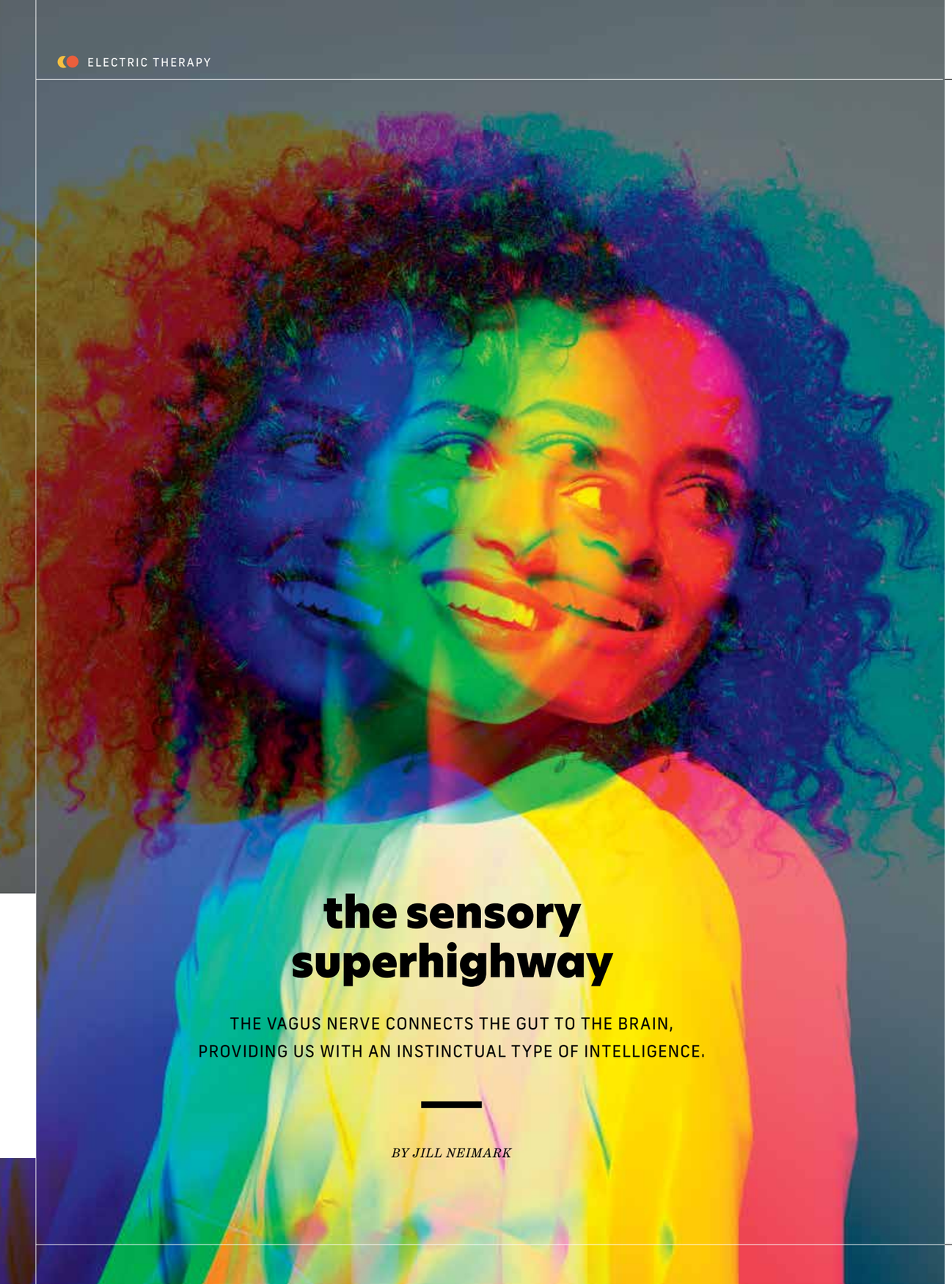

the sensory superhighway

THE VAGUS NERVE CONNECTS THE GUT TO THE BRAIN, PROVIDING US WITH AN INSTINCTUAL TYPE OF INTELLIGENCE.

BY JILL NEIMARK

YOU'VE GOT A SENSORY superhighway in your body—a unique nerve that emerges from your brain and branches out on either side of your neck, then travels like a patiently wandering pilgrim to your heart, esophagus, lungs, stomach, small intestine, liver, gallbladder, pancreas, and part of the colon and kidneys. It's called the vagus nerve and it's the longest nerve in your entire body.

