Insulin pill could replace injections for diabetes

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Insulin pills to replace the injections necessary for those suffering from diabetes appear closer to reality through new research by chemical and biomedical engineers at The University of Texas at Austin.

The breakthrough addresses the problem of pills surviving stomach acids to later deposit their contents in the opposing alkaline environment of the small intestine. The chemical answer: place the insulin in a polymer hydrogel sensitive to these changes in pH levels, according to Dr. Nicholas Peppas, professor of biomedical engineering, chemical engineering and pharmaceutics at the university.

His newly developed gel can quickly transport insulin through stomach acids and then actually linger in the small intestine where insulin needs to be ingested.

When the insulin travels through the stomach's acids, the insulin-loaded gel expands and protects its precious contents. After safe passage to the small intestine's alkaline surroundings, the pill not only shrinks and releases insulin, but attaches to the intestinal wall so its contents releases for the extended period necessary to maintain consistently healthy blood sugar levels.

Peppas, a National Academy of Engineering member who has spent the past 10 years studying this problem, revealed his discovery in the April 14 issue of the American Chemical Society's monthly peer-reviewed journal, *Biomacromolecules*.

According to the American Diabetes Association, 20.8 million children and adults in the country, or 7 percent of the population, have diabetes and the number continues to rise.

Previous work by Peppas had demonstrated the effectiveness of the hydrogel barrier of molecules methylacrylic acid and polyethylene glycol (PEG) linked to form a porous polymer network and securely hold insulin inside. But once the insulin safely arrived at its destination, it passed too quickly from the small intestine to provide sufficient insulin into the bloodstream.

Peppas' addition of a form of the popular health food, wheat germ agglutinin, converted the hydrogel's stealth quality among stomach acids into a lingering characteristic among the higher pH alkaline intestine.

"We successfully increased the hydrogel's ability to attach to the upper intestinal tract for 10 hours," Peppas said. "In that time, most insulin that is released hopefully would pass into the intestinal wall and go into the blood."

Peppas has a patent pending on the work.

Source: University of Texas at Austin