# MyTruHealth Results Report



John Doe Sample Date: 19 Jan 2023 Report Date: 07 Mar 2023



## Hi John,

Thank you for embarking on a journey with MyTruHealth test provided by InvitroU. Through this test, you will gain valuable insights that can empower you to make informed decisions for a healthier life.

With lifelong access to these valuable health insights, you have the opportunity to take control of your well-being towards better health and aging. This partnership marks the beginning of an ongoing collaboration where we provide you with meaningful metrics and outcomes, such as personalized lifestyle interventions, as we work towards a life filled with vitality and longevity.

Your involvement in this initiative is greatly appreciated as it contributes to the progress of science and innovation in the pursuit of healthy aging. Together, let's work towards revolutionizing our approach to living and aging, starting with you!

Thanks,

The InvitroU Team (65 6460 0497 (a) support@invitrou.com

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# What is Epigenetics? how is it different from genetics?

You may have heard of Genetic Tests. Genetics is the study of genes and heredity. Genes are passed down from parents to offspring, and they play a role in determining our physical characteristics, such as eye color and hair color. However, genetic information alone does not solely dictate our fate or overall health. Not all genes are actively being expressed or "read" by our cells simultaneously. This is where epigenetic control comes into play.

Epigenetics is the study of how cells control gene activity or gene expression without changing the DNA sequence. The prefix "epi-" means "on top of" or "beyond," and so epigenetics refers to factors that influence gene expression but are not encoded in the DNA sequence itself. When a gene is "expressed," it means that the information contained within the gene is being used to create a specific protein or molecule that our body needs to function properly. Epigenetic changes are modifications to DNA that regulate whether genes are turned on (i.e. being "expressed") or off, and they can arise from a diverse range of influences, such as environmental factors, dietary choices, and lifestyle habits.

A common type of epigenetic modification is called DNA methylation. Methylation occurs when a methyl group (CH3) is added to a specific location on our DNA. This can turn off genes and prevent them from being expressed. DNA Methylation is a reversible process, and just like other epigenetic changes, it can be affected by a variety of factors.

Our epigenetic tests MyTruHealth and MyTruAge examine the positioning and quantity of methyl groups on your DNA, providing valuable insights on alterations affecting your gene expression and their tangible impact on the body, rather than solely focusing on the DNA sequence. An applicable analogy would be:

DNA as hardware: DNA serves as the physical material that contains the genetic information in living organisms. Epigenetic mechanisms as software instructions: Epigenetic mechanisms, including DNA methylation and other modifications, can be compared to software instructions that send signals to the hardware (DNA), modulating gene expression and impacting the organism's behavior and development.

Epigenetic changes can be reversed, so it is important to understand them by using epigenetic tests. By comprehending these changes, we can make informed modifications to our lifestyles and employ epigenetic tests as a means to monitor and demonstrate the reduction of individual risk in developing diseases and mortality.

#### Genetic Testing **VS** Epigenetic Testing

		MyTruHealth
	Genetic Test	Epigenetic Test
Measures the Genetic Code	•	
Reports Health Risks	Ø	⊘
Measurement of How Genes are Expressed		⊘
Able to influence With Lifestyle Changes		⊘
Unique Algorithms For Health Insights		⊘
Measures a Value that You Can Improve Over Time		⊘

**Epigenetic testing empowers you with comprehensive information pertaining to your health status and the potential risk of developing certain diseases.** As our understanding of epigenetics grows, epigenetic tests are likely to become even more important in the prevention, diagnosis, and treatment of disease.



# What is Biological Age? and why is it important to know?

We are all familiar with chronological age, the measure of time elapsed since birth. This is a widely known concept unaffected by lifestyle, dietary habits, or environmental factors.

With advancements in scientific understanding, a novel approach known as "Biological Age" has emerged as a method to assess one's age. Unlike chronological age, Biological Age measures how effectively the body functions, regardless of the number of years since birth. It encompasses various factors, such as DNA methylation, lifestyle choices, and environmental influences. This age measurement is derived from statistical research and provides a valuable framework for comprehending an individual's health status and mortality risk.