Science is starting to pay close attention to the vagus nerve because it ferries sensory signals and information back and forth between the brain and the body, and has a profound impact on physical and mental health. The vagus nerve's primary job is to shift you into a state of rest and relaxation—or what is known as parasympathetic mode. It's when we are in this mode that our bodies repair and heal, inflammation is quieted down, blood pressure drops, heart rate slows and digestion improves. Around 80% of your body's parasympathetic nerve fibers are contained in the vagus nerve. In contrast to parasympathetic mode, sympathetic "fight-or-flight" mode prepares our body and brain for action, challenges and threats.

"The vagus nerve has the ability to stimulate the brain, including areas that play an important role in emotion," explains J. Douglas Bremner, MD, a psychiatrist at Emory University in Atlanta. "It also regulates a variety of processes in the body, including inflammation. Devices that stimulate the vagus nerve hold great promise for medicine."

The vagus nerve begins in the medulla oblongata, a long stemlike structure that is in the lower part of the brain stem, right above the spinal cord. The medulla oblongata connects the brain to the spinal cord and helps regulate everything from respiration to cardiac function, vasodilation and reflexes such as vomiting, coughing, sneezing and swallowing, all part of the unconscious but critical parasympathetic nervous system. To regulate the body, the parasympathetic nervous system depends on information from the vagus nerve, as well as feedback from other parts of the brain.

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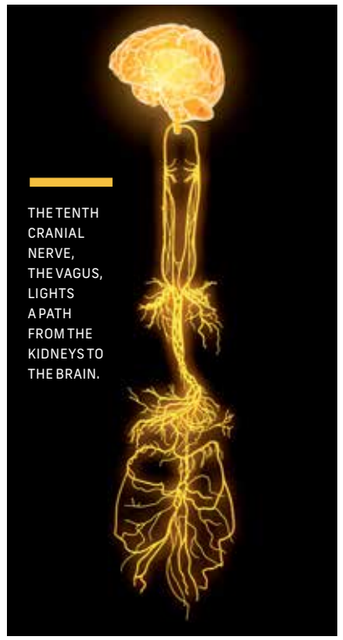
>
> *J. DOUGLAS BREMNER, MD, EMORY UNIVERSITY*



THE TENTH CRANIAL NERVE, THE VAGUS, LIGHTS A PATH FROM THE KIDNEYS TO THE BRAIN.

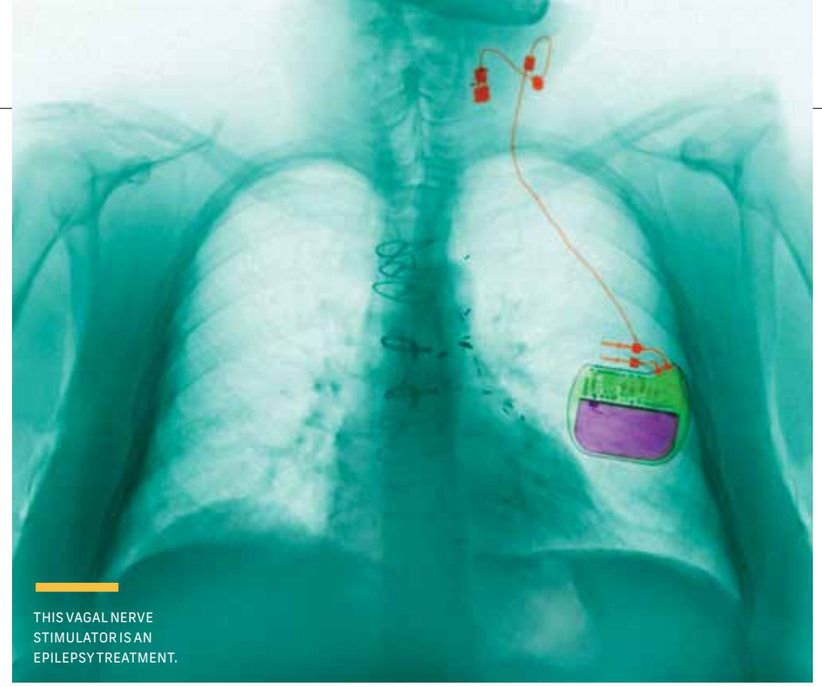
Making the Connection

The vagus nerve helps explain the connection between body and mind. An astonishing 30% of our total stomach acid is regulated by the vagus in response to the mere smell, taste and thought of food. Picture fresh cookies hot out of the oven, or a sizzling pepperoni pizza with extra melted cheese, and the mere thought will stimulate your vagus nerve to increase stomach acid. But that's not all that happens when you digest. Vagal nerve fibers in the gastrointestinal tract detect changes in nutrients and molecules needed for digestion. They transmit the information to the brain and then send back the brain's response to those tissues, which respond by secreting or inhibiting various molecules involved in digestion and immune function.

