

written by
Harvard Medical School



Insulin Therapy

Managing Your Diabetes



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What Is Insulin?

The cells of your body need energy and one source of energy is sugar in your blood. Insulin is a hormone produced by your body that helps the cells in your body remove sugar (glucose) from your blood. Without enough insulin, your cells do not get enough sugar, and the levels of sugar in your blood are too high. As a result, a number of serious health consequences can eventually occur, including damage to your heart, kidneys, and eyes.

Who Needs Insulin?

Type 1 diabetes

People with type 1 diabetes aren't able to make insulin and must take insulin to control their blood sugar levels. When you are first diagnosed, you start with small doses of insulin. The dose is then adjusted over time. Your body's response to the hormone is determined based on your daily blood sugar monitoring. Most people with type 1 diabetes undergo what's known as intensive insulin treatment. It involves

3 or more insulin injections per day or the use of an insulin pump, in addition to frequent blood sugar monitoring.

Type 2 diabetes

People with type 2 diabetes have a different problem: cells in their body don't respond to insulin (a problem known as insulin resistance). Even though people with type 2 diabetes can still make insulin, they can't make enough to keep blood sugar levels from rising.

If you have type 2 diabetes, a variety of treatments can help control your blood sugar levels. The most important treatment is lifestyle: achieving a healthy weight by eating healthy foods and getting regular exercise. People newly diagnosed with type 2 diabetes are also advised to take metformin, a pill that improves the body's response to insulin.

Insulin must be taken by injection, using either a needle and syringe or a pen injector, which resembles a ballpoint pen.

If you still have trouble keeping your blood sugar close to normal levels (a fasting blood sugar of 100 mg/dl or an A1C of 7% or less), your doctor may recommend adding a second medication. This drug may be taken by mouth or as an injection, including insulin.

In the past, people with type 2 diabetes took insulin only if lifestyle changes and oral drugs did not control their blood sugar. Now, insulin is sometimes used as a first-line treatment in people with type 2 diabetes, based on evidence that starting insulin earlier in the course of the disease may help preserve the body's ability to make insulin.



How to Take Insulin

Insulin must be taken by injection, using either a needle and syringe or a device that streamlines the process. The most common of these devices is a pen injector, which resembles a ballpoint pen. It provides multiple accurate doses of insulin so you don't need to measure and fill syringes.

Preparing Your Dose

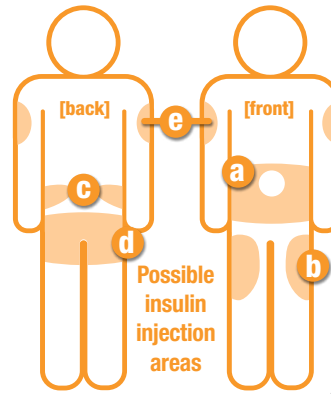
A diabetes educator will show you how to measure, prepare, and administer injections. Insulin comes in different formulations that differ in how they react in the body.

Types of Insulin

Type of insulin	Starts working	Peaks	Estimated duration
Very rapid-acting	15 minutes	1–2 hours	3–5 hours
Rapid-acting	30–60 minutes	1–2 hours	5–8 hours
Intermediate-acting	1–2 hours	4–8 hours	8–12 hours
Long-acting	1 hour	None	24 hours
	3–4 hours	6–8 hours	6–23 hours

Source: Harvard Health Report: Diabetes: A Plan for Living

You and your doctor will discuss what type, when, and how you should take your insulin. Each person's treatment is different. Insulin must be refrigerated or stored at room temperature, but not frozen. Discard insulin that has expired or looks strange.



Injecting Insulin

You can inject insulin in almost any fatty area under the skin: in your (a) abdomen, (b) thigh, (c) hip, (d) buttock, or (e) upper arm. It's a good idea to rotate the injection spots to avoid skin problems such as lumpy

fat deposits that may result if you inject the same area too often. Insulin is absorbed at different rates depending on where you inject it. In general, it is absorbed fastest through the abdomen, slowest through the thigh and buttocks, and at an intermediate rate through the arm. Areas with more fat tend to absorb insulin more slowly. You don't need to clean your skin with alcohol before injecting insulin unless the skin is dirty.

Then follow these steps:

- 1) Pinch up a fold of skin and quickly insert the needle at a 90-degree angle. Keep the skin pinched to avoid injecting insulin into the muscle.
- 2) Push the plunger down to inject the insulin and hold the syringe and needle in place for 5 seconds.
- 3) Release the skin fold and remove the needle.



People with type 2 diabetes who need insulin usually require only 1 or 2 injections per day. People with type 1 diabetes, who usually need 3 or more injections daily, may also receive insulin through a pump. This device consists of a pump (worn in a pocket or on a belt) that attaches to the body through a long, thin, flexible tube tipped with a needle, which is left in place under the skin. The pump stores insulin in a cartridge and is programmed to release a small dose of insulin throughout the day and night.

