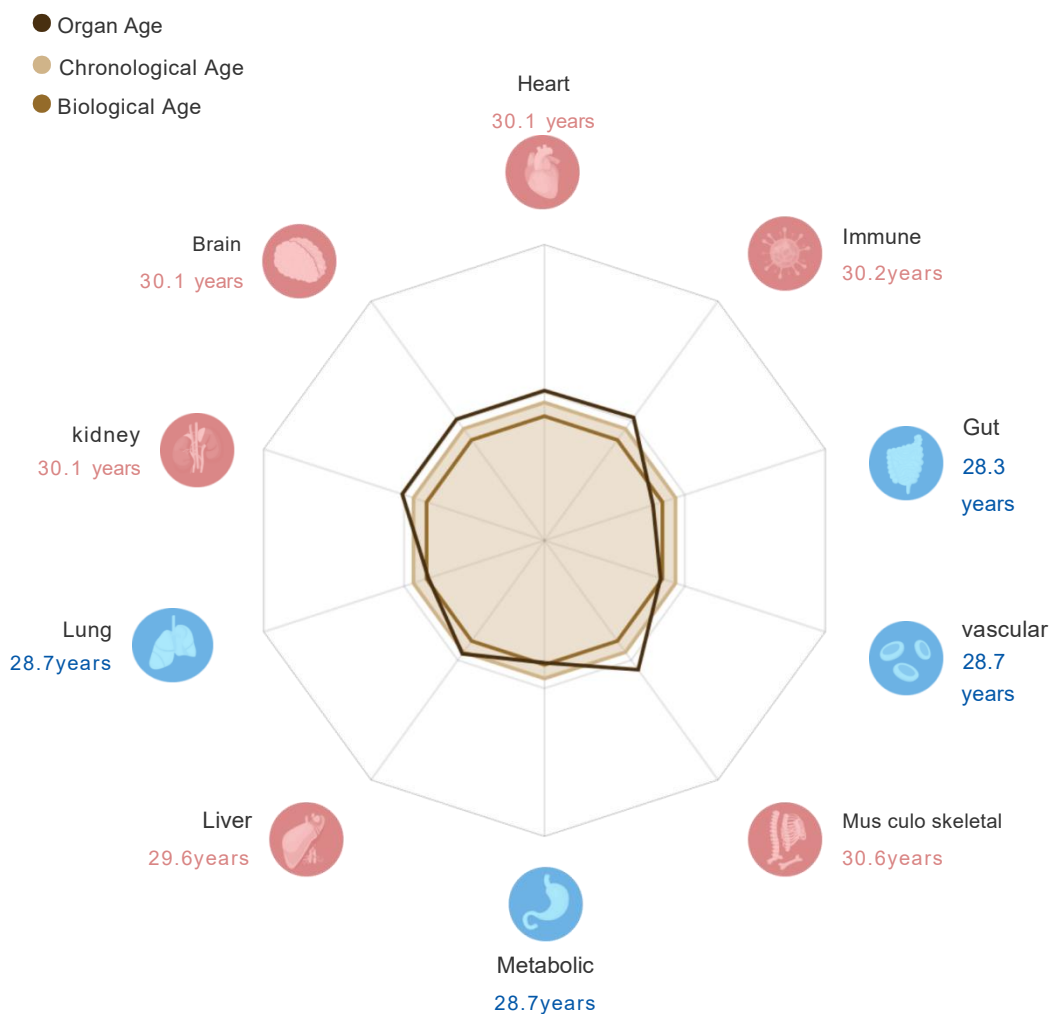
Systemic Organs Biological Age provides insights into the health status of individual organs relative to chronological age. It is determined by analyzing DNA methylation patterns, providing predictions about the current and future physiological and functional states of specific organs throughout the aging process

This report evaluates the biological age of 10 systems or organs, including the heart, brain, kidneys, liver, lungs, musculoskeletal system, metabolism, blood vessels, gut, and immune system. By offering both an overall and in- depth perspective, it enables a more comprehensive understanding of the body's aging process.

\*The Light brown line represents your chronological age, while the dark brown line shows your biological age. Red- marked values indicate that a specific item's age surpasses your chronological age, highlighting the need for increased attention and care.

Your Biological Age is:29.5

Your Chronological Age is:28.8



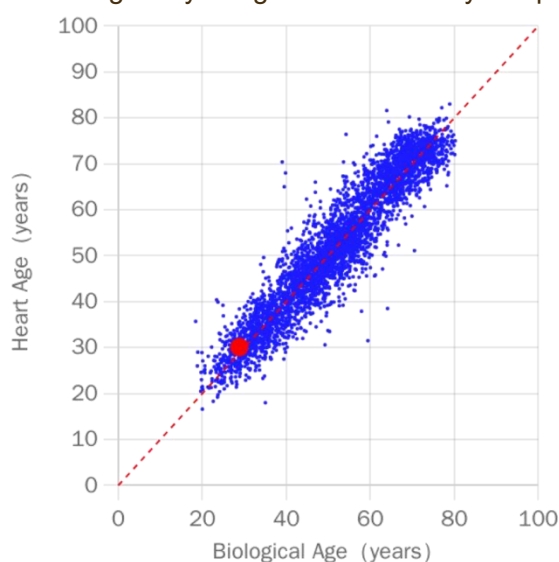
Organ Age

# Heart Biological Age

Your Heart Biological Age is

 30.1

your heart age is younger than 53% of your peers.



## Heart Biological Age

As the body's "pump," the heart supplies oxygen and nutrients to organs, directly influencing various diseases. Cardiovascular conditions like coronary artery disease, and myocardial infarction are closely linked to heart aging.

With age, structural and functional changes occur, including myocardial hypertrophy, reduced elasticity, and arterial stiffness, increasing cardiovascular risk while affecting immune and metabolic health.

When the heart age exceeds chronological age, the risk of heart disease, heart failure, and aging-related conditions rises. Regular monitoring helps detect potential issues early and provide a scientific basis for personalized prevention and intervention strategies, ultimately improving overall health.

\*If you have a family history of heart disease or suspect cardiovascular risks, consult a qualified healthcare professional before considering anti-aging interventions to ensure personalized and expert guidance.

## Key Gene Functions & Roles



### **TGFBR1**

- TGFBR1 is a crucial regulator in the TGF- $\beta$  signaling pathway, playing a key role in heart and vascular development. Mutations in this gene are linked to non-syndromic congenital heart disease (CHD) without aortic involvement. Notably, two missense variants, p.R398C and p.R398H, can lead to either gain or loss of function, affecting the SMAD signaling pathway and influencing cardiovascular health.

Chromosome 9



### **RBM20**

- RBM20 is a key player in alternative RNA splicing, particularly in cardiac tissue. It regulates genes essential for sarcomere structure, mitochondrial function, calcium handling, and ion channel activity. Mutations in RBM20, especially within its arginine/serine-rich (RS) domain, are strongly associated with dilated cardiomyopathy (DCM), a condition characterized by left ventricular dilation and impaired contraction, leading to heart failure. These mutations may cause RBM20 to mislocalize from the nucleus to the cytoplasm, disrupting normal splicing and forming cytoplasmic granules that contribute to cardiac dysfunction.

Chromosome 10

## Your Key Methylation Loci Results

Methylation LOC	Rate of Reference population	Your Methylation Rate
cg16155702	0.783	0.758
cg11024682	0.437	0.540
cg06872964	0.488	0.502
cg00574958	0.094	0.138
cg18608055	0.545	0.565

## Heart Health Tip


Coenzyme Q10 (CoQ10) is a fat-soluble, vitamin-like compound found in all human cells, particularly in mitochondria. It supports heart health by reducing oxidative stress, enhancing mitochondrial function, and improving energy metabolism, which are essential for maintaining optimal cardiac performance.

To achieve heart-protective benefits, a daily intake of 30–200 mg is recommended for adults, as both excessive and insufficient intake may be ineffective. Before starting CoQ10 supplementation, it is advisable to consult a healthcare professional to ensure a safe and personalized dosage based on your health condition and needs.

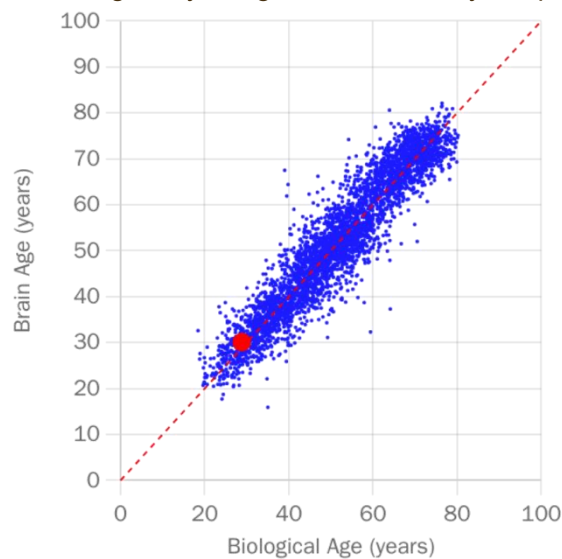
Organ Age

# Brain Biological Age

Your Brain Biological Age

 is **30.1**

your brain age is younger than 52% of your peers.



## Brain Biological Age

As the body's "command center," the brain processes information, regulates emotions, and controls movement. Neurological disorders such as Alzheimer's and Parkinson's disease are closely linked to brain aging.

With age, structural and functional changes occur, including neuron loss, glial cell proliferation, and neurotransmitter imbalances. These changes may contribute to cognitive decline and mental health issues.

When brain age exceeds chronological age, the risk of neurodegenerative diseases and psychological disorders increases. Monitoring brain age enables early detection of potential issues, guiding effective prevention and intervention strategies to support overall well-being.

\*If you have a family history of neurological disorders or suspect brain health concerns, consult a qualified healthcare professional before considering anti-aging interventions to ensure safe and effective choices.

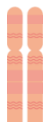
## Key Gene Functions & Roles



### ***RBM15***

• RBM15 is a key regulator of RNA N6-methyladenosine (m6A) methylation, playing a crucial role in cortical brain development. It regulates progenitor cell proliferation, differentiation, and migration during neurodevelopment by controlling mRNA stability and gene expression. Alterations in RBM15 expression and function have been associated with various neurodevelopmental disorders, highlighting its importance in maintaining brain health.

Chromosome 1



### ***TREM2***

• TREM2 is a membrane glycoprotein predominantly expressed in microglia within the central nervous system. It is essential for microglial activation, survival, and phagocytosis, contributing to brain homeostasis and neurodegenerative disease response. In Alzheimer's disease (AD), TREM2 variants—such as R47H and R62H mutations—are linked to an increased disease risk by impairing receptor-ligand binding, disrupting microglial function, and exacerbating neuroinflammation. TREM2 activation enhances A $\beta$  clearance and reduces inflammation, making it a potential therapeutic target.

Chromosome 16

## Your Key Methylation Loci Results

Methylation LOC	Rate of Reference population	Your Methylation Rate
cg05731218	0.890	0.926
cg05066959	0.937	0.960
cg02255454	0.874	0.833
cg18147395	0.732	0.774
cg19283806	0.321	0.424

## Brain Health Tip


Ergothioneine is a naturally occurring thio-amino acid found in mushrooms, certain legumes, and animal tissues. It can cross the blood-brain barrier, helping to neutralize oxidative stress in neurons, protect mitochondrial function, and regulate neuroinflammation. These effects make it a valuable compound for slowing neurodegenerative processes and supporting long-term brain health.

To achieve optimal neuroprotection, a daily intake of 10-20 mg of ergothioneine is recommended. However, excessive or insufficient intake should be avoided. Consulting a healthcare professional before using ergothioneine supplements is advisable to ensure a personalized and safe supplementation plan based on individual health needs.

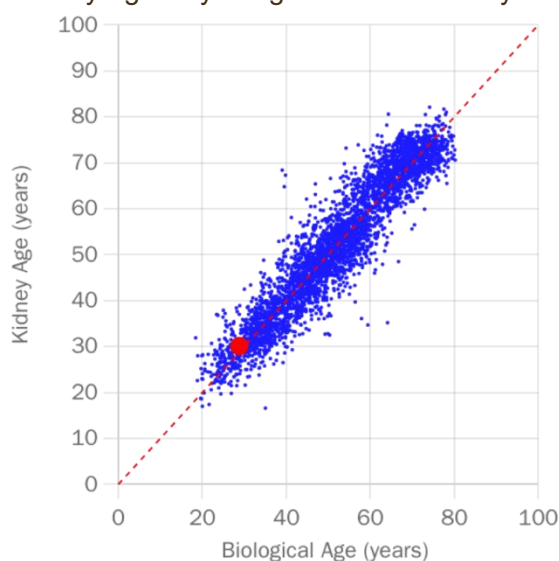
Organ Age

# Kidney Biological Age

Your Kidney Biological Age

 is **30.1**

Your kidney age is younger than 61% of your peers.



## Kidney Biological Age

As the body's "filter," the kidneys remove waste and regulate fluid balance. Their aging and health status directly impact on urinary system diseases, such as kidney stones and diabetic nephropathy.

With age, structural and functional changes occur, including a decline in glomerular filtration rate and tubular function, increasing the risk of chronic kidney disease and related complications.

