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Chapter 1
Type 2 Diabetes: The Basics

Taking care of your diabetes means taking care of your whole body: from positive thinking in your brain to checking the bottoms of your feet for scrapes and cuts. It's a whole-body endeavor, and we're here to take you on that journey as you discover what diabetes is, how to manage and treat it, and how to prevent complications down the road.

This chapter starts off with the basics of diabetes: what it is and how it affects your body. These are the Biology 101 facts that you can reference down the line. It's fascinating stuff (and you don't need a medical degree to understand it). Then we tell you who else has diabetes and what the contributing risk factors are. After all, you're not the only one with diabetes. As of 2015, more than 30 million people in the United States had it, too.

What Exactly Is Diabetes?

You have diabetes, or perhaps someone you love has diabetes. That's not an easy diagnosis to hear. But it doesn't have to be a scary unknown either. In fact, scientists know more about diabetes and have more tools at their disposal than ever before.

The following sections explain how diabetes affects your body. It's good to know what's happening before you dive into how to manage and treat diabetes.

Getting the lowdown on blood glucose

Diabetes is a disorder in which the amount of glucose, also called sugar, is too high in the blood. When you were diagnosed with type 2 diabetes, you were probably told that your blood glucose was sky high. But why would your blood glucose be high?

It all comes down to eating — that amazing topic that everyone likes to obsess about. When you eat food, your body breaks that food down into glucose, and then the glucose travels in your bloodstream to waiting cells. That glucose really wants to get out of your blood and into your cells because that's how you get energy. That's the goal!

Insulin is a hormone that helps move glucose from your blood to inside your cells. However, people with type 2 diabetes don't make enough insulin or aren't as sensitive to that hormone. Therefore, the glucose gets trapped in the blood and can't get inside your cells. Then high blood glucose — diabetes — happens.


TECHNICAL STUFF

Glucose is just a simple form of carbohydrate. The simplest carbohydrates are sugars, and the simplest sugar is glucose. It's your body's main source of energy, used to power everything from getting up in the morning to taking your dog for a walk. Is it blood glucose or blood sugar? Actually they're the same thing. Blood glucose is simple sugar. So, you may hear people say their "sugars" are too high or their blood glucose is too high. Blood glucose is the more technical term; sugar is the more colloquial term. We use *blood glucose,* or simply *glucose,* in this book.

The mighty hormone insulin

You've probably heard of insulin, and you may associate it with injections or an insulin pump. We usually think of that as the synthetic or man-made medication. But the hormone in your body is also insulin. And it's one of the most important hormones for helping you metabolize your food and get energy.

Specialized beta cells in the pancreas make insulin. The pancreas, which is totally essential and underappreciated (until it stops working), is little, about 6 inches long, and sits right behind your stomach (see Figure 1-1).

The pancreas has islet cells that include both beta cells, which make insulin, and alpha cells, which make another hormone called glucagon. Both insulin and glucagon are important for metabolizing food.

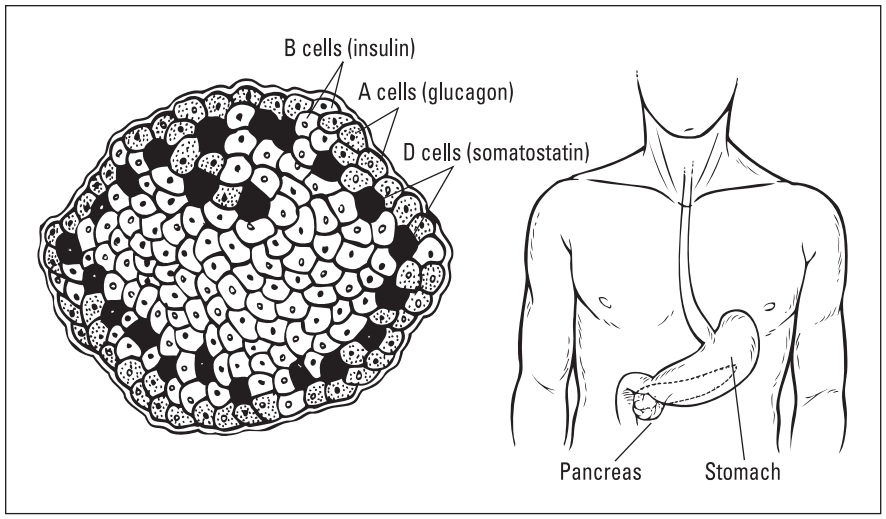

FIGURE 1-1: The pancreas and its specialized cells.

