# Type 1 vs. Type 2 Diabetes: Yes, There Is a Difference!

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## Type 1 vs Type 2 Diabetes

When I see a patient who has been newly diagnosed with diabetes, one of the first questions I ask them is, “What type of diabetes do you have?”

Often, when they walk into my office, they aren’t sure. Or they have a misconception about the types of diabetes. For example, if they required insulin immediately at the onset of diagnosis, they assumed right away that they have type 1 diabetes, when they actually had type 2 diabetes.

So let’s clear up some of those misconceptions today, and explain the differences between type 1 diabetes and type 2 diabetes.

### How Are Type 1 Diabetes and Type 2 Diabetes Alike?

Both type 1 diabetes and type 2 diabetes can occur at any age. In the past, we had incorrectly assumed that type 1 diabetes was “juvenile-onset” and that type 2 diabetes was “adult-onset.” However, we now know that type 1 diabetes is an autoimmune disease, meaning that it can occur at any age. Type 2 diabetes *does* occur more often in adults, but it is occurring at an alarming rate in children.

In the past, type 1 diabetes was called “insulin-dependent” diabetes and type 2 diabetes was previously called “non-insulin-dependent” diabetes.

Both types of diabetes may require insulin – people with type 1 diabetes will *always* require insulin (which we will discuss in greater detail), while people with type 2 diabetes will *sometimes* require insulin – meaning both types of diabetes are “insulin-requiring” diabetes.

Both types of diabetes require proper management of blood sugar levels, either through the use of insulin (as discussed above) or through other means (oral or injectable medications and diet and exercise, for people with type 2 diabetes). If blood sugar levels are not properly controlled, the risk of complications increases.

Complications include kidney failure, diabetic retinopathy – which can lead to blindness, heart disease, stroke, diabetic neuropathy, and amputations.

### The Type 1 and Type 2 Diabetes Difference

Although there are a lot of similarities, there are also stark differences in type 1 and type 2 diabetes.

For starters, type 1 diabetes is an autoimmune disease. In general, our bodies have an immune system that protects us from illness by attacking foreign bodies. However, if you have an autoimmune disease, it can’t always tell from the “good things” from the “bad things” so the body essentially begins to attack itself.

In the case of type 1 diabetes, the pancreas is attacked, and the beta cells (which produce insulin) are destroyed. And type 1 diabetes is one of about 80 types of autoimmune diseases!

This all boils down to the fact that the fact that *you can't prevent type 1 diabetes.*

Type 2 diabetes is a metabolic disease as opposed to an autoimmune condition. Generally, insulin secretion from the beta cells of the pancreas is inadequate because the body has developed a condition called *insulin resistance.*

According to Merck Manual, "Pathogenesis is complex and incompletely understood. Hyperglycemia develops when insulin secretion can no longer compensate for insulin resistance. Although insulin resistance is characteristic in people with type 2 DM and those at risk of it, evidence also exists for beta-cell dysfunction and impaired insulin secretion."

To put this very simply, we don't know *exactly* the pathophysiology of type 2 diabetes, but hyperglycemia (high blood sugar) develops due to insulin resistance.

**What Causes Diabetes?**

As we've already discussed, type 1 diabetes is an autoimmune disease. Thus, there is no known cause of type 1 diabetes, as there is often no known cause of other autoimmune diseases. We do know that there has to be a catalyst to "turn on" the autoimmune response. Genetics seem to play a role for some people, as well as environmental factors.

For example, a virus may trigger this response. There are ongoing research studies, such as TrialNet, that are attempting to pinpoint causes of type 1 diabetes.

There are several factors that seem to cause type 2 diabetes. Having one of these factors may not cause it, but having several may increase the risk:

- **Genes/family history** – certain ethnicities are known to have a higher predisposition to getting type 2 diabetes. For example, African Americans and American Indians are much more likely to get type 2 diabetes than Caucasians. Genetics can also predispose to obesity, which also can contribute.
- **Obesity/overweight** – the likelihood of developing type 2 diabetes increases with weight gain. The location of the excess weight can also make a difference. Excess belly fat is linked not just to type 2 diabetes, but insulin resistance and heart and vascular disease as well.
- **Insulin resistance** – the precursor to type 2 diabetes, insulin resistance is when the cells of the body (specifically the muscle, fat, and liver cells) do not use insulin efficiently. This means that more insulin must be produced for glucose to enter the cells. Eventually, the pancreas is unable to keep up with the excess insulin production, causing blood sugar levels to rise.

