

# Managing Hyperglycemia

UNDERSTANDING GLP-1 RECEPTOR AGONISTS

*People with type 2 diabetes experience two problems related to insulin: 1. decreased insulin production; and 2. insulin receptors in the body that do not respond to insulin.*

However, insulin is not the only hormone working poorly when someone has diabetes. In fact, people with type 2 diabetes also do not make enough of the family of hormones called incretins. They include gastric inhibitory peptide (GIP) and glucagon-like peptide-1 (GLP-1 receptor agonists). The incretins are released from the gut, or intestines, after eating.

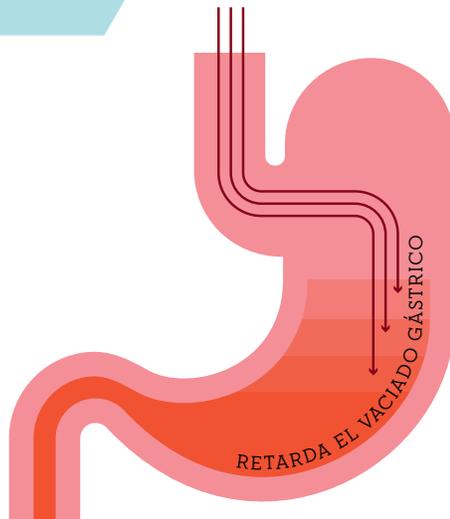
Man-made GLP-1 receptor agonists, commonly referred to as GLP-1, are a class of medications that copy the actions of naturally occurring GLP-1. These drugs replace lost GLP-1 and provide improved benefits. Like insulin, these medications would be destroyed by stomach acid if taken by mouth, so they must be injected under the skin to work.

## WHAT IS THIS MEDICATION USED FOR?

GLP-1 medications are used in addition to healthy eating and physical activity, to lower blood glucose levels in people with type 2 diabetes. There are several different kinds of GLP-1 medications available. All can be used alone or together with other medicines. The primary difference between them is how often you take them, ranging from twice-daily to once-weekly, and how many side effects might happen. In general, the once-weekly version causes less nausea and vomiting than those you take daily.

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### HOW DO GLP-1 MEDICATIONS WORK IN THE BODY?

When GLP-1 medications are released in the body, they do four things to help decrease blood glucose, or blood sugar, levels:

#### **SLOWS DOWN STOMACH EMPTYING**

GLP-1 medications help keep food in the stomach longer. That way the body can absorb food better as it moves more slowly through the intestines.

#### **REDUCES GLUCAGON SECRETION FROM THE PANCREAS**

Glucagon secreted from the pancreas tells the liver to send glucose into the blood stream. By reducing the amount of glucose released into the blood stream, this helps keep blood glucose levels stable between meals.

#### **INCREASES INSULIN RELEASE FROM THE PANCREAS**

Insulin needs to be released when eating so that glucose from the meal can be used. This helps keep blood glucose levels stable during meals.

#### **PROMOTES THE FEELING OF BEING FULL IN THE BRAIN**

Incretin receptors in the brain receive a signal so that the body knows it is time to stop eating.



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### **BENEFITS OF GLP-1 MEDICATIONS**

#### **IMPROVED BLOOD GLUCOSE LEVELS**

By having more normal incretin action from GLP-1 medications, people with type 2 diabetes may improve their A1C level by 0.5 to 1.6 percent. This can even occur in people who already take insulin. If they use more than one kind of insulin and take injections before meals, GLP-1 medication can be used instead of pre-meal injections. This can lower the A1C as well as pre-meal insulin can, but with less weight gain and lower risk of low blood sugar. These results support GLP-1 medicines as the preferred option for individuals on 2 or 3 oral agents who require additional therapy.

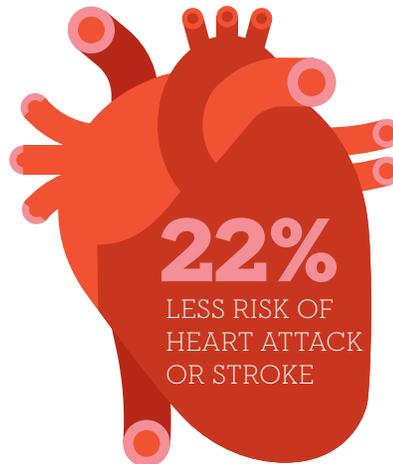
#### **WHAT IS A1C?**

The average blood glucose level of someone over 2 to 3 months.



