PHYSIOAGE®

COMPREHENSIVE HEALTH ANALYSIS

FOLLOW-UP 9

PREPARED FOR

MS. FEMALE PATIENT

BY PROVIDER

JOSEPH RAFFAELE, MD

BASED ON TESTS PERFORMED

MARCH 1, 2021

POWERED BY

PHYSIOAGE®

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Introduction

The information we have gathered will enable you to better control your health. By measuring how well you're aging in important body systems, we give you a personalized view of your overall health and identify your weakest and strongest systems.

We compare your measurements to our database of hundreds of patients, each with multiple visits. We use this data, along with statistical modeling, to calculate your physiological age. Three main factors affect your physiological age: actual age, rate of aging, and functional capacity. On average, the aging process diminishes functional capacity by 1 to 3 percent per year. If you start off at a higher capacity, you start falling from a higher point (for instance, if you're genetically endowed, or if your lifestyle, diet or medication improves it.) The rate at which you fall depends on similar factors. In order to understand what is happening at any particular point or over time, you need to measure that system's function objectively.

Does that mean that I'm aging like a 57-year-old even though I'm 45?

You can't determine your rate of aging from one test, which is just a snapshot. In order to know your rate of aging, you must have at least two separate time points, generally a year apart, to calculate the rate of change in that system.

Now that you have more than one set of biomarkers, we can begin to capture your rate of aging and understand how your body is changing over time. Each subsequent set of biomarkers increases our ability to accurately assess your rate of aging. The diagrams that follow are a variation of the chart that appeared in your baseline report. The vertical axis represents the physiological age of each system, while the horizontal axis shows your measurements over time. Each dot marks the physiological age during that biomarker session, while the slope of the line shows your rate of aging. The thicker shaded gray line represents your actual age and will always have an upward slope because it increases with time.

If the slope of your physiological age line is steeper than that of your actual age line, your system is aging more rapidly than average. In contrast, if the slope is less steep, it's aging more slowly than average; if it's running parallel, it's not aging at all. Finally, if the slope is declining, this system is actually functioning better - it's getting more youthful! As in the baseline diagrams, any point above the actual age line indicates an older physiological age, and anything below indicates a younger physiological age.

You may notice that for some of your biomarkers, the line is wavy, with fluctuations up and down. This occurs because there is an inherent variability in these measurements that can sometimes be greater than the actual change in the body system. Your physician will also point out changes in medications that can cause more extreme changes, such as the dramatic change certain blood pressure medications can cause to CardioAge. Over time, however, these fluctuations become less important, and the trend in your physiological age becomes more solid.

Report Card

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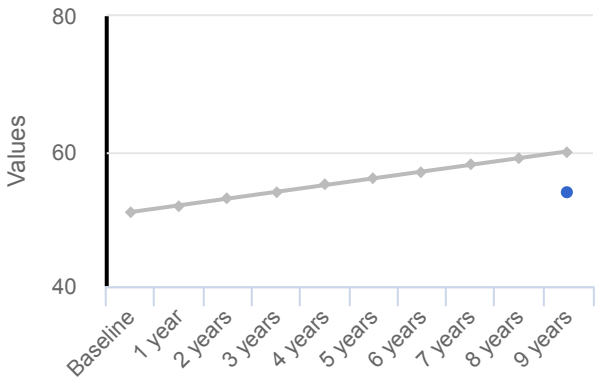
Biomarkers of Aging

PhysioAge™ Composite

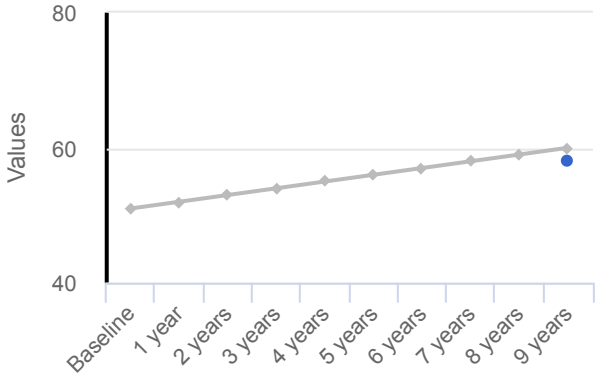


Your PhysioAge is 54.1, 5.9 years younger than than average for your age

Sometimes we can become too focused on the trees and lose sight of the forest. So this composite score tells how well you are aging across many systems.

That's important because some treatments benefit one system but cause adverse effects in another. For example, high intensity exercise can improve your arterial and pulmonary systems. But too-intense exercise can age your immune system. Some therapies, such as telomerase activators, subtly but profoundly affect all organ systems.

TelomerAge



Your TelomerAge is 58, 2 years younger than than average for your age

Your molecular "ends" of time.

If there is a candidate to be considered the human body's molecular clock, then one of the front runners must certainly be the length of our telomeres. From the Greek, telos, meaning 'end,' and mere, meaning 'part,' telomeres are the caps on the ends of each of our chromosomes that protect them from being mistaken for damaged DNA. They are composed of thousands of repetitions of the same sequence of 6 base pairs (the letters of DNA, TTAGGG). With each cell division, they shorten by about 50-100 base pairs because of the difficulty DNA polymerase has replicating one of the strands. At young adulthood, the mean lymphocyte telomere length (MTL) is about 8 kb (8,000 kilo base pairs). Once it reaches 4 kb, the cell no longer is able to divide and enters what is called 'replicative senescence,' in which it fails to perform its function and produces detrimental inflammatory molecules. The molecular clock stops ticking.

How are telomeres measured? The subset of your white blood cells used to calculate your ImmunoAge, the lymphocytes, is the cell type whose telomere length has been most studied. This is mostly because of its easy access through a routine blood draw, as opposed to a biopsy of solid tissue such as your lungs or arteries. Hundreds of studies have linked the shortening of lymphocyte MTL not only to the aging process, but also to cardiovascular disease, smoking, various cancers, and even psychological stress. (A few studies have measured the correlations between MTL and the telomere lengths of other tissues in the body and have found general agreement.)

The average person's lymphocyte MTL decreases about 30-50 base pairs per year; you are more likely to be in the higher end of this range if you smoke, don't exercise, have a lot of stress, or have a chronic disease. Thus, if you start out with a lymphocyte MTL of 8 kb and lose 0.04 kb/yr (40 base pairs), you will get to the critical length of 4 kb in 66 years, again, very close to the average human lifespan.

- Telomere length is predictive of mortality when corrected for age.

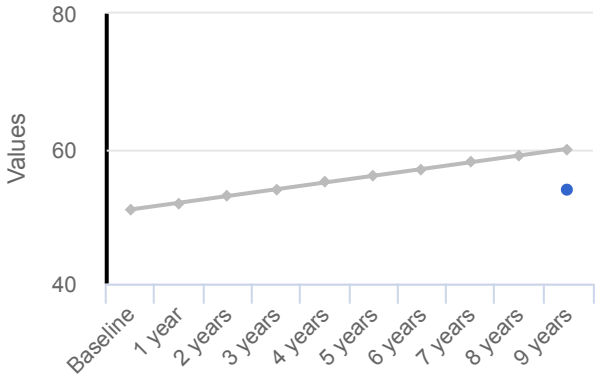
- Telomere length is associated with risk for osteoporosis, diabetes, cardiovascular disease, dementia and cancer.

You may be thinking, "If your telomere length functions as such a great biomarker of aging and disease, why don't we just measure it instead of bothering with all these other tests?"

First, mortality can be caused by a failure in any major system. But also, while telomere length correlates with age very well, the combination of biomarkers correlates much better, confirming the age-old notion that the whole is more than the sum of its parts.

- Genetic inheritance. In addition to the rate of loss, each of us inherits about 50% of our telomere length at birth from our parents.
- Psychological stress. Studies have shown that chronic emotional stress, such as being the caregiver to an Alzheimer's patient, can increase one's rate of telomere loss.
- Oxidative stress. Chronic increased inflammation can shorten telomeres, in addition to the effect of continuous cell division.
- Antigenic stress. When your lymphocytes are chronically stimulated to divide in response to latent infections (particularly viral infections such as HIV or CMV) or tumors, their telomeres shorten more rapidly.

ImmunoAge™

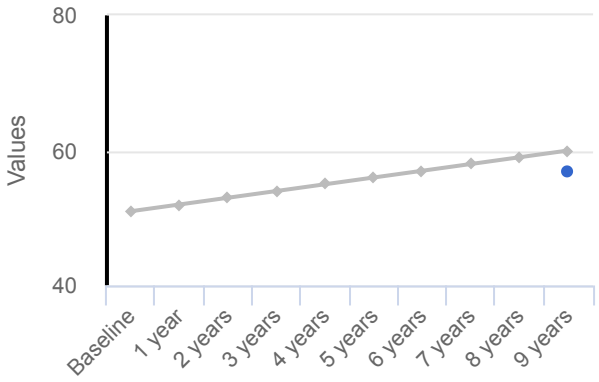


Your ImmunoAge is 54, 6 years younger than than average for your age

Older adults are more likely to succumb to infections than their younger selves. Cancer rates increase exponentially with age. Dysfunctional immune cells cause chronic inflammation, which increases the likelihood of degenerative diseases such as osteoporosis, atherosclerosis, and dementia.

One of the most prominent changes in immune function as we age is a decrease in naive suppressor cells. These cells are designed to target a specific anitgen. If they detect it, they will multiply rapidly to mount a vigorous defense. As humans age, these cells become less prevalent in the blood until, around our ninth decade, we have nearly a complete absence of the ability to fight off new infections and tumors. It is no coincidence that the average life expectancy falls around that age.

CardioAge



Your CardioAge is 57, 3 years younger than than average for your age

It's all in the pulse. Today we know that what Mr. Sydenham said holds true for women as well. Even before him, Chinese doctors knew that you could tell a lot about the age of a person's cardiovascular system just by feeling the pulse at the wrist.

The human pulse is a product of the cardiac cycle - the rhythmical filling of the chambers of the heart with blood from the veins, called diastole, and the subsequent ejection of the blood into the arteries, called systole.

As the heart pumps out a large amount of blood, the elastic aorta expands to accept the increased volume causing the pressure to increase less than if it were a rigid tube. The pressure wave then travels down the aorta to the legs and arms where it meets the smaller arteries feeding the capillary beds of

your organs. The drop in pressure at these resistance arteries causes a reflected wave to return to the aorta.

Arteries stiffen and constrict with age.

The aorta and other large arteries stiffen from a loss of elastin and cross-linking of collagen. This stiffening causes the reflected wave to travel back to the heart faster so that it rushes into the last bit of blood coming out of the heart in the aorta at the end of systole. The increased central pressure as a result of the collision of the forward and reflected waves occurs in the aorta but not in the arms, and is called the augmentation pressure (AP). The amount of augmentation pressure is dependent not only on the speed of the reflected wave, but also on how much resistance the forward wave meets when it hits the smaller vessels. Thus, the AP combines the two major facets of arterial aging - stiffening of the large arteries and constriction of the resistance arteries - into a single value that increases linearly with age.

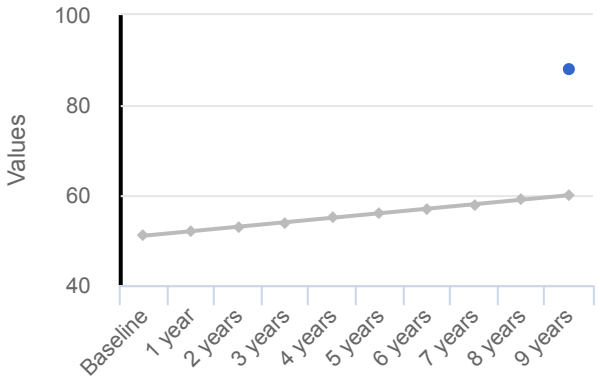
Your CardioAge is created by comparing your AP with that of thousands of healthy (no other cardiac risk factors), men and women aged 18 to 90 years old.

- **Age:** It takes time for all of the following risk factors to affect your arteries.
- **Sedentary vs. active lifestyle:** Activity, in particular vigorous exercise, increases the production of nitric oxide in your small arteries, which decreases AP. Chronic aerobic exercise lowers your resting heart rate, which decreases the total number of times your heart beats in a day.
- **Height:** Taller people have lower central pressures because the reflected wave takes longer to travel back up the aorta to the heart.
- **Gender:** Women have slightly stiffer arteries than men, even after adjusting for height. Your CardioAge is gender-adjusted.
- **Smoking:** After having a cigarette, even in young people, AP is increased because it causes constriction of the resistance arteries. Despite this increase in central pressure, arm blood pressure often remains deceptively low in young smokers. With years of smoking, the large arteries stiffen more rapidly and the smaller arteries become clogged - both of these processes increase your CardioAge.
- **Obesity:** Increased abdominal fat (central obesity) has been associated with increased arterial stiffness independent of arm blood pressure, age, and ethnic group.
- **Cholesterol:** High total and LDL cholesterol levels have been associated with increased arterial stiffness. Thus, cholesterol lowering medications can lower your CardioAge.
- **Caffeine:** Consumption of caffeinated coffee has been associated with increased AP, even after one cup, without a similar increase in arm blood pressure. If you had a cup of a caffeinated drink within 2 hours of your test, your CardioAge could be somewhat higher.
- **Hormones:** Low testosterone increases AP in men undergoing androgen deprivation therapy. Growth hormone deficiency is associated with increased arterial stiffness.
- **Blood pressure medications:** The more recent blood pressure medications, such ACE inhibitiors, angiotensin receptor blockers, and calcium channel blockers, lower your augmentation pressure and therefore your CardioAge. Beta blockers, such as atenolol, propranolol, and metoprolol can actually increase your CardioAge. Diuretics often have a neutral effect. If you are on any of these medications at the time of your test, you must tell you doctor so that your results can be interpreted correctly.

The SphygmoCor device looks like a standard blood pressure cuff but detects the pressure caused by the wave of blood pumped out by your heart. The pressure in the aorta is different from that in the arm (where blood pressure is traditionally measured) because of the effect of what is called the "reflected wave". The software analyzes the shape of the pressure wave within the arm cuff to determine the pressure in the aorta as it comes off the heart.

The arterial pulse wave shape offers information about the health of the arterial system as blood moves through it during the pulsatile cardiac cycle.

PulmoAge



Your PulmoAge is 88, 28 years older than than average for your age

Breathing tests are typically used to assess and monitor symptoms of asthma and emphysema patients. These symptoms include coughing, wheezing, and shortness of breath. If you've never had any of these symptoms, you are unlikely ever to have taken such a test. But some experts now recommend this test for everyone over 20. It is quick, inexpensive and can screen for the existence of otherwise invisible lung disease that can gradually develop in those exposed to passive smoke, asbestos, and other environmental toxins.

From screening to lung age. Spirometry (from the Latin word spirare, to breathe) turns out to be an informative biomarker of aging. Spirometry performed by tens of thousands of individuals has resulted in large databases which shows a strong correlation between results and age, once adjusted for height, gender and ethnicity.

The Buffalo Health Study followed nearly 1,200 men and women between the ages of 20 and 89 for twenty-seven years. It found that lower lung function predicted earlier death.

The correlation between lung health and mortality is not solely based on respiratory diseases. Studies show that decreased spirometry results result in an increased risk of all kinds of deaths. These findings bolster the idea that respiratory function over time reflects how well the body as a whole is aging, making spirometry one of the most valuable biomarkers of aging.

> We consider FEV1 as a surrogate for a number of unmeasured aging processes ... and not as a specific measure of lung function.
>
> Dr. Milton Hollenberg San Francisco Medical Center

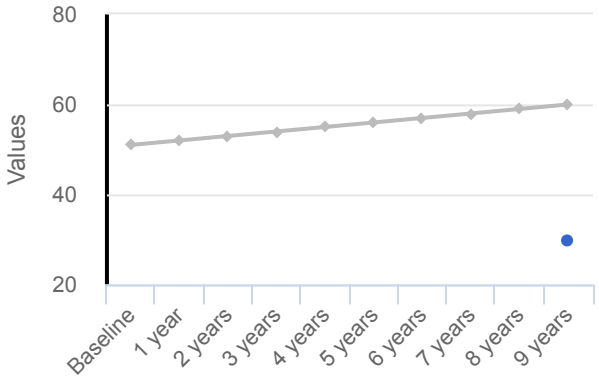
Many of the same factors that affect your CardioAge affect your PulmoAge. The most significant factors:

Toxins - Cigarette smoke, asbestos, and other toxins will decrease your score.

Lung Structure - Differences in the structure of your chest, barrel vs. narrow, can also affect it.

Medications - Asthma or emphysema inhaled medications such as bronchodilators and anti-inflammatories can improve your FEV1 and FVC, so your physician needs to know if you are taking one in order to accurately interpret your results.

NeuroAge™



Your NeuroAge is 30, 30 years younger than than average for your age

As early as your mid-twenties, certain aspects of your cognitive function begin to decline in a linear fashion. You don't notice the decline unless you tax the system, e.g., play a video game, do long division in your head, or other intensive thinking.

While most domains of cognitive function are affected by normal brain aging, two areas are particularly sensitive to the aging: Reaction time and processing speed.

Reaction time The Stroop Test measures how quickly and accurately you can apply a rule to a stimulus and then inhibit the application of that rule (press the space bar when the word spells the color of its font, then reverse the rule).

Processing speed The Symbol Digit Coding test measures how many paired sets of symbols and digits you can process on a computer screen with your eyes and then press the corresponding key on the keyboard. This test involved the grid with corresponding symbols and numbers.

Your NeuroAge is a weighted composite of the scores on these two tests.

