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DEVICES

'Smart' Gels Studied for Glucose Detection

A biological sensor for glucose currently under development may lead to a new era of implantable "intelligent drug delivery" devices, **Purdue University** researchers said in a statement released Tuesday. Such devices could be implanted in the body to release medications like insulin.

Purdue researchers created the "biomimetic" gel in such a way that it's "imprinted" for glucose molecules. This is accomplished by beginning with a gel containing glucose molecules, then washing the glucose away using a slightly acidic chemical. When the glucose-imprinted gel is placed in the blood, the glucose in the liquid diffuses into the gel and binds to the empty glucose-shaped spaces.

Similar materials might be used to create a future medical device that can sense the presence of glucose and possibly signal the release of insulin or other medications, researchers said.

"I'd be the first one to say that we have a lot of work to do, but our findings so far are very encouraging," said Mark Byrne, a **Purdue** doctoral student. "There's a lot of interest in glucose sensing for diabetes research, and that

has been the main focus of this work. However, we are also working on systems that bind other molecules that are important for the treatment of other conditions. Essentially, we are trying to design what nature has done so well, and that's a difficult thing to do. We are creating artificial binding sites."

Binding sites are the areas of molecules that allow them to attach to other molecules. The process is similar to the way a key fits into a lock. Binding sites must have the proper shape and other characteristics for them to bind to a specific molecule. In the case of the gel, it contains binding sites for glucose.

These sensing mechanisms may someday be incorporated into medical device implants. The sensor would be part of a meshwork containing medications inside many microscopic holes. Sensing glucose in the blood would cause the meshwork to expand, opening pores and releasing insulin or other medications.

"Ultimately, it would be nice to design something of this sort that would provide therapy for Type I diabetes. It would automatically sense when the glucose level was high, and then it would release an appropriate level of insulin.

Then, whenever the glucose level went down again, the polymer gel would intelligently stop the release of insulin," Byrne said in a statement.

Researchers said such applications probably will be at least five years in the future.

As reported in *Medical Industry Today*, diabetes affects about 16 million Americans and as many as 150 million people worldwide. About 700,000 Americans suffer from insulin-dependent diabetes, also known as Type I diabetes. People with the disease must inject themselves with insulin at least twice a day.

The research is supported by the National Institutes of Health, and the work is being conducted under the auspices of the recently formed Program in Therapeutic and Diagnostic Devices, which is supported by the National Science Foundation. The program brings together engineers from a broad range of backgrounds and expertise and was formed to train researchers in the field of biomedical devices, including artificial organs, biomaterials, controlled release devices and tissue-engineered materials.