Illustration by Kathryn Born, MA

Beta cells are the only cells that make insulin. In type 2 diabetes, several things are happening with those beta cells:

- **The beta cells don't work well.** They don't make as much insulin as they're supposed to.
- **There may be fewer beta cells than usual.**
- **The beta cells that are making all the insulin get burned out (super tired) and eventually make less insulin.** It's a cycle in which insulin production can get worse over time.

At the same time that beta cells are struggling in the pancreas, another crazy thing happens: Cells in your body become less sensitive to insulin. So, even though the insulin may be sitting right next to the glucose by a cell, saying, "Hey, let us in!" your cell doesn't let them in. Instead, your cells need more insulin than ever before to let those glucose molecules inside. This is called *insulin resistance* or *decreased insulin sensitivity.*

It's a double whammy: Your pancreas makes less insulin, and yet you need more insulin than ever before. It's not a good combination.

If your body doesn't make enough insulin or if you have insulin resistance, your glucose can't get inside your cells and builds up in your blood. This is called *high blood glucose.* It's the key factor that defines diabetes.

Scientists are still trying to figure out why beta cells fail or die — and also why the body becomes less sensitive to insulin. If they can get to the bottom of those questions, we're on our way toward a cure for type 2 diabetes.


TIP

In the meantime, scientists know that insulin sensitivity can be improved by exercise. Just a short bout of exercise can improve insulin sensitivity for up to 24 hours. It's another amazing effect of breaking a sweat besides burning calories.


REMEMBER

Insulin is a hormone that helps your cells use glucose for energy. It's made by beta cells in the pancreas. People with type 2 diabetes may not make enough insulin or may not be as sensitive to insulin — or both.

Don't forget glucagon

Your pancreas makes another hormone, glucagon, which works together with insulin to turn food into energy (refer to Figure 1-1). Glucagon works very closely with the liver by stimulating glucose stored inside it. This is an essential step when you need extra energy and you're not eating. For example, you might release glucagon when you exercise or if you need energy between meals. As you can see, it's a delicate balance to get energy from the foods you eat, but also have access to energy whenever you need it.

High blood glucose is not good

The bottom line is that people with type 2 diabetes have too much glucose in their blood.

High blood glucose can create problems in the short term and long term. It's so important because it can make you feel crummy from time to time, but it can also cause dangerous complications down the road.

As blood glucose levels rise, your body tries to flush out extra glucose in your blood by filtering it through your kidneys and out through your urine. That's why people with undiagnosed or out-of-control diabetes pee a lot. So much peeing causes people to feel thirsty, dehydrated, and tired. Dehydration can also blur vision.

However, high blood glucose may not cause these symptoms in everyone. Or sometimes the symptoms just aren't that noticeable. People can walk around for years without any symptoms or knowledge that they have high blood glucose and diabetes.

In the long term, high blood glucose damages blood vessels and nerves. The damage can lessen blood flow throughout your body, from your heart to your head to your feet. This, in turn, can lead to complications like eye disease, heart disease, stroke, and kidney failure. You find out more about complications in Chapter 8.

The great news is that you can take active steps to lower your blood glucose by eating wholesome foods, exercising, losing weight, and taking prescribed medications. You don't have to experience problems in the short or long term. The most important thing to remember is that you can take control of your blood glucose and diabetes.

Paying attention to blood pressure

Two out of every three people with diabetes have high blood pressure or take medications to lower it. That's a big number. Blood glucose and blood pressure go hand in hand. Why? Because they're both related to your blood vessels.

High blood glucose can damage blood vessels, causing them to narrow and inhibit the flow of blood. This in turn can cause high blood pressure, which can lead to further damage such as a heart attack, stroke, or kidney failure.

Also, diabetes and high blood pressure share similar risk factors, including smoking, obesity, and eating foods high in saturated fats. For example, if you're overweight and smoke cigarettes, it's a double whammy on your body.

WARNING

High blood pressure doesn't have any symptoms. You won't know you have high blood pressure until you have your blood pressure checked by your healthcare provider. Make sure you have it tested every time you visit your doctor or nurse.

Most people with diabetes will have a goal of less than 140 mmHg for systolic blood pressure (the top number) and less than 90 mmHg for diastolic blood pressure (the bottom number) to reduce the risk of cardiovascular disease and other complications.

Different Types of Diabetes

So far, you've heard all about type 2 diabetes, but there are actually many different types of diabetes. The most common type by far is type 2 diabetes. It accounts for 90–95 percent of all people with diabetes.

Type 1 diabetes

Type 1 diabetes is another common type of diabetes. It usually comes on much more severely than type 2 diabetes. In general, people with type 1 diabetes have to take insulin right away to survive because their bodies don't make any insulin. They have to take insulin for the rest of their lives. This is unlike type 2 diabetes, which has a more gradual progression.

