Discovery may have implications for diabetes management and therapy

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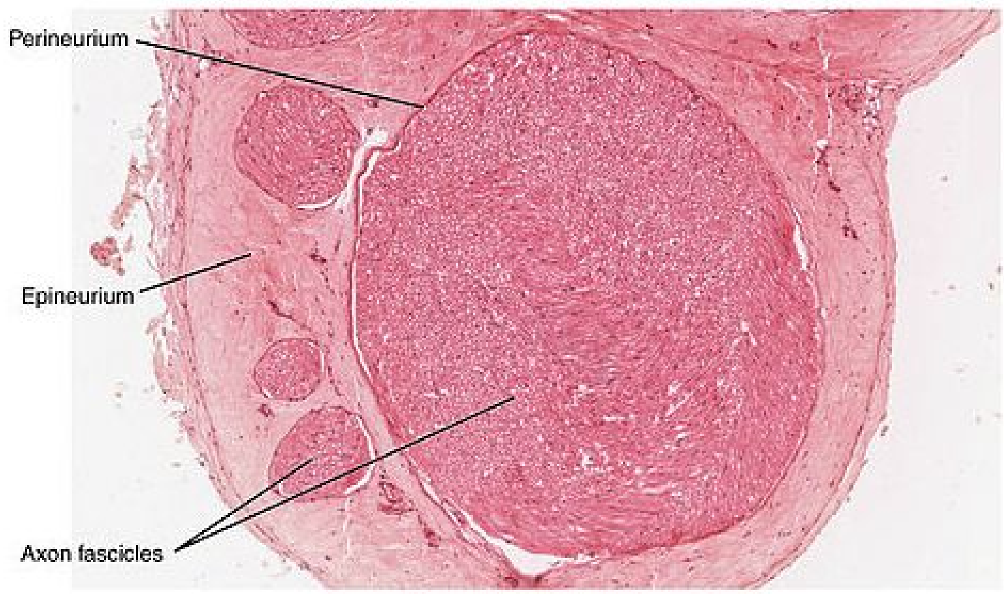

Cross-section of a nerve. Credit: OpenStax College/Wikipedia

Theodoros Zanos, Ph.D., head of the Neural & Data Science Lab & assistant professor at the Institute of Bioelectronic Medicine, The Feinstein Institutes for Medical Research, and his collaborators, discovered how the vagus nerve relays signals from the periphery to the brain to help regulate glucose, potentially uncovering a new way to measure blood glucose levels. This finding progresses research into future bioelectronic medicine treatments and diagnostics for metabolic syndrome and diabetes. The findings were published today in the

Springer Nature journal, *Bioelectronic Medicine*.

In humans, glucose is the primary sugar for high energy demanding cells in brain, muscle and peripheral neurons. Any deviation of normal blood glucose levels for an extended period of time can be dangerous or even fatal, so regulation of blood glucose levels is a biological imperative. Prior research showed that the vagus nerve, which connects to many major organs in the body and communicates changes in the body to the brainstem, plays a role in regulating metabolism. Because the specifics of how this was accomplished were largely unknown, Dr. Zanos and his colleagues' sought to identify the specific signals relayed from the periphery to the brain that responded to changes in glucose levels. By deciphering these signals, they can better understand when and how to stimulate the vagus nerve to regulate metabolism.

"One of our goals is to understand the neural code of the vagus nerve as it related to different conditions, because we believe by listening to and stimulating this nerve, we can open new possibilities to diagnose and treat various diseases," said Dr. Zanos. "The vagus nerve is one of the major information conduits of the body with an average of 100,000 nerve fibers, making this code difficult to pick up and decipher, so we have a lot to learn. We're excited to demonstrate in this most recent study that the vagus nerve of a mouse transports important signals from the periphery to the central nervous system related to glucose homeostasis—this discovery gets us closer to new technologies that will have the potential of helping many patients living with various metabolic diseases."

Dr. Zanos collaborated on this study with Feinstein Institutes researchers Emily Battinelli Masi, Ph.D., Todd Levy, MS, Tea Tsaava, MD, Chad E. Bouton, MS, and Sangeeta S. Chavan, Ph.D. Also co-authoring the article, titled "Identification of hypoglycemia-specific neural signals by decoding murine vagus nerve activity," was Feinstein Institutes President and CEO Kevin J. Tracey, MD.

"This discovery by Dr. Zanos and our bioelectronic medicine researchers give us new understanding of the body's neural signaling and offers hope for diabetes management," said Dr. Tracey.

Bioelectronic medicine is a new approach to treating and diagnosing disease and injury that has emerged from the Feinstein Institutes' labs. It represents a convergence of molecular medicine, neuroscience and bioengineering. Bioelectronic medicine uses device technology to read and modulate the electrical activity within the body's nervous system, opening new doors to real-time diagnostics and treatment options for patients.

Last year, Dr. Zanos and his collaborators were the first to decode specific signals the nervous system uses to communicate immune status and inflammation to the brain. Identifying these neural signals and what they're communicating about the body's health was a step forward for bioelectronic medicine as provided insight into diagnostic and therapeutic targets, and device development. Those findings were published in *Proceedings of the National Academy of Sciences* (*PNAS*).

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