

# INSULIN PUMP THERAPY



An insulin pump is a small electronic device that delivers customizable rapid-acting insulin dosing throughout the day through a small tube (cannula) placed beneath the skin. If you have type 1 or type 2 diabetes and you use multiple injections of insulin daily, an insulin pump could be an option for you. Since it offers features that aren't available when injecting insulin by pen or syringe, insulin-pump therapy can often improve your A1C, as well as the length of time that your glucose levels are in a safe target range.

The continuous delivery of rapid-acting insulin by the pump 24 hours a day is referred to as **basal** insulin, which replaces your long-acting basal insulin that you may inject once or twice daily.

**Bolus** insulin delivery is given at mealtime using a preset **insulin to carbohydrate ratio (I:C ratio)**, a calculation that focuses on matching 1 unit of rapid-acting insulin with a self-estimated measurement of carbohydrate grams you plan to eat at your meal. This dose will cover the food you are eating, attempting to keep your blood glucose levels at a target that you and your healthcare provider have predetermined is safe and appropriate for you. The bolus insulin dose is further increased to correct your blood glucose values if they are above this targeted goal. This "**sensitivity**" or "**correction factor**" is a set ratio based on an estimate of the specific amount that 1 unit of insulin will decrease your blood glucose. The pump uses a built-in calculator to determine these bolus doses, so it will do the math for you!

The length of time that an insulin bolus dose is active in your system is called the **active insulin time** or **insulin on board**. This reflects how much insulin remains active in your body and is still working from a prior insulin bolus injection. If your glucose is elevated and you think you may need additional insulin to lower it, using this calculation guides you on how much additional insulin you may need and how soon, so it doesn't overlap the prior dose. This calculation decreases your risk for low blood-glucose levels. If you do not currently use ratios when injecting your insulin, you can meet with a diabetes health team to learn this method.

Some of the available insulin pumps use a small plastic tubing with a small insertion needle or plastic cannula leading from the pump and placed under the skin. Another pump, a tubeless one, is adhered directly to the skin with insulin flowing into the body through a small cannula that is inserted from a "pod" under the skin. These "pod" pumps are managed by a remote handheld device. You must change the site where your pump is inserted into your body every 2-3 days. It is personal preference whether you choose a tubed-tethered pump vs a tubeless one.

Pumps can be used with a blood-glucose meter or a continuous glucose-monitoring system (CGMS), providing you with measurements of your blood-glucose levels to help you decide on how much insulin you may need. You must input these glucose values in order for the pump to give you a bolus insulin dose to cover incoming food and to correct a glucose level that is higher than your goal.

Some pumps are paired to the CGMS sensor, so the blood-glucose value is communicated continuously to the pump from the CGMS. These pumps are called "hybrid closed-loop systems" and make background adjustments to the basal insulin delivery or even temporarily suspend the delivery based on the glucose information shared every 5 minutes with the pump. More pumps will offer this technology in the future.

These ongoing background adjustments to your basal insulin dose improve your overall blood glucose and A1C and further decrease risks for hypoglycemia. However, these "hybrid" systems only adjust that basal insulin dosing. You must still enter the carbohydrates consumed at mealtime and your blood glucose, so that the pump can calculate the dose to cover incoming food and correct glucose elevations.

Insulin pumps can help you be more precise with your insulin dosing, eliminate injections, and provide you with more flexibility in your lifestyle. However, you must be consistent with monitoring your blood glucose or wear a CGMS to obtain the glucose data necessary to properly utilize the pump. Should you decide to use an Insulin pump to help you control your diabetes, you could work with diabetes care professionals who can provide training on safe pump operations, as well as problem-solving skills to keep you safe.

If you are interested in learning more about insulin pumps or how to use this technology, speak with your health care provider.