

The Summer Undergraduate Research Fellowship (SURF) Symposium
6 August 2015
Purdue University, West Lafayette, Indiana, USA

The Effects of Vagus Nerve Stimulation on Neuroinflammation in Epilepsy

Elizabeth St. Clair, Gabriel Albors, and Pedro Irazoqui
Weldon School of Biomedical Engineering, Purdue University

Amy Brewster
Department of Psychological Sciences, Purdue University

ABSTRACT

Epilepsy is a neurological disorder characterized by chronic, unexplainable seizures. Recurring epileptic seizures are associated with long-term structural damage and cognitive deficits, and can even lead to sudden, unexplainable death. Approximately 30% of epilepsy cases are not responsive to medication. Epileptic seizures often induce inflammation in the brain and may increase the frequency of future seizures, resulting in a detrimental cycle. Vagus nerve stimulation (VNS) is a non-pharmaceutical treatment method for epilepsy that has been shown to reduce inflammation in peripheral pathways. The role of VNS in the modulation of neuroinflammation has yet to be demonstrated experimentally. To explore this, several cuff electrodes were attached to the left vagus nerve in an epileptic rodent model. The electrodes will deliver a biphasic square waveform continuously for up to two weeks and record the resulting action potentials from the nerve. Immunohistochemistry will be used to evaluate microglial activation in the hippocampus, an indicator of neuroinflammation. The anticipated results will show whether continuous stimulation of the left vagus nerve effectively reduces microglial activation in the hippocampus of the epileptic rodents. If so, these results would suggest that inflammation in the brain can be effectively modulated using VNS, thereby reducing structural and cognitive damage as well as seizure recurrence. In this way, VNS could be an effective and reliable treatment method for epileptic patients who are not responsive to medication.

KEYWORDS

Epilepsy, vagus, nerve, electrical, stimulation, inflammation, neuroinflammation, rodents