



clevelandFEScenter

Global Expertise in Neural Engineering



*MOVEMENT
RESTORATION*

*AUTONOMIC
SYSTEM*

*BRAIN
HEALTH*

PAIN

*TOOLS &
TECHNOLOGY*



Established in 1991, the FES Center is a consortium with institutional partners: Louis Stokes Cleveland VA Medical Center, the private educational institution of Case Western Reserve University and the public hospital system of MetroHealth Medical Center. In 2015 University Hospitals joined the consortium, and in 2017 the Cleveland Clinic Neurological Institute.

The focus of the Cleveland FES Center is to improve people's lives by supporting fundamental research in the neuromuscular sciences, developing new technologies and methods, performing clinical evaluation and feasibility testing, and promoting the widespread deployment of new technologies through professional education and commercial partnerships.



Why FES?



“A hallmark of our research activities has been collaboration. We have transdisciplinary teams of expertise in order to address the clinical problem at hand.”

Robert Kirsch, PhD
Executive Director

“A number of the researchers here at the Center moved to Cleveland because we wanted to help people. We want to have a chance that the work we do actually end up in a device that can help a number of people. It is what motivates us to do what we do.”

Ken Gustafson, PhD
Associate Director of
Research & Education

“Over the last decade, basic neuroscience has provided us with a template of understanding the networks of neurons that can be interacted with. This is exciting, allowing for new and really groundbreaking science that now have opportunities for clinical application.”

Cameron McIntyre, PhD
Associate Director of
Industrial Relations

“Collaborations, like the FES Center, between clinicians and engineers really require communication and an understanding how to speak different languages to ultimately serve our final mission, helping our patients.”

Ron Riechers, MD
Medical Director

What is FES?

The technique known as Neuromodulation, or Functional Electrical Stimulation (FES), is the application of small artificially generated electrical currents to either generate or suppress activity in the nervous system. This replaces the actions of neurons that have been damaged by injury or disease.

FES can “speak the language of the nervous system’ to produce and control the movement of otherwise paralyzed limbs for standing and hand grasp, activate visceral bodily functions such as bladder control or respiration, create perceptions such as skin sensibility, arrest undesired activity such as pain or spasm, and facilitate natural recovery and accelerate motor relearning. Because virtually all body functions are directly controlled or indirectly influenced by the nervous system, FES is a powerful, broadly applicable technique.

The programs of the Cleveland FES Center illustrate the breadth and depth of the technology being used to make a difference in the everyday life of people who have been affected by Stroke, Traumatic Brain Injury, Spinal Cord Injury, and other neurological conditions.



Culture

A trans-disciplinary alliance of active, passionate and committed professionals, in science and medicine, specializing in the fields of biomedical and neural research, engineering, medicine and rehabilitation. We embrace an open-door, collaborative, compassionate, and inquisitive engagement.

Together, we translate academic knowledge, neural technology, and clinical practice into *hope and progress.*



Technology

The Cleveland FES Center has the ability to conceive, fabricate, test, and produce advanced technologies addressing clinical applications. Our technological capabilities are divided into two segments; innovation and technical.

The innovation group is charged with identifying the cutting edge techniques, materials and concepts from across the industry for possible inclusion into FES applications.

The technical group is charged with fabricating small quantities of implantable and external devices to a quality level fit for human use.



Impact

The goal of everyone in the FES Center is to positively impact the lives of patients with neurological disorders using advanced neuromodulation technologies. While academic research can initiate new concepts for clinical care, we need to work together with the neuromodulation industry to turn those concepts into clinical reality.

Cameron McIntyre, PhD



Education

Developing technology and advanced science is most valuable if it is communicated effectively. The Cleveland FES Center is dedicated to the dissemination of information related to our work through hosting cutting edge scientific and community-based conferences, participation in presentations, professional publications, popular media features and community programs. Widespread deployment of new technologies is achieved through professional, educational and commercial partnerships.



Research

The scope of the Cleveland FES Center and applications of neuromodulation, or functional electrical stimulation (FES), have grown notably over the past several years. The FES Center has been a significant engine of this expansion. The scope of research of the FES Center has correspondingly evolved and expanded.

The Cleveland FES Center has five research thrusts:

Movement Restoration **Autonomic System**
Brain Health **Pain** **Tools & Technology**




Implantable Electrode Design

Epimysial & Intramuscular Electrodes

Both electrodes have a tandem conductor close coiled lead wire from the connector, covered with a silicone tube ("closed helix"). The epimysial electrode terminates in a Pt-10 Ir disc mounted in a silicone backing reinforced with Dacron. The intramuscular electrode has a stainless steel stimulating area wound around the lead's distal end.

Myoelectric Signal (MES) Electrode

The MES electrodes are bipolar epimysial electrodes surgically implanted on the fascia of the target muscle. They are made of two 4mm diameter Pt-10 Ir discs mounted on a medical grade Dacron reinforced silicone backing. The discs are positioned 10mm apart. The distal lead wires for the bipolar MES electrodes begin with a Y-junction and run together to the distal recording electrode pair, with an impedance of 2 Ohms/cm.



Cuff Electrode

This automatic spiraling electrode is designed to form to the natural shape of the nerve. The cuff electrode has four contacts that can be grouped together to create a stimulation that will activate groups of muscles.

To place an order or for more information on electrodes contact:

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