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Insulin delivery using solid micro needle patches in diabetic rats

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Diabetes mellitus is the 6th leading cause of death in the United States. In 2011, 17 million patients received treatment for type 2 diabetes and 700,000 additional patients begin treatment each year. The US annual economic burden for diabetes care reached $218 billion in 2007, and continues to rise. Insulin is delivered by subcutaneous injection, but this route has a negative effect on glycemic control in two ways. First, insulin uptake from the subcutaneous space is slow and often results in post-meal hyperglycemia and delayed hypoglycemia. Second, many patients resist insulin therapy due to a fear of needles and subcutaneous injections. Therefore, an alternative insulin delivery method may become paramount in maintaining adequate glycemic control. Current efforts to develop alternative insulin delivery methods (e.g., oral or inhaled) have had limited clinical impact due to variable uptake, poor bioavailability, long-term safety concerns, and poor acceptance from patients and clinicians. As an alternative novel approach, we developedsolidmicroneedle patches for insulin delivery. Microneedlesrange in length from 150 – 900 mmand have been developed to create transport pathways for small drugs, macromolecules, and fluid flow in a painless manner. The microscopic length permits delivery of fluid to capillaries but limits the extension into the abundant nerve-ending region of the dermis, thereby minimizing pain. Fluid delivery through a microneedle has been shown to be relatively painless as compared to a hypodermic needle. We delivered insulin to diabetic rats subcutaneously and through a solid microneedle patch and found that rats receiving insulin via the microneedle patch achieved statistically higher insulin levels and a greater reduction in glucose levels.

Biography

Eric Ian Felner received his Doctor of Medicine (1994) and Master of Science in Clinical Research (2008) degrees from Emory University, completed training in Pediatrics (1997) and Pediatric Endocrinology (2000) at the University of Texas Southwestern, and served as Division Chief (2001-2003) of Pediatric Endocrinology at Tulane University. He is an Associate Professor of Pediatrics at Emory University and directs the following programs: Pediatric Endocrine Fellowship, Pediatric Clerkship, and Endocrine Teaching Modules. His research focuses on delivery devices and immune-modulating therapy for patients with diabetes. He has published more than 50 manuscripts and book chapters and, has written an endocrine textbook.

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