

## Chapter 10: Laboratory Assessment

A number of laboratory studies are used to monitor the progress of individuals as they reverse insulin resistance, prediabetes and diabetes.

### Urine tests

**Urine glucose:** In those individuals with uncontrolled diabetes urine glucose test strips can be used to monitor those with sugar in their urine. This finding is called glucosuria. However, diabetes control is more accurately monitored with blood glucose levels and is the standard of care.

**Urine ketones:** For those who want to verify that they are in nutritional ketosis, urine ketone test strips can be purchased to test the urine for ketones. This is probably a good way to verify whether you are correctly eating a ketogenic diet during the early stages. You simply urinate on one of the test strips while sitting on the toilet and then match the color of the test strip to the picture on the bottle. These are rather inexpensive and can be purchased online.

### Blood Tests

**Blood ketone test strips:** These test strips use a drop of blood pricked from the finger and are read by a small meter, much like a glucometer use by diabetics. It is utilized to measure the degree of nutritional ketosis the user is in. They are more accurate than urine ketone test strips.

**Fasting glucose:** This test can be performed by using either a test strip that utilizes a drop of blood from a finger prick or venous blood that is sent to a commercial lab. It is capable of distinguishing between an individual with normal glucose control (that is an individual with

normal insulin insensitivity or one with mild insulin resistance from those with severe insulin resistance such as those with prediabetes and diabetes.

**Fasting insulin:** This test uses venous blood and is sent to a commercial laboratory. It helps distinguish between an individual with no insulin abnormalities and from those with insulin resistance, prediabetes or diabetes.

**HOMA-IR (Homeostatic Model Assessment Have Insulin Resistance):** Insulin resistance can be thought of as pre-prediabetes. The Homa-IR is calculated using the fasting glucose and fasting insulin levels. This calculator can be found at [thebloodcode.com](http://thebloodcode.com). A healthy range is 0.5-1.4. Levels above 1.9 indicate early insulin resistance. About 2.9 indicate significant insulin resistance.

**Hemoglobin A1c:** This test uses venous blood and is sent to a commercial laboratory. You do not have to be fasting for this test. It measures the amount of sugar that accumulates on red blood cells as they age. The higher the level, the higher your average blood glucose is. It can distinguish between those individuals with prediabetes and diabetes from those who don't have these conditions

**Liver enzymes:** These test use venous blood and are sent to a commercial laboratory. You don't have to be fasting for this test. Elevated liver enzymes. There is some sort of inflammation of the liver. Although there are many reasons for the elevation of liver enzymes such as medications, viral infection and toxic substances, one of the more common reasons that we are interested in is the development of fatty liver disease, a result of prolonged exposure to high carb diets with resultant insulin dysfunction. Fatty liver disease can result in the development of cirrhosis and liver cancer. Fatty liver disease can be reversed with a low carb diet.

## **Fasting Lipid panel:**

**Total cholesterol:** This is a measure of all the different types of cholesterol totaled together in the blood.

**HDL:** This is generally considered to be the good cholesterol

**Triglycerides:** Triglycerides are typically the result of fats digested in a meal or fats mobilized from our bodies.

**LDL:** This is generally considered to be the bad cholesterol.

**Total cholesterol/HDL ratio:** More important than either component itself, is the total cholesterol/HDL ratio. The lower it is the better. The lower it is the lower your risk of heart disease. Less than 5 is considered normal.

**Triglycerides/HDL ratio:** Like the total cholesterol/HDL ratio, this ratio is more important than either component itself. And, like the total cholesterol/HDL ratio, the lower the ratio the less likely you have insulin resistance.

## **Thyroid panel:**

**Free T3:** Free T3 is the active thyroid hormone. It is the free 4 hormone with a single iodine molecule removed.

**Free T4:** Free T4 is the T3 prohormone. It is the storage form of the thyroid hormone.

**TSH (thyroid-stimulating hormone):** It is the thyroid secreted by the pituitary gland. It is the hormone we monitor to determine whether we have an underactive or overactive thyroid. It is used to monitor those on thyroid medications to make sure they get the proper amount.

**Thyroglobulin antibody:** This is an antibody targeting thyroglobulin, the storage form of thyroid hormone. Its presence indicates inflammation of the thyroid.

**Thyroid peroxidase antibody:** This is an antibody targeting an enzyme of the thyroid gland. This enzyme, thyroid peroxidase enzyme is responsible adding iodine to a molecule called thyroglobulin. Its presence, like thyroglobulin antibody, indicates inflammation of the thyroid.