Digital Angel Developing an Implantable Glucose-Sensing RFID Tag

The company was awarded a patent for an RFID-enabled sensor tag it hopes will one day help diabetics more closely monitor their blood-sugar levels.

By Beth Bacheldor

Oct. 31, 2006—Digital Angel Corp., a St. Paul, Minn., maker of RFID tags for identifying and tracking animals and other assets, has begun developing an RFID-enabled sensor tag it hopes will make it easier for diabetics to monitor their blood-sugar levels.

The glass-encased tag, about the size of a grain of rice and implanted via a syringe into a person's forearm, will be similar to RFID microchips implanted in animals and humans today, according to Kevin McGrath, president and CEO of Digital Angel, a subsidiary of Applied Digital Inc.. Attached to the tag, protruding from the glass encasement and exposed to human tissue, will be metallic filaments that leverage glucose-sensing technology. McGrath says these filaments have been available for some time, acting as transducers that measure and translate electrical conductivity into glucose levels.

What's been missing has been a way for the measurements captured by the filaments to communicate their findings—this is where RFID comes in. When an RFID interrogator scans the microchip—it must be 6 inches or closer to get a read—the RF signal from the reader energizes the RFID chip, providing the electric current the filaments need to measure the glucose level. The filaments take a reading and share it with the RFID microchip, which transmits the data to the interrogator.

"There are 10 million to 13 million people [in the United States] who take blood-sugar readings by pricking themselves multiple times every day," says McGrath. If you could pass a scanner over skin and take a reading in a way that doesn't hurt and is convenient—you could easily do it sitting at your desk—the people that currently measure their glucose would be much better off, and the many who aren't doing it but should, probably would."

Last week, Digital Angel was awarded a patent for its design of the glucose-sensing RFID microchip. McGrath said this step was necessary before development could get underway. "There is a lot of money associated with developing these microchips," he says. "We'll probably spend $1 million to $2 million to develop it, so we decided to get the patent first. We didn't want to spend all that time and money, and then find out it wasn't patentable." The patent, No. 7,125,382, was granted on Oct. 24 and is titled "Embedded Bio-Sensor System."

A team of RFID scientists, engineers and doctors is now working on the microchip. Their biggest challenge will be to develop a sensor tag able to function for up to six months after being implanted in the body. Because the body views microchips and other implants as foreign objects, scarring often occurs that can block the filaments' ability to work. Moreover, McGrath adds, the electrical currents the filaments rely on to measure glucose levels actually speed up the scarring process. "We've found a way to use far less current to

stimulate the filaments, so fouling of the filaments doesn't occur as aggressively," he says. The glass casings on current implantable microchips protect them from any ill effects of scarring.

"There's still work that needs to be done to take the microchip from the design stage, and we are working with folks in the medical community to get the sensor tag to a stage where we think it will last and be reliable for six months." The goal, says McGrath, is for patients to swap out implants in alternating arms twice a year. In such a scenario, a doctor would remove the nonworking tag from one arm by making a small incision in the skin and insert a new tag via a procedure similar to giving a shot.

Digital Angel hopes to complete a prototype in a year, then begin clinical trials. Depending on the outcome of the trials, the company will apply for a license with the U.S. Federal Drug Administration some time after that date.

Once the product is ready to go to market, Digital Angel's sister company, VeriChip Corp., will market and distribute it. VeriChip, a subsidiary of Applied Digital, currently serves as Digital Angel's exclusive licensee in the area of human-implantable identification products. Digital Angel may also license the glucose-sensing microchip to other companies, McGrath says, such as drug and medical device distributors.

Work is underway to leverage RFID in other applications targeted at diabetics, as well. Cambridge Consultants, for instance, in collaboration with NXP Semiconductors (formerly Philips Semiconductors), reported in August that it had built an RFID-enabled prototype consisting of a glucometer and an insulin pump, designed to help diabetics better control the level of sugar in their blood (see Diabetic Device Uses RFID to Administer Insulin).