Neural Modulation Of Autonomic Nervous System To Alter Memory And Plasticity Of The Autonomic Network

Tech ID: 30525 / UC Case 2017-997-0

SUMMARY

Researchers at UCLA from the Departments of Medicine and Bioengineering have created a device that modulates the autonomic nervous system to treat heart conditions like arrhythmias.

BACKGROUND

The autonomic nervous system controls unconscious bodily functions like breathing and maintaining heart function. The cardiac autonomic nervous system includes the Vagus nerve and intrinsic cardiac nervous system. Modulating this system can provide therapeutic effects such as preventing cardiac arrhythmias (improper beating of the heart). Currently, pharmacological treatments, ablation therapies, and cardioversion (defibrillation) are used to treat arrhythmias like atrial fibrillation. Drug treatments have side effects (e.g. nausea, breathing problems) and can build a tolerance over time. Ablation and cardioversion usually require repeat procedures, can potentially lead to further complications like stroke, and still requires the use of medication after the procedure. Modulation of the autonomic nervous system provides a new avenue to treat heart conditions in patients where current treatments do not work.

INNOVATION

Researchers from the Departments of Medicine and Bioengineering have created a device that modulates the autonomic nervous system to treat heart conditions like arrhythmias. The device electrically stimulates the Vagus nerve to control heart function. In a canine study, stimulation of the Vagus nerve either prevented atrial fibrillation or dampened its effect 75% of the time and prevented further arrhythmias by reorganizing the autonomic nervous system. This success rate is comparable to the high success rate of ablation therapies, but without the side effects or the need for subsequent medication. This strategy has also been shown to work in other cardiac complications. In a guinea pig study, vagal nerve stimulation prevented maladaptive changes in cardiac structure and function seen after chronically overloading the heart.

APPLICATIONS

- Prevention of arrhythmias/atrial fibrillations
- Creates changes in the autonomic nervous system that can:
  - Modulate heart activity after traumatic events like heart attack to prevent further and compounding complications
  - Prevent maladaptive heart changes after traumatic events or from progressive heart complications
- Can also be used to also treat epilepsy and depression

ADVANTAGES

- Rapid therapeutic onset
- Can be reversible (unlike ablation)
- Effects last even after treatment is over
- Can be used for a variety of heart conditions, including progressive ones
- Has been shown to have beneficial effects in epilepsy and depression

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,642,530	05/09/2023	2017-997

Additional Patent Pending

RELATED MATERIALS

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OTHER INFORMATION

KEYWORDS

Heart, Cardiovascular, bioelectronics, electroceutical, circulation, arrhythmia, vagus nerve, neuromodulation, neurostimulation, autonomic nervous system, heart attack, medical devices, heart disease, implantable devices

CATEGORIZED AS

- **Biotechnology**
  - Health
- **Medical**
  - Devices
  - Disease: Cardiovascular and Circulatory System
- **Engineering**
  - Other

RELATED CASES

2017-997-0

▶ Salavation et al. Vagal stimulation targets select populations of intrinsic cardiac neurons to control neurally induced atrial fibrillation. Am J Physiol Heart Circ Physiol 311:H1311-H1320, 2016.

▶ Beaumont et al. Vagus nerve stimulation mitigates intrinsic neuronal remodeling and cardiac hypertrophy induced by chronic pressure overload in guinea pig, Am J Physiol Heart Circ Physiol 310:H1349-H1359, 2016.

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

▶ Vagal Suppression Of Neurally-Induced Atrial Fibrillation

▶ Spatio-Temporal Pacing and Recording for Evaluation, Induction, and Mapping of Arrhythmias

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