When the kidney age exceeds chronological age, the risk of renal failure, urinary disorders, and aging-related health issues rises. Regular monitoring enables early detection, guiding effective prevention and intervention strategies to support overall well-being.

\* If you have a family history of kidney diseases or suspect renal risks, consult a qualified healthcare professional before considering anti-aging interventions to ensure personalized and expert guidance.

## Key Gene Functions & Roles



### **S100A9**

- S100A9 encodes a calcium-binding protein belonging to the S100 protein family, playing a crucial role in calcium oxalate (CaOx) kidney stone formation. It promotes inflammation and renal injury, facilitating CaOx crystal deposition in the kidneys. Through activation of the TLR4-p38/ MAPK-LCN2 pathway, S100A9 enhances renal inflammation and damage, closely linking it to macrophage activity and crystal deposition.

Chromosome 1



### **PRDM16**

- PRDM16 is a zinc finger transcription factor belonging to the PR domain protein family, exerting protective effects in kidney-related diseases, particularly in acute kidney injury (AKI). It helps reduce renal cell apoptosis, especially during ischemia/reperfusion (I/R) injury

Chromosome 1

## Your Key Methylation Loci Results

Methylation Loci	Rate of Reference population	Methylation Loci Rate of Reference population your Methylation Rate
cg17944885	0.823	0.867
cg20669414	0.884	0.838
cg23597162	0.464	0.539
cg16203607	0.038	0.030
cg07242860	0.064	0.035

## kidney Health Tip


Alpha-lipoic acid (ALA) is a potent antioxidant found in foods like spinach, red meat, and organ meats. It reduces oxidative stress, enhances renal energy metabolism, and strengthens antioxidant defenses, potentially slowing the progression of diabetic nephropathy.

For optimal kidney support, adults are advised to consume 300-600 mg of ALA daily, avoiding excessive or insufficient intake. Consultation with a healthcare professional is recommended to tailor supplementation based on individual health needs, ensuring both safety and efficacy

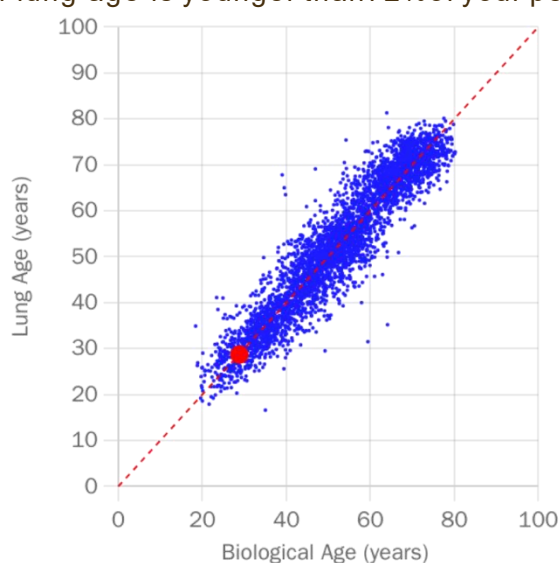
## Organ Age

## Lung Biological Age

Your Lung Biological Age

 is **28.7**

your lung age is younger than 72% of your peers.



## Lung Biological Age

As the body's "gas exchanger", the lungs facilitate respiration, directly impacting conditions like pulmonary fibrosis and chronic obstructive pulmonary disease (COPD).

With age, structural and functional changes occur, including reduced lung capacity and decreased airway elasticity, leading to breathing difficulties and impaired oxygenation, while significantly increasing the risk of chronic diseases.

When lung age exceeds chronological age, the risk of respiratory disorders and aging-related health issues rises. Monitoring lung age enables early detection and effective prevention strategies, helping to maintain respiratory health and slow lung aging.

\* If you have a family history of lung diseases or suspect respiratory risks, consult a qualified healthcare professional before considering anti-aging interventions to ensure personalized and expert guidance.

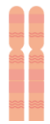
## Key Gene Functions & Roles



### **YAP1**

• YAP1 is a key effector of the Hippo signaling pathway, involved in cell proliferation, apoptosis, and tissue repair. Studies indicate that YAP1 plays a crucial role in alveolar type II cells, mitigating pulmonary fibrosis by inhibiting cellular senescence and improving mitochondrial function. By regulating downstream genes such as Prdx3, YAP1 reduces oxidative stress, maintains lung cell viability, and promotes alveolar regeneration, contributing to lung health.

Chromosome 11



### **CHAC1**

• CHAC1 is a glutathione-specific  $\gamma$ -glutamylcyclotransferase that regulates intracellular redox balance by degrading glutathione (GSH). In the lungs, CHAC1 upregulation is closely associated with increased reactive oxygen species (ROS) and decreased GSH levels, promoting cell death, particularly ferroptosis. Studies suggest that low CHAC1 expression in lung cancer cells correlates with cancer progression, whereas its upregulation can suppress tumor cell proliferation and induce apoptosis via ferroptosis activation.

Chromosome 15

## Your Key Methylation Loci Results

Methylation LOC	Rate of Reference population	Your Methylation Rate
cg23576855	0.626	0.794
cg26385126	0.799	0.721
cg26468478	0.074	0.035
cg06126421	0.714	0.775
cg15342087	0.834	0.851


## Lung Health Tip

Quercetin, a natural flavonoid, is abundant in apples, citrus fruits, onions, tea leaves, and certain plants. It helps reduce lung inflammation and fibrosis, protects lung cells from oxidative stress, slows down lung tissue aging, and maintains alveolar structure integrity. Additionally, quercetin improves airway elasticity, contributing to better respiratory function and delayed lung decline. For optimal lung protection, a daily intake of 10-20 mg of quercetin is recommended. However, excessive or insufficient intake should be avoided. Consulting a healthcare professional before taking quercetin supplements is advised to ensure a personalized and safe supplementation plan based on individual health needs.

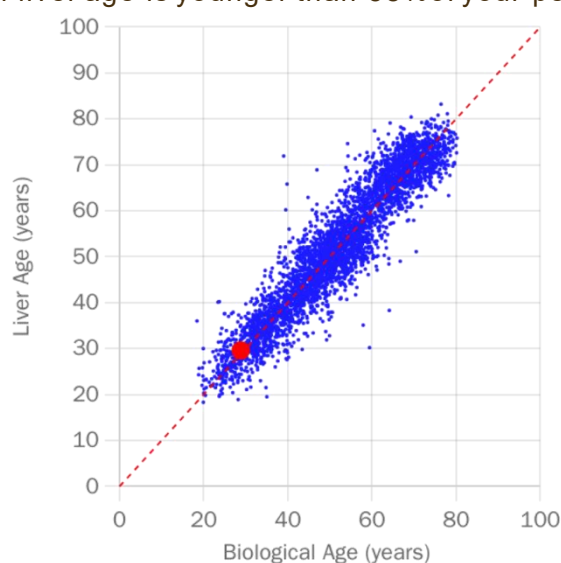
Organ Age

# Liver Biological Age

Your Liver Biological Age

 is **29.6**

your liver age is younger than 58% of your peers.



## Liver Biological Age

As the body's "detox center," the liver metabolizes drugs, eliminates waste, and regulates nutrients, playing a crucial role in digestive and metabolic health. Conditions like fatty liver disease and obesity are closely linked.

With age, structural and functional changes occur, including hepatocyte damage and reduced regenerative capacity, increasing the risk of liver dysfunction and digestive complications.

When liver age exceeds chronological age, the risk of liver failure, metabolic disorders, and aging-related health issues rises. Regular monitoring enables early detection and effective prevention strategies, supporting overall health and liver longevity.

\*If you have a family history of liver diseases or suspect hepatic risks, consult a qualified healthcare professional before considering anti-aging interventions to ensure personalized and expert guidance.

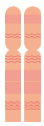
## Key Gene Functions & Roles



### **SLC11A1**

• SLC11A1 is closely associated with liver function, particularly in the progression of liver fibrosis in chronic hepatitis C. By modulating immune and inflammatory responses, SLC11A1 influences liver fibrosis development. High expression of SLC11A1 is linked to milder fibrosis, while low expression may accelerate fibrosis progression, potentially leading to cirrhosis. Therefore, SLC11A1 plays a critical role in liver injury and repair.

Chromosome 2



### **NOTCH1**

• Notch1 encodes a transmembrane receptor involved in cell fate determination, proliferation, and differentiation. In the liver, Notch signaling plays a crucial role in liver development, repair, and disease progression. It is essential for bile duct development, regulating hepatoblastoma differentiation into cholangiocytes. Additionally, Notch signaling promotes liver regeneration, particularly in chronic liver injury and fibrosis, by activating hepatic progenitor cells (HPCs) to repair damaged tissue.

Chromosome 9

## Your Key Methylation Loci Results

Methylation LOC	Rate of Reference population	Your Methylation Rate
cg11024682	0.437	0.540
cg06872964	0.488	0.502
cg19789753	0.097	0.108
cg03497652	0.650	0.670
cg03384175	0.549	0.547

### Liver Health Tip

Silymarin, a natural compound extracted from milk thistle seeds, provides strong antioxidant and anti-inflammatory benefits. It protects liver cell membranes, promotes liver cell repair and regeneration, and enhances detoxication and metabolic functions. Silymarin plays a crucial role in delaying aging, improving liver function, and preventing inflammation and fibrosis.

For optimal liver support, a daily intake of 140-420 mg of silymarin in divided doses is recommended. However, excessive or insufficient intake should be avoided. Consulting a healthcare professional before taking silymarin supplements is advised to ensure a personalized and safe supplementation plan based on individual health needs.

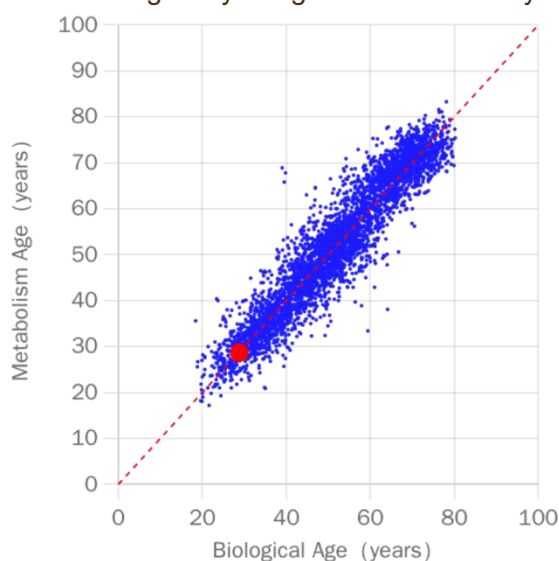
Organ Age

# Metabolic Biological Age

Your Metabolic Biological Age

 is **28.7**

Your metabolic age is younger than 64% of your peers.



## Metabolic Biological Age

As the body's "signal messenger" for biochemical reactions and substance metabolism, the metabolic system plays a crucial role in conditions like metabolic syndrome, insulin resistance, and thyroid dysfunction.

With age, glandular structure and metabolic efficiency decline, leading to a lower basal metabolic rate, reduced insulin sensitivity. It'll heighten the risk of metabolic disorders and are closely linked to chronic inflammation.

When the metabolic age exceeds chronological age, the risks of metabolic syndrome, insulin resistance increases. Regular assessment helps identify early metabolic imbalances, enabling targeted interventions to restore metabolic stability, slow aging, and enhance overall well-being.

\*If you have a family history of metabolic disorders or suspect metabolic risks, consult a qualified healthcare professional before considering anti-aging interventions to ensure personalized and expert guidance.

## Key Gene Functions & Roles



### ***KLF6***

- KLF6 encodes a zinc-finger transcription factor that plays a critical role in gene regulation. It is strongly associated with metabolism, particularly hepatic lipid and glucose metabolism. Studies indicate that KLF6 activates the PPAR $\alpha$  signaling pathway at the post-transcriptional level, influencing lipid metabolism and glucose homeostasis in the liver.

Chromosome 10



### ***TXNIP***

- TXNIP encodes thioredoxin-interacting protein, which is crucial for insulin regulation. Research suggests that TXNIP significantly influences pancreatic  $\beta$ -cell function and insulin secretion. Overexpression of TXNIP inhibits insulin secretion, promotes  $\beta$ -cell apoptosis, and reduces insulin sensitivity, contributing to insulin resistance and type 2 diabetes development.

Chromosome 1

## Your Key Methylation Loci Results

Methylation LOC	Rate of Reference population	Your Methylation Rate
cg16155702	0.783	0.758
cg11024682	0.437	0.540
cg06500161	0.579	0.645
cg10877049	0.845	0.781
cg25778871	0.104	0.143

### Metabolic Health Tip

NMN (Nicotinamide Mononucleotide), a derivative of vitamin B3, is naturally found in foods like edamame, cabbage, mushrooms, and fish. NMN enhances mitochondrial function, improves energy metabolism, and supports cellular repair. It also reduces fat accumulation and insulin resistance, helping to slow metabolic aging and maintain overall vitality.

For optimal metabolic support, a daily intake of 250-500 mg of NMN is recommended, avoiding excessive or insufficient consumption. Consulting a healthcare professional before using NMN or similar supplements is advised to ensure a safe and personalized supplementation plan.