If your cognitive scores are declining at a more rapid rate than is typical, you are more likely to have significant neurologic disease decades later than someone whose decline is average, and now is the time to act.

A NeuroAge significantly higher than your chronological age may mean that your brain is aging more rapidly than it should and could be indicative of an adverse effect of a medication you are taking or early brain disease. This can occur even when your memory is unaffected.

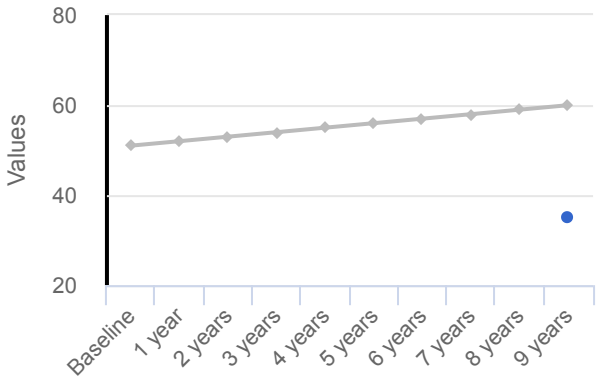
The CNS Vital Signs tests assess the main areas of cognitive function, by taxing them more than your daily activities (Most people find the 20-minute battery to be quite challenging). It is used to screen for significant neurologic impairment from dementia, ADHD, or medications and is a screening test that everyone should take periodically.

These distort your results:

- Sleep deprivation
- alcohol intoxication
- moderate to severe depression
- caffeine
- recent concussions

CutoAge

Why do I need a fancy instrument to tell me how well my skin is aging?



Your CutoAge is 35, 25 years younger than than average for your age

Intrinsic vs. extrinsic skin aging. Most people think that just looking in the mirror ought to suffice, yet studies have demonstrated that facial skin appearance is more affected by the amount of sun exposure (photoaging) than it is by the passage of time. As such, your skin's appearance is not a great biomarker of aging. However, intrinsic skin aging (the loss of elasticity and fine wrinkling that occur in areas of your body that receive relatively little sun exposure), correlates very closely with age. This linear change in elasticity is hard to appreciate with the naked eye until it is relatively advanced.

Skin elasticity, while an accurate and interesting biomarker, is not the most significant metric in terms of health.

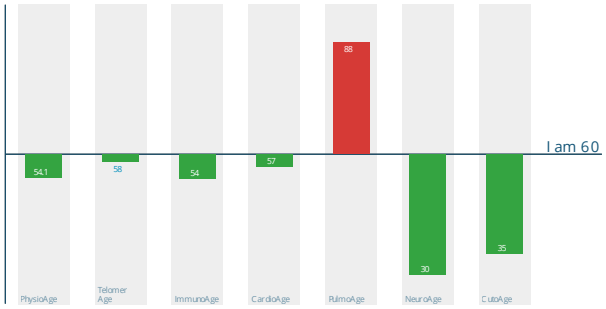
To measure intrinsic skin aging we use the Cutometer, an instrument that has been validated in hundreds of studies of skin aging over the past 25 years. It works by applying a sequence of precise and gentle suctions to a small area of skin and then measuring with an optical sensor how much the top two layers of your skin move with each suction. The movement is very slight - only 0.2-0.5 mm - much less than the amount it moves when you do a "pinch test" to see how fast your skin returns to normal after pinching it between your two fingers. Yet by involving only the top two layers, the Cutometer can non-invasively assess the amount and structure of the collagen and elastin in your skin.

A typical adolescent has a skin elasticity around 90%. With each passing year, the average person loses about 1%. A typical 80-year-old will have around 35% elasticity.

Comparing Systems

This bar chart shows the most current ages of your overall PhysioAge Composite and the physiological systems we measured to calculate it. Your PhysioAge Composite is a weighted average of the other underlying ages.

A bar pointing up indicates that this particular physiological system is older, or weaker than average for your age. A bar pointing down indicates it is younger, or stronger than average for patients your age. Each of us has a different combination of weaker and stronger systems depending on genetic inheritance and lifestyle factors/therapeutic interventions.



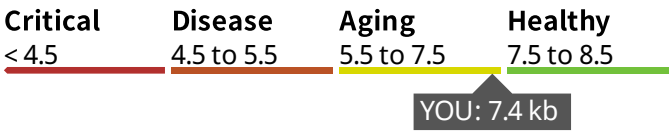
Health Status Indicators

Telomere Length

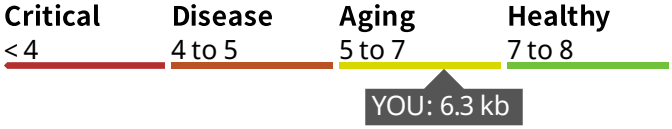
Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
C	Granulocyte Telomere Length	7.4	kb	5.5 - 10	>8.5		
C	Lymphocyte Telomere Length	6.3	kb	4.5 - 9	>8.0		

As discussed in the TelomerAge section, the mean lymphocyte telomere length is a potent biomarker of aging. Although it is measured in lymphocytes, is reflects telomere attrition in other tissues as well.

Granulocyte Telomere Length Granulocyte Telomere Length is measured in the very short-lived neutrophils, eosinophils, and basophils (hours to a few days lifespan). Because these cells do not continuously divide after being released into the bloodstream, the GTL reflects very well the telomere length of the hematopoietic progenitor cell residing in the bone marrow. This reflects the genetically determined component of your telomere length. As a result, the GTL is almost always longer than the LTL. The GTL-LTL gap (the difference between the lengths of each) is an even better (than LTL) measure of the chronic stress affecting your immune system from latent infections and also inflammatory diseases such as atherosclerosis.



Lymphocyte Telomere Length Lymphocyte Telomere Length is measured in all the circulating lymphocytes, including B-cells, T-cells, and NK-cells. The majority consists of T-cells which can exist in the peripheral circulation and lymph nodes for years, dividing when necessary to combat infection. Therefore, the lymphocyte telomere length is a good marker for the amount of time and degree of chronic stimulation to which your immune system has been subjected from pathogens.



Arterial Stiffness

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
	Anti-hypertensive	NO					
	Patient Had Caffeine Within Last 6 Hours	NO					
C	Aortic Pulse Pressure	36	mm Hg	30 - 50	<25		
C	Aortic Systolic Blood Pressure	129	mm Hg	102 - 129	70-93		
C	Systolic Blood Pressure (at rest)	134	mm Hg	90 - 129	70-110		
D	Diastolic Blood Pressure (at rest)	92	mm Hg	60 - 80	65-75		

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
B	Resting Heart Rate	72	bpm	50 - 99	33-55		
C	Augmentation Pressure	13	mm Hg	7 - 20	<2		
B	Augmentation Index @ 75	26	%	19 - 42	<8		

As arteries stiffen, the heart must work harder to get blood to the body. As your heart contracts, it generates a pulse that travels through the circulatory system. The pressure and volume of this pulse directly affect the wear on your organs. As arterial stiffness increases, it has several negative effects:

Stiffness results in increased pulse pressure, causing greater wear on sensitive tissues in the arteries, kidney, and brain. The increased pressure happens for two reasons. First, healthy arteries naturally smooth out the flow of blood that is forcefully ejected from the heart. As your arteries stiffen, this dampening effect is diminished. Second, the heart must pump with greater pressure to get blood through the stiffened arteries.

Also, an increase in arterial stiffness increases the work the heart needs to do to maintain the volume of blood needed by the body. This can lead to increased heart rate and subsequently may reduce the absorption of nutrients and oxygen from the blood.

Why is arterial stiffness important?

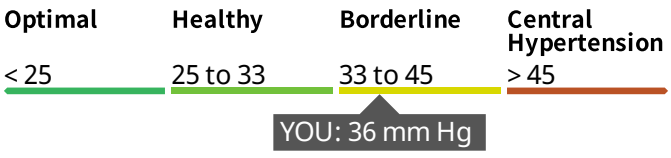
Various measures of arterial stiffness in the large arteries have been shown to predict the likelihood of future cardiovascular events such as heart attacks and strokes. These data of arterial stiffness have been shown to be better predictors than other commonly measured parameters such as upper arm blood pressure.

What factors affect arterial stiffness?

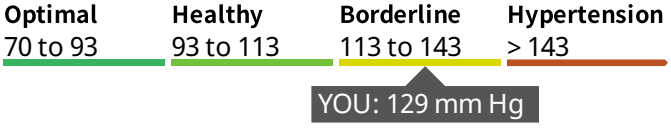
Arteries naturally harden as we age. Genetic predisposition, diet and exercise seem to be the primary determinants of how rapidly this process occurs.

Consistant exercise will help to prevent arteries from becoming stiffer, and can help to increase compliance of stiff arteries. Also, some blood pressure medicines reduce arterial stiffness by relaxing the muscles in the wall of the artery.

Aortic Pulse Pressure Aortic Pulse Pressure is the difference between the ASBP and aortic diastolic blood pressure. This is similar to the AP used to calculate your CardioAge. If you are over 40 years old, your ASBP is greater than 121 mm Hg, and your APP is greater than 45 mm Hg, then you should consider talking to your doctor about starting lifestyle and diet modification to lower your ASBP. If these are not successful, then blood-pressure lowering medications such as an ACE inhibitor, calcium channel blocker, or ARB should be considered. In contrast, it doesn't matter what your SBP is if your ASBP is below 120 mm Hg. Many young men with muscular arms have SBPs greater than 130, but have very low central pressures because of the amplification of blood pressure that occurs in the peripheral circulation. These are the newest recommendations for diagnosing and managing hypertension using central blood pressures to avoid treating individuals who won't benefit and to pick up those who will but would be missed by conventional arm cuff blood pressure measurements.



Aortic Systolic Blood Pressure Aortic Systolic Blood Pressure is the peak blood pressure experienced by the aorta during systole. In many studies, it has proven to be a much better predictor of cardiovascular disease risk than arm SBP.



Systolic Blood Pressure (at rest) Systolic Blood Pressure is the peak blood pressure reached during systole, the part of the cardiac cycle during which the heart contracts and squeezes blood into the peripheral circulation. SBP increases with age and predicts strokes and heart attacks in many studies. However, it is not as good a predictor of cardiovascular disease nor your rate of aging as Augmentation Pressure (AP).

Optimal	Healthy	Borderline Hypertension	Hypertension
70 to 110	110 to 125	125 to 135	135 to 210

YOU: 134 mm Hg

Diastolic Blood Pressure (at rest) Diastolic Blood Pressure is the time during the cardiac cycle that the heart muscle is relaxing and filling up with blood. It is often misunderstood to continue to rise with age, when in fact, it reaches a peak in mid-adulthood and then starts to decline because of the decrease in elastic recoil of the aorta and muscular arteries. A decline in DBP in an older adult accompanied by an increase in SBP increases rather than decreases the risk of cardiovascular disease.

Optimal	Healthy	Borderline Hypertension	Hypertension
65 to 75	75 to 85	85 to 90	90 to 120

YOU: 92 mm Hg

Resting Heart Rate Resting Heart Rate is the number of times your heart beats per minute. It has been shown to be a good low-tech marker for cardiovascular disease risk. Several studies have shown that resting heart rate predicts cardiovascular mortality, with the risk decreasing in line with heart rate (assuming the absence of other pathologies that produce the same low resting heart rate)

Athletic	Healthy	Deconditioned	Unhealthy
33 to 55	55 to 72	72 to 82	82 to 100

YOU: 72 bpm

Augmentation Pressure

Optimal	Healthy	Borderline	Hypertension
< 2	2 to 10	10 to 18	> 18

YOU: 13 mm Hg

Augmentation Index @ 75 Augmentation Index @ 75 is the AP corrected for the difference between systolic and diastolic blood pressure, called the 'Pulse Pressure,' and heart rate. In younger patients, it may be a slightly better indicator of cardiovascular age than AP. However, in older patients, it is less useful because it plateaus by age 65.

Optimal	Healthy	Borderline	Central Hypertension
< 8	8 to 28	28 to 35	> 35

YOU: 26 %

Cardiovascular Risk

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
B	C-Reactive Protein	1.2	mg/L	<2.9	<1.00		
A	Total Cholesterol	167	mg/dL	125 - 200	125-175		
B	HDL Cholesterol	59	mg/dL	>46	>60		
B	LDL Cholesterol	110	mg/dL	<129	50-100		
B	Triglycerides	82	mg/dL	<149	<50		
A	Cholesterol/HDL Ratio	1.6	Ratio		<3.0		
C	Homocysteine	12	µmol/L	<11.3	6.0-8.0		

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
A	Coenzyme Q10	1.8	mg/L	0.44 - 1.64	1.50-3.00		
A	LDL/HDL Ratio	1.9	Ratio		<2.0		

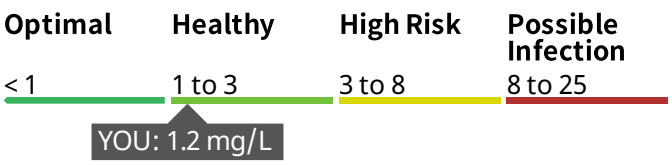
Heart disease is the leading killer of Americans. That's tragic because, after years of study, the medical community has a solid understanding of this disease and a plethora of treatment options. We can often completely mitigate these diseases and their consequences. The results listed here will help you and your physician determine your risk and what strategies you can take to mitigate or minimize that risk.

Heart disease claims the lives of about one in five Americans. Abnormal values in this section should be taken seriously. They are strongly indicative of your risk of a stroke, cardiovascular disease, atrial fibrillation, diabetes, hypertension and more.

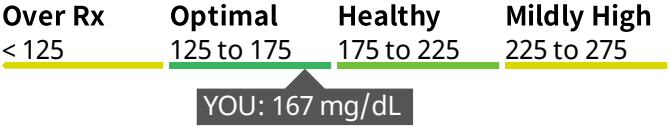
What factors determine my risk of heart disease?

The results below have been shown to be accurate predictors of cardiovascular risk by the famous Framingham Heart Study. This gold-standard study has been ongoing since 1948. It involved an initial 5,209 men and women. It now includes their children, grandchildren, and others. The resulting data has allowed physicians to discover what makes heart disease tick.

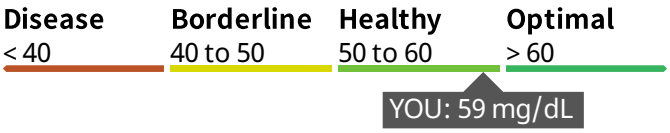
C-Reactive Protein C-Reactive Protein is called an 'acute phase reactant' because it is released from the liver during an acute infection to help fight off microbial invaders. In the absence of infection, however, a C-reactive protein level greater than 3 mg/L has been associated with an increased risk of CVD in a large number of studies. This is thought to be a result of the low level of inflammation (immune system activation) produced by atherosclerotic plaques. A level of 1-3 mg/L is normal, but ideally it should be less than 1 (the lower the better).



Total Cholesterol Total Cholesterol is made up of the LDL, HDL, and TG. A normal cholesterol level is below 200 mg/dL, but ideally it should be below 150. However, the relative amounts of the LDL and HDL affect how "dangerous" a given total cholesterol level is. For example, if your total cholesterol is 230, and your HDL is 70, you are in a less risky range than if your total cholesterol is 190 and your HDL is 30. This is because the LDL accompanying the first of these profiles would likely be significantly lower than that of the second.



HDL Cholesterol High-density lipoprotein (HDL cholesterol, HDL-C) is a type of protein that removes excess cholesterol from tissues and carries it to the liver for removal. For this reason it also called the "good" cholesterol. Insufficient levels of HDL-C will result in elevated blood levels of cholesterol which may be deposited in arterial walls and can lead to plaques and wall hardening along with inflammation. A higher level of HDL is thus associated with a lower risk of heart attack or stroke. Exercise has been shown to improve the functionality of HDL and a health diet of high fiber and low saturated fats has a beneficial effect globally on cholesterol levels.



LDL Cholesterol LDL Cholesterol is known as the "bad" cholesterol because it can become oxidized by free radicals and initiate atherosclerosis as discussed above. All things being equal, the lower the LDL the better. A level below 130 mg/dL is normal, and above 160 mg/dL confers a significant increase risk of CVD. When the total cholesterol is 150 mg/dL, the LDL is usually about 80 mg/dL. Nutritional anthropologists have speculated that this is the average human level of LDL when we consumed the natural diet of our ancestral environment.

Over rx	Optimal	Healthy	Borderline
< 50	50 to 100	100 to 130	130 to 150

YOU: 110 mg/dL

Triglycerides Triglycerides are the three- (hence the "tri") chain fatty acid lipoproteins which are increased significantly immediately after a meal, but circulate in lower levels in the fasting state. Levels above 150 mg/dL are associated with an increased risk of CVD, but can also be the result of inflammation of the pancreas. You must be fasting for 8 hours for the TG level to be interpretable. This because the type of food you ate just prior to a test can have a great impact on the level and not be representative of the average TG level. For example, if you had high-fat meal prior to the test, your TG could be twice as high as if you had an average or low-fat meal.

Healthy	Normal	Borderline	High
50 to 100	100 to 150	150 to 200	200 to 500

YOU: 82 mg/dL

Cholesterol/HDL Ratio This ratio is also known as non-HDL cholesterol which is another risk predictor of heart disease. Dividing your total cholesterol by the HDL component ("the good" cholesterol), it essentially subtracts the HDL and leaves all the bad types of cholesterol as the result. This calculation provides a more reliable estimate of risk than either total cholesterol or LDL ("bad cholesterol") alone. A higher ratio correlates with a higher risk of heart disease.