Type 1 diabetes used to be called juvenile diabetes because it typically occurs in children. However, adults can also develop type 1 diabetes. Type 1 diabetes is an autoimmune disease in which the body destroys its own beta cells and, therefore, can no longer produce insulin. Of all the people with diabetes, about 5 percent have type 1 diabetes. (The "Type 1 or type 2?" sidebar explains how doctors determine whether you have type 1 or type 2 diabetes.)

Gestational diabetes

Gestational diabetes is a type of diabetes that occurs during pregnancy. It usually goes away after giving birth but gives moms and their babies a lifetime risk of developing type 2 diabetes. Women with gestational diabetes are more likely to someday have type 2 diabetes. Their children are also more likely to develop type 2 diabetes and be obese.

Women with gestational diabetes can take medications, eat healthy foods, and exercise to manage their blood glucose during pregnancy. Uncontrolled blood glucose during pregnancy can increase the risk of preeclampsia and injury during birth because babies are large. When you've had gestational diabetes, you have a two in three risk for it in subsequent pregnancies.

TYPE 1 OR TYPE 2?

Sometimes it's not obvious at first whether someone has type 1 or type 2 diabetes. A blood glucose test only tells you that you have diabetes, not whether it's type 1 or type 2 or some other form. For example, some adults may have type 1 diabetes, but still have some insulin production. This makes it appear more like type 2 diabetes at first. This is sometimes called *latent autoimmune diabetes* (LADA).

Your doctor can give you a separate test to help determine whether you have type 1 diabetes. People with type 1 diabetes have antibodies in their blood that signal an autoimmune disease. So, a physician can give you a blood test to detect autoantibodies and diagnose type 1 diabetes.

Gestational diabetes is different from already having type 2 diabetes and becoming pregnant. Women with preexisting type 2 diabetes should try to have their blood glucose on target before they become pregnant. They also need to exercise, eat healthy foods, and often take medications to manage their blood glucose during pregnancy.


TIP

All pregnant women should be tested for gestational diabetes during the 24th to 28th week using the oral glucose tolerance test (see Chapter 9 for more details on tests to diagnose gestational diabetes). Then women with gestational diabetes should get a test for type 2 diabetes 4–12 weeks after giving birth and every 3 years thereafter.

Other types of diabetes

Type 1, type 2, and gestational diabetes are the main types of diabetes. However, they're not the only ones. Other forms of diabetes occur because of mutations in single genes. You can inherit these gene mutations, or they can occur out of the blue. Maturity-onset diabetes of the young (MODY) and neonatal diabetes mellitus are two of the most common forms.

Cystic fibrosis–related diabetes is another type of diabetes common in people with cystic fibrosis, which occurs because of scarring of the pancreas. This also destroys beta cells and stops insulin production.

Prediabetes

Prediabetes is another term you've probably heard alongside type 2 diabetes. And it's exactly what it sounds like. *Prediabetes* is a higher than normal blood glucose level that isn't high enough to be diabetes. One out of three American adults has prediabetes, although many don't know they have it; nine out of ten Americans who have prediabetes are undiagnosed.

Why does prediabetes matter? Well, it turns out that making changes to the foods you eat or exercising more can reduce your risk for diabetes. This is especially true for people with prediabetes. Finding out you have prediabetes can be a wakeup call to make changes to your lifestyle and health.

In one study called the Diabetes Prevention Program, people with prediabetes who lost 5–7 percent of their body weight through changes to diet and exercise reduced their risk of developing diabetes by 58 percent during the 3-year course of the study. This was a landmark study that showed that people at risk for type 2 diabetes can make changes to prevent or delay the disease.

How Is Diabetes Diagnosed?

A healthcare provider can diagnose diabetes by measuring the amount of glucose in your blood using a simple blood test. There are four main tests:

- **A1C test:** The A1C test is also called the hemoglobin A1C, HbA1C, glycated hemoglobin, or glycosylated hemoglobin test. Whew, that's a lot of different names for one test. To keep things simple, we'll refer to it as the A1C test.

  The A1C test measures your average blood glucose over 3 months. It's a picture of your blood glucose over time. It actually measures the percentage of hemoglobin (a protein) in your blood that has been *glycated* or attached to glucose over the past three months. You'll hear the number as a percentage such as 7 percent. A1C can be used both to diagnose diabetes and to measure how well you are managing your diabetes if you have it.

  For diagnosis, an A1C of 6.5 percent or more means you have diabetes. Prediabetes can be diagnosed with an A1C of 5.7–6.4 percent.

  You'll probably hear a lot more about your A1C because it's the test most commonly used to evaluate your diabetes. Your provider will give you an A1C test at every visit or at least three times a year. You can eat or drink what you want before you have an A1C test, so there's no need to fast.