**Symptoms of Diabetes**

Typically, the symptoms associated with both type 1 diabetes and type 2 diabetes are associated with hyperglycemia. When the blood sugar levels reach very high levels, symptoms are often felt. However, people with type 2 diabetes are less likely to feel symptomatic with hyperglycemia.

Symptoms of hyperglycemia include:

- Excessive urination
- Excessive thirst
- Weakness
- Fatigue
- Confusion
- Increased hunger

- Weight loss
- Nausea and vomiting
- Blurred vision
- An increase in fungal infections

Often, the initial diagnosis of type 1 diabetes is made when these symptoms compound together, and an emergency situation occurs – diabetic ketoacidosis.

In the same vein, type 2 diabetes diagnosis may occur emergently due to hyperosmolar hyperglycemic state (HHS). HHS tends to occur when the body is under stress or illness, or the person is taking medications, such as corticosteroids.

**Differentiating Between Type 1 Diabetes and Type 2 Diabetes**

Sometimes it is easy to distinguish between type 1 diabetes and type 2 diabetes.

For example, a child who develops diabetes is most likely to have developed type 1 diabetes. Insulin resistance often accompanies type 2 diabetes, thus it can usually be diagnosed easily based on other clinical presentation, as well as other comorbid conditions.

However, sometimes the diagnosis is not always cut and dry.

For example, I have worked with quite a few adult patients who are average weight who come to see me with a new diagnosis of type 2 diabetes. It is not out of the question to be diagnosed with type 2 diabetes and be average weight – there are other risk factors aside from weight that come into play. But remember – type 1 diabetes is an autoimmune condition, so as a diabetes educator, I begin to think, “Is this person type 1 or type 2?”

Certain lab tests can be performed that will help to differentiate between the two types of diabetes. Drawing a serum C-peptide level can prove helpful. A C-peptide level helps to determine if the pancreas is producing insulin; a fasting C-peptide level below five µU/mL (0.6 ng/mL) is indicative of type 1 diabetes. A fasting C-peptide level greater than one ng/dL in a patient who has had diabetes for more than 1-2 years is characteristic of type 2 diabetes.

Islet-cell (IA2), anti-GAD65, and anti-insulin autoantibodies are all different lab tests that can be drawn that will be present in someone with type 1 diabetes, but not type 2 diabetes.

**Can Diabetes be Reversed?**

The reversal of type 2 diabetes is a hot-button issue lately. There have been several highly publicized research studies that indicate that there *may* be a possibility.

We’ve known for a while that people with type 2 diabetes who have bariatric surgery often have rapid normalization of blood sugar levels post-surgery – even before they have lost much weight.

But what about those people who don’t have bariatric surgery – or don’t qualify for it?

In one study, participants reversed their diabetes by following a low-calorie milkshake diet, then returned to normal eating after eight weeks. After six months, those who had achieved remission were still free of diabetes. However, it is important to note that most of the study participants who achieved remission had been diagnosed with diabetes less than four years prior, although there were a few study participants who had been diagnosed more than eight years prior.

One speculation as to why this low-calorie diet works to cause remission is it “may allow the body to use up fat from the liver, causing fat levels to drop in the pancreas as well. That “wakes up” the insulin-producing cells in

the pancreas, normalizing blood glucose levels."

Dr. George King, the chief scientific officer at Joslin Diabetes Center and a professor at Harvard Medical Center, notes that these studies are exciting. However, his concern is that people have a hard time maintaining weight loss. He does note that even a short-term reversal can stave off diabetic complications.

As far as type 1 diabetes reversal, there is also research pending. A recent study published in *Cell Stem Cell* indicated that gene therapy might allow for reversal. Researchers used an adeno-associated viral (AAV) vector to deliver two proteins (Pdx1 and MafA) to a mouse pancreas. This process reprogrammed the alpha cells of the pancreas into beta cells, which are the insulin-producing cells of the pancreas.

According to study author George Gittes of the University of Pittsburgh School of Medicine, "A clinical trial in both type 1 and type 2 diabetics in the immediately foreseeable future is quite realistic, given the impressive nature of the reversal of diabetes, along with the feasibility in patients to do AAV gene therapy."

This means that the research is a boon for people with type 1 diabetes *and* type 2 diabetes!

Historically, we've tried to transplant beta cells from one pancreas to another. As with other transplants, sometimes it works – and sometimes it fails. Why?

Keep in mind that the person with type 1 diabetes has an autoimmune disease – so the same autoimmune mechanism that destroyed the initial beta cells will likely destroy the new beta cells, which is why the new research is so exciting.