# The concept of Biological Age is crucial for establishing the connection between epigenetics and health.

A significant factor in the aging process is the loss of regulation in gene expression. As mentioned earlier, gene expression is the mechanism by which genes are activated or deactivated to generate proteins, essential for various biological functions including cell growth, division, metabolism, and immunity. As we grow older, alterations in DNA methylation patterns can occur, disrupting the proper control of gene expression. Consequently, there can be an accumulation of defective or detrimental proteins, resulting in cellular and tissue damage, and contributing to the development of age-related chronic conditions like cancer, heart disease, and Alzheimer's disease.

Mounting evidence suggests that Biological Age is a more reliable indicator of overall health and disease vulnerability than chronological age. Consequently, it is crucial to acknowledge the profound influence of aging as the primary risk factor for a range of chronic illnesses. **Biological Age measurement captures the alterations in DNA methylation patterns and converts them into a numerical value.** This approach enables a straightforward yet comprehensive evaluation of an individual's overall health.

Ideally, everyone would want their biological age to be younger than their chronological age. This means that they are living a healthy lifestyle that will help them stay healthy and prevent sickness and disease for a longer period of time. Great news awaits! The realm of epigenetics brings hope as it unveils the reversibility of epigenetic changes, including DNA methylation. Yes, you read it right – **epigenetic aging is reversible**. Now, armed with a direct measure of aging, we hold the key to **slowing down the relentless march of biological aging!**  John Doe Patient ID: 7N3Q7BY | Sample Date: 19 Jan 2023 | Report Date: 07 Mar 2023

Assessing an individual's health status can be challenging, with healthcare providers often relying on multiple indicators such as blood cholesterol, inflammation markers, and blood sugar levels. They also perform various tests, including colonoscopies, vision assessments, and physical function evaluations. However, by analyzing the methylation status of a blood sample, **Biological Age serves as a unified**, **straightforward metric that encompasses these diverse measures.** 

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# Why is **DNA METHYLATION**

# a better marker and measurement of aging than other factors?

In addition to analyzing DNA methylation patterns, Biological Age can be calculated using various methods. A recent study conducted a comparison of six potential estimators for determining biological age:



The study concluded that the epigenetic clock analyzing DNA methylation patterns is the most promising molecular estimator of biological age.1

Similarly, a comparative review of different forensic methods for age estimation concluded that **DNA methylation is the most promising age-predictive biomarker.2** 

Discover the most accurate measurement of your Biological Age and unravel the depths of your disease vulnerability with the use of MyTruHealth and MyTruAge today. Unlock the power of the tests to establish a direct link between your health, longevity, and personalized approaches for addressing your wellbeing. Take charge now and unleash the insights to optimize your health journey!

1. Jylhävä, Juulia, et al. "Biological Age Predictors." EBioMedicine, vol. 21, 2017, pp. 29–36., doi:10.1016/j.ebiom.2017.03.046.

2. Lee, Hwan Young, et al. "ForensicDNA Methylation Profilingfrom Evidence Material for Investigative Leads." BMB Reports, vol. 49, no. 7, 2016, pp. 359–369.

## How was this test created? and is it accurate?

# MyTruHealth — 900,000

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sites on the DNA

Our Competitors 2,500

sites on the DNA

The creation of the test and its accuracy are vital aspects to consider. The development of the test involved a rigorous process of scientific research, analysis, and validation. Extensive studies and investigations were conducted to establish the correlation between DNA methylation patterns, biological age and risk of chronic diseases. These findings formed the foundation for the test's creation.

With an extensive examination of over 900,000 locations on the DNA, the data we get from your DNA is 40,000 times larger than many competitors.

The question arises: how do we decipher and comprehend the wealth of information we uncover?

Harnessing the power of computer learning and artificial intelligence, we've built a remarkable mathematical model. Armed with nearly a million data points from over 15,000 patients, this algorithm scrutinizes blood tests, imaging data, genomics, proteomics, transcriptomics, and health history.

The results are astounding. Through meticulous analysis, we unveil correlations with unparalleled accuracy, linking variables to health outcomes. If a DNA location exhibits methylation in 2000 patients, and 1999 of them develop Alzheimer's, we confidently predict a high risk for this disease.

These groundbreaking calculations extend to biological aging. By comparing biological and chronological age, we forecast susceptibility to various diseases and even estimate the time of mortality. Prepare to revolutionize health prediction as we delve into the intricacies of your DNA.

