Docket #: S15-465

Electrical Neurostimulation of the Olfactory System for Nerve Regeneration

A Stanford University physician has developed a device to stimulate regeneration of olfactory nerves using minimally invasive electrical neurostimulation. The proposed device would be introduced endoscopically through the nose and target either the olfactory epithelium, sinonasal lining, cranial nerves or other intracranial neurologic structures for a predetermined amount of time.

Our sense of smell is key to our ability to enjoy everyday events such as eating, drinking, and experiencing the natural world around us. Even before the COVID-19 pandemic, over 20 million Americans experienced some form of the loss of sense of smell, and now there will be millions more. Yet there is no definitive treatment to jumpstart olfactory nerve regeneration and restore function. To address this need, a physician specializing in otolaryngology, with a courtesy appointment in neurosurgery, at Stanford University has developed a device to electrically stimulate olfactory nerves and induce nerve repair and regeneration. To determine whether electrical stimulation is a viable treatment method, researchers chemically damaged olfactory nerves in rats. One day after injury, a group of rats received one hour of continuous electrical stimulation at the olfactory bulb via electrodes placed intranasally. After one month, the treated rats improved their food-finding time compared to baseline whereas those who didn't undergo treatment had a worse score. This work shows that electrical stimulation of olfactory nerves can promote the recovery of neurons responsible for smell.

Given that there are over 200 causes of olfactory loss, the inventor proposes several device designs with which one can stimulate olfactory nerves. These include having a flexible probe that can accommodate nasal cavities of a variety of sizes and shapes, and having electrodes that can either stimulate the olfactory epithelium and olfactory nerve or olfactory bulbs. This invention is a minimally invasive device that

has the potential to provide an effective solution for a debilitating problem.

Applications

- Treatment of olfactory loss due to altered function of the: cranial nerve, nose, paranasal sinus, or ventral skull base intracranial structures such as the olfactory bulb or cortex
- Treatment of olfactory loss due to disorders such as: chronic rhinosinusitis, cranial neuropathy, or other intracranial pathology

Advantages

- No commercial olfactory stimulation devices currently available
- Minimally invasive medical device
- Can address a variety of olfactory injuries and disorders

Publications

- Patel, Zara. Electrical stimulation of olfactory neurons may improve regeneration after damage. Presented at: 66th American Rhinologic Society Annual Meeting. September 2020. Boston, MA.
- Bai, Nina. Sniff: Making sense of smell. *Stanford Medicine Magazine*(2023).

Patents

- Published Application: WO2022056310
- Published Application: 20240024664

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