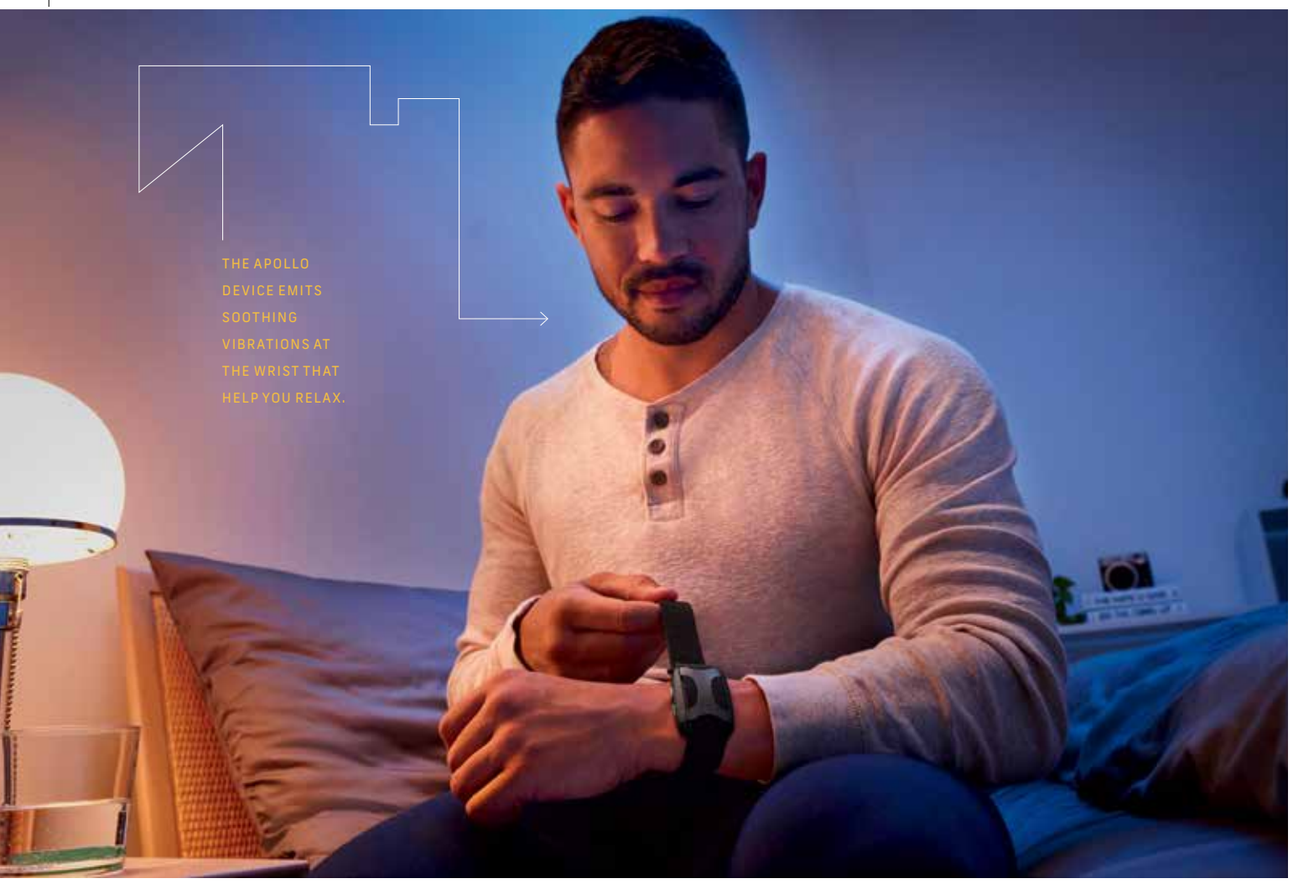
Given the power and reach of this single nerve, and the many tissues it travels through, it's not surprising that it can impact heart disease, epilepsy, depression, digestion and immune function. Indeed, therapies that stimulate the vagus nerve have already been approved by the Food and Drug Administration for treatment-resistant depression as well as epilepsy. Studies have shown both conditions improve significantly with vagus nerve stimulation, even when other therapies have not helped. One five-year study of 795 patients who suffered from severe, treatment-resistant depression found that 43% of those receiving vagus nerve stimulation went into remission. Another study of severe depression

and vagus nerve therapy found that learning, memory, verbal fluency and other cognitive abilities improved.