Optimal	Healthy	Borderline	Disease
< 3	3 to 4	4 to 5	> 5

YOU: 1.6 Ratio

Homocysteine Homocysteine is an intermediary metabolite produced during the conversion of the amino acid methionine (commonly found in dietary meat protein) into cysteine. This conversion requires adequate levels of vitamin B12 and folic acid. High levels of homocysteine act like free radicals and can damage arteries in the same way as oxidized LDL. Studies have associated levels of homocysteine greater than 9 micromol/L with an increase risk of CVD. While more recent studies have called this association into question, the preponderance of evidence suggests that maintaining a normal to low homocysteine level by ensuring adequate intake of B-vitamins is likely to benefit your cardiovascular health.

Borderline	Optimal	Healthy	Borderline
< 6	6 to 8	8 to 11	11 to 15

YOU: 12 µmol/L

Coenzyme Q10 Coenzyme Q10 is a fat-soluble, vitamin-like compound that is naturally found in most tissues of the human body. It is primarily present within the mitochondria which are organelles contained within each cell. Coenzyme Q10 is a key component of cellular energy production, metabolism, and respiration. As an antioxidant it has many therapeutic benefits which include improving cardiac, neurodegenerative, and mitochondrial disorders.

Deficient	Borderline	Healthy	Optimal
< 0.5	0.5 to 0.8	0.8 to 1.5	1.5 to 3

YOU: 1.8 mg/L

LDL/HDL Ratio The ratio of bad (LDL) cholesterol to good (HDL) cholesterol is a simple indicator your risk of heart disease. Because women are less affected by bad cholesterol, men and women have different standards for what constitutes a healthy ratio.

Optimal	Healthy	Increased risk	High risk
< 2	2 to 3	3 to 3.5	> 3.5

YOU: 1.9 Ratio

Diabetes & Glucose

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
C	Hemoglobin A1C	5.6	%	<6	<5.2		
C	Estimated Average Glucose	114	mg/dL		<102.5		

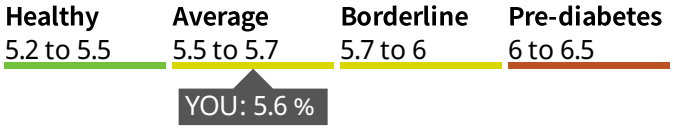
Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
B	Glucose	99	mg/dL	65 - 99	<89		
A	Insulin	10	µIU/mL	<16	<5.0		

Diabetes is the disorder in which your blood sugar (glucose) is not maintained within the normal range, which leads to complications such as cardiovascular and kidney disease, retinopathy, neuropathy, and ultimately premature death. There are two forms of diabetes.

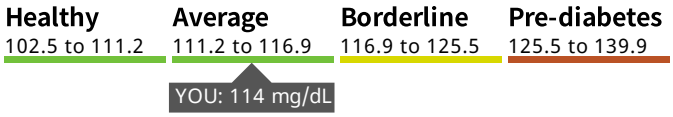
TYPE I comprises 5% of cases, occurs in childhood or adolescence (juvenile diabetes), and is an autoimmune disorder in which the insulin-producing cells of the pancreas are destroyed. The destruction progresses fairly rapidly and results in an insufficient or complete lack of insulin, which can lead to extremely high blood glucose and diabetic coma.

Type II comprise 95% of cases, usually begins in adulthood and the risk increases with age. In contrast to Type I, it is a disorder of insulin resistance and only late in its natural history is there a decrease in insulin production. There is a gradual onset that is usually coincident with decreased physical activity and body fat accumulation. A prediabetes state of "glucose intolerance" often occurs months to years before. Similar to cholesterol, blood glucose level has a continuous range from frank disease to optimal. These biomarkers of blood sugar control allow us to tell you how well you are processing glucose.

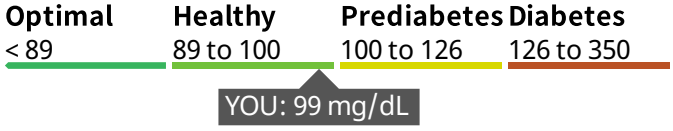
Hemoglobin A1C Hemoglobin A1C is also known as 'glycosylated' or 'glycated' hemoglobin. Hemoglobin is the protein in your red blood cells that carries oxygen. As your red blood cells circulate, they are exposed to the glucose in your blood plasma. Over time, the glucose molecules can attach to the hemoglobin which then becomes glycated hemoglobin. The percentage of glycated hemoglobin in your red blood cells depends on the amount of time the red blood cells circulate and the concentration of glucose to which they are exposed. Because the average life span of a red blood cell is 4 months approximately, the percentage of them containing glycated hemoglobin serves as an excellent measure of the average blood glucose level over the past 4 months. HgbA1c is a subset of the general category called advanced glycation end-products which go by the very descriptive acronym AGEs. (The more AGEs you have, the faster you age.) These are any biomolecules (proteins, etc.) that have undergone a reaction in which a glucose molecule becomes permanently attached. Once this happens, the proteins do not function well and unfortunately, unlike with red blood cells, they are often not removed from the body for a very long time. This leads to suboptimal function of the tissue. Lower levels of AGEs production lead to better maintenance of youthful tissue function.



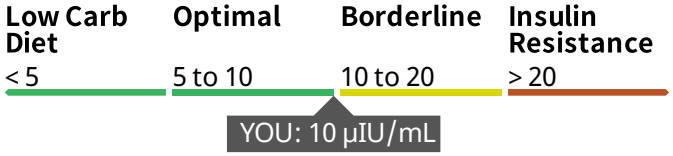
Estimated Average Glucose



Glucose



Insulin Insulin is the hormone secreted from the pancreas when your blood glucose rises after eating, which enables your tissues (mainly the liver, muscles, and brain) to efficiently absorb glucose. The amount of insulin it takes to maintain a given level of blood glucose is indicative of your level of insulin resistance (or conversely, insulin sensitivity). Measuring insulin while fasting helps to further interpret the health of your blood glucose level. For example, given two people with a fasting glucose of 100 mg/dl, the one with the lower fasting insulin would have better overall insulin sensitivity and would be more likely to have lower glucose after a meal than the other.

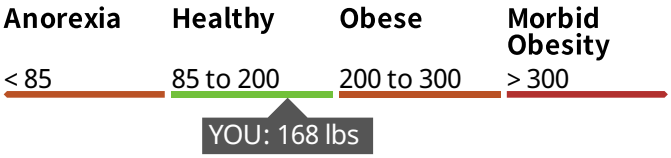


Muscle and Fat

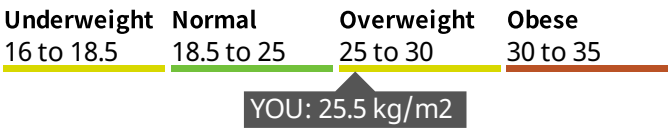
Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
	Height	68	inches				
B	Weight	168	lbs				
C	Body Mass Index	25.5	kg/m2				
	Fat Mass	64	lbs				
	Lean Body Mass	108	lbs				
F	Percent Bodyfat	38.1	%		<21.0		
B	Visceral Fat Level	11	Index		1-4		
	Skeletal Muscle Mass	59	lbs				
	Total Body Water	78	lbs				
	Intracellular Water	45.5					
	Extracellular Water	32.5	lbs				
D	Extracellular / Total Body Water	0.417			0.340-0.375		

The InBody multi-polar bioimpedance spectrometry device assesses body composition by applying varying frequencies of a low level current to all four limbs of the body. By doing so, it is able to measure much more accurately overall lean body mass (LBM) than a device that utilizes a single frequency and applies it only to the legs. Then, by subtracting the LBM from the total body weight, overall fat mass and percentage can be calculated.

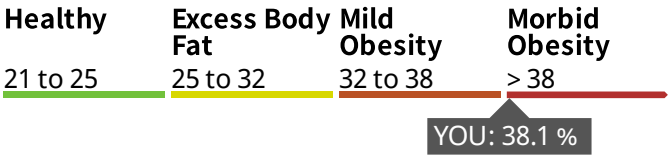
Weight Weight is less useful as a measure of health except: * when compared with past values; a significant change in weight can be indicative of mental or physical disease. * When indexed on gender and height; it can be compared with normal values. Other metrics, such as those in the Body Composition section, are a much better measure of health.



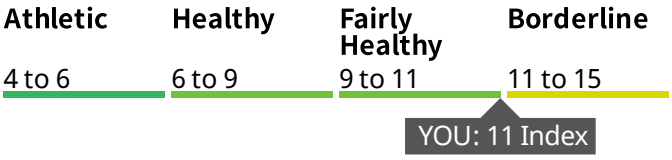
Body Mass Index Body Mass Index is a crude first attempt to correct for the shortcomings of just looking at weight. It uses height to adjust the health implications of a person's weight. However, two people of the same height and weight can have very different relative proportions of body fat and therefore very different body compositions. The normal range for BMI is 18.5-25 (kg/m2). The average is in the middle of this range at about 22 kg/m2. Using this range, a person is underweight for his height if his BMI is less than 18.5. He is slightly overweight if his BMI is 25-27 and obese if it is 27-31. Morbid obesity is defined as a BMI greater than 31. You can imagine, however, that a very muscular person can be considered obese by using a simple BMI estimation. Most Mr. Universe competitors would be considered obese, and some morbidly obese, by BMI standards when they in fact have very little body fat. BMI is only really useful for estimating if a person is underweight and in need of putting on some muscle. The most important determinant of the health of your body composition is the relative proportion of muscle to fat.



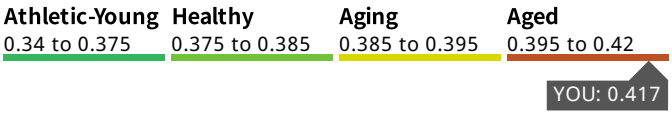
Percent Bodyfat Percent Bodyfat is calculated by dividing the FM by the total body weight. 90% of males have scores between 10-20%; 90% of females have values between 18-28%.



Visceral Fat Level Visceral Fat Level Visceral Fat Level is an indicator based on the estimated amount of fat surrounding the internal organs of the abdomen. Maintain a visceral fat level under 10 to stay healthy.



Extracellular / Total Body Water Extracellular / Total Body Water is actually an interesting biomarker of aging. This ratio is a measure of the "quality" of your LBM. The lower the ratio, the healthier your LBM. It can help to diagnose the condition of sarcopenic obesity (high fat and low muscle), which might show a normal LBM, when in fact a higher than normal portion of it is ECW. Between 20 and 85 years old, the ratio gradually increases from 0.36 to 0.39. In certain disease states, the ratio can exceed 0.40.



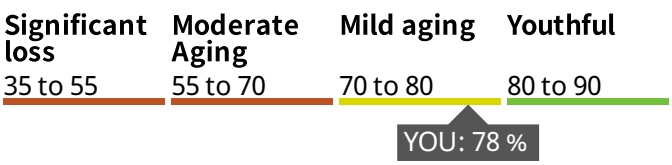
Skin Elasticity

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
B	Skin Elasticity	78	%		90-100		

Skin elasticity, as measured by Cutometer using the PhysioAge protocol, is a measure of your skin's ability to stretch in response to being pulled and then how close to its original state it can return after applying multiple strains. This is expressed as a percentage where 95% is about the maximum because human skin is not 100% elastic.

Because it is measured on the underside of the forearm, it is consider unsunexposed and therefore a measure of instrinsic skin aging, the kind that would take place even if you never exposed your skin to sun.

Skin Elasticity



Lung Health

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
	Spirometry Interpretation	Mild obstruction					
	Forced Vital Capacity	3.447	L				
D	FVC Percent Predicted	4	%		>110		
	FVC Predicted	84	L				

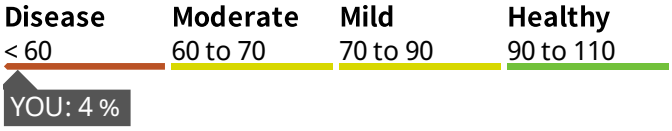
Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
	Forced Exhaled Volume in 1 seconds	1.927	L				
D	FEV1 Percent Predicted	3	%		>110		
	FEV1 Predicted	71	L				
	FEV1/FVC	56	%				
	Respiratory Rate	16	breaths / min				

As mentioned in the PulmoAge section, FEV1 is a powerful biomarker of aging hiding in the guise of a lung disease test. But both the forced expiratory volume (FEV1) and the forced vital capacity (FVC) tests you took are also important screening tests for lung disease.

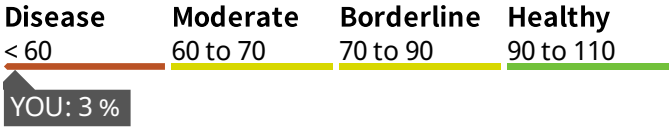
Screen for potential lung disease: If your FEV1/FVC is less than 0.70 then you may have some element of obstructive pulmonary disease like asthma, bronchitis, or COPD. Your provider will ask you to repeat the test if the value is abnormal. From that point, you may move on to more extensive tests or be referred to a pulmonary specialist.

If your FVC is below the normal range for your age, then you may have some element of restrictive lung disease such as emphysema or pulmonary fibrosis.

FVC Percent Predicted



FEV1 Percent Predicted



Cognitive Function

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
A	Standard Composite Memory	117		90 - 109	>109		
A	Standard Verbal Memory	122		90 - 109	>109		
A	Standard Visual Memory	118		90 - 109	>109		
A	Standard Psychomotor Speed	109		90 - 109	>109		
B	Standard Processing Speed	101		90 - 109	>109		
C	Standard Reaction Time	85		90 - 109	>109		
A	Standard Cognitive Flexibility	110		90 - 109	>109		

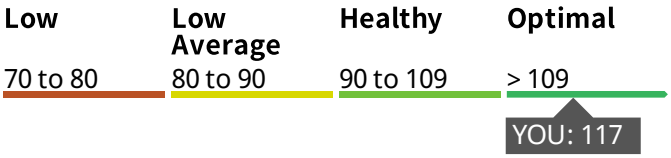
Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
B	Standard Executive Functioning	103		90 - 109	>109		
B	Standard Motor Speed	101		90 - 109	>109		

There are six core tests you are asked to complete on the PhysioAge version of the CNS Vital Signs computerized neuropsychological battery. As we discussed in the NeuroAge section above, two of them - Stroop and Symbol Digit Coding - are the most age-sensitive and are used to calculate your brain's processing speed and reaction time. The other four tests - finger tapping, shifting attention, verbal and visual memory - are used to calculate the cognitive domains of psychomotor speed, verbal and visual memory, cognitive flexibility, and executive functioning.

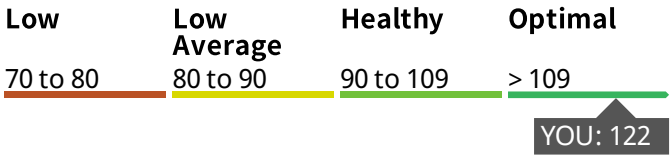
For each of these domains, the software calculates a raw "subject" score that is not adjusted for age, gender, or education. To follow your change with time in each these tests, we used this raw subject score. However, in order to interpret the clinical meaning of these tests, the scores must be normalized for age and gender, similar to the concept of "grading on a curve" or the results of a standardized IQ test. As with IQ, the average Standard score is 100.

If you score low on any two domains, or very low on any single domain, the first thing your doctor will do is have you repeat the test battery to make sure that the low scores are not the result of your misunderstanding the instructions or getting off to a bad start. If your results are confirmed, you should be evaluated for the possibility of a neuropsychological disorder, adverse medication reaction, or accelerated brain aging.

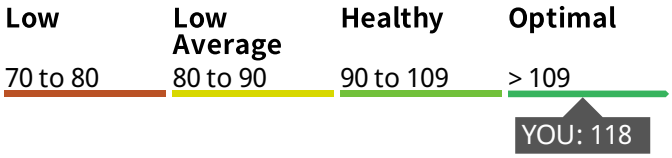
Standard Composite Memory Standard Composite Memory ability to retain verbal and visual information, e.g., grocery lists and remembering a person's name upon seeing his face again.



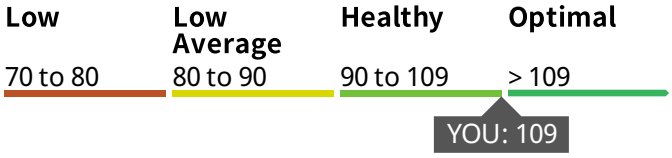
Standard Verbal Memory



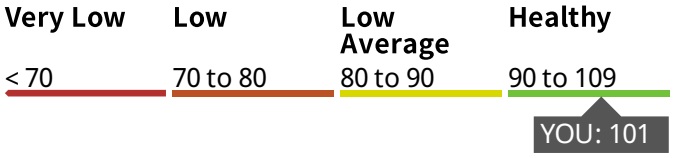
Standard Visual Memory



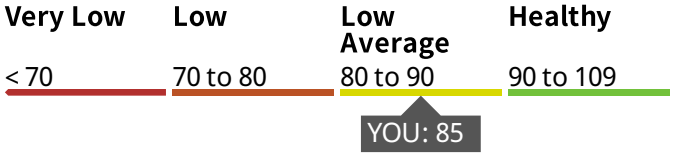
Standard Psychomotor Speed Standard Psychomotor Speed ability to move your limbs or fingers quickly when completing simple task such as typing.



Standard Processing Speed Standard Processing Speed ability to rapidly complete a series of tasks, e.g., scanning a table of contents, inputting numbers into keyboard, or playing a video game.