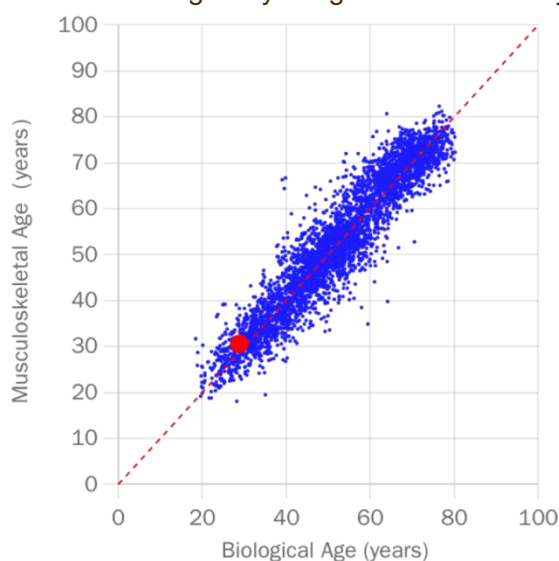
Organ Age

# Musculoskeletal Biological Age

your Musculoskeletal Biological Age is

 30.6

Your musculoskeletal age is younger than 52% of your peers.



## Musculoskeletal Biological Age

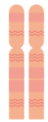
As the body's "framework," the musculoskeletal system supports movement and overall function, directly impacting mobility and conditions like osteoporosis, arthritis, and sarcopenia

With age, bone mineral density (BMD) declines, muscle mass and strength diminish, increasing fracture risk and reducing physical capability. A sedentary lifestyle further accelerates this aging process.

When musculoskeletal age exceeds chronological age, the risks of fractures, joint pain, and aging-related mobility issues rise. Regular assessment helps detect early signs of deterioration, enabling targeted interventions to preserve strength, flexibility, and overall health.

\* If you have a family history of bone or muscle diseases or suspect musculoskeletal risks, consult a qualified healthcare professional before considering anti-aging interventions to ensure personalized and expert guidance.

## Key Gene Functions & Roles



### **HSPG2**

- HSPG2 plays a crucial role in muscle and skeletal systems. In muscle tissues, it facilitates cell adhesion and signal transduction, maintaining excitability and functional stability. In the skeletal system, HSPG2 is involved in cartilage formation and maintenance, supporting structural integrity and ensuring proper bone development and joint function

Chromosome 1



### **KLF6**

- KLF6 encodes a zinc-finger transcription factor that regulates various cellular transcriptional activities. It is closely associated with metabolism, particularly in hepatic lipid and glucose metabolism. Studies indicate that KLF6 modulates lipid and glucose metabolism in the liver through post-transcriptional activation of the PPAR $\alpha$  signaling pathway

Chromosome 1

## Your Key Methylation Loci Results

Methylation LOC	Rate of Reference population	Your Methylation Rate
cg07839457	0.463	0.429
cg12277888	0.582	0.562
cg15416179	0.058	0.047
cg06500161	0.579	0.645
cg22040809	0.513	0.537

## Musculoskeletal Health Tip

Vitamin D, a fat-soluble vitamin, is primarily obtained from deep-sea fish, egg yolks, dairy products, and synthesized by the skin through sunlight exposure. It enhances calcium absorption and bone mineralization, while also regulating osteoblast and osteoclast balance to maintain bone density. Additionally, Vitamin D interacts with muscle cell receptors, promoting muscle protein synthesis, strength, and coordination.

For optimal bone and muscle health, a daily intake of 600-800 IU of Vitamin D is recommended, avoiding excessive or insufficient consumption. Consult a healthcare professional before taking Vitamin D supplements to ensure a safe and personalized supplementation plan.

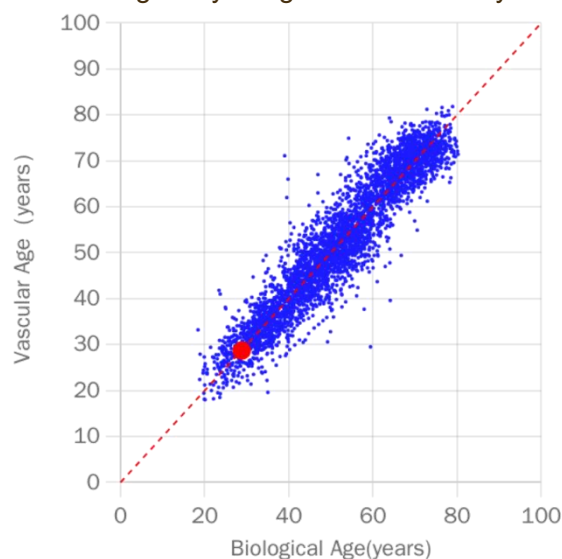
Organ Age

# Vascular Biological Age

Your Vascular Biological Age is

 **28.7**

your vascular age is younger than 69% of your peers.



## Vascular Biological Age

As the body's "pipeline system," blood vessels transport oxygen and nutrients, playing a vital role in cardiovascular function and conditions such as atherosclerosis, coronary artery disease, and stroke.

With age, vascular elasticity declines, and blood flow resistance increases, leading to impaired blood pressure regulation, heightened oxidative stress, and inflammation—factors that raise the risk of arterial stiffness and thrombosis.

When vascular age exceeds chronological age, cardiovascular risks significantly increase. By assessing vascular elasticity, endothelial function, and calcification levels, early signs of vascular aging can be detected. Healthier lifestyle modifications can help slow vascular aging and reduce disease risk.

\* If you have a family history of vascular diseases or suspect vascular risks, consult a qualified healthcare professional before considering anti-aging interventions to ensure personalized and expert guidance.

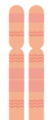
## Key Gene Functions & Roles



### **APOA5**

- APOA5 plays a key role in triglyceride metabolism by lowering triglyceride and VLDL levels while increasing HDL, improving lipid balance and supporting cardiovascular health. Its function helps reduce the risk of coronary artery disease by promoting efficient lipoprotein metabolism.

Chromosome 11



### **CYP1A1**

- CYP1A1 influences vascular function by metabolizing arachidonic acid into 20-HETE and EETs. 20- HETE promotes vasoconstriction, smooth muscle growth, and cardiovascular homeostasis, while EETs act as vasodilators with anti-inflammatory effects , offering cardiovascular protection.

Chromosome 15

## Your Key Methylation Loci Results

Methylation LOC	Rate of Reference population	Your Methylation Rate
cg04917472	0.555	0.632
cg13827209	0.128	0.113
cg24977276	0.928	0.934
cg13332754	0.924	0.920
cg19448292	0.808	0.820

## Vascular Health Tip


Omega-3 fatty acids, primarily found in deep-sea fish and flaxseeds, are powerful polyunsaturated fats with potent anti-inflammatory properties. They inhibit pro-inflammatory cytokines (e.g., TNF- $\alpha$ , IL-6), reduce immune overactivation, improve blood flow, and support vascular health.

For optimal vascular benefits, adults are advised to consume 1,000-2,000 mg of Omega-3 fatty acids daily, avoiding excessive or insufficient intake. Consulting a healthcare professional before supplementation ensures a personalized and safe approach based on individual health needs.

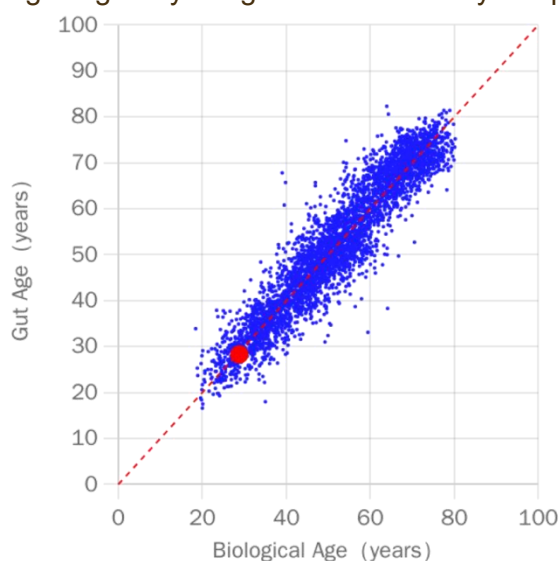
Organ Age

# Gut Biological Age

Your Gut Biological Age

 is **28.3**

your gut age is younger than 63% of your peers



## Gut Biological Age

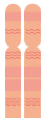
As the body's "digestion and absorption center," the gut is responsible for breaking down food, absorbing nutrients, and playing a crucial role in immune regulation and toxin metabolism.

With age, gut barrier function declines, leading to disruptions in the gut microbiota, increased intestinal permeability, and impaired digestion. These changes affect nutrient absorption and are strongly associated with immune dysfunction, metabolic abnormalities, and chronic diseases.

When musculoskeletal age exceeds chronological age, digestive disorders and immune related and metabolic risks significantly increase. Experts recommend regular colonoscopy screenings for individuals aged 50-75, combined with gut health monitoring and preventive care, to improve overall aging and health outcomes.

\* If you have a family history of gastrointestinal diseases or suspect gastrointestinal risks, consult a qualified healthcare professional before considering anti-aging interventions to ensure personalized and expert guidance.

## Key Gene Functions & Roles



### **JAK2**

• JAK2 is closely associated with immune cell function in the gut. It regulates signaling pathways of multiple cytokines, such as IL-6, IL-12, and IL-23, which play a critical role in the pathology of inflammatory bowel disease (IBD). Activation of JAK2 may lead to excessive immune responses in the gut, exacerbating inflammation. In IBD patients, increased expression of JAK2 may promote severe intestinal inflammation.

Chromosome 9



### **NOD2**

• NOD2 is an intracellular pattern recognition receptor that detects peptidoglycan components in bacterial cell walls, activating the NF-κB signaling pathway to initiate immune responses. Mutations in the NOD2 gene are closely linked to susceptibility to inflammatory bowel diseases, such as Crohn's disease.

Chromosome 16

## Your Key Methylation Loci Results

Methylation LOC	Rate of Reference population	Your Methylation Rate
cg19379924	0.036	0.024
cg01881688	0.801	0.776
cg16692735	0.600	0.382
cg06343673	0.884	0.904
cg16936953	0.460	0.436

## Gut Health Tip


Probiotics are beneficial live microorganisms found in fermented foods like yogurt. They enhance microbiome diversity, restore gut barrier function, and reduce toxin buildup, optimizing overall gut health. Additionally, probiotics promote short-chain fatty acid production, reduce inflammation, and help prevent colorectal disorders while slowing intestinal aging.

Since probiotics come in various strains, it is essential to consult a healthcare professional before using supplements. A tailored approach based on individual health conditions and needs ensures safe and effective gut support.

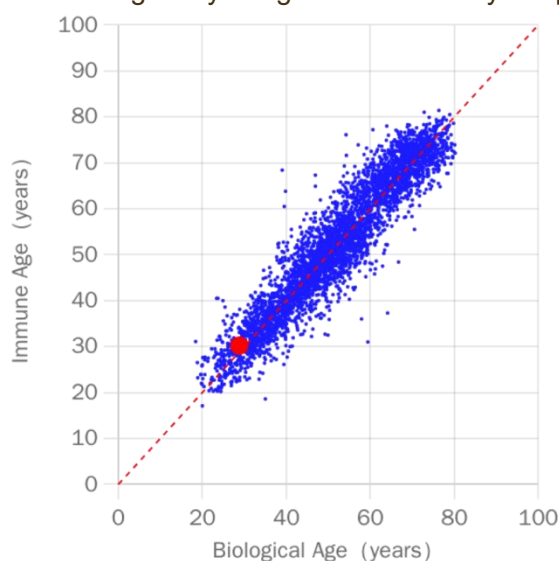
Organ Age

# Immune Biological Age

Your Immune Biological Age

 is **30.2**

your immune age is younger than 55% of your peers.



## Immune Biological Age

As the body's "defense barrier", the immune system is crucial for pathogen recognition, immune response, and maintaining homeostasis. It is implicated in immune-related conditions like shingles, allergies, and autoimmune diseases.

With age, immune function declines, manifesting as an imbalance in immune cell ratios and reduced activity. This increases the risk of infections and may lead to chronic inflammation and autoimmune diseases, which are closely associated with cancer, chronic inflammation, and other health issues.

When the immune age exceeds chronological age, individuals face higher risks of infections and immune-related health problems. Monitoring immune age, along with vaccination, nutritional interventions, regular exercise, and sufficient sleep, can optimize immune function, slow immune aging, and improve overall health.

\* If you have a family history of immune-related diseases or suspect immunological risks, consult a qualified healthcare professional before considering anti-aging interventions to ensure personalized and expert guidance

## Key Gene Functions & Roles



### **ZAP70**

- ZAP70 is a tyrosine kinase that plays a crucial role in T cell receptor (TCR) signaling. It regulates T cell activation, immune synapse formation, and downstream signaling protein recruitment. ZAP70 deficiency can lead to impaired T cell function, resulting in immune deficiencies and severe disruptions in immune system function.

Chromosome 2



### **PIK3IP1**

- PIK3IP1 negatively regulates the PI3K/AKT signaling pathway by inhibiting PI3K activity. It plays an essential role in immune system regulation, particularly by maintaining T cell quiescence and suppressing excessive immune activation. Additionally, PIK3IP1 contributes to regulatory T cell (Treg) development, helping to control autoimmune responses. Reduced PIK3IP1 expression has been associated with exacerbation of autoimmune diseases.