- **Fasting plasma glucose test:** A fasting plasma glucose test can be used to diagnose diabetes. It's also a simple blood test, and it measures your blood glucose as a snapshot in that moment. So, it's different from the A1C, which measures your blood glucose over several months. You can't eat or drink anything besides water for 8 hours before a fasting plasma glucose test.

  A reading of 126 mg/dL or above means you have diabetes. Prediabetes can be diagnosed with a fasting plasma glucose of 100–125 mg/dL.

- **Random plasma glucose test:** A random plasma glucose test is another test to diagnose diabetes. Just like it sounds, it can be done "randomly" as a snapshot of your blood glucose. Sometimes healthcare providers do this test if you have other clear signs of diabetes. A reading of 200 mg/dL or above means you have diabetes.

- **Oral glucose tolerance test:** An oral glucose tolerance test can also diagnose diabetes by measuring how well the body uses glucose. You don't eat or drink anything besides water for 8 hours before the test. Upon arrival at the doctor's office, you'll have your blood drawn for a baseline measure. Then you'll drink a liquid with 75 grams of glucose. You'll have your blood drawn 2 hours later. If your reading is 200 mg/dL 2 hours after drinking the liquid, you have diabetes.

Table 1-1 shows the different types of tests used to diagnose diabetes and lists the readings that indicate whether you have diabetes or prediabetes.

TABLE 1-1 Criteria to Diagnose Diabetes

Test	Reading	Diagnosis
A1C	5.7%–6.4%	Prediabetes
	6.5% or above	Diabetes
Fasting plasma glucose	100–125 mg/dL	Prediabetes
	126 mg/dL or above	Diabetes
Random plasma glucose	200 mg/dL or above	Diabetes
Oral glucose tolerance test	200 mg/dL or above two hours after	Diabetes

Understanding Risk Factors

No one knows exactly why some people get diabetes and other people don't get diabetes. There is not a single test that can predict whether you'll develop type 2 diabetes. Instead, type 2 diabetes develops because of a combination of genetic and environmental factors. There isn't just one trigger.

However, there are known risk factors for type 2 diabetes that include your family history, race, ethnicity, and lifestyle. Finding out your risk for diabetes may empower you to make changes such as exercising more or quitting smoking.

Age is a significant risk factor because more people 45 years and older have type 2 diabetes than younger people. Everyone 45 years or older should be tested for type 2 diabetes once they reach 45 years of age and then every 2 years after that.

Family history is another important risk factor. Having a mom or dad, brother, or sister with type 2 diabetes puts you at risk, too. The genes you've inherited are a risk factor, although no one has pinpointed a "diabetes gene."

Your race and ethnicity can also put you at risk for type 2 diabetes. Native Americans, African Americans, Hispanics, Asian Americans, and Pacific Island Americans all have a higher risk of diabetes than non-Hispanic whites. African Americans and Hispanics are over 50 percent more likely to develop diabetes than non-Hispanic whites.

Gestational diabetes is another risk factor that gives moms and their babies a lifetime risk of type 2 diabetes. Women with gestational diabetes should be tested for diabetes after they give birth and then every 3 years. Staying active and breastfeeding your baby can help prevent type 2 diabetes later.

High blood pressure, bad cholesterol, and triglycerides also increase your risk for diabetes and heart disease. Smoking or using other tobacco products are contributors, too.

Use the following checklist to determine your risk for developing type 2 diabetes. If you have several risk factors, talk to your doctor about being tested. You can also go to `www.diabetes.org/risktest` to discover your risk for type 2 diabetes.

- Getting older, particularly people over 45 years.
- Being overweight.
- Having a family history of type 2 diabetes.
- Race/ethnicity: Native Americans, African Americans, Hispanics, Asian Americans, and Pacific Islanders have a greater risk of type 2 diabetes than non-Hispanic whites.
- Gestational diabetes.
- High blood pressure.
- High "bad" cholesterol and low "good" cholesterol.
- Not getting much physical activity.

Who Else Has Diabetes?

At the beginning of the chapter, you found out that over 30 million people in the United States have diabetes. In 2015, 1.5 million Americans (18 years old or older) were diagnosed with diabetes.

Americans aren't alone in their struggles against diabetes. About 422 million people had diabetes worldwide in 2014, with people in low- and middle-income countries struggling the most for access to basic care. Worldwide, its prevalence has nearly doubled from 1980 to 2014, according to the World Health Organization.

The statistics around diabetes are stark. And there is much work to be done. Understanding the basics of this disease is an important step in taking action for yourself and for your family and friends, too.