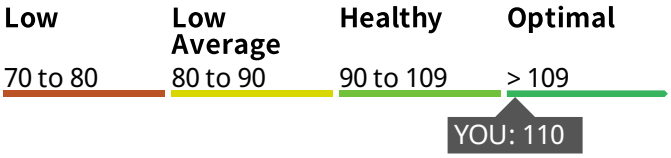


Standard Reaction Time Standard Reaction Time ability to make a complex decision quickly when presented with a stimulus, e.g., putting on the brakes when a yellow light appears or swerving to avoid hitting a cyclist suddenly appearing in your lane.

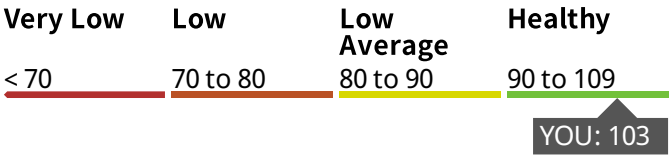


Standard Cognitive Flexibility Standard Cognitive Flexibility ability to adapt to a changing

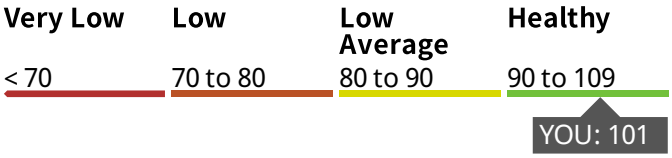
environment and not be stuck applying old rules to new situations.



Standard Executive Functioning Standard Executive Functioning ability to shift focus from one task quickly to another and back, e.g., multitasking at work, and applying different rules to a changing situation.



Standard Motor Speed



Sex Hormones

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
	Menstrual Phase	menopausal					
B	Follicle Stimulating Hormone	119	mIU/mL				
C	Sex Hormone Binding Globulin	59	nmol/L	14 - 73	60-100		
B	Testosterone	50	ng/dL	2 - 45	30-45		
A	Free Testosterone	5	pg/mL	0.1 - 6.4	4.0-10.0		
A	Free Testosterone %	2	%	0.5 - 1.8	1.00-2.00		
B	Dihydrotestosterone	29	ng/dL		30-46		
B	Dehydroepiandrosterone Sulfate	220	µg/dL	<145	250-350		
A	Estradiol	67	pg/mL		50.0-200.0		
B	Estrone Sulfate	3800	pg/mL		1500-2600		
B	Progesterone	500	ng/dL		1000.0-3000.0		

Follicle Stimulating Hormone Follicle Stimulating Hormone is a protein hormone secreted from the pituitary gland whose function is to recruit one of the follicles in the ovaries to undergo the final stages of maturation before becoming an egg and being ovulated. At the beginning of a new menstrual cycle, the FSH level begins to rise. Once a follicle is selected, the hormone inhibin is released from the surrounding cells into the circulation and inhibits further secretion of FSH from the pituitary gland. As a woman approaches menopause, the number of follicles declines and it becomes more difficult to find one to recruit. This causes the FSH level to rise (decreased inhibin production) and can help to indicate how far into the perimenopause a woman is. The best time to draw the FSH level is the third to fifth day after the first day of the period. If the FSH is above 10-15, then she is most likely in early perimenopause. An FSH level of 15-25 is usually found in the mid-perimenopause, and late-

perimenopause and post-menopause usually are associated with levels above 25. Once a woman has not had a period for 12 months, the FSH is usually in the 60-100 range.

Suppressed	Healthy
< 20	> 20

YOU: 119 mIU/mL

Sex Hormone Binding Globulin Sex hormone-binding globulin (SHBG) is a protein made in the liver with the primary function of transporting sex steroid hormones (e.g. testosterone, estradiol) through the blood stream to their target tissues. Once the hormone is released from SHBG, it is free to act at the level of the receptor. Higher levels of SHBG results in lower free, bioactive levels of hormones and can manifest in clinical symptoms of deficiency related to that hormone. Conversely, lower levels of SHBG result in higher levels of the free hormone. Factors such as sex, age, nutritional status affect levels of SHBG. They are lower in the presence of obesity, insulin resistance, liver disease, and hyperthyroidism and are decreased by a higher protein intake diet, androgens (e.g.testosterone), and growth hormone. SHBG is increased by estrogens, thyroid hormone, oral contraceptives, a lean body mass, and in calorie restriction or anorexia. Understanding your levels of SHBG in relation to your hormones helps us assess your hormone status and make the necessary adjustments to your treatment program.

Consider PCOS	Borderline	Optimal	Healthy
< 30	30 to 60	60 to 100	100 to 140

YOU: 59 nmol/L

Testosterone Testosterone In men, this is the principal sex steroid hormone produced in the testicles under stimulation by LH. It has potent anabolic (muscle- and bone-building) effects directly, and androgenic (libido and mood enhancement/skin oil and hair production) effects through its immediate metabolite, dihydrotestosterone (DHT). Studies have shown that the total testosterone level declines modestly with age in men, but that the free testosterone level declines 10-20% per decade starting in the mid-twenties. This discrepancy is explained by the fact that the total testosterone level includes SHBG and the decrease in testosterone production is offset by the increase in SHBG. Declining free testosterone levels have been associated with the increase in low libido, depressed mood, loss of muscle and bone, and CAD risk in aging men. In women, testosterone affects libido/sexual function, mood, cognitive function, bone health, and muscle mass. It circulates in the blood at about 5% the level of men. During a woman's early reproductive years, 75% of testosterone comes from the conversion of DHEA/DHEA-S to testosterone and only 25% directly from the ovaries. In the post-menopause, about 50% of the testosterone comes from the ovaries because they continue to produce testosterone while the level of DHEAS continues to decline.

Borderline	Healthy	Optimal	Healthy if no symptoms
5 to 15	15 to 30	30 to 45	45 to 99

YOU: 50 ng/dL

Free Testosterone This a test of unattached or "free" testosterone. Most of the testosterone circulates in your blood tightly attached to a protein called sex hormone binding globulin (SHBG) and to a lesser extent, the protein albumin. Free testosterone is the portion that is not attached to proteins, and is therefore free to be easily used by your body. If the binding proteins are high, specifically SHBG, there will be less free testosterone that your body can utilize. SHBG increases under certain conditions and thus higher levels of estrogen, thyroid hormones, and weight loss can result in lower free testosterone whereas higher levels of androgens result in increased free testosterone. Therefore, while knowing a total testosterone level is important, the amount of testosterone that is metabolically active will give a clearer picture of any excess or deficiencies that may have a clinical impact.

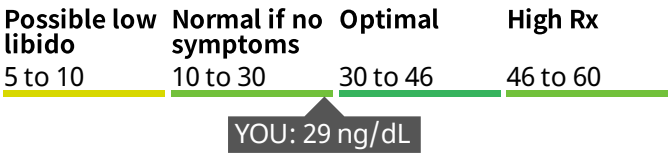
Low	Borderline	Healthy	Optimal
< 1	1 to 3	3 to 4	4 to 10

YOU: 5 pg/mL

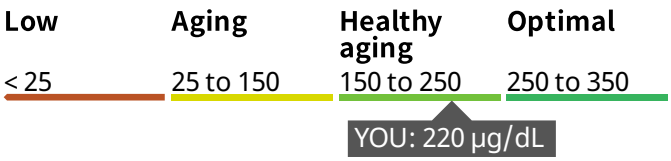
Free Testosterone % Free Testosterone % is the proportion of free, metabolically active testosterone, of the total testosterone. The higher the percentage, the more metabolically active testosterone there is circulating in your blood.

Dihydrotestosterone Dihydrotestosterone is directly created from testosterone by the activity of the

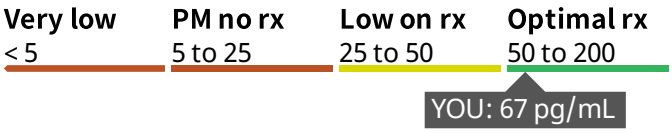
important enzyme, 5-alpha reductase. Dihydrotestosterone (DHT) is responsible for the androgenic effects of testosterone such as increased libido, mood, and skin oil production. Inhibitors of 5-alpha reductase like finasteride (Propecia/Proscar) or dutasteride (Avodart), are potent blockers of DHT production.



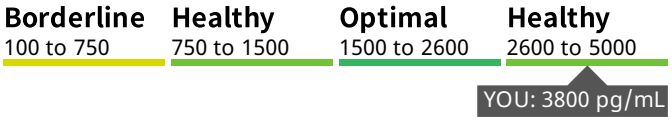
Dehydroepiandrosterone Sulfate Dehydroepiandrosterone Sulfate is a weak androgen produced by the adrenal glands, which sit on top of the kidneys and also produce adrenaline. DHEA is the actual hormone produced in the adrenals; it then circulates to the liver where it is sulfated so it can stay in the blood longer. DHEA is often called the "Mother Steroid" because it is a precursor to many sex hormones, including testosterone, estradiol, and estrone. In women is it the source of up to 75% of the circulating testosterone level (through the intermediary androstenedione). In men, testicular production of testosterone dwarfs the amount produced by conversion of DHEA into testosterone. In addition to being a precursor hormone, it has direct effects on the health of your arteries, bone, and immune system. The level of DHEAS is a well-documented biomarker of aging as its level reaches a peak in the mid-twenties and declines 10-20% per decade thereafter. Similar to other hormones that decline with age, the normal range shown above for DHEAS is age-adjusted. Therefore, you can have a level that is "normal for your age" but is considerably lower than the optimal level range which we considered to be that of a 25 year old.



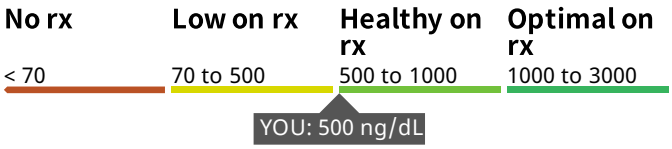
Estradiol Estradiol is just as important in men as it is in women, but circulates in a more steady range and at about one-fifth the level of a premenopausal woman. **In women** , it is the most potent estrogen of the ovaries. It is metabolized into estrone and estriol, both active, but weaker estrogens. In addition to causing the build-up of the lining of the uterus (endometrium) characteristic of a menstrual cycle, estradiol is important for maintaining the health of the arteries, bone, brain, skin, and immune system. Similar to FSH, the estradiol level needs to be interpreted in the context of the timing of the menstrual cycle. It is lowest in the first few days of the period (30-50 pg/mL) and gradually rises (100-150 pg/mL) during the 12 or so days prior to the pre-ovulatory spike (350-700 pg/mL). In the second half of the menstrual cycle (days 15-28), it averages between 150-200 and then declines just prior to the onset of the next cycle. In the perimenopause, the levels can fluctuate wildly from very low (less than 20 pg/mL) to very high (greater than 700 pg/mL), depending on whether a healthy follicle is recruited. In the post-menopause, the level is less than 20, but can be almost undetectable (less than 5 pg/mL). A minimum level of 30 pg/mL is about what is needed to eradicate hot flushes and maintain healthy bones and skin. A somewhat higher level of 50-100 pg/mL is needed to maintain arterial and brain health. **In men** , it is important for maintaining the health of the arteries, bone, brain, skin, and immune system. The bulk of the estradiol circulating in a man is derived from the direct conversion of testosterone into estradiol by the enzyme called aromatase. The average estradiol level of a man runs between 20 and 50 pg/mL, but gradually increases from the low to the high end of this range as men get older. DHEA also serves as a source of estradiol. Estradiol is metabolized into estrone and then sulfated by the liver into estrone sulfate.



Estrone Sulfate Estrone Sulfate is a circulating storage form of estrogens. After estradiol is metabolized to estrone, it can be converted back to estradiol or a sulfate group can be added to enable it to circulate in the blood for a longer period of time. If a tissue has the enzyme to take the sulfate group off, then it can extract it from the circulation and convert it back into estradiol. Thus, the estrone sulfate level is measure of the total reservoir of estrogens available. Estrone sulfate levels vary between 230-2200 in men and 100-3600 in women. Women who take oral estrogen therapy (as part of their HRT) can raise the estrone sulfate to over 10,000 pg/mL because of the first pass effect in the liver; this can increase the effective estradiol exposure of the body which might not be apparent when only the estradiol level is measured.



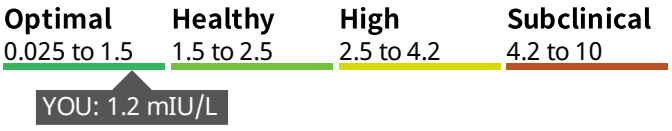
Progesterone In females, progesterone is the "pro-gestational" hormone because it aids in maintaining a pregnancy (gestation). There is essentially no progesterone (< 0.7 ng/mL) circulating in the first half of the menstrual cycle. Once an egg is ovulated, the part of the ovary that released it (called the corpus luteum) starts to produce progesterone for about two weeks. A healthy luteal-phase progesterone level runs between 13 and 25 ng/mL. Progesterone transforms and stabilizes the lining of the uterus that has built up in the previous two weeks so that it is ready for a fertilized egg to implant. If no egg is implanted, then the corpus luteum shrivels up and the progesterone declines after 14 days causing the lining to destabilize and shed off. One of the first signs of perimenopause is the decrease in the amount of progesterone the corpus luteum produces (< 9 ng/mL). These lower levels cannot adequately stabilize the lining and can cause the shorter cycle lengths characteristic of perimenopause. Progesterone receptors occur in the breast as well as in the uterus. There they can modulate the effect of estrogens. Progesterone also has bone and central nervous system enhancing effects.



Thyroid Function

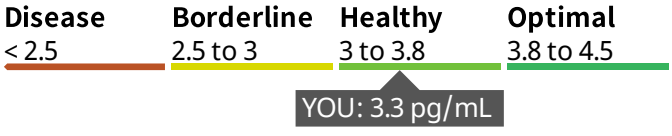
Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
A	Thyroid Stimulating Hormone	1.2	mIU/L	0.4 - 4.5	0.025-1.500		
B	Thyroxine	5.4	µg/dL	4.5 - 12			
B	Free T3	3.3	pg/mL	2.3 - 4.2	3.8-4.5		
	Reverse T3	13	ng/dL				

Thyroid Stimulating Hormone Thyroid Stimulating Hormone is produced in the pituitary gland and controls the production and release of thyroid hormones from the thyroid gland. T4, and to a greater degree, T3, inhibit the release of TSH in a negative feedback fashion. Therefore, a higher TSH indicates that the pituitary gland senses there is inadequate circulating thyroid hormone and tries to stimulate further production and release by secreting more TSH. In contrast, a TSH below the normal range - particularly if it is undetectable - indicates the state of hyperthyroidism where excess thyroid hormone is causing the suppression TSH.



Thyroxine Thyroxine essentially functions as a precursor hormone reservoir (80% of circulating thyroid hormones) of T3. It is released into the circulation and then is converted into T3, either in the liver or target cells such as the heart and subcutaneous fat. IGF-1 is important for the conversion of T4 into T3.

Free T3 Free T3 is the fraction of the total T3 that is not bound to its binding protein and is able to get into cells. Free T3 decreases with age because T4 is less efficiently converted to it by the liver and other tissues. This results in decreased thyroid activity at the tissue level and has been associated with decreased cognitive function, depression, cardiovascular disease, and increased cholesterol.

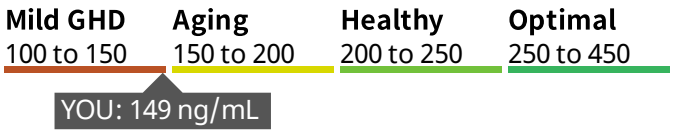


Growth/IGF Hormones

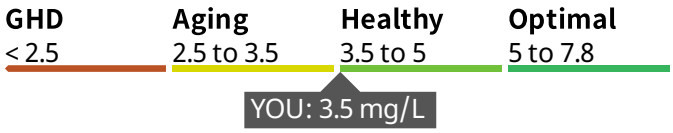
Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
D	Insulin-Like Growth Factor 1	149	ng/mL		250-450		
B	IGF Binding Protein-3	3.5	mg/L	3.5 - 6.9	5.0-7.8		
B	Prolactin	7	ng/mL		10.0-20.0		

Growth hormone has become almost a household word ever since the controversy surrounding its use in professional sports exploded into the mainstream media. It has been touted as the cure-all of athletic ailments and the fountain of youth for aging baby boomers. The truth is that this hyperbole is unwarranted, but so is all the negative press about potential adverse effects of growth hormone therapy. It is simply part of one of the important protein hormone systems in the body. It is FDA approved for lifelong therapy in growth hormone deficient adults (GHDA) because a serious deficiency increases the risk of premature cardiovascular death as well as lowers many elements of quality of life. The issue of when to consider starting GH deficiency is controversial and should be discussed in detail with your doctor in the context of lab results, symptoms, and other diagnostic testing.

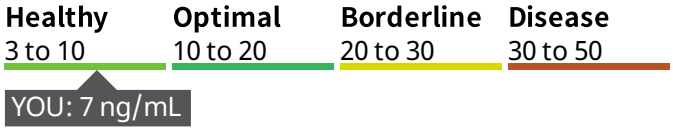
Insulin-Like Growth Factor 1 Insulin-Like Growth Factor 1 is a large, protein hormone that has a similar structure to insulin. It is the hormone used to assess your level of growth hormone (GH) secretion. Because GH is secreted from the pituitary gland in short bursts throughout the day (particularly during the deep stages of sleep, fasting, and after intense exercise), a random GH blood level doesn't impart much information about your body's total GH production. In contrast, IGF-1, which is produced in most tissues after stimulation by GH, circulates in a relatively steady state throughout the day. Therefore, it is a good measure of your total 24 hour GH production. IGF-1 has potent anabolic (muscle and bone building), immune-enhancing, and cardiovascular health-promoting effects. It is a good biomarker of aging because the average IGF-1 declines 15% per decade (in both men and women) starting in the mid-twenties. The normal range shown above is age-adjusted, i.e., because IGF-1 levels decline with age, it is considered " normal for your age" to have a level considerably lower than the optimal range which we believe is the range that is normal for a 25 year old.