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# Your Biological Age

vs Chronological Age

Biological Age 23.44

10 Years

Age 0

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Age 96

Our Oldest Patient

**Chronological Age** 

33.28

#### Your Biological Age is lower than your Chronological Age.

You have embarked on a transformative journey. Now, you can unveil your DNA's status and delve into the remarkable potential for transformation through positive lifestyle changes.

If your biological age exceeds your chronological age, there are actionable steps you can take to slow down the aging process. On the other hand, if your biological age is lower than your chronological age, maintaining your current practices while incorporating additional beneficial strategies can further enhance your well- being. Let's navigate the path to a healthier and more balanced future together.



#### Your Biological Age Compared to the General Population.

This graph shows you the biological and chronological age of the general population. It is important to consider that our patient demographic predominantly consists of individuals within the preventive, integrative, and functional medical community. Therefore, it is possible that our population metrics may exhibit slight variations from the broader general population.

These variations can be attributed to factors such as the test's affordability and the inherent interest of participants in healthy aging. However, to ensure a comprehensive understanding and avoid bias, we actively seek participants beyond this specific population. Our recruitment efforts encompass individuals from diverse backgrounds, including different socioeconomic statuses, races, genders, nationalities, and more. This inclusive approach allows us to obtain a broader and more representative overview of the factors influencing biological age.

# How to improve your Biological Age?

To have a positive impact on DNA Methylation patterns associated with aging, it is recommended to incorporate a variety of exercises into your routine, including endurance, strength, balance, and flexibility training.

Based on data from epigenetic studies, it is suggested that exercising a minimum of four times per week is required to minimize epigenetic aging.

#### Fitness

As you age, regular exercise assumes greater significance due to the increased variability and predictive nature of epigenetic markers associated with physical activity.

Lowering biological age can be potentially facilitated by incorporating protein-rich foods like fish and poultry into your diet, as they are excellent sources of omega-3 fatty acids.

Under the guidance of a nutrition professional, explore the inclusion of dietary approaches like calorie restriction, Mediterranean cuisine, or fasting mimicking into your routine.

Deliberate on increasing your intake of polyphenols such as trans-resveratrol, sulforaphane, epigallocatechin-3-gallate (EGCG), quercetin, and genistein.



Nutrition



Consult your doctor regarding supplements and medications like Metformin, Resveratrol, Coenzyme Q10, Folate, Vitamin D, NMN, and Rapamycin, known for their potential to slow aging.

Growth hormone optimization is a potential approach for thymus regeneration, but it is important to talk to your doctor about the risks and benefits of growth hormone therapy before starting treatment.

# **Psychosocial**

Scientific research has revealed that both physical and emotional stress can expedite the process of epigenetic aging. Consequently, it is vital to adopt suitable measures to minimize your subjective level of stress.

Comorbidities

Implement precautionary measures to avoid behaviors that increase the risk of developing type 2 diabetes and obesity. These measures may include adopting a healthy diet, limiting alcohol consumption, and refraining from tobacco use.

Insufficient sleep and insomnia have been linked to accelerated aging. Prioritize obtaining a minimum of 7 hours of sleep each night. Implement preventive measures to mitigate the risk of viral infections, including practicing good hygiene and receiving vaccinations.



Wear a mask in areas with harmful air pollution.

To minimize potential exposure, it is advisable to access online sources for PM2.5 particle matter data and avoid areas where the PM2.5 levels exceed 55 µg/m<sup>3</sup>.

To reduce exposure, it is advisable to avoid direct contact with pesticides and abstain from consuming unwashed foods that have been treated with pesticides.

# **Your Pace of Aging Value**

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Your Pace of Aging (DunedinPACE) Value represents how many biological years you are aging per year at the precise moment.

- It distinguishes your current actions from the markers you have accumulated from your past or inherited from your ancestry.
- An average person will age at a rate of 1.0 biological years/1.0 years of chronological aging.
- The fastest pace of aging measured thus far is 1.4 biological years/1.0 years of chronological aging.
- The slowest pace of aging measured thus far is 0.6 biological years/1.0 years of chronological aging.
- It is desirable to have a pace of aging that is less than 1.

# Your DunedinPACE Value: 0.0

1.4

#### What Does Your Pace of Aging Mean?

An average pace of aging implies that for every year you age chronologically, your biological age also increases by one year. However, it is crucial to recognize that this is merely an average, and there exists a considerable range of variation in the pace of aging among individuals. Factors such as genetics, lifestyle, and environment contribute to this variation. Achieving a pace of aging below 1, indicating a slowed aging process, is desirable.