Chromosome 22

## Your Key Methylation Loci Results

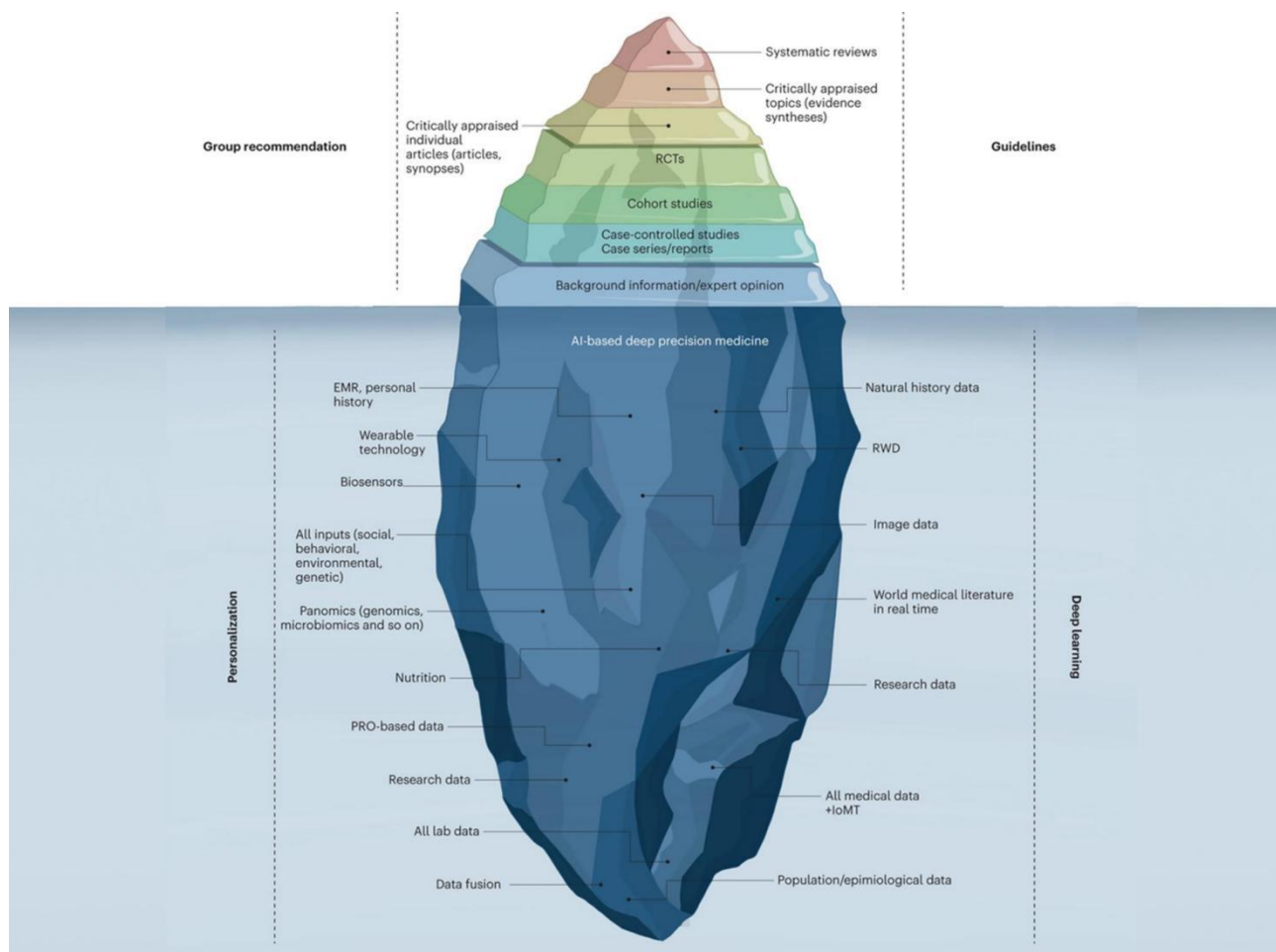
Methylation LOC	Rate of Reference population	Your Methylation Rate
cg07839457	0.463	0.429
cg17087669	0.160	0.148
cg22100563	0.681	0.645
cg23819411	0.451	0.445
cg27496793	0.297	0.358

## Immune Health Tip

Selenium is an essential trace mineral found in Brazil nuts, seafood, whole grains, and certain plants. It plays a crucial role in antioxidant defense, immune regulation, and inflammation reduction by supporting enzymes like glutathione peroxidase and selenoproteins, which protect immune cells from oxidative stress.

For optimal immune support, adults are recommended to consume 55 mcg of selenium daily, avoiding excessive or insufficient intake. Before using selenium supplements, consult a healthcare professional to ensure a personalized and safe approach.

# Conclusion on Organs Age



Evidence-Based Medicine (EBM) is a fundamental principle of modern healthcare. It emphasizes that medical decisions should integrate the latest scientific evidence, clinical expertise, and the unique circumstances of each patient delivering optimal treatment and health management. Compared to traditional, experience-based approaches, EBM relies on high-quality research to drive precision and personalization in medical interventions.

A major challenge in preventive care and health management is how to accurately assess an individual's health status and identify potential risks at an early stage.

DNA methylation-based Organ Age testing offers a data-driven, evidence-based approach to health evaluation. Studies have found that DNA methylation patterns change in predictable ways with age and exhibit organ-specific characteristics. By analyzing methylation profiles of key organs—such as the heart, brain, kidneys, liver, and lungs—and critical systems including metabolism, vasculature, immune function, skeletal muscle, and the gut, it is possible to build highly accurate models of organ aging. This method enables the early detection of organ health shifts and provides a robust scientific foundation for personalized health interventions.

Organ Age assessment provides precise, data-driven insights to support evidence-based medicine, enabling physicians to identify organs experiencing accelerated aging and to develop targeted intervention plans based on clinical indicators. Additionally, Organ Age assessment can be used to monitor the effectiveness of anti-aging interventions - including diet, exercise, and medications, making health management more scientific, precise, and individualized.

## Harnessing Organ Age Insights to Slow Aging

Regular monitoring of organ biological age not only helps detect hidden health risks but also provides scientific guidance for optimizing lifestyle, slowing down aging, and improving overall well-being. It lays a solid foundation for longevity and a higher quality of life. Here's how it can help you:

### 1. Accurately understand your Health status

Biological age reflects the true functional state of each organ, offering deeper insights than chronological age alone. Certain organs may age faster due to lifestyle choices, environmental exposure, or chronic diseases. Detecting these changes early helps identify hidden health concerns.

### 2. Early warning for potential Risks

Accelerated organ aging often signals the early stages of diseases such as cardiovascular disorders or liver and kidney dysfunction. Regular assessments allow for early risk detection and proactive prevention.

### 3. personalized Health Management

By understanding the biological age of key organs, targeted interventions can be designed—ranging from diet optimization and tailored exercise plans to nutritional support and risk factor mitigation, empowering more precise health management.

### 4. Evaluate Anti-Aging Intervention outcomes

For individuals using anti-aging therapies such as medications, supplements, or other treatments, Organ Age testing provides scientific feedback on the effectiveness of these interventions, ensuring efficient use of time and resources

### 5. promote proactive Health Awareness

Ongoing Organ Age assessment encourages a stronger awareness of one's health status, offering a clearer view of the aging process and motivating individuals to take more active steps toward improving their well-being.

## Body Aging Timeline

### Age 25 – Skin

The rate of collagen synthesis slows down. By age 35, visible signs of skin aging become increasingly noticeable.

### Age 30 – Muscles & Vital Functional System

Around this age, muscle mass reaches its peak. Starting at 40, individuals lose approximately 0.5% to 2% of muscle mass per year. Hair, kidney, joint, and gut health also begin to show early signs of aging around this stage.

### Age 34 – Lungs

The muscles involved in respiration and the flexibility of the chest wall begin to decline. As a result, lung capacity gradually decreases.

### Age 35 – Brain & Bones

The brain starts to decline at 35, and ages precipitously at 54. Bone density increases until 25, but at 35 bone loss starts to exceed replenishment.

### Age 40 – Eyes

The eye muscles become increasingly weak, the ability to focus decreases, and presbyopia begins to appear.

### Age 45 – Liver

The liver's detoxification ability will decline significantly at the age of 45.

### Age 50 – Endocrine System

In women, estrogen levels drop sharply during menopause. In men, testosterone production decreases by approximately one-third.

### Age 60 – Immune System

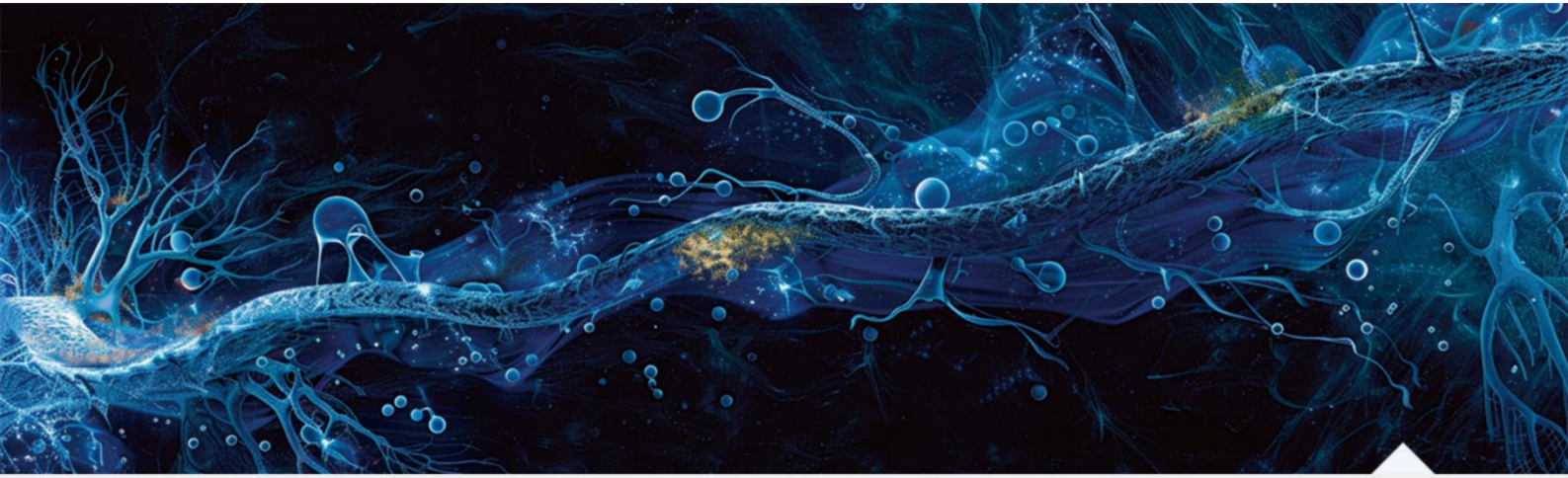
T lymphocyte count continues to decline, leading to a gradual weakening of immune function and increased susceptibility to infections.

# Telomere Length



# Telomere Length Assessment

Unveiling Cellular Aging



## Key Highlights of This Chapter

This report leverages DNA methylation to estimate telomere length, offering insights into your cellular health and aging. By comparing against peers and calculating telomere age, it reflects your cell repair capacity and regeneration potential, laying the foundation for personalized health optimization and anti-aging strategies.

Telomere length is widely recognized as the “biological clock” that governs cellular aging, serving as a fundamental molecular marker for assessing the rate of aging and overall physiological health. These protective structures, located at the ends of chromosomes, gradually shorten with each successive cell division, leading to a progressive decline in a cell’s ability to replicate. As telomeres erode over time, the capacity for tissue renewal diminishes, increasing susceptibility to age-related diseases. By precisely measuring telomere length, scientists can gain critical insights into an individual’s cellular aging status, offering valuable scientific guidance for the development of personalized anti-aging strategies and preventive healthcare interventions.

## Telomere Length-A Molecular Ruler for cellular Lifespan

Telomeres are specialized nucleotide sequences that cap the ends of chromosomes, acting as essential buffers that safeguard genomic integrity during cellular replication. However, due to the inherent limitations of the DNA replication process, telomeres undergo progressive shortening with each cell cycle. Once they reach a critically short length, cells experience replicative senescence or undergo programmed cell death (apoptosis), leading to diminished regenerative capacity across various tissues and organ systems. This inevitable biological phenomenon is a key determinant of organismal health span and longevity. A deeper understanding of telomere dynamics not only enhances our comprehension of aging at the molecular level but also paves the way for innovative therapeutic approaches aimed at preserving cellular function, delaying the onset of degenerative diseases, and ultimately promoting a longer, healthier life.

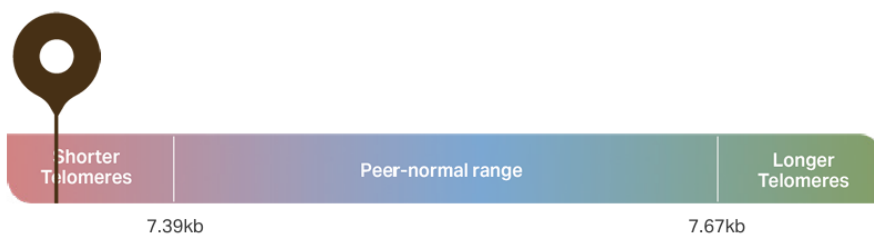
Telomere length assessment is the key to unlocking your cellular health and optimizing longevity.