IGF Binding Protein-3



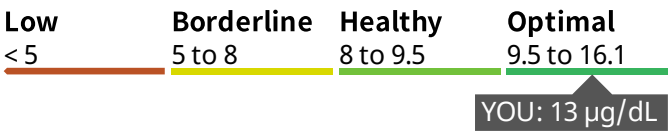
Prolactin



Corticosteroids

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
A	Cortisol	13	µg/dL		9.5-16.1		

Cortisol

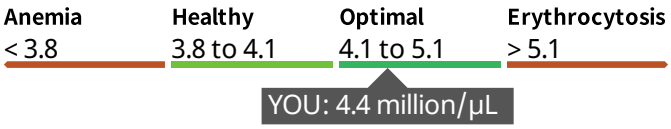


Blood

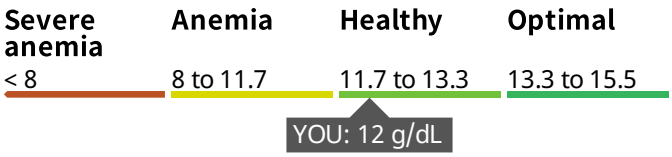
Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
A	Red Blood Cells	4.4	million/µL	3.8 - 5.1	4.10-5.10		
B	Hemoglobin	12	g/dL	11.7 - 15.5	13.3-15.5		
A	Hematocrit	42.6	%	35 - 45	40.0-46.5		
A	Mean Corpuscular Volume	92	fL	80 - 100	85.0-95.0		
A	Mean Corpuscular Hemoglobin	31	pg	27 - 33	28.5-31.5		
A	Mean Corpuscular Hemoglobin Concentration	32.7	g/dL	32 - 36	32.0-36.0		
B	Red Cell Distribution Width	13	%	11 - 15	<12.5		
A	Platelets	252	thousand/µL	140 - 400	200-400		
A	Mean Platelet Volume	8.1	fL	7 - 11	7.5-9.0		

There are three components of the common Complete Blood Count (CBC): the WBC, RBC, and platelets. The WBC tells us about the state of the immune system. The RBC tells us about the state of the oxygen carrying capacity of our blood. The platelet count is a measure of our ability to form a 'plug' when a blood vessel has been damaged.

Red Blood Cells Anemia is defined as an RBC below the normal range. It can be caused by acute blood loss from trauma or bleeding of an internal organ. If the blood loss is more gradual, then it can go on undetected until the body's stores of the nutrients necessary to make red blood cells are depleted. An RBC above the normal range is called 'erythrocytosis.'

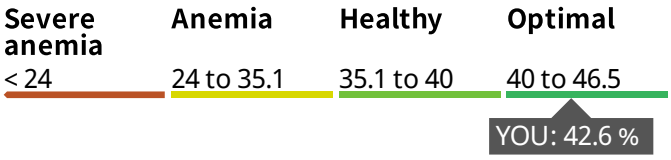


Hemoglobin Hemoglobin is the oxygen carrying protein found in the red blood cells of all humans and other vertebrate organisms. Low hemoglobin is most often indicative of blood loss and/or iron deficiency, but can also result from a genetic disorder of hemoglobin production such as thalassemia. An elevated hemoglobin level occurs with erythrocytosis.

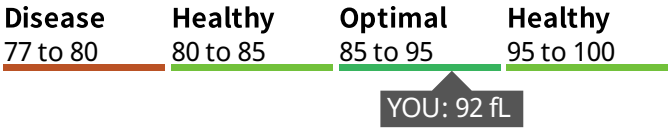


Hematocrit Hematocrit is a term similar to the RBC but is the concentration of red blood cells in the

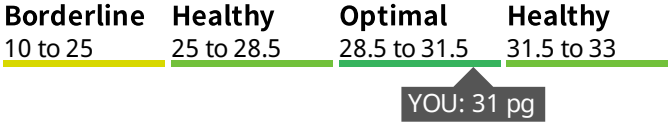
blood rather than the number. These two measures of the oxygen carrying capacity of the blood usually track together. They can diverge when you are in a state of dehydration (in which case the number of cells stays the same, but the concentration increases). The hematocrit is the more often used parameter.



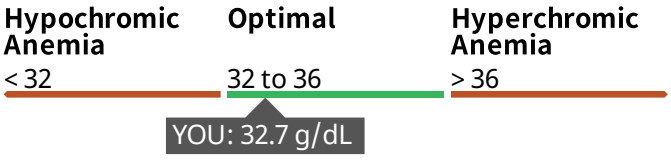
Mean Corpuscular Volume Mean Corpuscular Volume is a measure of the average size of your red blood cells and when it is above or below the normal range can be indicative of particular disease states or nutrient deficiencies. For example, in vitamin B12 and/or folate deficiency, the size of the red blood cells increases. In iron deficiency anemia, the size of the red blood cell decreases.



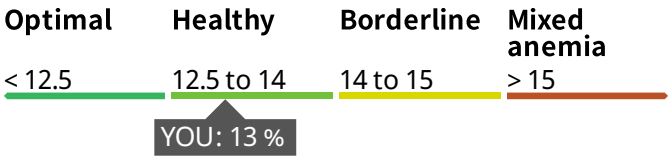
Mean Corpuscular Hemoglobin Mean Corpuscular Hemoglobin is the average amount of hemoglobin in each red blood cell (aka 'corpuscle') and can help your doctor understand the type and cause of anemia your may be exhibiting. It is calculated by dividing the total amount of hemoglobin by the RBC. It is reduced in iron-deficiency anemia.



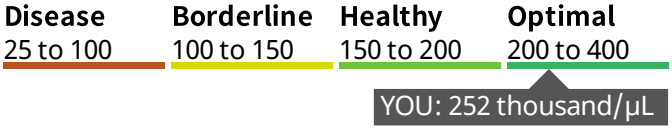
Mean Corpuscular Hemoglobin Concentration Mean Corpuscular Hemoglobin Concentration is similar to the MCH, but is calculated by dividing the hemoglobin by the hematocrit. It is the most sensitive indicator of iron deficiency anemia.



Red Cell Distribution Width Red Cell Distribution Width (RDW or RDW-CV, for cell volume), measures the variation of sizes of red cells. If your cells tend to be about the same size, your value will be lower. If you have a larger variety of sizes of red blood cells, your value will be higher. This value is routinely reported during standard blood tests. B12/folate deficiency causes red blood cells to be larger than normal, while iron deficiency causes them to be smaller. Thus, if there is a mixed iron and B12/folate deficiency, there will both and increased number of small and large cells and the RDW increases. During active blood loss, the bone marrow steps up the production of red blood cells to replace them and maintain oxygen carrying capacity. These new red blood cells (called reticulocytes), are larger than mature red blood cells and can increase the RDW. The RDW has been shown to be a predictor of mortality in older populations, possibly because it is a marker for vitamin/nutrient deficiencies.



Platelets Platelets are fragments of bone marrow precursor cells called 'megakaryocytes' and are the critical component in thrombus (clot) formation. In addition to maintaining hemostasis (controlling bleeding), platelets release growth factors that play significant roles wound healing and repair/regeneration of connective tissue. There are disorders of abnormally low and high platelet count called thrombocytopenia and thrombocytosis, respectively. Ninety five percent of people have a platelet count between 150,000 and 450,000 per microliter. A level 100,000-150,000 may be physiologically insignificant in a small percentage of people, but is more likely to be the early stages of a gradually worsening thrombocytopenia. Platelet levels below 25,000 can lead to an increase in life-threatening hemorrhages from minor trauma. Thrombocytosis above 500,000 can lead to an increase risk of strokes and heart attacks.



Mean Platelet Volume Mean Platelet Volume is a measure of the average size of your platelets. It is used to determine if a low platelet count is the result of clumping together of individual platelets or an actual decrease in platelet number. Higher MPVs mean the platelets are larger, which could put an individual at risk for a heart attack or stroke. Lower MPVs indicate smaller platelets, meaning the person is at risk for a bleeding disorder.

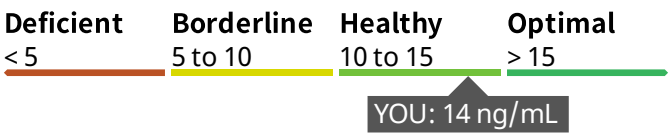
Vitamins

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
A	Vitamin D	49	ng/mL	20 - 100	40-60		
B	Folate	14	ng/mL		>15.0		
B	Vitamin B12	668	pg/mL		700-1100		

Vitamins are essential cofactors in many of the important reactions in your body. They varying structures and belong to different classes of molecules so they shouldn't be lumped together when talking about research showing their effectiveness. Many studies demonstrates that there are ranges of blood levels of indiviyvitamjns that are associated with disease, lower quality health , and optimal function.

Vitamin D Vitamin D can be synthesized in the skin from a precursor molecule upon exposure to ultraviolet B light. This is an important source because there is not much vitamin D in the typical diet, although it is found in some fish and eggs as well as vitamin D-fortified foods (e.g., dairy products). As a result, vitamin D deficiency is common in Northern latitudes and in the elderly who often get little sun exposure and have poor diets. Vitamin D is critical for maintaining normal calcium metabolism, bone health, and immune system function. Severe vitamin D deficiency in childhood causes rickets (malformed long bones), but lesser levels of deficiency have been demonstrated to adversely affect the cardiovascular and immune systems and cause osteoporosis. Values in the deficient range and below are associated with an increase in hypertension, general joint and muscle aches, and poor immune system function. Vitamin D exists in two forms, D2 and D3. Some studies have suggested that repletion with vitamin D3 more efficiently raises vitamin D levels than repletion with D2. To raise the level of a person with vitamin D insufficiency to sufficiency, it takes a three-month course of 800-1000 IU of vitamin D3. A number of studies have suggested that higher levels of serum vitamin D are associated with lower rates of common cancers.

Folate Folate is the form of the member of the B-vitamin family (B9) that is naturally found in the body and foods. Folic acid, the synthetic form of the vitamin found in most supplements and fortified foods, needs to be reduced to folate before it can be combined into its active form tetrahydrofolate. Its name is derived from the Latin for leaf, folium, because leafy vegetables are a rich source of folate. Folate is important for rapidly-growing tissues because it is needed for DNA and RNA synthesis. Folate deficiency during pregnancy can result in neural tube defects. It is also critical for red blood cell production, and folate deficiency results in a form of anemia characterized by enlarged red blood cells (megaloblastic anemia). The metabolism of homocysteine requires adequate levels of folate; in fact, an increase in serum homocysteine level is an early and sensitive indicator of folate deficiency.



Vitamin B12 Vitamin B12 is a water-soluble vitamin found in animal products such as fish, meat, eggs, fowl, and dairy but not generally in plant foods. As a result, vegetarians are at risk for B12 deficiency unless they eat B12-fortified cereals or supplements. There are several forms of B12, but

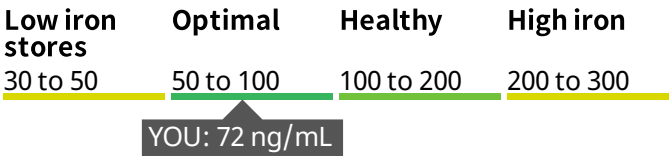
all contain the mineral cobalt and are called cobalamins. In food, B12 is bound to proteins and must be released by stomach acid, whereas the form in supplements and fortified foods is free and doesn't require acid for release. Therefore, people on stomach acid-suppressing medications (proton pump inhibitors, antacids) can have low B12 levels. B12 is important for red blood cell production, nerve cell health, and DNA synthesis. The anemia of B12 deficiency can be corrected or avoided by a high folate level, but this is a dangerous situation because folate will not prevent the neuropathy that results from B12 deficiency. Therefore, these levels should always be assessed together. People in the lower end (200-400) of the "normal" range can be effectively suffering from B12 deficiency. Pernicious anemia is the autoimmune disorder in which the lining of the stomach does not produce intrinsic factor, the molecule necessary for absorption of B12 from the small intestine once it is released in the stomach. B12 deficiency can also lead to an elevated homocysteine level.

Trace Essential Minerals

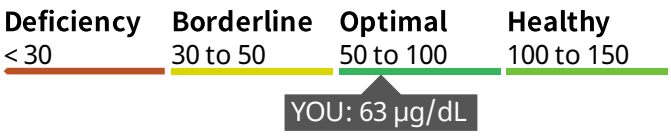
Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
A	Ferritin	72	ng/mL		50-100		
A	Iron	63	µg/dL	40 - 160	50-100		
A	Transferrin Saturation	23	%		20-30		
B	Total Iron Binding Capacity	269	µg/dL	250 - 450			

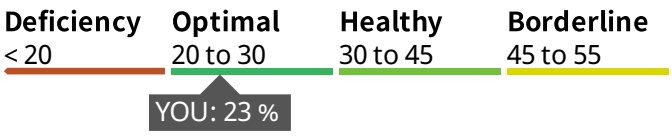
are so named because they are found in much smaller amounts in your body than the major essential minerals. But maintaining optimal levels of them is necessary of healthy aging. The nine trace minerals are chromium, copper, fluoride, iodine, iron, manganese, molybdenum, selenium, and zinc (in alphabetical order). There are many others that have important roles in the body as well, such as vanadium. Other trace minerals can have deleterious effects when found in higher concentrations, e.g., lead, mercury, and arsenic.

Ferritin Ferritin is the intracellular storage form of iron and is the best indicator of total body iron stores. While the serum iron, TIBC, and transferrin saturation (collectively known as 'iron studies') can be good screening tests for iron deficiency and overload disorders, they should be confirmed with a ferritin test. A level below 30 is diagnostic of iron deficiency. If it is accompanied by anemia, then it is called iron deficiency anemia. Serum ferritin levels above 300 ng/mL should raise suspicion of an iron overload disorder, the most common of which is hereditary hemochromatosis. This genetic disorder causes the gradual accumulation of iron in many tissues of the body because of a defect in the natural block in the stomach to absorbing more dietary iron than necessary. However, ferritin is also an acute phase reactant (like CRP) and in the presence of an acute infection, a high level cannot be used to diagnose iron overload. We believe the "normal" range is too wide, and consider an optimal level of ferritin to be 50-100. This avoids the possibilities of inadequate iron for enzyme function, and too much iron and consequent increased free-radical production.



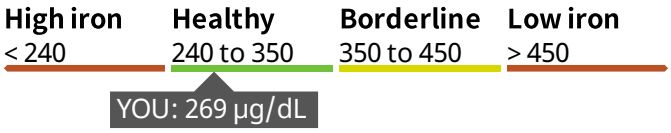
Iron Iron is an essential nutrient for the production of red blood cells and many enzyme-dependent reactions. While iron deficiency can cause anemia and fatigue, an excess of iron can increase free-radical production and increase the risk of cancer and cardiovascular disease. As with many nutrients, an optimal level is needed for good health - too much or too little can cause harm. The serum iron level can fluctuate quite significantly depending on recent dietary iron intake. A better indicator of iron deficiency is the transferrin saturation.





Transferrin Saturation Transferrin Saturation is the percentage of TIBC that has iron attached to it. Iron deficiency is diagnosed when the level drops below 20%. If the saturation is above 45%, then an iron overload condition should be considered. Iron overload can be genetic or from other diseases. The most common genetic cause is hereditary hemochromatosis (HHE) which affects up to 1% of caucasian populations.

Total Iron Binding Capacity Total Iron Binding Capacity is the amount of the iron binding protein called "transferrin" in the blood stream. It is usually increased in iron deficiency and decreased in conditions of excess iron.



Major Essential Minerals

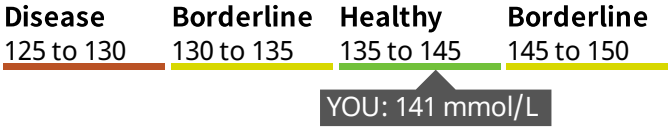
Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
B	Sodium	141	mmol/L	135 - 146			
B	Potassium	4.6	mmol/L	3.5 - 5.3	4.0-4.4		
C	Chloride	96	mmol/L	98 - 110	101-106		
B	Carbon Dioxide	23	mmol/L	21 - 33	24-28		
D	Calcium	8.1	mg/dL	8.6 - 10.2	9.0-9.8		
C	Phosphorus	4	mg/dL	2.5 - 4.5	2.5-2.9		

Your major essential minerals are comprised of your electrolytes and other minerals that circulate in your bloodstream in relatively high concentrations and perform essential functions.

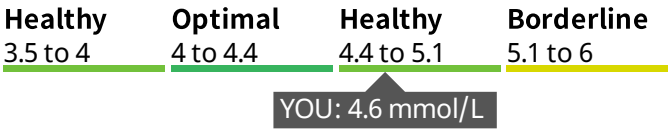
Electrolytes are the positively and negatively charged small molecules (called 'ions') found in your cells, blood stream, and extracellular fluids. They are maintained in a delicate balance by your kidney, lungs, and endocrine system. They are critical in the electrical signaling between and within cells, the acid-base balance (pH), and the maintenance of the fluid balance between different body compartments. Small fluctuations in their relative levels can be clues to serious disease processes. Cations and anions (negatively and positively charged ions) travel together as salts to balance the overall charge of a fluid. They are usually measured together in a serum sample because interpretation of one requires knowledge of the levels of most of the others.