#### Influence of Accelerated Aging

Pace of Aging typically increases across much of the adult lifespan. A faster DunedinPACE is the result of lifetime stress-induced DNA methylation changes. Greater exposure to stress, tobacco smoke, diseases, and lower-quality nutrition is linked to an accelerated DunedinPACE.

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# Pace of Aging *Versus* Your Body's Biological Age

#### What distinguishes these two metrics and how should they be interpreted?

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Quantifying one's rate of aging versus biological age is like having a speedometer that tells you how fast you are aging, instead of just telling you about your age at a fixed moment in time. Biological age is a valuable metric, but it does not differentiate the influence of past experiences from current factors on DNA methylation.



There are many external factors that influence one's pace of aging. The above image is a graphical representation of potential influences on your pace of aging.

Knowing both metrics can be beneficial in various scenarios, and a compelling example is the hypothetical case of two identical twins.

Let's consider the case of two identical male twins, Twin A, and Twin B, who are both 40 years old chronologically. Twin A has consistently led a healthy lifestyle, practicing proper nutrition, exercise, and following recommended supplements and habits. In contrast, Twin B had a more stressful life in his twenties and early thirties but recently made positive changes. Currently, both twins share the same lifestyle, nutrition, and exercise routines, and possess the same baseline DNA sequence.

If we solely examine their biological age, it is likely that Twin A would have a lower biological age due to his lifelong healthy habits, while Twin B might have a higher biological age due to his past health history. This might give an inaccurate impression that Twin B's current actions are accelerating his aging process, despite their current lifestyles being identical.

However, if we had a method to assess the instantaneous aging rate, we could differentiate between the advanced aging that occurred in the past and the current rate of aging influenced by ongoing lifestyle factors. This distinction would allow us to determine which lifestyle traits should be maintained and which ones should be modified.

# Your Immune Age



#### Immune Age and Your Immune Health

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Think of Immune Age as a measure of your immune system's strength. Have you ever wondered why older individuals are more susceptible to illnesses like COVID-19 and the flu? It's because the immune cells necessary for a robust response tend to decrease as we age. This decline in immune function, known as Immunosenescence, is a normal part of the aging process.

Immunosenescence affects the number of immune cells in our blood. As we get older, we have fewer immune cells such as Naive T Cells, Natural Killer Cells, Macrophages, Dendritic cells, and others. This can lead to a higher risk of infections, cancer, and autoimmune diseases among the elderly population. An indication of immunosenescence is a decreasing CD4T/CD8T ratio. It is common for the CD4T/CD8T ratio in older individuals to be less than one. A study conducted with Swedish elderly individuals discovered that a CD4T/CD8T ratio less than one was associated with a higher short-term mortality risk.

To evaluate the state of your immune system, we assess your Immune Age and CD4T/CD8T ratio. These indicators shed light on the concentration of immune cells and epigenetic changes, providing valuable insights into your immune system's overall health.



## **Potential Concerns with High Immune Age**

Immune Age serves as a surrogate indicator for the immune system and has the potential to predict the composition of your immune cells. A higher Immune Age compared to chronological age may signify that your immune system is not functioning at its highest potential.

### **Immune Age and Your Longevity**

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Unfortunately, a higher Immune Age is also correlated with shorter lifespans. 2,734 deaths were included in a study and it showed that higher Immune Age correlated to a higher hazard ratio for death.



## How to Improve Your Immune Age?

One of the extraordinary aspects of epigenetic measurements in relation to aging is the potential for improving health through appropriate interventions.

Currently, there is available data on how to bring about changes and enhance healthier outcomes. For example, Immune Age acceleration has been found to have significant associations with certain factors. These factors include fish intake (p=0.02), moderate alcohol consumption (p=0.01), BMI (p=0.01), and blood carotenoid levels (p=1x10-5), which serve as an indicator of fruit and vegetable consumption. Thus, consuming alcohol moderately (validated only at 1 drink per week) could assist in reducing this metric. Furthermore, the consumption of fish, fruits, and vegetables is correlated with an improved Immune Age. Additionally, interventions such as reducing BMI and body weight have also shown correlations with improved metrics.

