Helping Diabetics Shed Pins and Needles

Callus-building finger pricks and multiple insulin injections characterize the daily lives of many diabetics. But light beams, pills and a few well-timed sniffs may someday replace those burdensome routines.

Last week, at the International Diabetes Federation Congress in Washington, D.C., researchers unveiled a blood sugar meter that doesn't require skin pricks and reported progress toward insulin nasal sprays and pills.

Diabetics strive to maintain healthy blood sugar levels by carefully managing their diet, weight and exercise, and in some cases by taking insulin or other medications. They track their blood sugar with monitors that require puncturing a finger for a drop of blood, in some cases four or more times a day. Now, scientists at Futrex Inc. in Gaithersburg, Md., have developed a simple monitor to end pincushion fingers. The hand-held, battery-powered device measures blood sugar by shining near-infrared beams through the skin of the fingertip or wrist and measuring the light's absorption. Robert D. Rosenthal, research director at Futrex, expects these painless, 6-second assays to encourage diabetics to monitor their blood sugar more often.

Earlier monitors required an initial, three-hour calibration by the patient's physician, but Rosenthal says the new version will need no personal calibration. Futrex expects to submit the device for FDA approval by next January, and Rosenthal estimates that its cost will compare favorably with that of standard testing methods.

Though the preliminary data appear promising, the meter "remains to be really tested in the field on the same person at different times," cautions Richard C. Eastman, clinical director of the National Institute of Diabetes, Digestive and Kidney Diseases in Bethesda, Md. The institute will conduct such tests independently later this year, Eastman says.

Nasal insulin, an idea more than 60 years old, may have finally defeated its major roadblock. In previous studies, absorption enhancers used to transport the insulin across the nasal mucosa proved unacceptably irritating to patients, but British scientists have now tested a nasal spray that incorporates lecithin, a natural component of cell membranes. In the small clinical trials conducted so far, the experimental spray has not posed an irritation problem, reports Rury Holman of the Diabetes Research Laboratory in Oxford, England.

His team conducted a double-blind, randomized trial in which 10 diabetics received a series of either single insulin injections or two to four puffs of insulin from a pen-sized sprayer, immediately before a meal. Blood insulin levels peaked just 36 minutes after volunteers received the spray, compared with 94 minutes after the injection, Holman says. Blood insulin levels also returned to normal much more quickly with the nasal spray than with the injection, potentially eliminating the need for between-meal snacks to avoid low sugar levels.

After participating in the study, "none of my patients ever want to go back to [pre-meal] injections," Holman says. The nasal spray would not replace morning injections of long-acting insulin.

"The major advance is quality of life," comments Boston University's James Melby, who conducted human tests of some of the earlier, irritating nasal sprays. Melby cautions, however, that the researchers need to confirm the absence of irritation in much larger trials. With such confirmation, a commercial product might become available within three to five years, according to the Danish company that developed the spray and the device for administering it.

Israeli scientists have set their sights on an insulin pill, which might conceivably eliminate all injections. "Basically, you have to protect the insulin and enhance its absorption," says biochemist Ehud Ziv of Hadassah Hospital in Jerusalem. His group accomplished this by adding sodium cholate to increase insulin's absorption and a soybean-derived compound to resist intestinal enzymes, and then packaging it all in stomach-acid-resistant microcapsules.

Like the nasal spray, the microcapsules produced short, steep insulin peaks in both dogs and humans. Ziv says oral insulin reduces the risk of low-blood-sugar incidents by mimicking the body's normal route for insulin. Unlike the injected drug, the oral form passes through the liver before entering the circulation.

French researchers describe similar success with oral insulin in rats. They used nanoparticles of insulin suspended in an oily mixture, which included agents that protect against stomach acids and digestive enzymes.

Insulin pills, still awaiting controlled clinical trials, remain a long way off, Ziv notes. While he envisions oral insulin eventually freeing diabetics from the syringe, he admits that others in his group view the pills only as a replacement for pre-meal injections. *– J. Travis*

Chemists devise new route to AIDS drugs

Just as couturiers dream up innovative ways to fashion apparel, drug designers seek out novel routes for creating their compounds. The ingenuity of two such chemists may eventually pay off with less costly drugs for fighting AIDS.

Zidovudine, also known as AZT, currently represents the most effective AIDS treatment and the only one to gain FDA approval. At Emory University in Atlanta, Michael W. Hager and Dennis C. Liotta have now developed a way to make zidovudine from simpler, less expensive starting materials. Their technique may also yield other, related compounds with antiviral activity, they suggest in the June 19 JOURNAL OF THE AMERICAN CHEMICAL SOCIETY.

Zidovudine belongs to a class of compounds called nucleosides, which slow infection by interfering with viral replication. Chemists usually synthesize new nucleosides by modifying naturally existing ones. These natural nucleosides are costly to obtain, but their complex structure ensures that the end product has the right molecular shape. Past attempts to start with simpler materials have generally yielded nucleoside mixtures that included undesirable chemical variants, Liotta says.

He and Hager took a completely different tack that allowed them to avoid nucleosides altogether and to use starting materials that can be mass produced inexpensively. They changed the reaction conditions so that the useful version of zidovudine would form slightly faster than the undesirable versions and would not convert into those variants, Liotta explains. "We never thought it would be as selective as it is," he told SCIENCE NEWS.

Some companies developing nucleosides seem interested. "It's a very unique way of going about making nucleosides, and it allows access to a number of other compounds that may have potential anti-HIV activity," says Stanley A. Lang, a chemist with American Cyanamid Co. in Pearl River, N.Y. The company is looking into Liotta's approach as it develops an AZT-like drug called FLT, he says.

Liotta emphasizes that the recent experiments are just a first step. "Some things scale up well and some things don't," he says. "You really don't know what will happen." *– E. Pennisi*