Sodium Sodium is the principal positively charged ion (called a "cation") of the extracellular space. It is the same as the sodium found in most foods and table salt (sodium chloride). The body responds to changes in the serum sodium level in three main ways: (1) Modulating thirst: as little as a 1% increase in serum sodium can make you thirsty so you consume water to decrease the level to normal. (2) Producing sodium-regulating hormones: certain hormones (natriuretic peptide) cause the kidneys to lose sodium while others (aldosterone) cause them to retain sodium. (3) Producing water-regulating hormones: antidiuretic hormone (ADH) causes the kidneys to hold onto free water. Water follows sodium. When you eat a salty meal, you become thirsty and drink water. The extra fluid is retained

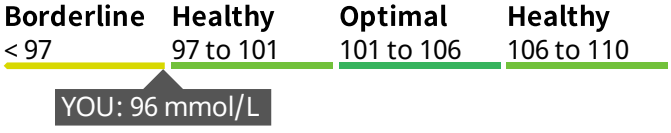
(causing the characteristic post-Chinese food bloating and edema) until it can be excreted as the hormonal sodium excretion pathways kick in. ADH is inhibited by alcohol causing the excessive urination of clear water noted after drinking a lot of beer or other alcoholic beverages. When these mechanisms are not functioning well or are overwhelmed, a state of hypernatremia (high serum sodium) or hyponatremia (low serum sodium) can ensue. The most common cause of hypernatremia is dehydration from decreased water intake. Hyponatremia is most commonly from sodium loss through sweat that is replaced only with water. Other causes include diuretics, Addison's disease, diarrhea, and kidney disease.



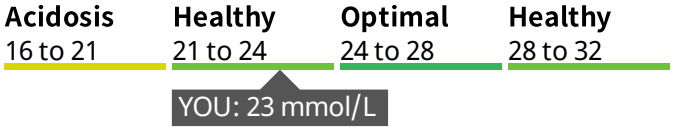
Potassium Potassium is the principal intracellular cation, and only about 2% of your total body potassium is located in your body fluids and blood stream. Increased serum potassium (hyperkalemia) is most commonly caused by kidney disease, but other medications, such as ACE inhibitors, potassium-sparing diuretics, and NSAIDs, can cause it. Hyperkalemia can cause abnormal heart rhythms and respiratory failure. Low serum potassium (hypokalemia) can be caused by dehydration, vomiting, diarrhea, and inadequate repletion when taking diuretics.



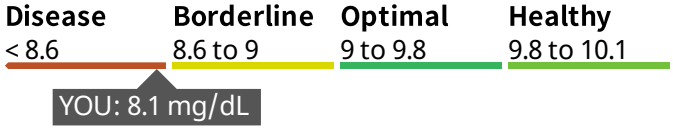
Chloride Chloride is the anion that travels with sodium in and out of cells to help regulate body fluids and acid-base balance. When a problem arises with the serum sodium level, the chloride can diverge from sodium to buffer the pH of the blood temporarily. Chloride is ingested as sodium chloride in food and table salt. Increased chloride levels most commonly indicate dehydration, and a decreased level can be caused by vomiting, chronic lung disease or with a loss of acid from the body.



Carbon Dioxide Carbon Dioxide should really be called bicarbonate or HCO3 because CO2 is actually the gas that your lungs exhale. When it is dissolved in water, CO2 is associates with a hydrogen ion to become HCO3 and acts as a buffer for acid in the blood. A low serum bicarbonate level indicates that your body is in an acidic state and the bicarbonate is being used up to buffer it. This can be caused by diabetes, kidney disease, and chronic diarrhea. A high bicarbonate level indicates alkaline pH of the blood due to acid loss from vomiting, lung disease, or Cushing's syndrome. While it is technically not a mineral but a molecule, it is one of the electrolytes so it is included in this section.

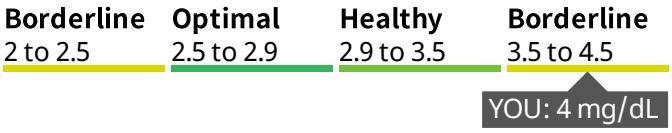


Calcium Calcium is a mineral cation in your blood that is essential for the healthy functioning of your muscles, nervous system, and heart. Its serum concentration is very tightly regulated by your kidneys and endocrine system because deviations from the normal level can have serious consequences. If there is a mild elevation (less than 10.5), the first thing to do is to repeat the blood test to make sure it is not a lab error. Persistently high serum calcium (hypercalcemia) is commonly caused by either hyperparathyroidism (benign tumors of the parathyroid gland secreting too much parathyroid hormone) or cancer that has spread to the bones. Low serum calcium is most commonly caused by a low serum protein level (from malnutrition) because the calcium is bound to protein. A follow-up ionized serum calcium level will be normal if this is the only cause. Other causes of hypocalcemia are low vitamin D level, underactive parathyroids (hypoparathyroidism), magnesium deficiency, and kidney failure.



Phosphorus Phosphorus is a mineral which forms phosphates when combined with oxygen. The bonds between the phosphorus and oxygen in phosphates contain energy which is used in many chemical reactions in the body. Only a very small amount (1%) of your total body phosphate circulates in your blood. The rest is incorporated into bones, teeth, and muscle or is found in the rest of the cells of the body in energy storage molecules. An abnormal

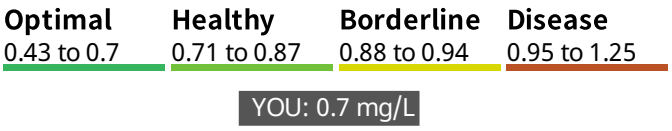
level of phosphorus normally does not cause any symptoms. However, it can indicate a problem with the parathyroid hormone or vitamin D and can help to interpret the cause of low or high calcium. Low phosphorus can be associated with hypercalcemia, hypothyroidism, out-of-control diabetes, and diuretic abuse. High phosphorus can be associated with kidney disease and excess phosphate intake.



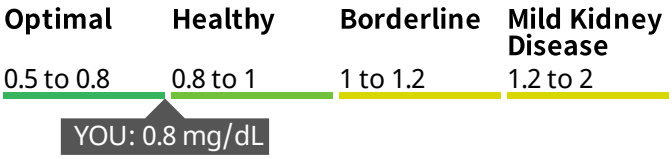
Kidney Function

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
A	Cystatin-C	0.7	mg/L		0.43-0.70		
A	Creatinine	0.8	mg/dL	0.5 - 1.2	0.50-0.80		
C	Urea Nitrogen in Blood	29	mg/dL	7 - 25			
C	BUN/Creatinine Ratio	33	Ratio		10.00-20.00		
A	Uric Acid	5.1	mg/dL	2.5 - 7	2.5-6.0		

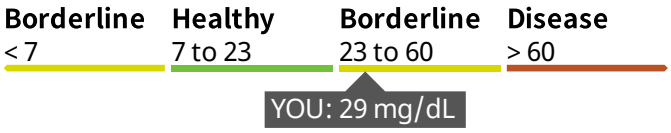
Cystatin-C Cystatin-C is a protein produced by cells in the body which is later filtered by the kidney. Measuring Cystatin-C gives an indication of the filtration rate of the kidney, a marker of kidney health or injury. It is more sensitive to the small changes in early kidney injury than other proteins such as creatinine. And unlike other kidney function tests, Cystatin-C is less affected by age, gender, protein intake, muscle mass, or ethnicity. Cystatin-C identifies patients with early kidney injury and is also good predictor of the development of cardiovascular disease.



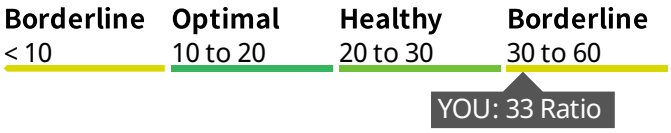
Creatinine Creatinine is a product of the breakdown of creatine, compound produced by your muscles when they are actively contracting. Because creatinine is produced at a relatively constant rate and is excreted almost exclusively by your kidneys, its serum level is a good indicator of kidney filtration rate (health). However, an increased serum level can be found in people with higher muscle mass or who have been exercising vigorously prior to the test. Cystatin C is a newer measure of kidney function that is not affected by these factors. Low levels of creatinine are usually found in people with relatively low muscle mass and higher levels can indicate kidney function decline. A level above 2 is usually an indication that some impairment of kidney function is present. In most individuals, creatinine slowly increases (0.5-1% per year) with age, making it a biomarker of kidney function aging.



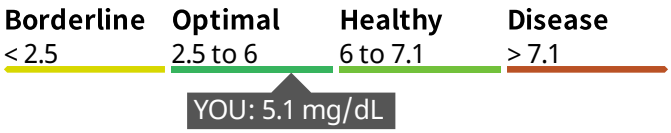
Urea Nitrogen in Blood Urea Nitrogen in Blood is produced when your body breaks nitrogen-containing protein down into its constituent amino acids and the liver combines the nitrogen into the waste product urea. There is a relatively constant production of BUN, which the kidneys then filter out and excrete into the urine. Diseases that affect the kidneys or the liver can raise BUN. Other causes include heart failure, dehydration, and or gastrointestinal bleeding. Low BUN is not very common and if present is usually not a cause for concern. The most common cause of an elevated BUN in an otherwise healthy individual is mild dehydration.



BUN/Creatinine Ratio BUN/Creatinine Ratio is used to differentiate dehydration or excess BUN production from kidney problems. In kidney failure, both creatinine and BUN rise, so the ratio will not increase. When there is excess BUN production only (from, e.g., gastrointestinal bleeding) you will see an increased BUN/Creatinine. A mildly elevated ratio (22-25) can occur in people with low muscle mass (which causes a low creatinine level) and slight dehydration, but is usually not a cause for concern.



Uric Acid Uric Acid is a product of the breakdown of one type of nucleic acid (a component of DNA/RNA) called a purine. The serum uric acid level can rise when there is excessive production or decreased excretion via the kidneys and feces. Excess production can occur during chemotherapy/radiation (breakdown of cells with release of DNA) and decreased excretion because of kidney disease. Some people have an inherited condition in which they produce a higher level of uric acid and are at risk for kidney stones and gout (the painful inflammation of joints caused by the presence of uric acid crystals in the joint space). Like bilirubin, uric acid is also a potent antioxidant and people with a level in the upper range of normal may have better protection from free-radical damage.



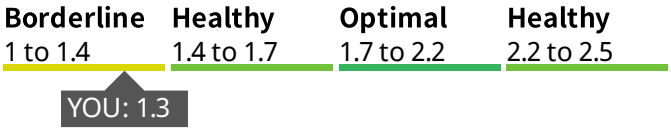
Liver Function

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
C	Albumin / Globulin ratio	1.3			1.7-2.2		
B	Albumin	3.9	g/dL	3.6 - 5.1	>4.5		
B	Globulin	2.2	g/dL	2.2 - 3.9	2.4-2.8		
A	Protein	6.1	g/dL	6.2 - 8.3	6.0-8.0		
B	Gamma-Glutamyl Transferase	20	IU/L	3 - 70	<10		
B	Alanine Aminotransferase	21	IU/L	6 - 40	<20		
B	Aspartate Aminotransferase	29	IU/L	10 - 35	<20		
C	Alkaline Phosphatase	62	IU/L	33 - 130	0-40		
A	Bilirubin, Direct	0.1	mg/dL	<0.2	0.00-0.20		
A	Bilirubin, Total	0.9	mg/dL	0.2 - 1.2	0.6-1.2		
	Lactate Dehydrogenase	140	IU/L	120 - 250	152-218		

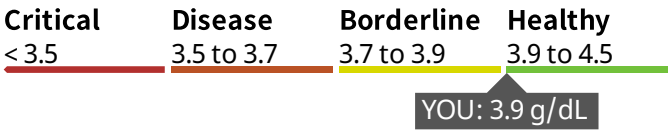
The tests usually grouped under the heading of 'liver function tests' impart a variety of information,

not all about just the liver. They can be divided into 3 categories: synthetic function, liver/bile duct damage, and immune system function.

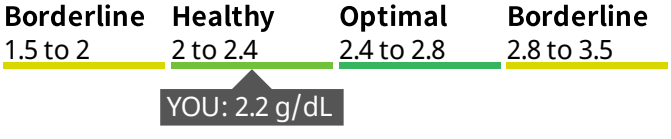
Albumin / Globulin ratio Albumin / Globulin ratio can serve as a more sensitive flag for disorders of high or low production of albumin or globulins because the individual levels can fluctuate according to hydration status. A low ratio can be caused by increased production of gamma globulins, as occurs in multiple myeloma. A high ratio is usually a sign of good health unless it is associated with a very low globulin, in which case it may signal hypogammaglobulinemia, which can be caused by kidney disease.



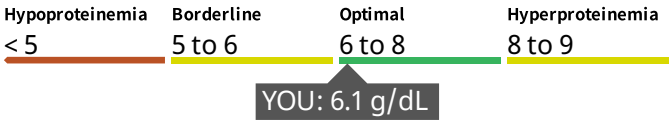
Albumin Albumin is the most abundant protein in human serum. It is important for maintaining normal osmotic pressure (the force keeping the fluid in the blood vessels), carrying certain hormones, and neutralizing free radicals. It is produced in the liver, and a decreased level can indicate reduced liver function or liver disease. The serum level of albumin decreases with age even in the absence of disease. An increased level is generally the result of dehydration. In the absence of dehydration, a higher serum level is generally a sign of good health.



Globulin Globulin is the term used for the non-albumin proteins circulating in the blood. These include many proteins but can roughly be divided into two groups. The gamma globulins are mostly composed of circulating antibodies made by mature B-cells called plasma cells. The other group contains SHBG, transferrin, ferritin, thyroid binding globulin, etc. Elevation of the serum globulins of the gamma variety can occur in lymphoma, multiple myeloma, and monoclonal gammopathy of undetermined significance.



Protein Protein is the sum of the albumin and globulin proteins in the serum.

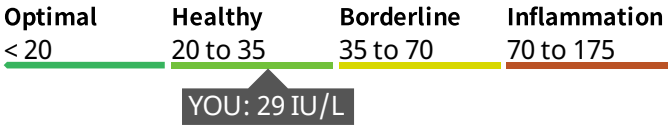


Gamma-Glutamyl Transferase Gamma-Glutamyl Transferase is an enzyme that transfers a gamma glutamyl group to other molecules. It is found in the liver, prostate, kidney, intestines, and pancreas. Often it is the earliest liver function test to be elevated in the event of bile duct blockage. It is most useful in determining if an elevation of alkaline phosphatase is from bone disease because if the GGT is elevated, liver disease is the cause of the elevation. Uncomplicated diabetes, acute pancreatitis, myocardial infarction, and certain liver-damaging drugs can also raise GGT.

Alanine Aminotransferase Alanine Aminotransferase is an enzyme that transfers the amino group from alanine during certain energy producing reactions. It is found in liver tissue, but also in skeletal and heart muscle. It is often used as an indicator of liver inflammation because its serum level can increase markedly when liver cells are damaged and leak the enzyme into the circulation, as occurs during hepatitis. Minor elevations can be seen after intense exercise, alcohol consumption, or when taking certain drugs, particularly cholesterol-lowering drugs of the statin family such as Lipitor.

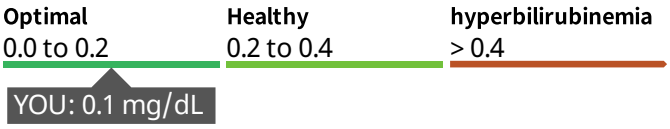
Aspartate Aminotransferase Aspartate Aminotransferase is an enzyme similar to ALT except it transfers the amino group of aspartate. It is used as an indicator of liver and cardiac muscle damage. When both ALT and AST are elevated, there is an increased risk of liver damage. The ratio of AST to ALT can be used to distinguish among causes of aminotransferase elevations. An AST/ALT < 2 is often indicative of chronic liver disease from Wilson's disease and alcoholic liver disease. An AST/ALT < 1 is indicative of acute liver

disease or that caused by fatty deposits in the liver, as occur in obesity and diabetes.

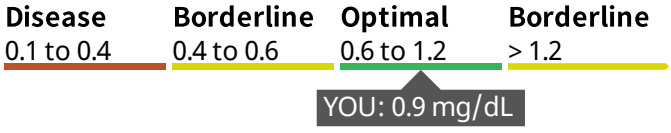


Alkaline Phosphatase Alkaline Phosphatase is an enzyme that takes phosphate groups off of molecules and works best in an alkaline (high pH) environment. It is present throughout the body, but particularly in liver, bile duct, and bones. The level of alkaline phosphatase is measured as a biomarker for damage to one of the organ system where it is produced. Alkaline phosphatase serum level can be elevated when the bile duct is blocked or inflamed. A healing fracture can cause an increase in alkaline phosphatase. Low levels of alkaline phosphatase can be associated with low thyroid function, but for the most part, a level lower than the low end of normal is of no clinical significance.

Bilirubin, Direct Bilirubin, Direct is the fraction of the total bilirubin that has been attached to a molecule (glucuronide) to prepare it for excretion. The indirect bilirubin is that fraction of the total that is free and unattached. The total bilirubin is the sum of the indirect and the direct bilirubin. In Gilbert's syndrome, it is the indirect bilirubin that is increased because of a low level of the enzyme that attaches the glucuronide molecule to bilirubin to prepare it for excretion. Gilbert's syndrome causes indirect bilirubin to rise during illness and can lead to a mild case of jaundice.



