

## How type 2 diabetes progresses

### Why you may need more medication over time

Garry Bieringer was 50 when his doctor told him he had [type 2 diabetes](#). The diagnosis, based on a routine blood test, surprised him because he hadn't noticed any symptoms. In the years after his diagnosis, Bieringer went through a process that is sadly familiar to many people with type 2. Every few years, his diabetes treatment changed. "It's a pattern," he said. "After taking a drug for a while, it loses effectiveness."

At first, Bieringer took metformin, the drug typically prescribed first to control blood sugar (blood glucose) levels in people with type 2 diabetes. After a few years, two more oral medications were added to his treatment. Six years later, those two drugs were no longer able to control his blood sugar level. He had to add both long-acting and rapid-acting insulin injections. He also took a daily injection of a drug to increase his body's production of insulin and slow digestion.

Like many people with type 2, Bieringer had a hard time hearing the news that he needed to move from oral medication to shots. "I felt like a failure," he said. "But my diabetes educator told me it wasn't my fault. My body was just changing." Those words of wisdom helped Bieringer come to grips with the steadily increasing demands of his condition.

Type 2 diabetes progresses over time, even when it's managed and treated. You may have to adjust your treatment plan and medications many times, but it's worth it to help prevent complications and stay as healthy as possible.

### How the disease progresses

For people with type 2, the years after diagnosis often require more oral medications and sometimes insulin or other injections as well. "Diabetes is a progressive disease, and often the first drug is not enough," said Dr. Kieren Mather, an endocrinologist at Indiana University.

Scientists understand the basics of type 2 well, including how the body makes and uses insulin. When beta cells in the pancreas can't produce enough insulin to control blood sugar, the result is diabetes. First, the body becomes less sensitive to insulin. This is called insulin resistance. Second, to get the body's attention, the beta cells pump out more insulin.

"What changes is beta cell response," Mather said. "At first, it increases to keep things normal in the face of insulin resistance." If insulin sensitivity doesn't improve, the beta cells work even harder to make more insulin.

Unlike people with type 1 diabetes, people with type 2 still have functioning beta cells in the early stages of the disease. They usually have no idea their pancreas is struggling to keep up until a doctor flags their blood sugar levels. "People often have [type 2] diabetes for longer than they realize," said Dr. Ravi Retnakaran, endocrinologist at the Lunenfeld-Tanenbaum Research Institute from Mount Sinai Hospital in Toronto. "Diabetes is silent."

As long as beta cells are functioning, type 2 diabetes can be treated by reducing the body's insulin resistance. Exercise and weight loss have been shown to make the body respond better to its own insulin. Metformin works to keep less of the body's stored glucose from entering the blood.

But as Bieringer's experience shows, metformin may not be enough as time goes on. When insulin resistance is still a problem, it's hard for the pancreas to make enough. "For whatever reason, beta cell function worsens over time," Retnakaran said.

As beta cells pump out more and more insulin to compensate for the body's insulin resistance, they sometimes begin to fail. "Typically, over time, the person will need more and more diabetes medications, and in the absence of this, the sugar will rise," Retnakaran said. "Meanwhile, the beta cells get worse."

That beta cell failure is why type 2 diabetes may feel like a race you can't win. "Overload leads to progressive dysfunction," Mather said. "It's like heart disease—the pancreas keeps working too hard and wears out."

### **Chain reaction [graphic]**

- The body becomes resistant to its own insulin.
- Beta cells pump out more insulin to make up for insulin resistance.
- Beta cells begin to fail and can't keep up with insulin needs. Diabetes is diagnosed.
- Lifestyle changes (diet and exercise) and medications (oral or injectable) are needed to control blood sugar.
- Beta cells keep failing and more medications are needed over time.

### **Understanding why it changes**

Despite decades of research, we still don't know why some people's beta cells wear out and others don't. One theory is that the rising level of blood sugar is toxic to the beta cells, which makes them fail and die faster. As they die, blood sugar gets harder to control, and the process speeds up. Research has shown that lowering blood sugar levels is enough to bring back some beta cell function.

Another possibility is that the immune system plays a role in beta cell decline. The immune system may be attacking the beta cells in reaction to the high levels of glucose in the blood. "It may be that there's a systemic inflammation and a targeted immune response," Mather said.

Genetics may also play a role. Researchers have connected more than 70 different genes to type 2 diabetes, but it's still hard to tell what the interaction between them is.

The answer could be "all of the above." And it varies from person to person. To slow or halt the progression of type 2 diabetes, it's not enough to deal with just the immune system or obesity. "What makes type 2 diabetes such a difficult problem to solve is that there are so many paths that lead to the same destination," Mather said. "Maybe we have to block three or four pathways to have an effect."

### **Slowing the progression**

[Research](#) continues on how to slow or even stop type 2 progression. There's a lot of evidence that it may be reversible. But studies have shown that remission usually isn't permanent. Within a year, type 2 diabetes is back.

Until researchers unravel the mystery of beta cell decline, doctors recommend the proven approach of [exercise](#), [diet](#) and [weight loss](#). This will help improve beta cell function, improve insulin sensitivity and delay progression of type 2 diabetes. "Keeping the load on the beta cells as low as it can be is the best approach," said Mather.

Learn more about [oral medications](#) and [types of insulin](#).