# Telomere length assessment

Telomeres are protective structures at the ends of chromosomes that gradually shorten with each cell division. By analyzing DNA methylation patterns, we can estimate telomere length and compare it with that of populations. Longer telomeres indicate good cellular vitality, while excessively short telomeres may accelerate cellular aging and increase the risk of disease.

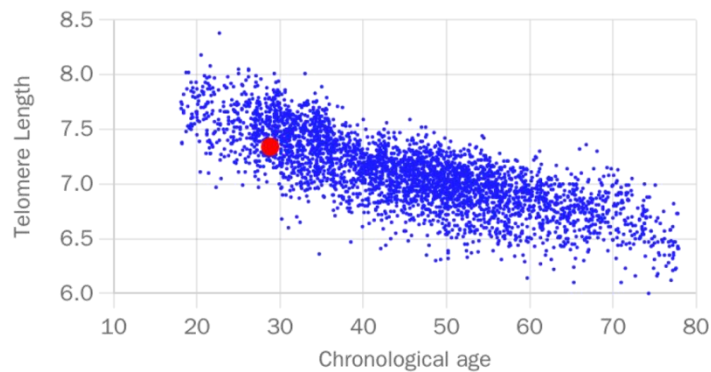
Your telomere length is **7.34kb**

Longer than that of **22%** of your peers.




## Telomere Length Comparison with Peers

Relationship Between Age and Telomere Length



## Telomere Age

Your Predicted Telomere Age Is

 **34** older than chronological age

# Conclusion on Telomere Length

## Functions and Roles of Telomeres

### protecting chromosomal stability

Telomeres safeguard chromosome ends, preventing degradation, fusion, and structural abnormalities to maintain genomic integrity.

### Ensuring Accurate cell Division

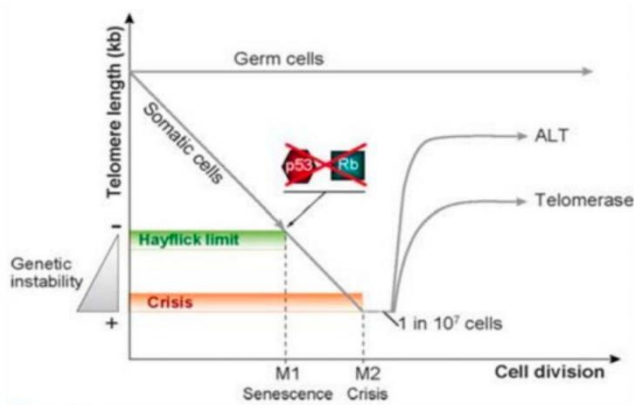
Telomeres and associated proteins enable proper chromosome replication and distribution, preventing division errors.

### The cell's "Lifespan clock"

Telomere shortening limits cell division, eventually triggering senescence or programmed cell death.

## Telomere shortening and cellular Fate

- When telomeres shorten to 5-7 kb, cells activate cell cycle regulators such as p53 and Rb, triggering cell cycle arrest. This protective mechanism prevents chromosomal instability due to telomere damage. This stage, known as Mortality Stage 1 (M1), marks the early transition toward cellular senescence or death while maintaining partial functionality.



- When telomeres further shorten to 2-4 kb, the apoptotic process enters Mortality Stage 2 (M2). At this critical threshold, severe telomere damage leads to the activation of programmed cell death. The cell's self-repair mechanisms fail, DNA damage becomes irreparable, and the cell ultimately undergoes apoptosis.

Telomere preservation has become a key focus in aging research. Telomerase, an enzyme that extends telomeres, has been shown in some studies to be influenced by lifestyle interventions such as meditation and specific diets, potentially slowing telomere shortening.

In the future, telomerase activators, gene therapies, and other telomere-targeted strategies may offer new approaches to delaying aging and preventing age-related diseases.

# Immune Blueprint



# Immune Function Assessment

Your Intelligent Guardian for Health



## Key Highlights of This Chapter

This assessment provides a comprehensive analysis of immune balance by evaluating three key functions: defense, surveillance, and homeostasis. Through precise measurement of immune cells and factors, it offers deep insights into the immune system's dynamic state—laying the foundation for personalized health optimization and proactive immune care.

As the body's first line of defense, the immune system safeguards against pathogens, monitors cellular abnormalities, and maintains internal balance. Immune equilibrium is a dynamic art—optimal health depends on a precise, well-calibrated response without overreaction or suppression.

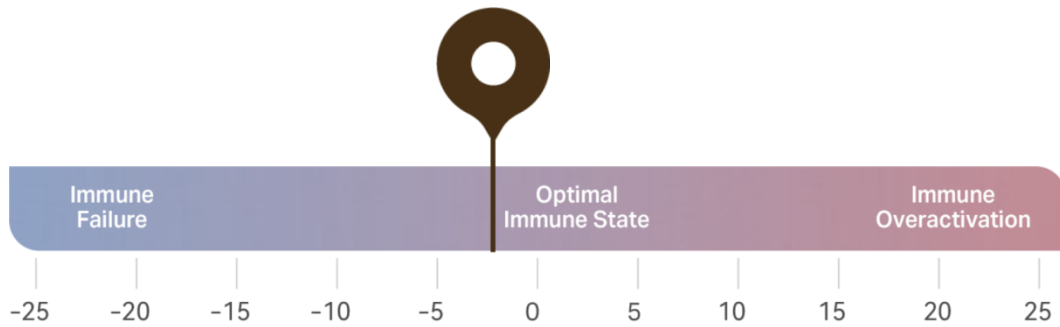
## Immune Balance - The Key to Keep Healthy

Stronger immunity is not always better, nor is weaker immunity safer. An overactive immune system can lead to autoimmune diseases (e.g., rheumatoid arthritis, lupus) or allergic reactions, while an underactive system increases susceptibility to infections and cancerous growths. True health lies in a balanced immune response—strong enough to defend, yet precise enough to protect.

Decode immune cell composition and key methylation markers to assess immune balance, responsiveness, and aging trajectory.

# Immune Balance

**Immune Function Score -2**



## Reference Range

An index of 0 represents the optimal state of immune balance. Positive values indicate mild immune activation, while negative values suggest slight immune suppression.

\*The Immune Balance Index within the range of  $\pm 5$  is considered healthy

0~-5 :	Normal Immune Function	0~+5 :	Normal Immune Function
-5~-10 :	Mild Immune Decline	+5~+10 :	Mild Immune Activation
-10~-15 :	Moderate Immune Decline	+10~+15 :	Moderate Immune Activation
Below -15 :	Increased Risk of Immune Failure	Above +15 :	Increased Risk of Immune Overactivation

## Optimal Health Through Immune Equilibrium

The Immune Balance Index is derived from DNA methylation data and quantifies the immune system's status by calculating the proportions of specific immune cells in peripheral blood. It helps assess the overall balance of immune functions, offering insights into immune expression trends and enabling the early detection of potential immune dysfunctions.

- Maintain a nutritious diet, adequate sleep, regular exercise, and a positive mindset.
- Consider immune-supporting supplements under medical guidance.
- Reassess immune function every 6–12 months or after targeted interventions, as immunity is a dynamic system requiring continuous monitoring and care.

# Triple Core Immunity

Based on the analysis of peripheral immune cell proportions, we evaluate your overall immune function across three dimensions: Immune Defense, Immune Surveillance, and Immune Homeostasis. This comprehensive assessment provides a clear understanding of your immune system's performance and offers valuable insights for future health management.

## 1. Immune defense

Your Result: ★★★★★

Immune Defense serves as the body's first line of protection against external pathogens such as bacteria, viruses, and fungi. It involves physical barriers like the skin and mucous membranes, along with immune cells and antibodies that work together to prevent infections. This score helps evaluate your body's ability to defend against external threats.

## 2. Immune surveillance

Your Result: ★★★★★

Immune Surveillance represents the immune system's ability to detect and eliminate abnormal cells. It involves continuous monitoring of cellular changes to identify and remove potentially cancerous or harmful cells, thereby reducing disease risks. This score offers insights into the effectiveness of your immune monitoring function.

## 3. Immune homeostasis

Your Result: ★★★★★

Immune Homeostasis reflects the immune system's capacity to maintain balance by responding effectively to external stimuli while avoiding overactivation that can lead to chronic inflammation or autoimmune disorders. This score helps assess your body's ability to recover and maintain immune stability.

## Immune Cell Ratios

This section estimates the relative proportions of various immune cells by analyzing DNA methylation patterns. These values are then compared with those of a healthy reference population. Changes in immune cell ratios provide a clear reflection of the immune system's balance and serve as valuable indicators for the early detection of potential immune function abnormalities.

Cell Type	Test Result(%)	Reference Range(%)
B Cells	3%↓	5-10%
NK Cells	4.4%↓	5-10%
CD4+ T Cells	25.3% ↑	15-25%
CD8+ T Cells	11.5%	7-12%
Monocytes	6.5%	5-10%
Neutrophils	49.4%	40-60%
CD4/CD8	2.2	1.5-4

B cells : Produce antibodies to identify and neutralize pathogens.

NK cells : : Recognize and directly eliminate virus-infected and tumor cells.

CD4+T cells : Regulate immune responses by secreting cytokines to activate other immune cells.

CD8+T cells : Identify and destroy virus-infected or cancerous cells.

Monocytes : Large immune cells in the blood that differentiate into macrophages to engulf pathogens and activate immune responses.

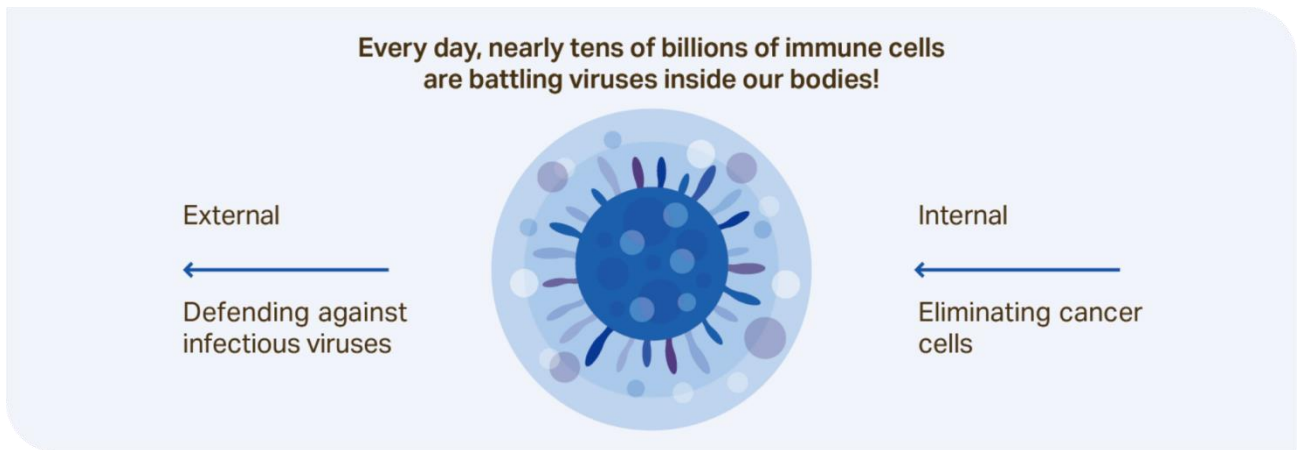
Neutrophils : The most abundant white blood cells, responsible for engulfing and digesting bacteria to combat infections.

CD4/CD8Ratio : Reflects immune system balance; changes can indicate immune health and aid in disease monitoring.

# Conclusion on Immune Blueprint

## The Dual Defense System of Immunity

While we enjoy life, billions of immune cells work tirelessly to safeguard our health—defending against external pathogens and eliminating abnormal cells. The immune system operates through two complementary arms: Innate Immunity and Adaptive Immunity, each playing a crucial role in maintaining balance and protection.



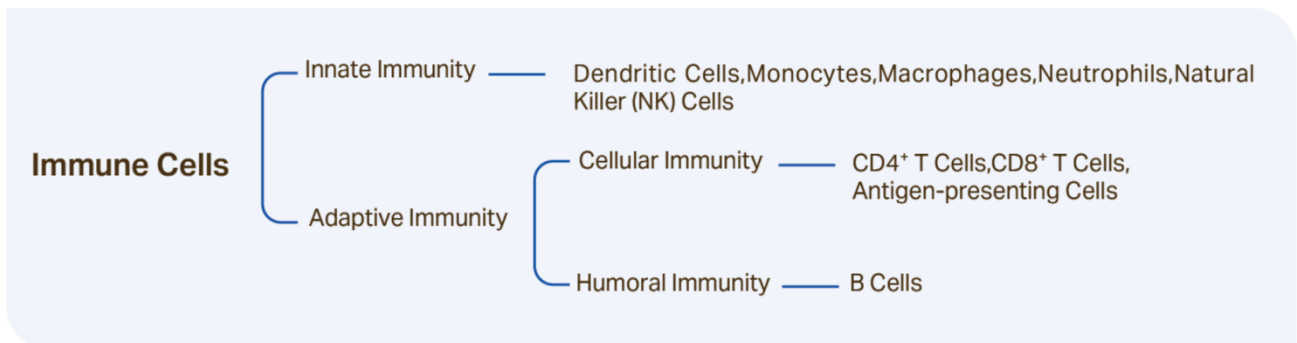
### Innate Immune Cells

The body's first line of defense, responding rapidly within hours to days after infection or injury. These cells act broadly and swiftly but lack pathogen-specific memory.

