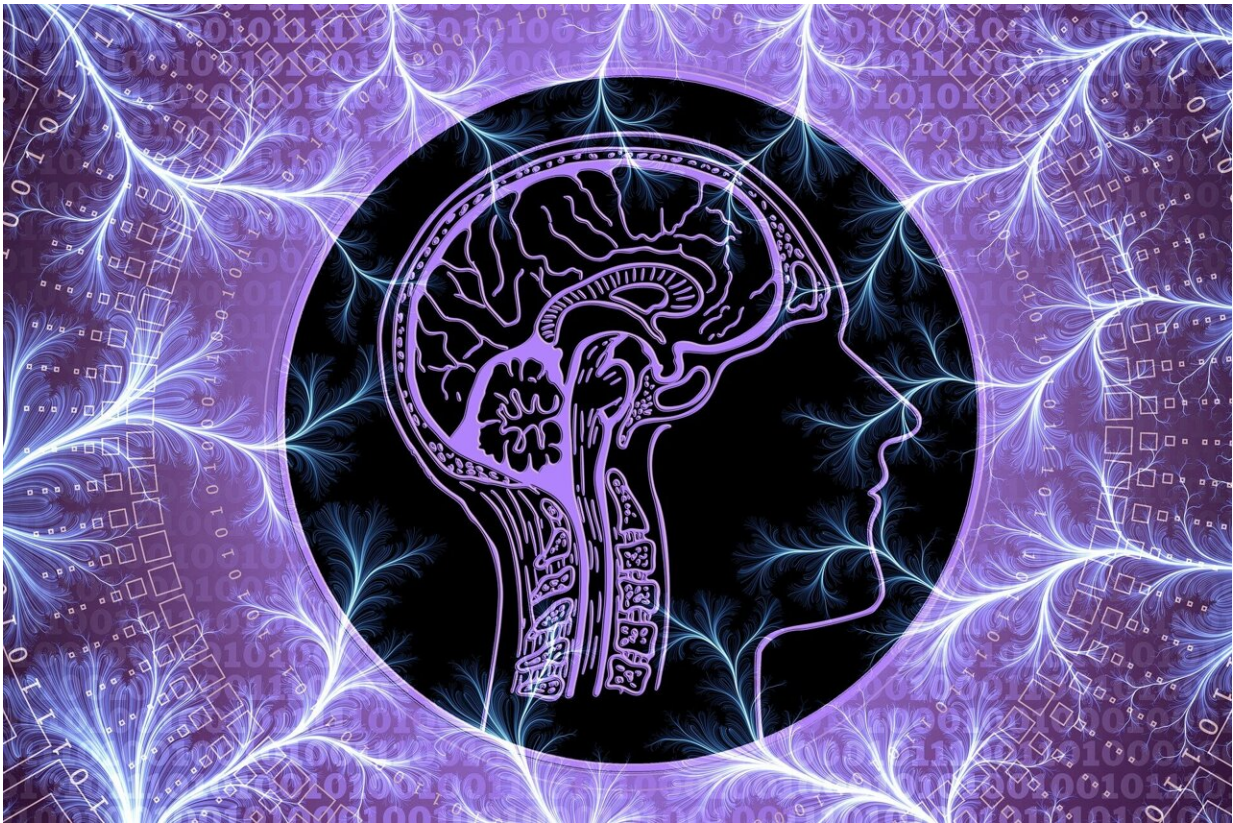


# Touching a nerve in the fight against chronic pain and diseases

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The human body's longest cranial nerve has the potential to improve health on numerous fronts, according to researchers.

Erika Folkes has almost given up on finding pharmaceutical solutions to her chronic pain, which is always present and can sometimes leave her in agony.

She has endured this kind of discomfort—defined as pain that lasts longer than three months—for decades. Some symptoms have been triggered by injury, notably whiplash from three car accidents, and others have resulted from simple body wear and tear.

## **Pain processor**

Aside from the occasional anti-inflammatory pill, [conventional medicine](#) barely eases the affliction felt by Folkes, an 83-year-old native of Austria.

"There are few, if any, effective pharmaceutical treatments for complex pain conditions," she said. "Nothing works."

Stefan Kampusch has some potentially heartening news for Folkes and the millions of other people like her across Europe. He led a [research project](#) that received EU funding to alleviate chronic pain by stimulating the longest cranial nerve in the body: the vagus.

Something of a "data highway," the [vagus nerve](#) runs from the brainstem at the bottom of the brain along the [spinal cord](#) to the colon, branching out on the way through the neck, chest and abdomen. Its job is to send crucial electrical messages back and forth between the brain and the body.

"The vagus nerve plays a key role in the processing of pain," said Kampusch, chief executive officer of an Austrian medical company named AURIMOD. "By stimulating it, we can target both the brainstem and brain circuits where pain is processed and controlled."