It is plausible that therapies aimed at preventing or delaying the decline in the immune system over time could be beneficial. One validated intervention in this field focuses on thymus regeneration. The thymus, one of our vital immune organs, tends to shrink as we age. Therapies involving DHEA, Metformin, and GH-related treatments have demonstrated improvements in thymus regeneration and alterations in the composition of immune cells within our body. It is advisable to consult healthcare providers about therapies that can potentially benefit the immune system.



# Telomeres and how their length affects you



As cells divide over time, telomeres shorten until cell division stops

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#### **Introduction to Telomeres**

Telomeres are repeating sequences of nucleotide (TTAGGG) that tag the ends of all chromosomes. Their primary function is to prevent chromosomal "fraying" when a cell replicates. Telomere length (TL) is maintained by an enzyme called telomerase. However, telomerase activity decreases over time as we age, resulting in the gradual shortening of telomeres. When telomeres become too short, a cell reaches a critical point where it can no longer divide, entering a state of inactivity known as "senescence." At this stage, the cell accumulates damage that it cannot repair, ultimately leading to its demise.

### Why are Telomeres important? Unraveling the Link between Telomere Length and Chronic Diseases

Telomeres play a pivotal role in human cell aging, influenced by a combination of genetic and epigenetic factors. A recent study conducted by researchers at the University of California Los Angeles reveals a suggestive connection between two key aspects of aging: DNA methylation and telomere length.

Telomeres, integral components of human cells, exert a profound influence on cellular aging. The length of telomeres has emerged as a critical factor in determining replicative senescence and cell destiny. Furthermore, it is closely associated with a diverse array of health conditions, encompassing cancer, cardiovascular disease, and age-related disorders.

Extensive research indicates a correlation between cellular aging, shortened telomere length, and reduced telomerase activity in numerous preventable chronic diseases. These chronic diseases include hypertension, cardiovascular disease, insulin resistance, type 2 diabetes, depression, osteoporosis, and obesity. Additionally, shorter telomeres have been linked to genomic instability and the development of cancer. Older individuals with shorter telomeres face a three to eightfold heightened risk of mortality from heart and infectious diseases compared to those with normal telomere length. Acquiring knowledge about telomere shortening rate and length is therefore vital for individuals, as it can significantly impact their health and rate of aging, empowering them to proactively collaborate with healthcare providers in disease prevention.



## **Your Mitotic Clock Report**

#### The Epigenetic Timer of Cancer and Stem Cell Potential

Certain tissue types have a significantly higher likelihood of developing cancer compared to others. Factors such as smoking, alcohol use, ultraviolet light exposure, and HPV contribute to these differences in specific organ cancers. Inherited genetic variation also plays a role, but only in a small percentage of cases. However, these explanations do not fully account for the vast differences in cancer risk between different tissues, such as the contrast between small intestine and brain cancer.

# The Link between Cellular Replication and Cancer: The "Bad Luck" Hypothesis

In 2016, researchers at Johns Hopkins conducted a study to explain the variation in cancer risk among different tissues.

They found a strong correlation (r2=0.81) between the lifetime risk of various cancer types and the total number of divisions undergone by normal self-renewing cells responsible for maintaining tissue balance. Furthermore, the study revealed that environmental factors and inherited predispositions account for only one-third of the variation, while the remaining variation is attributed to the "Bad Luck Hypothesis." According to this hypothesis, more frequent cell replication increases the likelihood of DNA copying errors, leading to the accumulation of mistakes and cancer development. Individuals with higher intrinsic errors due to bad luck are at a greater risk. Mitosis, the process of cell division, is vital for tissue growth, healing, and repair, and over time, the gradual accumulation of copying mistakes in trillions of cells raises the risk of cancer.

Monitoring cell replication (cell turnover) plays a crucial role in understanding tissue dynamics, aging, and disease progression. Epigenetic-based Mitotic Clocks, which measure the rate of cell turnover through DNA methylation, provide valuable insights into these processes.

#### A significantly high cumulative number of stem cell divisions detected using the Mitotic Clock can

**indicate a potential cancer risk**, although it is not always a definitive diagnosis. The DNA methylation Mitotic Clock estimates the number of cell divisions and has been correlated with increased cancer risk. However, factors like inflammation, exercise, and aging can also influence stem cell division.