Adjusting Your Insulin Regimen

Once you begin taking insulin, you will need to check your blood sugar often to make sure the number falls within a normal range. The optimal range varies depending on when you last ate a meal.

Optimal Blood Sugar Values

Time	Blood sugar
Before a meal	70-130 mg/dL
2 hours after a meal (peak blood sugar levels)	Less than 180 mg/dL



Your insulin needs will vary depending on a number of factors, including:

- Your weight.
- When and how much you eat.
- The amount of exercise you do.
- Any other drugs (especially diabetes medications) you are taking.
- Your blood sugar levels and whether they are under control.
- How well you are able to follow a complex regimen or program.

Work with your healthcare provider to adjust your insulin regimen to best suit your personal needs. Some regimens offer more flexibility in terms of how you time your meals and physical activity.

You should also monitor your diabetes by getting regular A1C tests, a blood test that reflects your average blood sugar levels over the previous 2 to 3 months. The American Diabetes Association guidelines recommend an A1C test every 3 months until you reach the goal of an A1C of less than 7%, after which you can be tested every 6 months.

Once you begin taking insulin, you will need to check your blood sugar often





Common Misconceptions About Insulin

Here are some common myths and facts about insulin:

MYTH: Insulin injections are painful.

FACT: No one likes shots, but insulin injections hurt less than most types of shots. The needles used are very small and thin, and insulin doesn't sting going into the skin. Most people find that the injections are less painful than the finger sticks needed to monitor blood sugar levels.

MYTH: Insulin makes you fat.

FACT: Some people complain that using insulin causes them to gain weight. Although insulin can cause a tendency to gain weight, healthy eating and regular exercise allow lots of people using insulin to avoid gaining weight.

MYTH: Using insulin means that your condition is more serious than it is for people who don't use it.

FACT: Diabetes is a serious condition even if it is controlled by diet and physical activity alone.

Source: CDC/NIH: New Beginnings: A Discussion Guide for Living Well with Diabetes. Nov 2005. http://ndep.nih.gov/media/New_Beginnings_2005.pdf.

Dealing With Special Situations

Certain situations that break from your normal routine can complicate your diabetes treatment—especially your insulin needs. If you need surgery, for example, you won't be able to eat for 8 to 12 hours before the procedure and may not be able to eat a normal diet afterwards. You may require careful adjustments to your insulin dosing.

Even mild infections such as a cold can raise your blood sugar levels, so be sure to check your blood sugar more frequently than normal if you are ill, and check in with your healthcare provider.

Traveling can also make insulin therapy challenging—especially if you are traveling across many different time zones. Your eating and exercise habits will likely change, so be sure to keep careful track of your blood sugar levels.

Eating out can be tricky as well because food prepared in restaurants tends to be higher in calories and fat (as well as having larger portion sizes) than homemade food. Check nutrition information from restaurants or a pocket-sized reference book (such as Calorie King) to keep tabs on your diet, which will affect your insulin needs.



What to Do About Low Blood Sugar

Low blood sugar, or hypoglycemia, is a potential problem for anyone who takes insulin. It is more likely to occur in people with type 1 diabetes than those with type 2 diabetes.

Causes

Low blood sugar can result from:

- Too much insulin.
- Too much exercise.
- Too little food or carbohydrates.
- A missed or delayed meal.

Symptoms

Low blood sugar can cause a range of symptoms, ranging from mild to severe:

Mild

Hunger or nausea.	Fast heart beat.
Cold or clammy skin.	Sweating.
Feeling jittery or nervous.	

Moderate

Short-tempered feelings.	Excessive sweating.
Unsteady or trouble walking.	Blurred vision.
Nervousness, fear, or confusion.	

Severe

Pass out or faint.	Seizures.
Coma.	Death.

Treatment

Although it's a good idea to check your blood sugar if you suspect it is too low, often there just isn't enough time. Once you start to feel strange, eat or drink some sugar as soon as possible. About 10 to 15 grams of carbohydrates will do the trick. **Some good choices include:**



- ½ a can of regular soda.
- 4-6 ounces of fruit juice.
- 2 tablespoons of raisins.
- 6 small pieces of sugary candy, such as LifeSavers or jelly beans.
- Fast-acting glucose tablets (*available in drug stores*).

If you have diabetes, make sure you have 1 of these sugar sources available at all times, just in case.

Prevention

To avoid low blood sugar, test your blood sugar often, especially before, during, and after exercise, or if you have a change in your daily routine, such as travel or illness. If you find that you have low blood sugar frequently, learn to count the carbohydrates in the food you eat and match your pre-meal insulin dose to the carbohydrate levels and your current blood sugar value.

Be aware that beta-blockers, which are used to treat high blood pressure and heart disease, and alcohol can mask the early symptoms of low blood sugar and lead to more severe symptoms.

Source: http://www.diabetesnet.com/diabetes_control_tips/hypoglycemia_prevention.php



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