Life Extension Magazine®

Three Blood Tests to Help You Better Manage the Risks of High Blood Sugar

Dr. Scott Fogle, Life Extension®'s Director of Clinical Information and Laboratory Services, discusses three blood tests to help readers better manage the risks of high blood sugar.

Start

Scientifically reviewed by **Dr. Gary Gonzalez**, MD, in October 2024. Written by: Dr. Scott Fogle, ND, Physician.

Q: I noticed that on a recent blood test my fasting blood sugar is **105 mg/dL**. Last checkup it was **100 mg/dL**. My doctor says it's fine and not to worry but everything I've read tells me that I might be on the road to diabetes or have something called impaired insulin sensitivity (or insulin resistance). Can you suggest some blood tests that would give me a better picture of my risk factors, especially since both diabetes and high cholesterol issues run in my family?

Scott Fogle, ND

A: That is a great question, and you are wise to raise it. You may have the condition referred to as "impaired glucose tolerance," also known as "insulin resistance" or "prediabetes." In other words, your glucose level is indeed too high if your goal is optimal health.

Here's why…

Though mainstream medicine once tolerated blood sugars as high as **140 mg/dL** as "normal," we now recognize the substantial cardiovascular, stroke, and cancer risks posed by sugar levels anywhere above **85 mg/dL**.[1-4] Above that level, your tissues are exposed to glucose at concentrations that cause chemical reactions with your body's proteins and fats called ***glycation***. Glycated proteins and fats trigger inflammation and oxidative stress, major enemies of longevity. Virtually all chronic diseases of aging (and aging itself) are accelerated by high glucose levels. As blood sugar rises, your risk of dying also goes up by approximately **40%** when **fasting glucose** consistently falls in the range of **110-124 mg/dL**. Risk of dying doubles when **fasting glucose** reaches the range of **126-138 mg/dL**.[5]

But glucose is only part of the story. In order to keep your sugar under control, your body puts out increasingly large amounts of **insulin**, the hormone we need to take sugar out of the bloodstream and drive it into cells. And insulin, while critically important for acute blood sugar control, poses a problem in the longer term.

Insulin is a growth factor, so too much insulin can predispose you to many kinds of cancer, as well as to heart disease, stroke, and the process of accelerated aging.[6-18]

In other words, your body may be putting out high amounts of insulin just to keep your blood sugar as "low" as **100** to **105 mg/dL**, but you are not out of the woods! To get a better idea of your overall risk, you'll need to know more than just a fasting blood sugar level. You'll need to know your insulin levels as well, particularly how much insulin it takes to get your blood sugar levels under control after you eat but most doctors never think to order those tests. Ideally, it shouldn't take too much insulin; if it does, then that is an early warning sign of insulin resistance.

There's more. Fasting blood glucose gives you no information about how your body handles the inevitable glucose load after a meal. Studies show that the *2-hour after-meal (postprandial) glucose level* correlates most strongly with catastrophic outcomes like cardiovascular disease, so getting fasting sugar under control is only half of the battle.[19] This all goes to say that you'll want to get some measurement of your glucose and insulin levels following a standard glucose load, in order to get an idea about how your own individual body manages it.

Three Tests to Assess Blood Sugar Management

Let's take a look at a group of three tests that together give you the best picture of your blood sugar when fasting and after a meal, your insulin levels when fasting and after a meal, the amount of glucose-related damage your body's proteins are undergoing, and the way your lipid profile is being affected by your blood sugar. Using the results from these tests can help you and your physician avoid the devastating damage caused by high blood sugar.

Glucose Tolerance Test with Insulin

> A glucose tolerance test with insulin provides your body with a single, precisely measured dose of glucose, and then measures your blood sugar and insulin responses over a total of three hours. You'll fast overnight (just like for any routine fasting blood sugar test), and on the morning of the test you'll have a fasting blood glucose and insulin level drawn to establish your baseline. This also gives you an up-to-date measurement of your fasting glucose.

You'll then be given a drink containing **75 grams** of glucose, and asked to wait. At one, two, and three hours after you drink this glucose "challenge" dose, technicians will draw additional blood glucose and insulin levels. (Don't forget to bring a book, tablet, or laptop to keep yourself quietly occupied; the test requires that you remain seated at the test site until it is finished.)

The results of this test will show you what your body does with a known glucose load. If you are healthy, you'll have a baseline fasting glucose of **70-85 mg/dL**, and a low fasting insulin level (less than **5 µIU/mL**). Over the next few hours, you'll see a rise in blood glucose as your body absorbs it from your intestine, but that rise should be tempered by a slight increase in insulin.

By two hours, your glucose should not rise above **140 mg/dL** or ideally not above **125 mg/dL** (or more than **40 mg/dL** above your baseline value); higher two-hour postprandial glucose levels are strongly associated with a host of dangerous outcomes (**Table 1**).[20] But — and here's the most important point — you'll also have a simultaneous measurement of your insulin level. While it's good to have normal fasting and after-meal blood sugar levels, you still have a problem if your corresponding insulin levels are too high.