### Adaptive Immune cells




Highly specialized defenders that recognize, target, and remember specific pathogens. Though slower to activate, they provide long-term immunity and faster responses upon re-exposure.

Together, these two systems form a seamless defense—innate immunity offers immediate protection, while adaptive immunity ensures precision and lasting resilience. This dual defense system is essential for maintaining health and preventing disease.






## Stem Cells and Immunity

As we age, stem cell self-renewal declines, impairing tissue repair and accelerating aging. Stem cells serve as the primary source of immune cells, generating T cells, B cells, macrophages, and natural killer (NK) cells— key players in immune defense. Beyond their role in immune cell production, stem cells also regulate immune responses. Mesenchymal stem cells (MSCs), for example, modulate immunity by secreting cytokines or interacting with immune cells, helping to suppress excessive immune reactions and prevent autoimmune diseases.


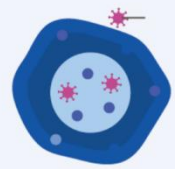

		
<b>Repair</b>	<b>Activate</b>	<b>Immune Modulation</b>
<p>MSCs transform into functional cells to repair damaged tissues and organs.</p>	<p>MSCs release cytokines to awaken dormant stem cells for further differentiation.</p>	<p>MSCs guide immune cell functions by enhancing tissue and immune regulation.</p>

NK cells, a crucial component of innate immunity, act as first responders. They interact with activation and inhibitory signals from other cells and play a pivotal role in cancer immune surveillance by eliminating abnormal or stressed cells without prior sensitization—preferentially targeting tumor cells while sparing healthy ones.

**Natural Killer (NK) cells recognize MHC| on a healthy cell and do not kill it**

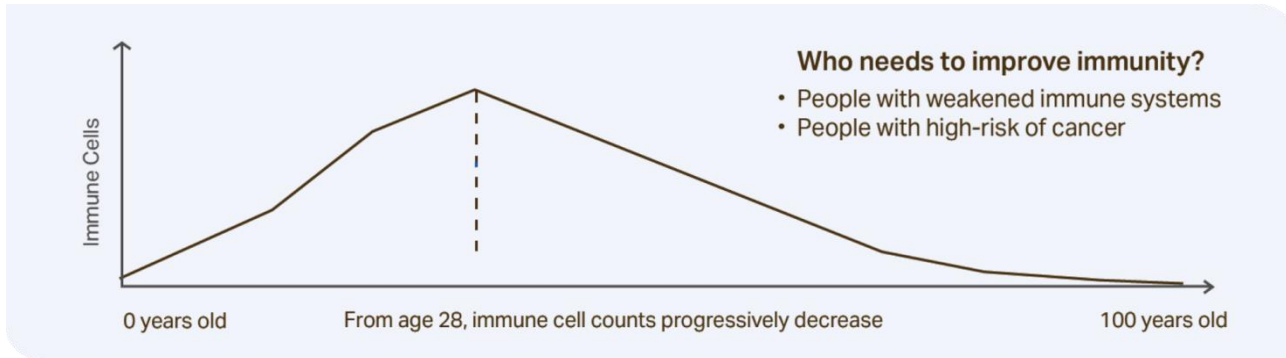
**Infected cells will not present MHC | will be destroyed**

Stem cells are essential for immune system repair and regeneration. Hematopoietic stem cell transplantation, for instance, restores immune function in patients undergoing chemotherapy or radiation. With their unique self-renewal and differentiation capabilities, stem cell therapies offer promising solutions for tissue regeneration, organ repair, and disease treatment.

## Immunity and Cancer Therapy

On January 3, 2022, scientists from the University of Oviedo Cancer Research Institute (Spain) and Paris University (France) published a review titled Meta-hallmarks of aging and cancer in *Cell Metabolism*. This review comprehensively summarized the convergence, opposition, and contradictions between the characteristics of aging and cancer. As aging progresses, genomic instability increases, DNA repair capacity declines, epigenetic modifications accumulate, and factors such as chronic inflammation and immune dysfunction collectively elevate the risk of tumor development.



Tumor formation results from the accumulation of genetic mutations, which may arise from genetic factors, environmental exposures (e.g., carcinogens, radiation, viral infections), or errors in cell replication. When immune surveillance weakens or tumor cells exploit immune escape mechanisms—such as inhibiting immune cell activity, secreting immunosuppressive factors, or modifying the tumor microenvironment—cancer cells evade immune clearance and continue growing, invading, and metastasizing under favorable conditions of blood supply, nutrients, and immune suppression. Immunotherapy enhances immune responses and disrupts tumor immune tolerance, playing a crucial role in cancer treatment. There are three main approaches:

### Adoptive Cell Therapy (ACT)

This technique involves collecting a patient's immune cells, expanding them *ex vivo* by thousands of times, or enhancing their tumor-targeting functions, and reinfusing them into the patient to eliminate cancerous or mutated cells. The four major types of adoptive cell therapy with significant research progress include:

Tumor-infiltrating lymphocyte (TIL) therapy; Engineered T-cell receptor (TCR) therapy; Chimeric antigen receptor T-cell (CAR-T) therapy; Natural killer (NK) cell therapy

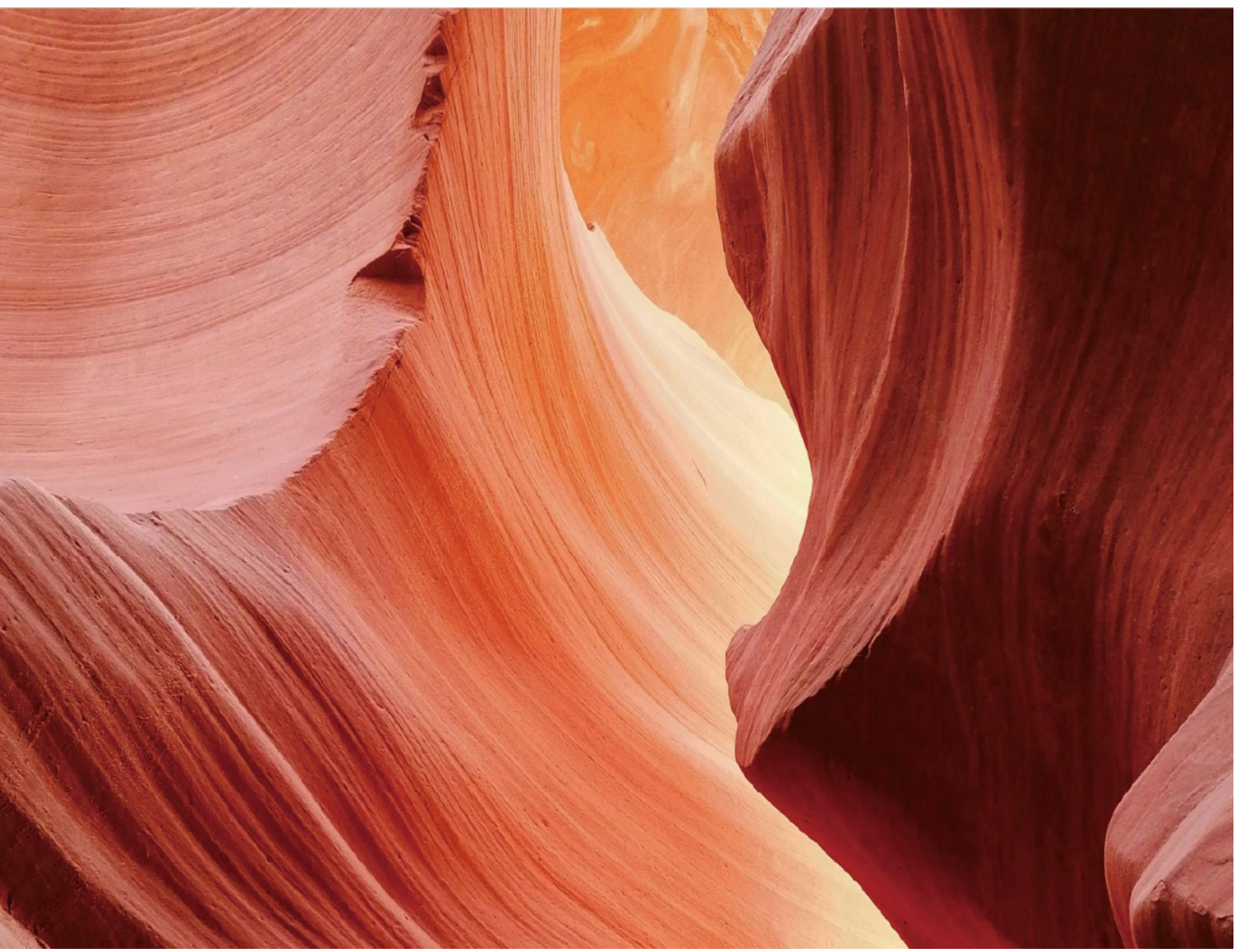
### Immune Checkpoint Inhibitors and Modulators

These therapies regulate immune system components to release new or enhance existing anti-cancer immune responses. They are divided into two types: Inhibitors: Block pathways that suppress immune cell activity, such as PD-1 and PD-L1 immune checkpoint inhibitors; Agonists: Stimulate immune cell activation, such as interleukin-2 (IL-2) and interferon-gamma (IFN- $\gamma$ ).

### Cancer Vaccines

These vaccines trigger immune responses against tumor-specific or tumor-associated antigens, encouraging the immune system to attack cancer cells. Cancer vaccines can be made from various components, including cells, proteins, DNA, viruses, bacteria, and small molecules. They are categorized into: Preventive vaccines: e.g., HPV vaccine, Hepatitis B vaccine; Therapeutic vaccines: e.g., Dendritic cell (DC) vaccines.

# DAMAGE EXPOSURE



# Exposure Damage Assessment

Decoding the Impact of the Environment on Health



## Key Highlights of This Chapter

This section systematically examines seven major categories of environmental exposure: tobacco, alcohol, air pollution, ultraviolet radiation, heavy metals, psychological stress, and sleep quality. By identifying DNA methylation markers linked to these exposures, we can precisely quantify cumulative damage over time. This scientific approach helps in recognizing health risks and formulating personalized protection strategies, ultimately enhancing overall health management and quality of life

Our traits are shaped not only by genetic inheritance but also by environmental influences. Environmental factors play a critical role in the aging process—pollution, poor diet, and unhealthy lifestyle choices can alter DNA methylation patterns, affecting gene expression and accelerating cellular aging. Exposure damage assessment analyzes DNA methylation markers associated with specific environmental factors, revealing the cumulative health impact of long-term exposure.

## Environmental Radar – Deciphering Health Damage from Exposure

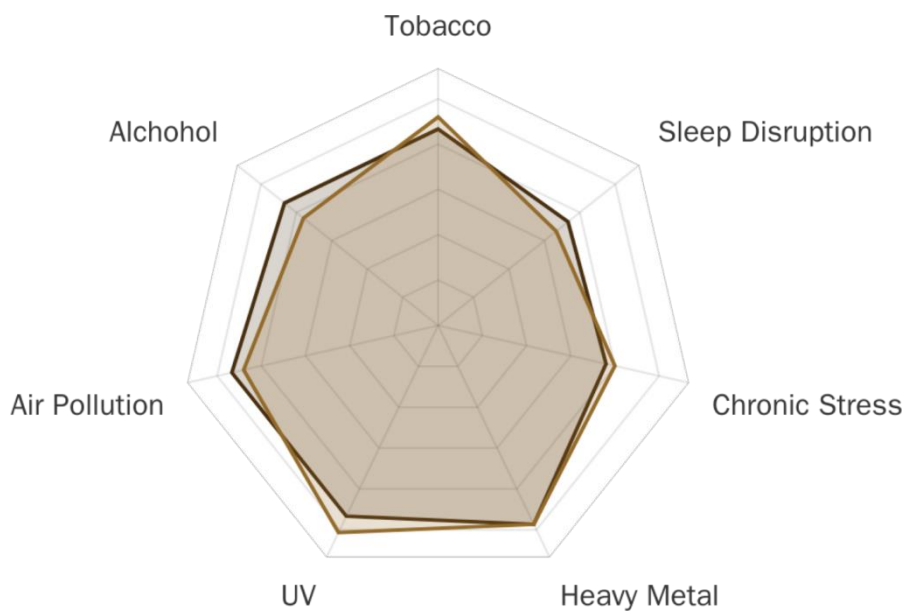
In today's fast-paced world, we are constantly exposed to various environmental factors. These exposures subtly shape our health trajectory by altering DNA methylation patterns. By analyzing specific DNA methylation markers, we can uncover the “biological footprint” left by environmental exposure within the body. This assessment not only evaluates the long-term effects of exposure but also compares individual risks to a reference population, providing a quantifiable measure of potential health threats.