#### **WEIGHT LOSS**

Many people lose 5 to 7 pounds in the first 6-months. For those struggling to lose weight, adding a GLP-1 medication can be very helpful.



#### **DECREASED RISK OF HEART ATTACKS AND STROKES**

People with type 2 diabetes are twice as likely to have a heart attack or stroke as their neighbors without diabetes. New research suggests that GLP-1 medications may lower the chance of death from these complications by as much as 22%.

Based on this research, GLP-1s are now strongly recommended by the American Diabetes Association (ADA) for people on metformin who have already experienced a heart attack and for those at very high heart disease risk.

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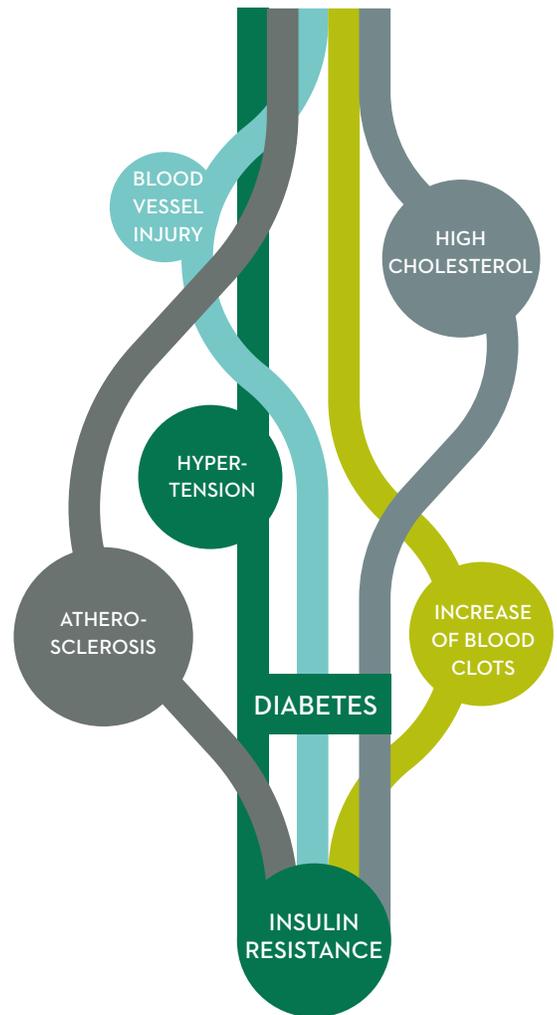
## *Understanding GLP-1 Receptor Agonists*

### HOW DO GLP-1 MEDICATIONS REDUCE HEART RISK?

These medications have been shown to lower blood pressure and cholesterol levels. How these medicines help the heart and blood vessels is unknown. One reason might be because heart disease and diabetes both come from the same basic problem of insulin resistance. As the body becomes less able to meet the need for enough insulin to control blood glucose, cholesterol levels also begin to rise. This can lead to high blood pressure and damage to blood vessel linings. The arteries may become so damaged and clogged that a heart attack or stroke may occur. Because GLP-1 medications work in so many ways, they not only help control the problem but may also directly work on insulin resistance.

### WHAT ARE THE POTENTIAL SIDE EFFECTS OF THESE DRUGS?

Sometimes GLP-1 medications can cause nausea, diarrhea or vomiting. These usually get better and may stop after a few weeks. Sometimes there can be irritation (bumps, redness, swelling and pain) where the medicine was injected.



Unlike insulin, GLP-1 medications used alone do not cause low blood glucose.

In rare cases, pancreatitis and gallbladder disease have been reported with these medications. Signs of pancreatitis and gallbladder disease may include stomach and back pain with upset stomach and nausea. If these symptoms occur, call your doctor right away.