

Chapter 2: The Four Insulin States and the Diabetes Progression

As I see it, there are four insulin states (Figure 1). An individual can exhibit normal insulin sensitivity, insulin resistance, prediabetes or full-blown diabetes. Each of these states can be diagnosed with laboratory studies. There are 3 laboratory tests that can easily help us to distinguish between these various insulin states.

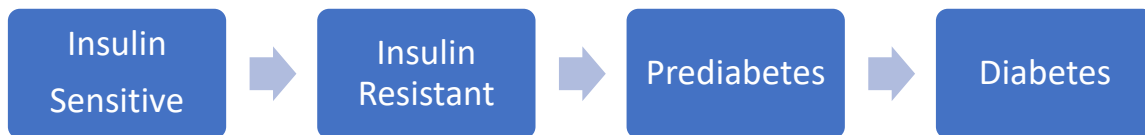


Figure 1. The Four Insulin States

We can simply obtain a fasting glucose. A value between 110 mg/dL and 126 mg/dL indicates prediabetes. A fasting blood glucose 126 or greater clinches the diagnosis of diabetes. Anyone with a random glucose level greater than 200 mg/dL can also be considered to have diabetes.

Although a lot more cumbersome, an oral glucose tolerance test, or GGT, can diagnose prediabetes or diabetes. It is typically performed by giving a drink with 75 g of glucose to a fasting individual. Glucose levels are drawn initially before the glucose load is consumed and 1, 2, 3 and up to 4 hours afterwards. This test can be used to distinguish between a person without prediabetes or diabetes from an individual with one of these conditions. This test cannot distinguish between an individual with normal insulin sensitivity or one with insulin resistance. After the 2 hour mark, a GGT value of between 140 mg/dL and 199

mg/dL indicates prediabetes. Those with values greater than 200 mg/dL are considered to have diabetes.

Now we get to a very important point. The only test that can definitively distinguish between an individual with normal insulin sensitivity from an individual with insulin resistance is a fasting insulin level! To reiterate, a fasting insulin level is crucial! Values < 8.4 indicate normal insulin sensitivity and those individuals with a value > 8.4 or higher are considered to have insulin resistance if not prediabetes or diabetes.

Insulin resistance is sometimes calculated by using a formula called HOMA-IR. This stands for Homeostatic Model Assessment of Insulin Resistance. It uses a fasting glucose level and a fasting insulin level to provide a number, the HOMA-IR. According to the website The Blood Code, a value of 1.9 indicates mild insulin resistance. A value about 2.9 indicates significant insulin resistance.ⁱ

Individuals with normal insulin sensitivity and insulin resistance can have normal hemoglobin A1c values, that is, <5.7%. An individual with prediabetes has a hemoglobin A1c of between 5.7% and 6.4%. Individuals with diabetes have a hemoglobin A1c >6.4%. Hemoglobin A1c values are typically used to monitor how well controlled a person with diabetes is. Generally, an individual with diabetes is thought to be well controlled if his hemoglobin A1c is <7%.

The Four Insulin States				
Lab tests used to diagnose the 4 insulin states	Insulin Sensitive	Insulin Resistant	Prediabetes	Diabetes
Fasting glucose	<110 mg/dL	<110 mg/dL	110 to 126 mg/dL	>126 mg/dL
Fasting insulin	<8.4	8.4 or higher	8.4 or higher	8.4 or higher
Hemoglobin A1c	<5.7%	<5.7%	5.7 to 6.4%	>6.4%
Random glucose				>200 mg/dL
OGGT: 2 hours after glucose administration	<140 mg/dL	<140 mg/dL	140 to 199 mg/dL	>200 mg/dL

Table 1. Laboratory Tests to Distinguish the Four Insulin States

The good news is that insulin resistance can be identified years or decades before an individual has an elevated fasting glucose, abnormal glucose tolerance test or an elevated hemoglobin A1c diagnostic of prediabetes or diabetes. Armed with this knowledge, patients with insulin resistance take steps to correct corrected and thereby avoid progressing to prediabetes or diabetes. A number of strategies can be used including eating a diet lower in carbohydrates and eating less frequently.

Chapter Summary

- There are 4 insulin states. These are normal insulin insensitivity, insulin resistance, prediabetes and diabetes.
- The insulin sensitive state and insulin resistant state have normal blood glucose levels and normal hemoglobin A1c levels.
- The insulin sensitive state and insulin resistant state can be distinguished from one another by obtaining a fasting insulin level.
- Prediabetes and diabetes are distinguished by fasting glucose level, hemoglobin A1c level or a glucose tolerance test.
- Abnormal insulin states can be reversed in most cases by decreasing the amount of carbohydrates in the diet and eating less frequently.

Resources

¹ <https://www.thebloodcode.com/homa-ir-calculator/>