Quantifying environmental impacts on gene expression to personalized protection

# Exposure Damage Score

The Exposure Damage Score is a quantitative measure used to assess the potential health impact of specific environmental or behavioral exposures. By comparing an individual's health risks under specific exposures to baseline levels in a reference population, this score helps evaluate the extent and trends of exposure-related health effects .

- Reference Group Exposure Damage Score
- Your Exposure Damage Score



\*The reference population refers to a group of individuals who, under natural conditions, experience minimal or baseline exposure to specific factors. This group serves as a comparative benchmark for assessing the health risks.

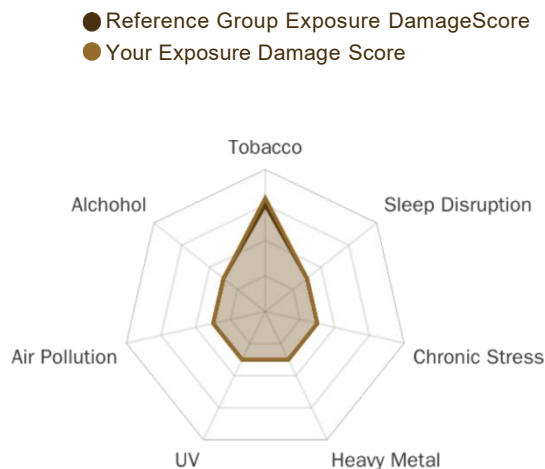
## Exposure Damage Score

# Tobacco Exposure

your Tobacco Exposure score is

 **84**

The impact of Tobacco Exposure on your health is Relatively Moderate



## What is Tobacco Exposure?

Tobacco exposure includes active smoking and passive smoking. Even if you do not smoke, being in an environment with tobacco smoke can still have serious health effects .

## Health Risks of Tobacco Exposure

According to the China Report on the Health Hazards of Smoking (2020), smoking damages lung structure, function, and the immune system, significantly increasing the risk of chronic obstructive pulmonary disease (COPD), lung cancer, and other respiratory diseases. Tobacco smoke contains numerous carcinogens that trigger gene mutations and contribute to cancer development. Smoking also impairs vascular function, accelerates atherosclerosis, and raises the risk of cardiovascular disease, hypertension, and type 2 diabetes. The longer the exposure, the greater the harm. Quitting smoking can significantly reduce these risks and improve overall health.

## Recommendations to Reduce Tobacco Exposure :

1. Quit smoking: Seek professional help to improve your success rate.
2. Avoid secondhand smoke: Maintain a smoke-free indoor environment and avoid smoking areas.
3. Support or strengthen smoke-free policies: Advocate and comply with public smoking bans
4. Air purification: Use air purifiers to reduce indoor smoke pollution.
5. Health Interventions: If exposed to tobacco, consider stress management and lung function training to mitigate negative effects .

Reducing tobacco exposure benefits health at any stage. Even after prolonged exposure, quitting helps the body recover and lowers disease risk.

## Key Gene Functions & Roles



### **AHRR**

- AHRR encodes a transcriptional repressor that regulates the activity of the aryl hydrocarbon receptor (AHR), modulating AHR-mediated gene expression. During tobacco exposure, carcinogens such as polycyclic aromatic hydrocarbons (PAHs) activate the AHR signaling pathway, leading to AHRR downregulation. Studies have shown that chronic smoking suppresses AHRR expression via mechanisms like DNA methylation, weakening the body's defense against harmful substances and increasing the risk of smoking-related diseases.

Chromosome 5



### **PRSS23**

- PRSS23 encodes a serine protease involved in extracellular matrix degradation and inflammatory responses. Highly expressed in the pancreas and liver, it plays a key role in tissue repair and immune regulation. Tobacco-derived toxins may alter PRSS23 expression, enhancing local inflammation and contributing to the development of chronic diseases such as COPD and lung cancer. Additionally, PRSS23 may influence the tumor microenvironment, promoting cancer cell proliferation and metastasis.

Chromosome 11


## Your Key Methylation Loci Results

Methylation LOC	Rate of Reference population	Your Methylation Rate
cg25189904	0.459	0.528
cg06644428	0.154	0.050
cg23916896	0.247	0.313
cg05575921	0.805	0.846
cg06126421	0.714	0.775
cg11660018	0.525	0.627
cg01692968	0.375	0.441
cg03636183	0.670	0.754

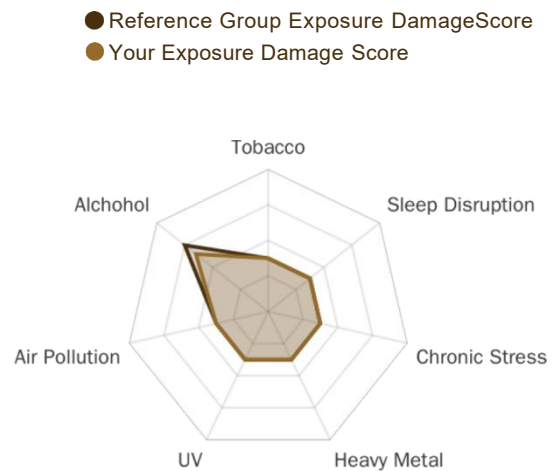
## Exposure Damage Score

# Alcohol Exposure

your Alcohol Exposure score is

 **72**

The impact of Alcohol exposure on your health is Relatively High



## What is Alcohol Exposure?

Alcohol exposure refers to consuming ethanol-containing beverages, a psychoactive and toxic substance that can lead to dependence and long-term health risks.

## Health Risks of Alcohol Exposure

The World Health Organization (WHO) highlights that alcohol consumption increases the risk of liver disease, cardiovascular disease, cancer, and mental health disorders like depression and anxiety. Alcohol is a known carcinogen linked to breast, liver, esophageal, and colorectal cancers. It also disrupts cardiovascular function, raises the risk of hypertension, stroke and impairs immune function. The greater the consumption and duration, the higher the risks. Reducing or quitting alcohol intake can lower these risks and improve overall health.

## Recommendations to Reduce Alcohol Exposure:

1. Reduce or Quit Alcohol consumption: Seek professional support if needed.
2. Avoid High-Risk Drinking situations: Limit participation in heavy drinking events and avoid drinking under stress.
3. Choose Healthier Alternatives: Option for non-alcoholic beverages.
4. Health Interventions: Manage stress, exercise, and maintain a balanced diet to mitigate alcohol-related risks.

Reducing alcohol exposure benefits health at any stage. Even after prolonged exposure, limiting intake can aid recovery and lower disease risk.

## Key Gene Functions & Roles



### **SLC7A11**

• SLC7A11 encodes a key subunit of the cystine/glutamate antiporter system Xc<sup>-</sup>. Acetaldehyde and reactive oxygen species (ROS) generated during alcohol metabolism deplete intracellular glutathione (GSH), leading to downregulation of SLC7A11 and triggering ferroptosis. This mechanism may play a crucial role in alcohol-related conditions such as alcoholic liver disease (ALD) and neurodegenerative disorders like alcohol-related cognitive impairment.

Chromosome 4



### **NCL**

• NCL encodes nucleolin, a major nucleolar phosphoprotein involved in ribosome biogenesis, rRNA processing, and chromatin remodeling. Alcohol exposure may impair nucleolar function, disrupting rRNA processing and ribosome synthesis, which in turn hampers protein production and stem cell proliferation. These effects are potentially linked to fetal alcohol syndrome (FAS) and alcohol-associated cancers, such as hepatocellular carcinoma.

Chromosome 2

## Your Key Methylation Loci Results

Methylation LOC	Rate of Reference population	Your Methylation Rate
cg00252472	0.194	0.218
cg06690548	0.851	0.862
cg06846495	0.400	0.311
cg12825509	0.441	0.386
cg18282388	0.565	0.655

## Exposure Damage Score

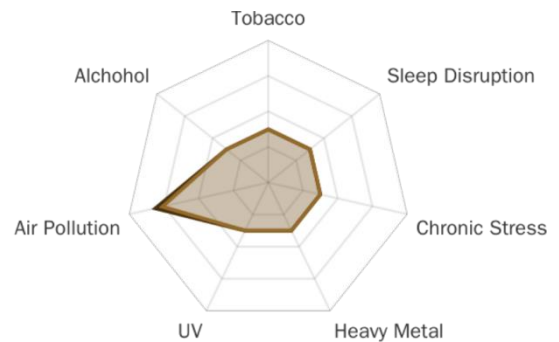
# Air Pollution Exposure

- Reference Group Exposure DamageScore
- Your Exposure Damage Score

your Air pollution Exposure score is

**81**

The impact of Air pollution exposure on your health is Relatively High



### What is Air Pollution Exposure?

Air pollution exposure refers to inhaling pollutants such as PM2.5, which can have harmful health effects over time.

### Health Risks of Air Pollution Exposure

According to the Health Protection Guidelines for Air Pollution, air pollution exposure can cause acute symptoms like eye irritation, coughing, and respiratory distress, as well as increase the risk of respiratory and cardiovascular diseases, including asthma, bronchitis, and hypertension. It may also weaken the immune system and worsen mental health. High-risk groups such as children, the elderly, and individuals with preexisting conditions require additional protection.

### Recommendations to Reduce Air Pollution Exposure:

1. Limit outdoor Exposure: Avoid outdoor activities during high pollution periods.
2. wear protective Masks: Use N95 masks to reduce pollutant inhalation.
3. Improve Indoor Air Quality: Keep windows closed and use air purifiers.
4. Eat Antioxidant-Rich Foods: Increase intake of fresh fruits and vegetables to support immunity.
5. Adopt Healthy Habits: Exercise moderately, get sufficient sleep, and manage stress.
6. Avoid High-pollution Areas: Reduce time spent in industrial zones and traffic-heavy areas.

Reducing air pollution exposure benefits health at any stage. Even after prolonged exposure, protective measures can help lower risks and support recovery.

## Key Gene Functions & Roles



### ***OTUB2***

- OTUB2 is a deubiquitinating enzyme of the OTU family, located on chromosome 14q32.12. It regulates protein stability and degradation by removing ubiquitin tags, impacting various cellular processes including signal transduction, DNA repair, and transcriptional regulation. Air pollutants such as fine particulate matter (PM2.5), sulfur dioxide (SO<sub>2</sub>), and nitrogen oxides (NO<sub>x</sub>) can induce oxidative stress, leading to abnormal protein ubiquitination and impairing cell survival and DNA damage repair mechanisms.

Chromosome 14



### ***FOXL2***

- FOXL2, located on chromosome 3q22.3, encodes a transcription factor primarily involved in ovarian folliculogenesis and granulosa cell differentiation, playing a key role in female reproductive system development and function. Endocrine-disrupting chemicals (EDCs) found in air pollution, such as polycyclic aromatic hydrocarbons (PAHs), may interfere with FOXL2 expression, impacting reproductive health. Additionally, pollutant-induced oxidative stress may contribute to premature aging or cellular damage via FOXL2 dysregulation.

Chromosome 3


## Your Key Methylation Loci Results

Methylation LOC	Rate of Reference population	Your Methylation Rate
cg07721244	0.089	0.040
cg04722215	0.605	0.483
cg21742790	0.473	0.522
cg04252203	0.403	0.465
cg05454562	0.479	0.523
cg16998831	0.585	0.538
cg07023317	0.566	0.562
cg13999433	0.449	0.467
cg11691844	0.428	0.509
cg06992688	0.585	0.597

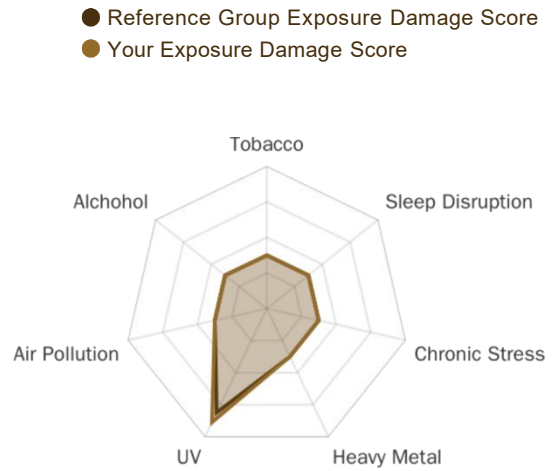
## Exposure Damage Score

# UV Exposure

Your UV Exposure score is

 **91**

The impact of UV exposure on your health is Relatively LOW



## What is UV Exposure?

UV exposure occurs when the skin is exposed to natural sunlight or artificial UV radiation from sources like tanning beds and sterilization lamps.

## Health Risks of UV Exposure

According to the WHO, excessive UV exposure can cause DNA damage, sunburn, and skin aging, as well as increase the risk of skin cancer and eye conditions like cataracts. High-risk groups, including children and individuals with fair skin or a history of skin cancer, are particularly vulnerable.

## Recommendations to Reduce UV Exposure:

1. Avoid peak sun Hours: Minimize outdoor activities between 10 AM and 4 PM.
2. wear protective Gear: Use wide-brimmed hats, sunglasses, and UV-blocking clothing.
3. use sunscreen: Apply SPF 30+ broad-spectrum sunscreen 30 minutes before sun exposure and reapply every 2-3 hours.
4. Be Mindful Indoors: UV rays penetrate windows, so use curtains or UV-protective films when necessary.

Moderating UV exposure is beneficial at any stage. Reducing excessive exposure lowers skin cancer and eye disease risks while improving overall skin health.

