

A Revolution Awaits New Medical Patch

From the Sept 21, 2009 edition of Providence Business News

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Imagine using a cell phone to relieve an asthmatic patient suffering from shortness of breath or a diabetic patient struggling through a hypoglycemic attack. A quick call is all it could take with a new skin patch produced by Providence's Isis Biopolymer.

The IsisIQ Patch very much resembles a Band-Aid, but contains more technology than anything you would find in a standard first aid kit. This fully programmable skin patch eventually will deliver up to three drugs via molecular transportation through the skin. For many of those who require medicine via shots every day, it could end a patient's need for needle injections. The patch could also help patients who are averse to swallowing pills on a regular basis.

Transdermal drug delivery is not new to the medical field. Skin patches that administer nicotine or birth control drugs have been in the market for years. Isis Biopolymer, however, has produced a product that transports the older, bulky technology into a sleek, digitally interactive world.

The difference is Isis Biopolymer's patch contains a tiny, programmable microchip that can administer differing amounts of a drug at different times of day. Later generations of the patch will be capable of delivering up to three types of drugs via one patch. And, most of the settings will be controlled by wireless communication.

The company's manufacturer will initially preprogram the patch, expected to go on the market as early as the end of this year. Later, doctors or patients could program a patch by a click of a button or, remotely, with a cell phone. The company is currently in discussions with several pharmaceutical and biotechnical companies for developing and licensing opportunities.

Shawna Gvazdauskas, Isis' chief commercial officer, said the reaction from the medical field has been overwhelmingly positive.

"The drug companies see the value of this technology from both a patient and business perspective. With transdermal drug delivery, you can eliminate most of the side effects caused by absorption of the drug in the GI tract. This leads to better patient compliance and improved health outcomes," said Gvazdauskas. The list of medicines that could be administered via the Isis patch goes on and on, but Gvazdauskas said patients who suffer from sleep or behavior disorders, cardiovascular issues, diabetes or those who require analgesics would be likely candidates for the product. Approximately 80 percent of today's top 200 brand-name and generic drugs could be administered through Isis' patch.

A key scientific advancement of the patch is its delivery method, known as iontophoresis, a noninvasive way of propelling drugs through the skin via electromotive force.

Within Isis' patch, the drug and a hydrogel are stored just under a circuit. When turned on, a single electrode repels the like-charged drug to enter the body through a selective barrier membrane. When turned off, the selective barrier membrane closes to the drug, preventing further absorption.

One of the major concerns regarding transdermal drug-delivery patches has been the potential of overdosing, even when adverse reactions occur. In the event of a medical emergency, a biosensor within Isis' patch can detect skin emanations, such as those that indicate a heart attack, shock or a diabetic reaction, and immediately shut down drug transmission.

Isis Biopolymer is riding the market for transdermal products, which is estimated to grow from \$5.7 billion in 2006 to nearly \$8 billion by 2010 within the United States. Globally, some reports estimate that the market could rise to \$32 billion by 2015.

Transdermal drug-delivery products are one of the most dynamic and fastest-growing sectors of the pharmaceutical industry because of their patient-friendly and cost-effective attributes. The demand for low-cost, self-administered, at-home care has boomed most recently in an effort to relieve the government and corporations from the burden of health care costs.

Transdermal drug delivery patches have not always had their day in the sun. Historically, the skin patches have been the subjects of criticism because of manufacturers' limited, one-size-fits-all approach. Additional skepticism was spurred when skin patches could not easily control the amount of the drug being released. Occasionally, patients also suffered from adverse skin reactions to the adhesive on some patches.

Isis Biopolymer went about attacking each of these issues, primarily by working on advances in microprocessors, thin-film batteries, biopolymers and proprietary adhesives.

In March, the company earned pre-approval from the state of Rhode Island for a \$100,000 tax break through the state's new Innovation Tax Credit. The program offers investors and others a credit of up to \$100,000 off their state income tax bill in return for their commitment. And this summer, Isis Biopolymer exceeded its goal of fundraising \$2 million to pay for the clinical trials, purchase new equipment, and double its work force, which now stands at 10.