#### **Mitotic Clock and Stem Cell Potential**

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Stem cells play a crucial role in replenishing and replacing damaged or aging cells in our bodies. However, it's worth noting that stem cells have a limited number of division cycles. Once they have undergone a certain number of divisions, they cease to divide and eventually die. Consequently, **a high DNA Methylation Mitotic Clock number may indicate a depletion in the potential of stem cells.** 

When an individual undergoes stem cell treatment, their DNA methylation mitotic clock may display a lower number compared to if they had not received treatment. This is because the injected stem cells are typically younger than the existing cells in the body, and the rate of division may be higher due to their increased activity.

Research studies have shown that stem cell treatment or transplantation can reduce the number of mitotic clocks. In one study, umbilical cord blood stem cell transplantation was found to decrease the mitotic clock in patients with Fanconi anemia, a genetic disorder associated with increased cancer risk. Another study revealed that allogeneic hematopoietic stem cell transplantation led to a decrease in the mitotic clock in patients with acute myeloid leukemia, a type of blood cell cancer. These findings suggest that stem cell therapy may lower the number of mitotic clocks.

## Your Results



#### Your average estimate for the rate of stem cell division for the tissue:

#### 50.00

This represents your average mitotic rate since birth. It provides an average estimate of the mitotic rate over time instead of instantaneous mitotic rate. Based on your results, you would be in the 71.7th percentile of lifetime intrinsic rate of cell division stem compared to others of your same chronological age.



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## What Does This Mean For Me?

It is important to note that this report does not detect cancer. This algorithm has been trained to predict the amount of stem cell division in tissue samples. While tissue turnover is generally correlated with an increased risk of cancer, It is NOT a definitive diagnostic. Still, it does highly correlate to cancer development risk.

If you are reading exceptionally high in this category, we would encourage you to pay special attention to getting regularly examined for any health issues with your physician. For instance, if someone is over the age of 65 and is in the top 10% of the stem cell mitotic rate, we might suggest preventative screening measures.

Increased mitotic rates measured with this algorithm may also indicate a depletion in the potential of stem cells. It is important to talk to your doctor about the risks and benefits of stem cell treatment before deciding if it is right for you.

## Weight Loss: Response to Caloric Restriction

Weight loss can pose a significant challenge for individuals who have been overweight for an extended period. The response to weight loss therapy varies from person to person. While a hypocaloric (calorie-deficient) diet is often recommended for weight loss, the outcomes can differ among individuals. This is because there are molecular and epigenetic factors influencing how the body responds to calorie deficit.

Understanding your body's specific response to calorie deficit is crucial for tailoring a personalized weight loss therapy. This report helps identify your personal weight-loss response to caloric restriction, enabling the customization of a plan that suits your individual needs and characteristics. By knowing how DNA Methylation influences your response to calorie deficit, you and your healthcare provider can determine the best interventions for your weight loss journey.

## PON3

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The PON3 gene encodes for a protein that circulates in the bloodstream and binds to lipoproteins, which are molecules that transport fat throughout the body. The PON3 protein protects lipoproteins such as HDL (high- density lipoprotein) and LDL (low-density lipoprotein) from oxidation. Oxidation of LDL can cause inflammation, which can lead to plaque buildup in arteries and damage to arterial walls. Oxidized LDL is also believed to be responsible for increased fat deposition in the body. It increases the production of triglycerides, which are the most common type of fat produced when the body has excess calories. Studies have found that the methylation pattern of the PON3 gene can predict how a person's weight and body fat will respond to caloric restriction.

#### Possible Outcomes (Epitype): Non-Responder, Intermediate Responder and Full Responder

	CpG site	Gene	β-value Responders	Your Score	Response Status
1	cg15500865	PON3	0.072	0.16	Hypermethylated
2	cg25161512	PON3	0.115	0.28	Hypermethylated
3	cg11435506	PON3	0.165	0.13	Hypomethlyated
4	cg03301582	PON3	0.120	0.15	Hypermethylated
5	cg08898155	PON3	0.163	0.50	Hypermethylated
6	cg04080282	PON3	0.324	0.53	Hypermethylated
7	cg26457160	PON3	0.490	0.51	Hypermethylated
8	cg10329418	PON3	0.252	0.46	Hypermethylated
9	cg27166921	PON3	0.253	0.42	Hypermethylated
10	cg24750391	PON3	0.355	0.42 🔍	Hypermethylated
11	cg08461772	PON3	0.418	0.56	Hypermethylated

### Your CpG Beta Values

#### Your Epitype

Your CpG loci around the PON3 gene hae been hyermethylated. According to your methylation levels, you are classified as an **Full Responder** to caloric restriction. This suggests that while calorie restriction as a method of weight loss should be ery effectie.