## Key Gene Functions & Roles



### **AGR3**

- AGR3 encodes a protein disulphide isomerase family member involved in protein folding and quality control within the endoplasmic reticulum (ER). Ultraviolet (UV) radiation can induce oxidative stress and protein misfolding, disrupting AGR3-mediated ER homeostasis.

Chromosome 7



### **TTC7B**

- TTC7B encodes a cytoplasmic and plasma membrane-associated protein containing tetratricopeptide repeat (TPR) domains. UV exposure may trigger keratinocyte apoptosis, compromising skin barrier integrity and affecting TTC7B's role in maintaining epidermal homeostasis.

Chromosome 14

## Your Key Methylation Loci Results

Methylation LOC	Rate of Reference population	Your Methylation Rate
cg00367281	0.766	0.736
cg05860019	0.805	0.766
cg08619295	0.768	0.761
cg27241845	0.652	0.663
cg23238147	0.077	0.095
cg05685892	0.429	0.248
cg06255943	0.705	0.804
cg01884057	0.273	0.408
cg02048220	0.825	0.782
cg04003327	0.777	0.771

## Exposure Damage Score

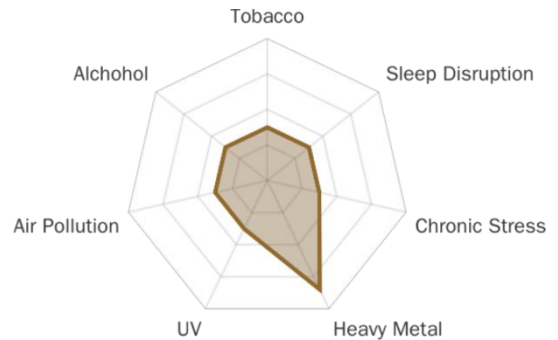
# Heavy Metal Exposure

- Reference Group Exposure Damage Score
- Your Exposure Damage Score

your Heavy Metal Exposure score is

 **88**

The impact of Heavy Metal exposure on your health is **Relatively Moderate**



### What is Heavy Metal Exposure?

Heavy metal exposure refers to the intake of toxic heavy metals through air, water, food, or occupational contact, which may accumulate over time and increase health risks.

### Health Risks of Heavy Metal Exposure

Heavy metal exposure results from various sources, including industrial activities and environmental pollution. In daily life, substandard cosmetics, hair dyes, toys, and kitchenware may contain excessive heavy metals. Additionally, polluted drinking water and residues in certain herbal medicines also pose health risks.

Contaminants such as lead, mercury, cadmium, and arsenic—recognized by the WHO and FAO—are linked to neurological damage, organ dysfunction, developmental impairments, and increased cancer risk. Lead and mercury notably impact children’s cognitive development and fetal health in pregnant women. Prolonged exposure to cadmium and chromium may increase the risk of lung cancer and kidney diseases.

### Recommendations to Reduce Heavy Metal Exposure:

1. choose safer Foods: Opt for organic or pesticide-free foods and limit high-risk items, such as certain seafood and vegetables.
2. Ensure Water Safety: Use filtered water and regularly test drinking water for heavy metal levels to avoid contamination
3. Healthy Diet and Detox support: Consume antioxidant-rich foods, such as leafy greens and berries, to aid the body in eliminating harmful substances.

Minimizing heavy metal exposure benefits health at any stage. Even after long-term exposure, reducing contact and adopting protective measures can lower disease risks and promote recovery.

## Key Gene Functions & Roles



### ***MIB2***

- MIB2 is expressed in various cell types, including those in the nervous, immune, and endocrine systems. It primarily regulates the Notch signaling pathway, playing a role in cell differentiation, proliferation, and apoptosis. MIB2 is crucial for neuronal survival and immune function. Studies suggest that lead exposure disrupts the Notch pathway, impairing MIB2 function and affecting neuronal survival and synaptic repair.

Chromosome 1



### ***TNFA/P8L3***

- TNFAIP8L3 is widely expressed in various tissues and encodes a protein with phospholipid binding and transport activity. It captures and transports signaling molecules such as phosphoinositide bisphosphate and triphosphate, regulating critical signaling pathways like PI3K-AKT and MEKERK. Chronic manganese exposure may increase neuroinflammation, impair TNFAIP8L3-mediated neuroprotective mechanisms and raise the risk of Parkinson's disease or movement disorders.

Chromosome 15

## Your Key Methylation Loci Results

Methylation LOC	Rate of Reference population	Your Methylation Rate
cg01912040	0.704	0.708
cg05962511	0.344	0.429
cg21566642	0.477	0.420
cg05575921	0.805	0.846
cg19246761	0.125	0.139
cg27425146	0.895	0.919
cg02346713	0.173	0.243
cg15357934	0.325	0.350
cg00588920	0.030	0.023
cg23279152	0.860	0.846

## Exposure Damage Score


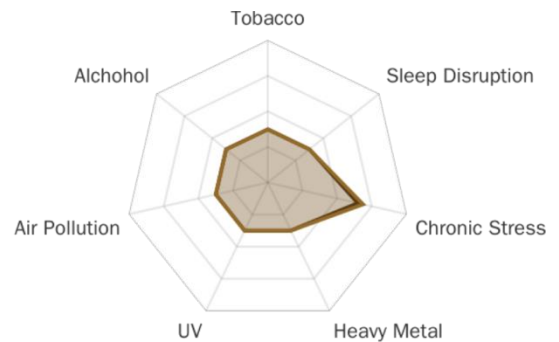
# Chronic Stress Exposure

- Reference Group Exposure Damage Score
- Your Exposure Damage Score

your chronic stress Exposure score is

**75**

The impact of chronic stress exposure on your health is Relatively Moderate

## What is Chronic Stress Exposure?

Stress is a natural response involving physical, psychological, and behavioral changes when an individual perceives that their resources are insufficient to meet external demands or challenges.

## Health Risks of Stress Exposure

According to the World Health Organization (WHO), stress is a natural reaction when facing challenges or threats. While moderate stress can enhance motivation and aid in completing daily tasks, excessive stress may negatively impact mental and physical health. Chronic or intense stress can worsen mental health conditions such as anxiety and depression and may exacerbate existing illnesses. It can also drive unhealthy coping mechanisms like overeating or substance use (alcohol and tobacco). Learning effective stress management and coping strategies can alleviate discomfort, improve problem-solving efficiency, and enhance overall wellbeing.

## Recommendations to Reduce Stress Exposure:

1. Time Management: Create daily schedules and prioritize important tasks to avoid time-related stress.
2. Exercise for stress Relief: Engage in suitable physical activities such as yoga, walking, or aerobic exercises to boost endorphin release and reduce stress.
3. Practice Mindfulness and Meditation: Incorporate mindfulness, deep breathing, or meditation to enhance self-awareness and calm emotions.
4. Build a support Network Communicate with family, friends, or colleagues to share concerns and seek help.
5. Maintain a Healthy Lifestyle: Establish a regular sleep routine and follow a balanced, nutritious diet to enhance stress resilience.

Reducing stress exposure benefits health at any stage. Even after prolonged exposure, managing stress aids recovery and reduces health risks.

## Key Gene Functions & Roles



### **JAZF1**

- JAZF1 encodes a nuclear protein with zinc-finger domains involved in chromatin interaction and insulin signaling regulation. Chronic stress activates the HPA axis and cortisol release, which may reduce JAZF1 expression, impair insulin sensitivity, and increase the risk of metabolic disorders.

Chromosome 7



### **MSX1**

- MSX1 encodes a transcriptional repressor crucial for embryonic development and bone metabolism. Chronic stress may disrupt MSX1-regulated cell differentiation and bone remodeling via MAPK and Wnt/ $\beta$ -catenin pathways, contributing to osteoporosis.

Chromosome 4


## Key Gene Functions & Roles

Methylation LOC	Rate of Reference population	Your Methylation Rate
cg26179948	0.058	0.023
cg09573795	0.354	0.428
cg02621907	0.076	0.023
cg10822172	0.524	0.585
cg17294330	0.835	0.792
cg00229532	0.908	0.917
cg07539200	0.059	0.065
cg25120210	0.578	0.577
cg02506717	0.545	0.603
cg00661523	0.215	0.257

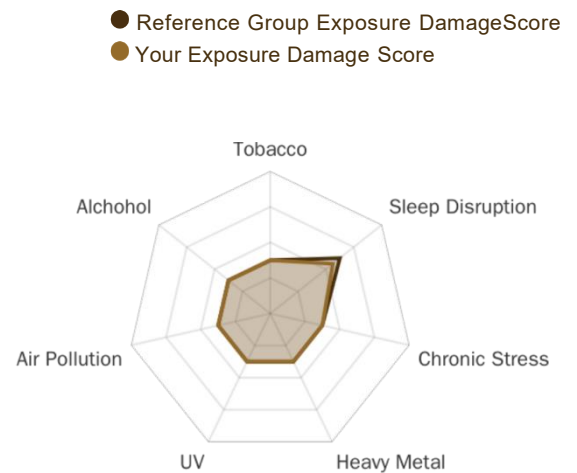
## Exposure Damage Score

# Sleep Disruption

your sleep Disruption score is

 **65**

The impact of chronic stress exposure on your health is Relatively High



## What is Sleep Disruption?

Sleep disruption refers to irregular sleep patterns, such as inconsistent sleep-wake times, frequent nighttime awakenings, and poor sleep structure. It includes conditions like insomnia, circadian rhythm disorders, and fragmented sleep.

## Health Risks of Sleep Disruption

Chronic sleep disturbance impairs cognitive performance, weakens emotional resilience, and elevates the risk of cardiovascular disease, obesity, type 2 diabetes, and immune dysfunction. It also disrupts circadian rhythms, impacting metabolic and hormonal balance

Prioritizing consistent sleep habits and optimizing sleep hygiene is a powerful, preventative strategy for long-term health.

## Recommendations to Reduce Sleep Disruption:

1. Align with your Body Clock: Keep consistent sleep-wake times.
2. optimize your sleep space: Cool, quiet, and screen-free
3. cut Late-Day stimulants: Avoid caffeine and alcohol in the evening.
4. Exercise smart: Stay active, but not too close to bedtime
5. setup a pre-sleep Routine: Relax with breathwork, meditation, or calm music.

Improving sleep patterns benefits health at any stage. Even after prolonged disruption, adopting healthy sleep habits can promote recovery and reduce chronic disease risk

## Key Gene Functions & Roles



### ***KIA A1429***

- Encodes a component of the m6A methyltransferase complex, regulating mRNA processing, alternative polyadenylation, and cell proliferation. Chronic sleep disorders—characterized by poor sleep quality and insufficient sleep—disrupt m6A methylation, contributing to altered neurotransmission, impaired synaptic plasticity, increased susceptibility to mood disorders and cognitive decline.

Chromosome 8



### ***NELL2***

- Encodes a protein involved in neuronal differentiation, axon guidance, and synaptic plasticity via MAPK signaling, as well as in modulating GnRH release and pubertal onset. Persistent sleep disorders may downregulate NELL2 expression, promoting neuroinflammation and impairing both cognitive and neuroendocrine functions.

Chromosome 12

## Your Key Methylation Loci Results

Methylation LOC	Rate of Reference population	Your Methylation Rate
cg26464482	0.084	0.058
cg00032756	0.095	0.114
cg06170203	0.324	0.399
cg22851864	0.573	0.579
cg19218082	0.623	0.940
cg04095045	0.128	0.213
cg23028436	0.072	0.082
cg01144053	0.065	0.036
cg11701615	0.663	0.632
cg25666403	0.016	0.015

# How to Leverage Test Results:

## Embark on a Journey of Evidence-Based Health Management

### Understand the Scope of the Report

DNA methylation testing is a powerful epigenetic tool that reveals how environmental factors shape methylation patterns and influence traits like tumor development, inflammation, aging, and metabolic disorders. Based on current scientific research, this report offers insights into biological aging and exposure related health risks.

### Maximizing the Value of Your Test Results



#### 1. Consult with Experts

Review your report with a qualified healthcare professional to receive personalized interpretation and tailored recommendations.



#### 2. Develop a customized Health plan :

Leverage your results to optimize your diet, exercise routines, and lifestyle choices. Consider seeking professional guidance to build a precise and actionable health management strategy.



#### 3. Retest Regularly :

It is recommended to repeat methylation testing every 6–12 months to:

- Monitor changes in biological age and health risks
- Evaluate the impact of lifestyle modifications over time



#### 4. Integrate with comprehensive Health Management :

Combine Your Methylation data with other medical tests and health screenings to create a more holistic view of your well-being.



#### 5. Stay Proactive :

Identify the high-risk factors, follow medical advice for more frequent screenings or targeted interventions.

### Important Notes

Health outcomes result from a complex interplay of genetic, environmental, and lifestyle factors. Some referenced studies are based on populations of different ethnic backgrounds (e.g., Caucasian, Latin American, African), and results may vary across ethnicities.

However, it is intended as a risk assessment and predictive tool—not a clinical diagnosis. Given current technological and scientific limitations, it may not reflect all influencing factors or fully represent your personal health status.

Health is a dynamic journey. While this report offers meaningful insights, its true value lies in how you use this information to improve your quality of life and long-term well-being.