Bilirubin, Total Bilirubin, Total is produced from the breakdown of hemoglobin when red blood cells are destroyed. It is relatively abundant in the blood stream of mammals and may have evolved as a potent antioxidant system to protect against the oxidation of lipids (cholesterol) in cell membranes. Increased levels of bilirubin are an indication of blockage of the bile duct (by gallstones or inflammation), or increased destruction of red blood cells that overwhelms the ability of the liver to process the bilirubin into its water-soluble form for elimination in the urine. Interestingly, levels in the higher end of the normal range are associated with a decreased incidence of heart attack. Chronic slightly elevated levels of bilirubin, in the absence of bile duct blockage, are most often caused by a benign genetic disorder called Gilbert's syndrome (found in about 5-10% of the population). When total bilirubin levels rise above 3 mg/dl, a yellowing of the skin called 'jaundice' can occur.



Lactate Dehydrogenase

Immune Health

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
A	White Blood Cells	4700	cells/µL	3500 - 9500	4000-7500		
A	Neutrophils	3421	cells/µL		3000.0-5000.0		
B	Neutrophil %	54	%	38 - 80	40.0-48.0		
C	Monocytes	356	cells/µL	200 - 950			

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
B	Monocyte %	8	%	<13			
A	Eosinophils	142	cells/µL	15 - 550	50-250		
B	Eosinophil %	2	%	<8	<2.0		
A	Basophils	0	cells/µL		0-50		
C-	Basophil %	0	%	<2	0.1-1.5		
C	Lymphocytes	1489	cells/µL				
B	Lymphocyte %	32	%	20 - 48			

As discussed in the ImmunoAge section, there is no better biomarker of the intrinsic or pure aging of the immune system than the decline in naive suppressor T-cells. The level of these virgin immune cells declines linearly with age. However, there are other aspects of the change in immune system health with age that are more complicated. To understand them, a brief overview of the cell types involved in protecting your body from invaders--both from the inside and outside--is necessary.

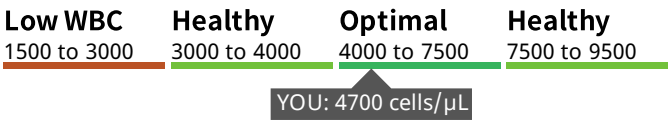
WBCs are the cells that guard the body against infections and other foreign material. The white blood cell count can increase significantly when you have an infection; but under normal conditions it represents only about 2% of the total number of white blood cells in your body. The rest are in your lymph glands, gastrointestinal tract, spleen, and other tissues. However, the relative proportions of the different types in the bloodstream are usually representative of the proportions in the rest of the body. While there are numerous sophisticated immune function tests, much can be learned about the state of the immune system simply by measuring the number and relative proportions of WBC subsets. WBCs can be divided up into two main types, granulocytes and lymphocytes.

The first three cell types in the table above (neutrophils, eosinophils, and basophils) are called 'granulocytes' because of fine granules in their cytoplasm that appear after being stained for microscopic examination. These cells make up the largest part of the innate immune system, the earliest responders to microbial and parasitic infections. They fight infection by releasing their granules of enzymes and free radical generators which destroy the invading organisms. They recognize the invaders as foreign by molecular structures that appear on most infectious agents. They also release the mediators of inflammation which cause blood to flow to the site of infection.

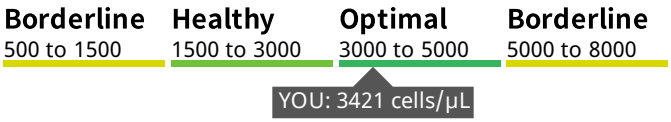
Lymphocytes do not have granules and are the mediators of the more precise and later responding adaptive immune system. Sometimes infections are wiped out by the immediate innate immune system response. But if the infection persists, the body recruits the adaptive immune system, its next wave of defense , which can recognize the particular molecular structure of the invader to more effectively target it. An acute bacterial or parasitic infection usually causes an increase in granulocytes, particularly neutrophils, whereas a viral infection most often increases the proportion of lymphocytes. Once the adaptive immune system has contained the infection, a small number of memory cells are left behind. These cells can persist in the body for decades and then promptly respond when the same infection is confronted which then allows it to mount a faster and brisker response than the first time. This memory feature of the adaptive immune system is the basis for vaccinations.

White Blood Cells White Blood Cells can be increased in a number of disease states including bacterial or viral infection, autoimmune disorders, and leukemias in which the number is often above 20,000. Low WBC counts (<3000) can be found in conditions of bone marrow failure, cancer, acute drug toxicity, certain viral infections, and congenital disorders of decreased bone marrow function. It helps to examine the subsets of the WBC count, such as neutrophils, lymphocytes, and eosinophils

for clues to what is causing the change in the WBC count.

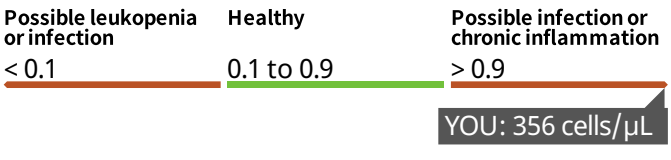


Neutrophils Neutrophils are the most abundant immune cell in the bloodstream, accounting for 50-65% of the total WBC; they do the majority of the work of the innate immune system. Their main function is phagocytosis (eating cells) and releasing their granules to destroy the engulfed bacteria and parasites. The ability of neutrophils to secrete bactericidal enzymes declines with age, increasing the severity of common bacterial infections in older adults. At the same time, their ability to turn off the inflammatory signals after the infection clears also declines, leaving the body in a chronic inflammatory state. Interestingly, their number increases with age in healthy adults, probably as a compensatory mechanism to offset the decline in per-cell functional activity.

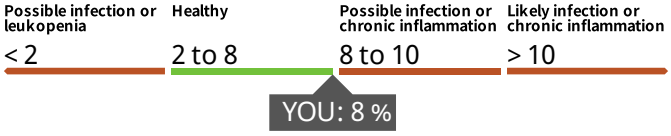


Neutrophil %

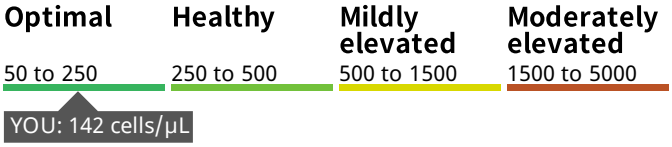
Monocytes Monocytes are released from the bone marrow, circulate in the blood for about 8 hours, and then enter the bone, brain, liver, lung, and skin to differentiate into specialized cells called macrophages. There they function as phagocytes which break down and process invading cells so that parts of them can be "presented" to the adaptive immune system. These cells are very important in controlling inflammation and the function of the other main white blood cell type, lymphocyte.



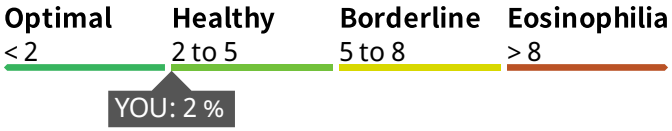
Monocyte %



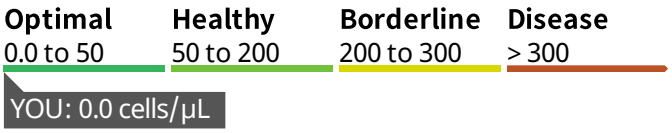
Eosinophils Eosinophils circulate in lower numbers, 0-8% of WBC, and their main function is to defend against infection by parasites. An increase in the number of eosinophils above 500 is often indicative of a parasitic infection or an allergic reaction to drugs, pollen or other allergen. There is some evidence that eosinophil function decreases with age, but the data is currently limited. There is no evidence of a change with age.



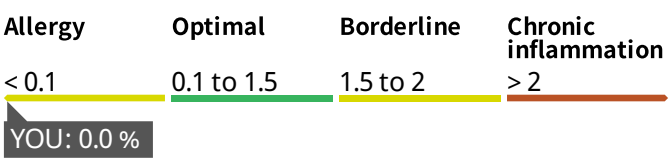
Eosinophil % A relative number that varies with the total white blood cell count and the relative percentages of other while blood cells (e.g. neutrophils, lymphocytes.



Basophils Basophils are found in very low numbers in the bloodstream and body (less than 2%). They are recruited to a site of infection and release histamine, a substance that causes capillaries to dilate and become permeable. This allows other important infection-fighting substances to move from the bloodstream into the site of infection. Currently available data indicates that there is no change in basophil number with age.

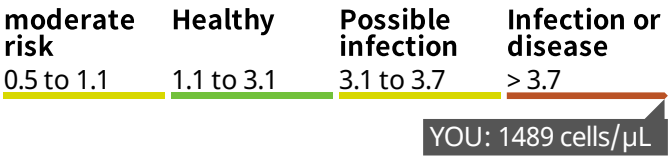


Basophil %

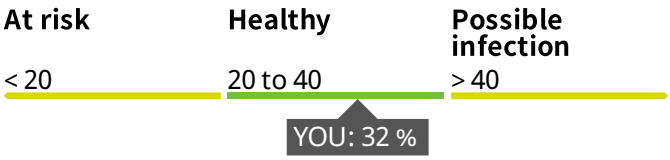


Lymphocytes Lymphocytes are the next most abundant white blood cell in the bloodstream and can be divided into subsets that have specific

functions and characteristic changes with age and disease states.



Lymphocyte %



Advanced Immune Health

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
A	T Cell Ratio	1.75	Ratio		1.50-2.50		
B	NK Cells	127	cells/µL		150-250		
A	NK Cell %	8	%	3 - 26	8-14		
B	B-Cells	126	cells/µL				
B	B-Cell %	10	%	5 - 22			
B	Helper T-Cells	768	cells/µL		>900		
A	Helper T-Cell %	51	%	32 - 59	45-55		
	Suppressor T-Cells	440	cells/µL				
	Suppressor T-Cell %	28	%	13 - 38			
	Healthy Suppressor T-Cells	422	cells/µL				
A	Healthy Suppressor T-Cell %	96	%		90-100		
A	Senescent Suppressor Cells	19	cells/µL		<50.00		
A	Senescent Suppressor Cell %	4	%	4 - 51	<10		
B	Naive Suppressor Cells	120	cells/µL		>250.0		
B	Naive Suppressor Cell %	24	%	11 - 57	>35		
A	CMV Antibodies (IGG)	0.9	IU/mL	<5	<0.91		

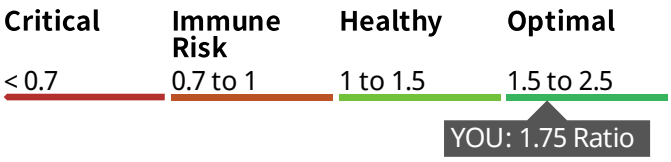
Lymphocytes are the next most abundant white blood cell in the bloodstream and can be divided into subsets that have specific functions and characteristic changes with age and disease states.

The table above depicts the important lymphocyte subsets that we assessed.

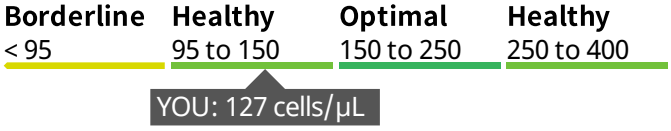
Many cells of the body are identified by molecule markers that protrude out of ("are expressed on" in biology lingo) their cell membranes. These

molecules enable the cell to communicate with other cells and receive instructions from signaling molecules, such as those that direct them to a site of infection. Lymphocytes can be subdivided by these 'cluster designation' or 'CD' markers into Natural Killer (NK) cells, B-cells, and T-cells, etc.

T Cell Ratio T Cell Ratio is the calculated by dividing the number of CD4 (Helper T-cells) by the number of CD8 (Suppressor T-cells). It is important because a number of landmark studies of adults older than 60 have shown that when the ratio is less than 1 (more suppressor cells than helper cells) the mortality rate increases by 50% regardless of other medical conditions. This "inversion" of the T-cell ratio occurs because of a simultaneous decline in helper cells with age and an even greater increase in senescent suppressor cells, most often because of longstanding CMV infection. You may wonder why a ratio between 1.5 and 2.5 is optimal while a higher ratio is just healthy. This is the case because in CMV negative adults ratios above 2.5 occur because of a decrease in naive suppressors--which can fight off new infections and higher numbers are desirable--and not an increase in senescent suppressor cells that occurs in CMV positive adults.

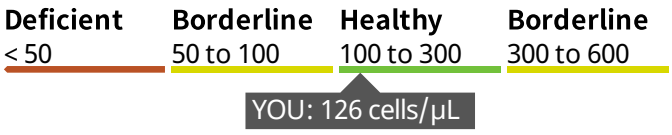


NK Cells NK Cells carry the CD56 and CD16 proteins on their surface. They are part of the innate immune system because they do not have a T-cell receptor and can kill virally infected and certain tumor cells. Recent research has demonstrated that they are deeply involved with the adaptive immune system. In healthy adults, the function of individual NK-cells decreases with age, but as for neutrophils, their number increases to compensate.

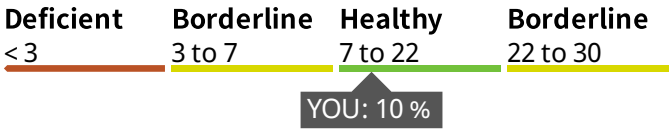


NK Cell %

B-Cells B-Cells are designated by expression of the CD19 marker and are derived from the bone marrow. They are the part of the adaptive immune system that produces antibodies that travel in the bloodstream looking for the antigens found on the surface of pathogens. Through a complex process of DNA rearrangement during maturation, each B-cell produces only one type of antibody. However, the large number of B-cells produced by a healthy young immune system enables it to recognize virtually any new pathogen that may invade the body. When an antibody encounters its unique antigen, it initiates a process that results in the invader's destruction. Unfortunately, the number of B-cells decreases linearly with age, which may be one of the reasons older adults are more susceptible to bacterial infections and cancer.

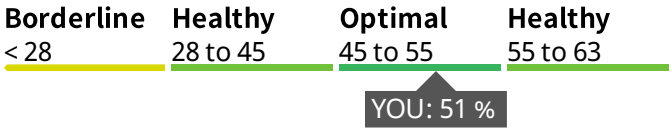


B-Cell %



Helper T-Cells Helper T-Cells help to orchestrate the functions of other WBCs by releasing cytokines (attracting and stimulating molecules) or by binding to them. They don't actually kill infectious agents or tumor cells (they are not cytotoxic) by themselves but rather recruit other cells to do so. They do not significantly decrease in number with age.

Helper T-Cell %



Healthy Suppressor T-Cell %

Immune Risk	Aging or CMV positive	Healthy	Optimal
30 to 50	50 to 75	75 to 90	90 to 100

YOU: 96 %

Senescent Suppressor Cells Senescent Suppressor Cells are suppressor cells that have undergone multiple rounds of cell division, often in response to chronic viral infections. They are no longer able to divide but do not die; far from being inert, they secrete inflammatory cytokines that can damage tissues. In older adults, they can comprise over 50% of the circulating suppressor cells. It is the increase in their number that is usually the cause of the decrease in the CD4/CD8 ratio which defines the major component of the immune risk profile.

Optimal	Healthy	Borderline	Disease
< 50	50 to 200	200 to 400	> 400

YOU: 19 cells/µL

Senescent Suppressor Cell %

Optimal	Healthy	Borderline	Disease
< 10	10 to 25	25 to 50	50 to 70

YOU: 4 %

Naive Suppressor Cells Naive Suppressor Cells are designated by lack of expression of the CD95 molecule with is involved in apoptosis. They are known as "virgin T-cells" because they have not encountered the antigen for their TCR and can be thought of as the reservoir of cells able to fight off new infections and tumors. They reach a peak of up to 50% of suppressor cells in young adulthood, but gradually decline as the thymus involutes. By the ninth decade, they can circulate in the single digits.

Disease	Borderline	Aging	Healthy
< 10	10 to 50	50 to 100	100 to 250

YOU: 120 cells/µL

Naive Suppressor Cell %

Immune risk	Borderline	Aging	Healthy
< 5	5 to 10	10 to 20	20 to 35

YOU: 24 %

CMV Antibodies (IGG) CMV Antibodies (IGG) is a ubiquitous virus from the herpes virus family that includes the common HSV1 (cold sores), and HSV4 (Epstein-Barr virus--mononucleosis). While it causes up to 15% of mononucleosis cases, most commonly the initial infection occurs without significant symptoms. In the United States, about 60% of the population has been infected with CMV, similar to HSV1 frequency. As with all the other herpes viruses, the infection is quickly controlled, but then remains latent in the walls of the arteries and monocytes. After the initial infection, IGG antibodies specific for the virus are produced and form the basis for the test to detect infection. If the antibody level is above 0.91, then one is considered to have been infected, i.e., is seropositive. In some studies, higher levels of the antibody titer have been associated with greater morbidity and mortality. Most physicians still think infection with CMV is benign and only causes problems for neonates or immunosuppressed individuals, but recent studies have demonstrated conclusively that it often causes significant shortening of lymphocyte telomeres and accumulation of senescent T cells. This results in weakening of the ability of the immune system to fight off infections and can result in earlier death from infection in older adults. The accumulaton of senescent T cells is also a source of increased inflammation in even middle-aged adults. There is currently no treatment for CMV infection, though work continues on a vaccine. It is transmitted sexually and through blood, but also can be acquired through casual contact with saliva if a person is actively shedding virus. We test for it because it is important to know CMV status to properly interpret telomere and lymphocyte subset tests. There is preliminary evidence that treatment with a telomerase activator can reduce the accumulation of senescent T cells that occurs after initial infection.

Not infected	Healthy Infected	Reactivations	Frequent reactivations
< 0.91	0.91 to 3	3 to 10	> 10

YOU: 0.9 IU/mL

Inflammation

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
B	C-Reactive Protein	1.2	mg/L	<2.9	<1.00		

Inflammation is caused by the series of immune system responses designed to repair damage to your body by physical agents (trauma and radiation) or infections (bacteria, viruses, parasites). It is an essential part of the healing process. Inflammation can be acute or chronic and is characterized by pain, redness, swelling, and warmth of the tissue as white blood cells (leukocytes) are pulled out of the veins to the site of injury or infection. If the acute inflammatory process fails to fix the problem, then chronic inflammation sets in and can cause long term damage to your tissues.