If you'll invest just three or four hours of your time, the glucose tolerance test with insulin will give you a more accurate picture of where you are right now, in terms of fasting and after-meal glucose and insulin. And that information will give you powerful clues to your risk factors, not only for diabetes, but also for all kinds of age-related conditions. If your results are abnormal, you'll have a clear roadmap of how to respond, and an excellent measuring tool to track your progress.

TABLE 1: THE DANGERS OF AFTER-MEAL BLOOD SUGAR ELEVATIONS[20]

- Retinal damage to the eye
- Arterial blockage
- Oxidative stress

- Increased inflammation
- Endothelial dysfunction
- Reduced coronary blood flow
- Increased cancer risk

Hemoglobin A1c

The glucose tolerance test with insulin gives you great information about where your body is right now, on the day of the test. To complement that information, you'll want some measure of longer-term sugar-induced glycation damage to your body's protein and lipid molecules. The standard test for that is ***hemoglobin A1c (HbA1c)***, a direct measurement of glycation damage to hemoglobin, one of the most important molecules in your body, and one that is readily measured with a simple blood test.

If a fasting or after-meal glucose is a snapshot, think of hemoglobin A1c as a security camera recording that tracks where you've been over the past 2-3 months.[19] Hemoglobin A1c results are reported as the percent of total hemoglobin that's been damaged by glycation; a level of less than **5.7%** is considered good, but **5%** is even better. If your level is higher than **5.7%**, it means your body has been seeing too much sugar for too long — and that means your insulin levels will also likely have been elevated as your body tries to cope, with potentially disastrous consequences. Studies show that the risk of heart attack, stroke, and cancer all go up with rising levels of hemoglobin A1c.[21-23] And one of the strongest correlations with frailty in older adults is a persistently elevated hemoglobin A1c level.[24,25]

VAP™ Test for Lipids

Although it doesn't measure glucose or insulin, the ***vertical auto profile (VAP™)*** test is especially valuable for people with borderline or elevated blood sugar. That's because both impaired glucose tolerance and full-blown diabetes are associated with blood lipid disturbances that create a very high cardiovascular disease and stroke risk; one of the major risks is from smaller-than-normal particles of low density (LDL) cholesterol.[26-29]

Unlike standard lipid profiles, a single VAP™ test directly measures all of the major cholesterol-related particles that have known impact on heart and blood vessel health.[30,31] This includes the so-called "small remnant" particles, basically leftovers from LDL- and very-low density lipoproteins (VLDL) that are independently associated with increased risk.

Why Know This Information?

> Simply because, as with the situation of a "normal" glucose but elevated insulin, you might have met your goal of a low LDL and a higher HDL, but still be at risk. This was shown in a study that looked at people who had reached "normal" levels of non-HDL cholesterol. Depending on their baseline risk, **63** to **88%** of those people still turned out to have small low-density particle size, meaning that they were still at significantly raised risk for cardiovascular disease.[32] A decrease in LDL size is associated with a **28%** increase in heart attack risk in men and a **130%** increase in risk among young women.[33,34] This is because small, dense LDL can penetrate the cells lining your arteries much easier than large bouyant LDL, thus leading to arterial plaque faster.

VAP™ testing also measures the important lipoproteins Lp(a) and B100, and the subcategories of HDL cholesterol, HDL-2 and HDL-3. HDL-2 may offer the greatest cardiovascular protection; people with

HDL-2 cholesterol less than **25 mg/dL** have a fourfold increased risk of a heart attack compared with those who have higher levels.[35]

Lp(a) and B100 particles are also associated with increased cardiovascular risk, and both are found in abnormally large quantities in people with diabetes or insulin resistance.[36] People with elevated Lp(a) have a **79%** increase in stroke risk, while those with a history of smoking and elevated Lp(a) are four times likelier to have blood vessel diseases.[37,38] APO B100 is correlated to your LDL particle number, and the higher the number the greater the chance your LDL is being oxidized and glycated, both of which contribute to more plaque in arteries.[39]

Summary

It is a good idea not to ignore a "borderline" fasting blood sugar result, especially in light of the current recommendations to keep blood sugar at **85 mg/dL** or lower. Even a marginally-elevated glucose level may mask a dangerously high insulin level; fasting glucose measurements also provide no information about the after-meal glucose surge that does much of the damage.

People concerned about their glucose should consider three tests: a glucose tolerance test with insulin measurement, a hemoglobin A1c, and a VAP™ lipid profile. The results of those tests will give you a customized assessment of your cardiovascular risk status.

If you have any questions on the scientific content of this article, please call a **Life Extension**® Health Advisor at 1-866-864-3027.

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