# Are You At Increased Risk For Developing Type 2 Diabetes?

# DNA methylation as a surrogate marker of Type 2 Diabetes

The development of Type 2 diabetes (T2D) involves complex interactions between genetic and environmental factors, which can be influenced by epigenetic changes. Various genetic and non-genetic factors have been identified that contribute to an increased risk of T2D. The good news is that adopting a healthier lifestyle, including proper diet and exercise, has the potential to reduce the risk of T2D by nearly 50% among high-risk individuals.

As a result, there is a strong interest in identifying individuals who are at a high risk of developing T2D. By delaying or preventing the onset of T2D and its complications, it may be possible to reduce T2D-related mortality rates and alleviate the financial burden associated with treating the disease and its complications.



To date, more than 65 genetic variants have been identified that increase the risk of T2D by almost 10 percent. However, genetic screening for T2D risk variants has not been implemented in clinics due to a number of limitations. These limitations include the modest impact of individual genetic variants, limited ability to accurately discriminate risk, and, most significantly, the absence of models that consider interactions between genes and the environment.

Unlike the DNA sequence, epigenetic profiles such as DNA methylation, can be influenced by environmental factors and have the potential to improve T2D prediction. Recently, an epigenome-wide association study identified 5 DNA methylation loci in the blood that were associated with T2D, including ABCG1 and PHOSPHO1. In this test, methylation scores combining the results from these 2 methylation loci predict the risk of prospective T2D occurrence.

#### What is ABCG1?

ABCG1 is a gene that encodes a member of the ATP-binding cassette (ABC) protein family, which plays a role in the homeostasis of glucose and lipids. These proteins do so by removing excess cholesterol from peripheral tissues and transporting it to the liver. Furthermore, the HDL-mediated increase in insulin secretion is dependent on ABCG1. Loss of ABCG1 genes results in sterol accumulation, impaired glucose-stimulated insulin secretion, and inflammation of pancreatic ß-cells which can all lead to diabetes.

The ABCG1 marker has been validated across different tissues in more than 10,000 individuals representing different ethnicities. Increased DNA methylation in ABCG1 is associated with the downregulation of its gene expression levels in T2D individuals. ABCG1 deficiency leads to increased cholesterol levels in the blood, which can contribute to the development of type 2 diabetes. In addition, DNA methylation on ABCG1 gene in blood DNA has been shown to be functionally correlated with a number of T2D risk factors, such as BMI, triglycerides, and HbA1c.

Your DNA methylation score at ABCG1 locus cg06500161 gives an indication of your level of risk for type 2 diabetes; if your score is 70.1% or greater, it is associated with a 9% increased risk for future type 2 diabetes occurrence.





#### What is PHOSPHO1?

PHOSPHO1 is a gene responsible for encoding a phosphatase enzyme with significant expression in skeletal muscle, where it plays a vital role in skeletal mineralization. Dysregulation of PHOSPHO1, often observed as a consequence of aging, diabetes, and hypercholesterolemia, can potentially contribute to vascular calcification. Intriguingly, a positive correlation has been identified between DNA methylation at the cg02650017 locus of the PHOSPHO1 gene in blood and HDL levels. Moreover, this DNA methylation pattern is associated with an increased risk of developing Type 2 diabetes in the future.

A DNA methylation score of 5.0% or greater at the PHOSPHO1 locus cg02650017 in blood DNA was associated with a 15% decreased risk for future type 2 diabetes occurrence.



## THE IMPACT ON YOU

<text><text><text><text>



## **Contact Us**

For more information, please contact our client service at +66 83-860-8875 or Line @welala

In Partnership with

Disclaimer: The information in the MyTruHealth report cannot be used to assess the risks of diseases or conditions, detect, diagnose, manage, or treat any health or medical disease/conditions. Any results from the test should not be regarded as medical information and/or advice.