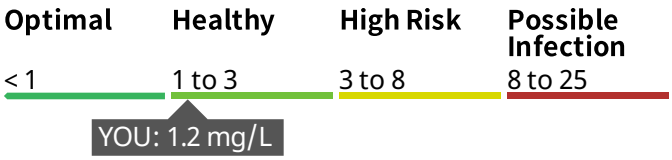
Importance

Tracking these markers can give clues to early chronic inflammatory processes so that changes in lifestyle, diet, exercise, as well as supplements and medication can reduce them before they cause disease.

Factors

Markers of chronic inflammation have been associated with increased risk of cancer, cardiovascular disease, dementia, COPD, and many other diseases of aging.

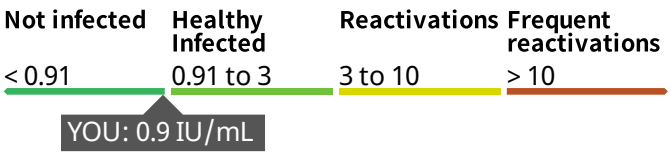
C-Reactive Protein C-Reactive Protein is called an 'acute phase reactant' because it is released from the liver during an acute infection to help fight off microbial invaders. In the absence of infection, however, a C-reactive protein level greater than 3 mg/L has been associated with an increased risk of CVD in a large number of studies. This is thought to be a result of the low level of inflammation (immune system activation) produced by atherosclerotic plaques. A level of 1-3 mg/L is normal, but ideally it should be less than 1 (the lower the better).



Viruses

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
A	CMV Antibodies (IGG)	0.9	IU/mL	<5	<0.91		

CMV Antibodies (IGG) CMV Antibodies (IGG) is a ubiquitous virus from the herpes virus family that includes the common HSV1 (cold sores), and HSV4 (Epstein-Barr virus--mononucleosis). While it causes up to 15% of mononucleosis cases, most commonly the initial infection occurs without significant symptoms. In the United States, about 60% of the population has been infected with CMV, similar to HSV1 frequency. As with all the other herpes viruses, the infection is quickly controlled, but then remains latent in the walls of the arteries and monocytes. After the initial infection, IGG antibodies specific for the virus are produced and form the basis for the test to detect infection. If the antibody level is above 0.91, then one is considered to have been infected, i.e., is seropositive. In some studies, higher levels of the antibody titer have been associated with greater morbidity and mortality. Most physicians still think infection with CMV is benign and only causes problems for neonates or immunosuppressed individuals, but recent studies have demonstrated conclusively that it often causes significant shortening of lymphocyte telomeres and accumulation of senescent T cells. This results in weakening of the ability of the immune system to fight off infections and can result in earlier death from infection in older adults. The accumulaton of senescent T cells is also a source of increased inflammation in even middle-aged adults. There is currently no treatment for CMV infection, though work continues on a vaccine. It is transmitted sexually and through blood, but also can be acquired through casual contact with saliva if a person is actively shedding virus. We test for it because it is important to know CMV status to properly interpret telomere and lymphocyte subset tests. There is preliminary evidence that treatment with a telomerase activator can reduce the accumulation of senescent T cells that occurs after initial infection.


Not infected
Healthy Infected
Reactivations
Frequent reactivations
< 0.91
0.91 to 3
3 to 10
> 10
YOU: 0.9 IU/mL

Exceptional Results

Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
Cardiovascular Risk						
Total Cholesterol	167	mg/dL	125 - 200	125-175		
Cholesterol/HDL Ratio	1.6	Ratio		<3.0		
Coenzyme Q10	1.8	mg/L	0.44 - 1.64	1.50-3.00		
LDL/HDL Ratio	1.9	Ratio		<2.0		
Diabetes & Glucose						
Insulin	10	µIU/mL	<16	<5.0		
Cognitive Function						
Standard Composite Memory	117		90 - 109	>109		
Standard Verbal Memory	122		90 - 109	>109		
Standard Visual Memory	118		90 - 109	>109		
Standard Psychomotor Speed	109		90 - 109	>109		
Standard Cognitive Flexibility	110		90 - 109	>109		
Sex Hormones						
Free Testosterone	5	pg/mL	0.1 - 6.4	4.0-10.0		
Free Testosterone %	2	%	0.5 - 1.8	1.00-2.00		
Estradiol	67	pg/mL		50.0-200.0		
Thyroid Function						
Thyroid Stimulating Hormone	1.2	mIU/L	0.4 - 4.5	0.025-1.500		
Corticosteroids						
Cortisol	13	µg/dL		9.5-16.1		
Blood						
Red Blood Cells	4.4	million/µL	3.8 - 5.1	4.10-5.10		
Hematocrit	42.6	%	35 - 45	40.0-46.5		
Mean Corpuscular Volume	92	fL	80 - 100	85.0-95.0		

Mean Corpuscular Hemoglobin	31	pg	27 - 33	28.5-31.5
Mean Corpuscular Hemoglobin Concentration	32.7	g/dL	32 - 36	32.0-36.0
Platelets	252	thousand/µL	140 - 400	200-400
Mean Platelet Volume	8.1	fL	7 - 11	7.5-9.0
Vitamins				
Vitamin D	49	ng/mL	20 - 100	40-60
Trace Essential Minerals				
Ferritin	72	ng/mL		50-100
Iron	63	µg/dL	40 - 160	50-100
Transferrin Saturation	23	%		20-30
Kidney Function				
Cystatin-C	0.7	mg/L		0.43-0.70
Creatinine	0.8	mg/dL	0.5 - 1.2	0.50-0.80
Uric Acid	5.1	mg/dL	2.5 - 7	2.5-6.0
Liver Function				
Protein	6.1	g/dL	6.2 - 8.3	6.0-8.0
Bilirubin, Direct	0.1	mg/dL	<0.2	0.00-0.20
Bilirubin, Total	0.9	mg/dL	0.2 - 1.2	0.6-1.2
Immune Health				
White Blood Cells	4700	cells/µL	3500 - 9500	4000-7500
Neutrophils	3421	cells/µL		3000.0-5000.0
Eosinophils	142	cells/µL	15 - 550	50-250
Basophils	0	cells/µL		0-50
Advanced Immune Health				
T Cell Ratio	1.75	Ratio		1.50-2.50
NK Cell %	8	%	3 - 26	8-14
Helper T-Cell %	51	%	32 - 59	45-55
Healthy Suppressor T-Cell %	96	%		90-100

Senescent Suppressor Cells	19	cells/µL		<50.00
Senescent Suppressor Cell %	4	%	4 - 51	<10
CMV Antibodies (IGG)	0.9	IU/mL	<5	<0.91
Viruses				
CMV Antibodies (IGG)	0.9	IU/mL	<5	<0.91

Concerning Results

Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
Arterial Stiffness						
Diastolic Blood Pressure (at rest)	92	mm Hg	60 - 80	65-75		
Muscle and fat						
Percent Bodyfat	38.1	%		<21.0		
Extracellular / Total Body Water	0.417			0.340-0.375		
Lung Health						
FVC Percent Predicted	4	%		>110		
FEV1 Percent Predicted	3	%		>110		
Growth/IGF Hormones						
Insulin-Like Growth Factor 1	149	ng/mL		250-450		
Major Essential Minerals						
Calcium	8.1	mg/dL	8.6 - 10.2	9.0-9.8		

Complete Data

Grade	Name	Result	Units	Lab Ref Range	Optimal Range	Baseline	Change
Telomere Length							
C	Granulocyte Telomere Length	7.4	kb	5.5 - 10	>8.5		
C	Lymphocyte Telomere Length	6.3	kb	4.5 - 9	>8.0		
Arterial Stiffness							
	Anti-hypertensive	NO					
	Patient Had Caffeine Within Last 6 Hours	NO					
C	Aortic Pulse Pressure	36	mm Hg	30 - 50	<25		
C	Aortic Systolic Blood Pressure	129	mm Hg	102 - 129	70-93		
C	Systolic Blood Pressure (at rest)	134	mm Hg	90 - 129	70-110		
D	Diastolic Blood Pressure (at rest)	92	mm Hg	60 - 80	65-75		
B	Resting Heart Rate	72	bpm	50 - 99	33-55		
C	Augmentation Pressure	13	mm Hg	7 - 20	<2		
B	Augmentation Index @ 75	26	%	19 - 42	<8		
Cardiovascular Risk							
B	C-Reactive Protein	1.2	mg/L	<2.9	<1.00		
A	Total Cholesterol	167	mg/dL	125 - 200	125-175		
B	HDL Cholesterol	59	mg/dL	>46	>60		
B	LDL Cholesterol	110	mg/dL	<129	50-100		
B	Triglycerides	82	mg/dL	<149	<50		
A	Cholesterol/HDL Ratio	1.6	Ratio		<3.0		

C	Homocysteine	12	µmol/L	<11.3	6.0-8.0
A	Coenzyme Q10	1.8	mg/L	0.44 - 1.64	1.50-3.00
A	LDL/HDL Ratio	1.9	Ratio		<2.0
Diabetes & Glucose					
C	Hemoglobin A1C	5.6	%	<6	<5.2
C	Estimated Average Glucose	114	mg/dL		<102.5
B	Glucose	99	mg/dL	65 - 99	<89
A	Insulin	10	µIU/mL	<16	<5.0
Muscle and fat					
	Height	68	inches		
B	Weight	168	lbs		
C	Body Mass Index	25.5	kg/m2		
	Fat Mass	64	lbs		
	Lean Body Mass	108	lbs		
F	Percent Bodyfat	38.1	%		<21.0
B	Visceral Fat Level	11	Index		1-4
	Skeletal Muscle Mass	59	lbs		
	Total Body Water	78	lbs		
	Intracellular Water	45.5			
	Extracellular Water	32.5	lbs		
D	Extracellular / Total Body Water	0.417			0.340-0.375
Skin Elasticity					
B	Skin Elasticity	78	%		90-100
Lung Health					

	Spirometry Interpretation	Mild obstruction			
	Forced Vital Capacity	3.447	L		
D	FVC Percent Predicted	4	%		>110
	FVC Predicted	84	L		
	Forced Exhaled Volume in 1 seconds	1.927	L		
D	FEV1 Percent Predicted	3	%		>110
	FEV1 Predicted	71	L		
	FEV1/FVC	56	%		
	Respiratory Rate	16	breaths / min		
Cognitive Function					
A	Standard Composite Memory	117		90 - 109	>109
A	Standard Verbal Memory	122		90 - 109	>109
A	Standard Visual Memory	118		90 - 109	>109
A	Standard Psychomotor Speed	109		90 - 109	>109
B	Standard Processing Speed	101		90 - 109	>109
C	Standard Reaction Time	85		90 - 109	>109
A	Standard Cognitive Flexibility	110		90 - 109	>109
B	Standard Executive Functioning	103		90 - 109	>109
B	Standard Motor Speed	101		90 - 109	>109
Sex Hormones					
	Menstrual Phase	menopausal			
B	Follicle Stimulating Hormone	119	mIU/mL		
C	Sex Hormone Binding Globulin	59	nmol/L	14 - 73	60-100

B	Testosterone	50	ng/dL	2 - 45	30-45
A	Free Testosterone	5	pg/mL	0.1 - 6.4	4.0-10.0
A	Free Testosterone %	2	%	0.5 - 1.8	1.00-2.00
B	Dihydrotestosterone	29	ng/dL		30-46
B	Dehydroepiandrosterone Sulfate	220	µg/dL	<145	250-350
A	Estradiol	67	pg/mL		50.0-200.0
B	Estrone Sulfate	3800	pg/mL		1500-2600
B	Progesterone	500	ng/dL		1000.0-3000.0
Thyroid Function					
A	Thyroid Stimulating Hormone	1.2	mIU/L	0.4 - 4.5	0.025-1.500
B	Thyroxine	5.4	µg/dL	4.5 - 12	
B	Free T3	3.3	pg/mL	2.3 - 4.2	3.8-4.5
	Reverse T3	13	ng/dL		
Growth/IGF Hormones					
D	Insulin-Like Growth Factor 1	149	ng/mL		250-450
B	IGF Binding Protein-3	3.5	mg/L	3.5 - 6.9	5.0-7.8
B	Prolactin	7	ng/mL		10.0-20.0
Corticosteroids					
A	Cortisol	13	µg/dL		9.5-16.1
Blood					
A	Red Blood Cells	4.4	million/µL	3.8 - 5.1	4.10-5.10
B	Hemoglobin	12	g/dL	11.7 - 15.5	13.3-15.5
A	Hematocrit	42.6	%	35 - 45	40.0-46.5

A	Mean Corpuscular Volume	92	fL	80 - 100	85.0-95.0
A	Mean Corpuscular Hemoglobin	31	pg	27 - 33	28.5-31.5
A	Mean Corpuscular Hemoglobin Concentration	32.7	g/dL	32 - 36	32.0-36.0
B	Red Cell Distribution Width	13	%	11 - 15	<12.5
A	Platelets	252	thousand/µL	140 - 400	200-400
A	Mean Platelet Volume	8.1	fL	7 - 11	7.5-9.0
Vitamins					
A	Vitamin D	49	ng/mL	20 - 100	40-60
B	Folate	14	ng/mL		>15.0
B	Vitamin B12	668	pg/mL		700-1100
Trace Essential Minerals					
A	Ferritin	72	ng/mL		50-100
A	Iron	63	µg/dL	40 - 160	50-100
A	Transferrin Saturation	23	%		20-30
B	Total Iron Binding Capacity	269	µg/dL	250 - 450	
Major Essential Minerals					
B	Sodium	141	mmol/L	135 - 146	
B	Potassium	4.6	mmol/L	3.5 - 5.3	4.0-4.4
C	Chloride	96	mmol/L	98 - 110	101-106
B	Carbon Dioxide	23	mmol/L	21 - 33	24-28
D	Calcium	8.1	mg/dL	8.6 - 10.2	9.0-9.8
C	Phosphorus	4	mg/dL	2.5 - 4.5	2.5-2.9

Kidney Function					
A	Cystatin-C	0.7	mg/L		0.43-0.70
A	Creatinine	0.8	mg/dL	0.5 - 1.2	0.50-0.80
C	Urea Nitrogen in Blood	29	mg/dL	7 - 25	
C	BUN/Creatinine Ratio	33	Ratio		10.00-20.00
A	Uric Acid	5.1	mg/dL	2.5 - 7	2.5-6.0
Liver Function					
C	Albumin / Globulin ratio	1.3			1.7-2.2
B	Albumin	3.9	g/dL	3.6 - 5.1	>4.5
B	Globulin	2.2	g/dL	2.2 - 3.9	2.4-2.8
A	Protein	6.1	g/dL	6.2 - 8.3	6.0-8.0
B	Gamma-Glutamyl Transferase	20	IU/L	3 - 70	<10
B	Alanine Aminotransferase	21	IU/L	6 - 40	<20
B	Aspartate Aminotransferase	29	IU/L	10 - 35	<20
C	Alkaline Phosphatase	62	IU/L	33 - 130	0-40
A	Bilirubin, Direct	0.1	mg/dL	<0.2	0.00-0.20
A	Bilirubin, Total	0.9	mg/dL	0.2 - 1.2	0.6-1.2
	Lactate Dehydrogenase	140	IU/L	120 - 250	152-218
Immune Health					
A	White Blood Cells	4700	cells/µL	3500 - 9500	4000-7500
A	Neutrophils	3421	cells/µL		3000.0-5000.0
B	Neutrophil %	54	%	38 - 80	40.0-48.0

C	Monocytes	356	cells/µL	200 - 950	
B	Monocyte %	8	%	<13	
A	Eosinophils	142	cells/µL	15 - 550	50-250
B	Eosinophil %	2	%	<8	<2.0
A	Basophils	0	cells/µL		0-50
C-	Basophil %	0	%	<2	0.1-1.5
C	Lymphocytes	1489	cells/µL		
B	Lymphocyte %	32	%	20 - 48	
Advanced Immune Health					
A	T Cell Ratio	1.75	Ratio		1.50-2.50
B	NK Cells	127	cells/µL		150-250
A	NK Cell %	8	%	3 - 26	8-14
B	B-Cells	126	cells/µL		
B	B-Cell %	10	%	5 - 22	
B	Helper T-Cells	768	cells/µL		>900
A	Helper T-Cell %	51	%	32 - 59	45-55
	Suppressor T-Cells	440	cells/µL		
	Suppressor T-Cell %	28	%	13 - 38	
	Healthy Suppressor T-Cells	422	cells/µL		
A	Healthy Suppressor T-Cell %	96	%		90-100
A	Senescent Suppressor Cells	19	cells/µL		<50.00
A	Senescent Suppressor Cell %	4	%	4 - 51	<10
B	Naive Suppressor Cells	120	cells/µL		>250.0

B	Naive Suppressor Cell %	24	%	11 - 57	>35
A	CMV Antibodies (IGG)	0.9	IU/mL	<5	<0.91
Inflammation					
B	C-Reactive Protein	1.2	mg/L	<2.9	<1.00
Viruses					
A	CMV Antibodies (IGG)	0.9	IU/mL	<5	<0.91

Disclaimer

The information provided in this report is intended for educational purposes only and is not to be used as a substitute for medical evaluation by a licensed medical practitioner. It is based on a careful analysis of the scientific literature and the experience of the physicians and staff at PhysioAge Systems LLC.