An estimated 20% of Europeans—[about 150 million people](#)—have some form of chronic pain. It's such people who might benefit from the results of Kampusch's EU-backed project, which ended in December 2022 after more than three years and was named AuriMod.

## System reset

The researchers developed a prescription-only [wearable device](#) to stimulate the vagus nerve. The trademarked product is called VIVO.

VIVO essentially gives patients a chance to "reset" their nervous systems. Signals reporting pain to the brain get subdued when the nervous system has become "stuck" in pain mode.

"We can correct the signals that say there's pain when there's no actual injury and we can delete the pain memory at a brain level," said Kampusch.

An evaluation of 148 people who have tested the vagus-nerve stimulation suggests it halves chronic lower back pain in around 60% of users within six weeks of treatment—a significant improvement on prescription pain medication.

The first generation of VIVO is available in mainly private clinics in Austria, Germany and Switzerland. In time, as approval and distribution plans develop, the device should be obtainable in more countries and through national health systems.

## Less invasive

It's a possible alternative to an existing system called the [spinal cord stimulator](#), which delivers electric pulses to subdue lower back pain.

The stimulator is considered a treatment of last resort offered only to a limited number of patients (for instance, an estimated 400 a year in Austria). It is both expensive and relatively risky, involving wire electrodes and a battery pack being inserted into the back.

As a result, demand for a less invasive alternative is high.

VIVO attaches behind the ear, with electrodes entering the skin close to where the vagus nerve weaves towards the visible portion of the outer ear.

Treatment—the intensity of which is tailored to the individual person—involves the nerve receiving constant stimulation (felt as a painless tingle) for seven days over an average of six cycles.

"We believe our device will offer chronic-pain patients a new line of therapy—hopefully one that will be more effective than the drugs available today," said Kampusch.

Folkes said that she was intrigued by a minimally invasive option such as VIVO and wished to learn more about it. She plans to raise the matter with her doctor.

A founding member of the [Chronic Pain Alliance](#), a patient-support group based in the Austrian capital Vienna, Folkes said she has trouble standing upright for much longer than five minutes because the beneficial effects of a back operation by her neurosurgeon three years ago have worn off.

"I will ask her to look into VIVO to see if it is something that could help me," she said.

Meanwhile, Folkes manages her symptoms through massage, physical

therapy and walks with her Labrador dog.

## **Bowel benefits**

Activating the vagus nerve, which is sometimes also called the "soul nerve" because of its complexity and sensitivity, can do more for people's health than dulling [chronic pain](#).

Such stimulation has also been found to improve mood, ease stress, aid digestion, help the heart and strengthen immunity.

"It seems that, every week, I hear of a new area of science that's investigating the health-promoting properties of the vagus nerve," said Dr. Eric Daniel Glowacki, a materials scientist at Brno University of Technology in the Czech Republic.

He leads an EU-funded project that aims to manipulate the vagus nerve to ease the symptoms of inflammatory bowel disease, or IBD, which affects as many as 3 million people in Europe.

Called [OPTEL-MED](#), the project runs for five years until the end of 2025.

Specifically, Glowacki's team is investigating a type of IBD known as Crohn's disease, which causes diarrhea, weight loss and malnutrition along with stomach [pain](#).

The researchers are developing an implant consisting of electrodes to stimulate the vagus nerve.

## **Light-powered implant**



The work is based on [growing evidence](#) that vagus-nerve stimulation at specific frequencies can have a dramatic impact on the spleen—an organ that is intimately involved in the body's inflammatory process.

"When the vagus nerve of Crohn's patients is stimulated at these frequencies, there's an overall drop in their splenic immune response and their symptoms ease and sometimes disappear completely," said Glowacki.

OPTEL-MED's goal is to create an implant that is both much smaller than any available today—a pacemaker, for example, is around the size of a matchbox—and doesn't require surgery every four to five years to change the battery.

The team's solution is for the implant to be powered by light in the red and near-infrared parts of the spectrum. At such wavelengths, light particles can penetrate skin and tissue to an implant located 2 centimeters beneath the skin near the collarbone, according to Glowacki.

"The idea is for the patient to place a device like a smart phone to their neck to activate the implant, which then stimulates the vagus [nerve](#)," he said.

To date, a super-miniature version of the device has been tested—safely and successfully—on mice and rats.

Next, the team plans to progress to larger mammals. Eventually, Glowacki hopes this wireless light-powered technology will be widely available to patients.

"We envisage people with Crohn's using their implants the way asthmatics use an inhaler," he said. "When they feel their symptoms coming on, they will hold up their phone and activate their device."

**More information:**

- [AuriMod](#)
- [OPTEL-MED](#)

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