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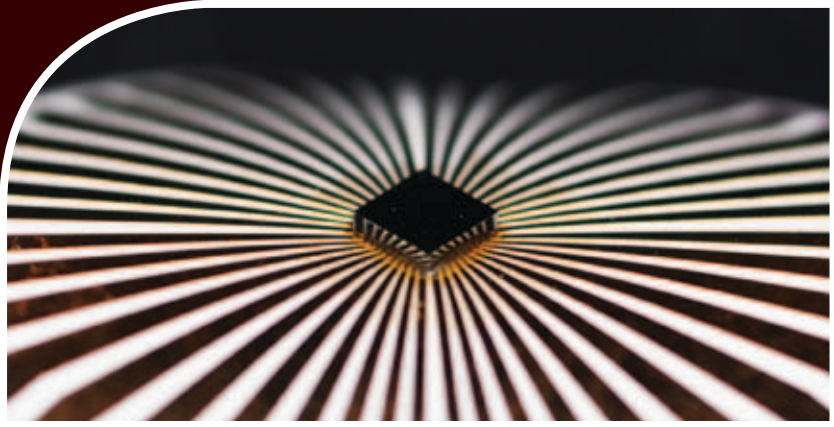
Advanced Platform Technology Center

A VA Research Center of Excellence



PROJECT OVERVIEW

Electrical Wound Therapy

Chronic wounds, such as ischemic wounds and pressure ulcers, are a leading cause of lengthy and repeated hospitalization for many veterans with disabilities. They are also among the most common causes of morbidity in the patient populations cared for by the VA. Electrical stimulation is a recommended treatment modality for severe chronic wounds, but its underlying physiological mechanisms are not fully understood. This has prevented the development of optimal treatments and limited its widespread clinical application.

We are developing a new electrotherapy delivery system, the Modular Stimulation System, that simplifies administration of stimulation and allows the systematic evaluation of its effects and will provide a basis for effective translation to the clinic.

The technology consists of a disposable single channel stimulator integrated into a flexible polymer carrier that can be affixed directly to the skin. The design combines advanced materials, microfabrication techniques and a simple, user-friendly communication interface to result in a novel medical device that should cost less than $100 to produce. The stimulation and control module is incorporated into a sterile occlusive dressing to conveniently and reliably deliver electrical currents without the inconvenience of wires that are prone to failure and could provide a path for bacteria to contaminate open wounds. Each device is suitable for up to one week of continuous use, after which the electric bandage can be easily replaced with another device individualized to optimize treatment to the current status of the healing wound. This simple, reliable, low-cost intervention can be used in a variety of settings, from the intensive care unit to the home and community environments.

Working prototype of the Modular Stimulation System for transcutaneous electrotherapy.

APT Center Contributions:

- Application specific integrated circuit design and fabrication
- Design controls and documentation within a quality system to facilitate future commercialization
- Assistance with intellectual property protection
- Project start-up and bridge funding
- Access to microfabrication and polymer processing facilities

Project Funding History:

Steris Corp/University Hospitals. Infectious Diseases Research Support, 2012 – 2013

US Department of Veterans Affairs, Merit Review F7129R, 2010-2013

2004 Presidential Research Initiative Grant, 2004 – 2005

Selected Publications:

"Reference gene identification for reverse transcription-quantitative polymerase chain reaction analysis in an ischemic wound healing model,"E, Ruedrich, M. Henzel, B. Hausman, K. Bogie. *J Biomolecular Techniques*. August 2013 In press

"Optimization of a rat ischemic wound model for evaluation of the effects of electrotherapy on wound healing," M. Henzel, D. Howe, J. Graebert, K. Bogie, *22nd Annual Meeting of the Wound Healing Society SAWC-Spring/WHS Joint Meeting*, Wound Rep Regen 20 A24, 2012

"A wearable stimulation bandage for electrotherapy studies in a rat ischemic wound model," D. Howe, J. Dunning, M. Henzel, J. Graebert, K. Bogie, *Conf Proc IEEE Eng Med Biol Soc.*, 2011:298-301, 2011.

"Evaluation of electrical stimulation for ischemic wound therapy: a feasibility study using the lapine wound model," K. Morris, M. McGee. J. Jasper, K. Bogie, *Arch Dermatol Res* 301(4):323–327, 2009

The **APT CENTER** is a Department of Veterans Affairs Rehabilitation R&D Center of Excellence that creates novel, cross-cutting technologies for the diagnosis, treatment or study of high priority clinical conditions within a structured framework that facilitates regulatory compliance, dissemination within the rehabilitation community and commercialization by outside manufacturers. Center projects focus on the following: prosthetics and orthotics, health maintenance, neural interface and enabling technologies. The Center has over 30 investigators, engineering and clinical staff, and support services including regulatory affairs, quality systems, project management and grants administration.

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