

# New Type of Insulin Could Be a **Breakthrough**

*By Kevin Gault*



**For people with type 1 diabetes, managing daily doses of insulin to achieve steady blood sugar levels is a never-ending challenge. But there's hope that a new type of insulin will make that daily struggle a thing of the past.**

SmartInsulin, a promising drug that is in early-stage clinical trials, is designed to release insulin only when a person's glucose levels are high. The potential benefits of this groundbreaking form of insulin are once-a-day injections, near-normal blood sugar levels and no risk of dangerously low blood sugar (hypoglycemia).

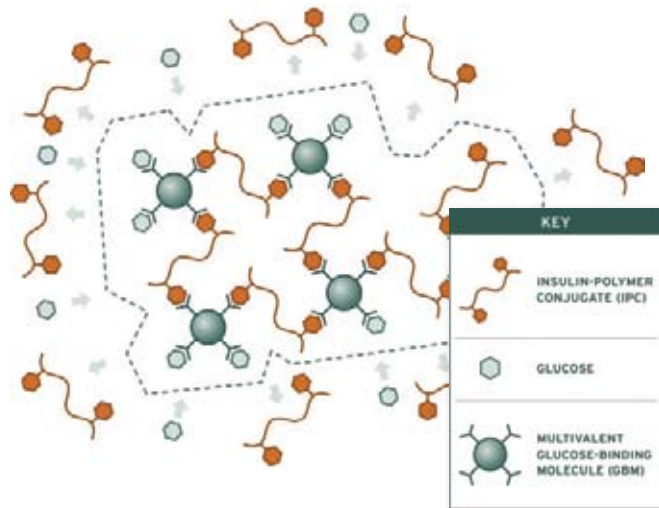
"Insulin currently comes in two forms—fast acting and long acting," explains Dr. Aaron Kowalski, director, Metabolic Control at JDRF. "When you inject either form, it works over a certain amount of time. This new product only releases insulin in response to glucose levels. When a person's glucose level is low, SmartInsulin stays inactive. But when glucose crosses a certain threshold, the insulin becomes available to work."

"This is very appealing for people with type 1 diabetes because instead of needing an insulin injection every time they eat and having drastically different insulin rates throughout the day, SmartInsulin makes the right amount of insulin available only when they need it."

### INSULIN AT THE RIGHT TIME

Engineers at the biotech company SmartCells, Inc., based in Beverly, Mass., developed SmartInsulin by attaching insulin to a biodegradable polymer. The polymer contains "binding molecules" that hold the insulin in place until a person's glucose levels rise. When glucose reaches higher levels, the polymer sheds insulin into the bloodstream.

"This drug works because of a tried-and-true process in



molecular biology called 'competitive binding,'" explains Kowalski. "The researchers at SmartCells have figured out a way to make a molecule in which insulin binds to the polymer when glucose levels in the body are low. But when glucose levels become higher, the insulin tends to bind to the glucose. That's how you get the insulin release at the right time."

### PROMISING RESEARCH

Research on SmartInsulin is in the pre-clinical stage and more testing needs to be done before it's available to patients, but animal testing has produced promising data.

In one experiment, researchers injected SmartInsulin into diabetic animals and followed those injections with injections of sugar to simulate a meal. Continuous glucose monitors tracked blood-sugar concentrations in the animals, and researchers noted the amount of insulin released in response to the increased glucose. The researchers observed that SmartInsulin can sense

and adapt to fluctuating glucose levels and deliver insulin as needed.

"With any person taking insulin, it's difficult to predict how blood sugar will swing after a meal, and there's always the dangerous risk of accidental overdose of insulin," says Todd Zion, Ph.D., president and co-founder of SmartCells, which got its start at the Massachusetts Institute of Technology. "Our formulation is designed to address the most critical issue in diabetes treatment—achieving tight glucose control without inducing severe hypoglycemic episodes."

"To accomplish this, patients will inject SmartInsulin only once a day using the same needles that are currently used for conventional insulin. We expect that these important treatment benefits will improve patient safety and quality of life while reducing diabetic complications."

In addition to providing appropriate doses of insulin for people with type 1 diabetes, the proprietary dosing technology

developed by SmartCells could have broad applicability for thyroid and growth-hormone deficiencies, and infertility.

### JDRF SUPPORT

JDRF is helping to accelerate research on SmartInsulin by providing funding for key proof-of-concept trials and helping to develop the next generation of the drug. JDRF's goal is to propel the research to human clinical trials as quickly as possible.

The grant is part of JDRF's innovative Industry Discovery and Development Partnership Program, which supports companies developing drugs, treatments, and technologies to address type 1 diabetes and its complications.

"JDRF's support will accelerate the commercial development of our SmartInsulin therapy," says Dr. Zion. "We're very pleased to have JDRF involved in this program, and we share their commitment to the development of breakthrough treatments for type 1 diabetes."

According to Dr. Kowalski, the SmartCells team has engineered a potential medical breakthrough: "This drug could be a great step forward for people with type 1 diabetes because it addresses so many issues. It's not a cure per se, but for most people with type 1 the main issue is trying to maintain a consistent blood sugar pattern, and that's a very difficult challenge with current technology. To say that this drug has the potential to be an improvement for someone with type 1 diabetes is a vast understatement. It could transform their lives if the approach proves successful." ●