In Europe, devices to stimulate the vagus nerve have been approved for epilepsy, depression, pain, chronic heart failure, headaches, reactive airway disease and irritable bowel syndrome. In addition, the therapy has been studied and found beneficial for inflammatory and autoimmune conditions like rheumatoid arthritis. The vagus nerve might help these conditions in part by regulating inflammatory responses, which originally evolved to help protect us when facing stressful events, says Bremner. "You release inflammatory molecules during stress, for instance when you are about to get into a fight and might get injured," he points out. "It could be adaptive to have an inflammatory response, which might help prevent infection from a cut or wound." But we know all too well that modern-day chronic stress can create chronic inflammation that harms, not helps, the immune system.



THIS VAGAL NERVE STIMULATOR IS AN EPILEPSY TREATMENT.



THE APOLLO DEVICE EMITS SOOTHING VIBRATIONS AT THE WRIST THAT HELP YOU RELAX.

Bremner is studying the impact of vagus nerve stimulation on post-traumatic stress disorder (PTSD). "We assume that PTSD starts in the brain," he says, "but it may be that the peripheral nervous system contributes as well." For instance, says Bremner, disordered breathing can increase anxiety in PTSD, and vagus nerve stimulation can help regulate breathing. "We've shown a 31% improvement in PTSD with vagus nerve therapy," he says.

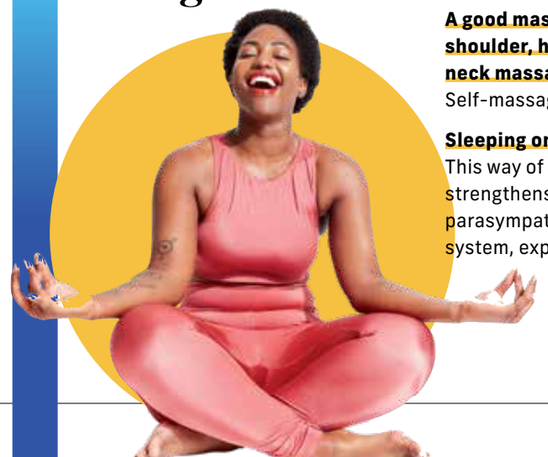
Even obesity may be influenced by the vagus nerve. Research shows that frequent, calorie-rich high-fat or high-carbohydrate diets impair the vagus nerve's ability to tell the brain we are sated and full. That can lead to overeating and obesity. A few small studies have shown that vagus nerve stimulation prevents weight gain in response to a high-fat diet. It also has been demonstrated to promote weight loss.

The impact of good "vagal tone," as researchers call healthy vagus nerve function, is quite broad and powerful. In 2010, scientists found that there was an upward spiraling positive feedback loop between high vagal tone and physical and mental health. High vagal tone reinforced positive emotions, leading to more social opportunities, which then fed back and reinforced positive emotions. Vagal tone can be measured by heart rate variability. When our nervous system is functioning well, it adjusts the timing between heartbeats. In a relaxed, parasympathetic mode, the variation between beats is higher.

Traditional vagus nerve therapy requires implanting a device similar to a pacemaker to continuously stimulate the nerve, but more recently noninvasive hand-held devices have been developed. The new generation of hand-held devices deliver stimulation to the vagus nerve through its branches in either the neck or the ear. They make it much easier to study the impact of the vagus nerve on multiple conditions. Hand-held portable devices include the Apollo, invented by scientists at the University of Pittsburgh, who discovered that low-frequency inaudible sound waves that you can feel but not hear can stimulate the vagus nerve. The Apollo is worn on the wrist or ankle. Another device, the Gammacore, is held against the neck where the vagus nerve branches, and sends electrical signals to stimulate the nerve. It's being used to help with migraine and cluster headaches.

"We may be on the verge of a new era in medicine," says Bremner, "where electrical stimulation takes a seat at the table with other therapeutic tools." •

Natural Ways to Stimulate Your Vagus Nerve



IF YOU WANT TO INCREASE YOUR VAGAL TONE AND SHIFT INTO YOUR "REST AND DIGEST" PARASYMPATHETIC HEALING MODE, SIMPLE TRIED-AND-TRUE METHODS INCLUDE:

Chanting "om" or other intonations based on production of a low, vibratory hum that stimulates the nerve
Those Tibetan monks were on to something! The vibration actually stimulates the auricular (ear) branch of the vagus nerve.

Singing, listening to and performing music, especially Mozart
A two-hour music therapy session that included singing, listening to, learning and performing music increased parasympathetic activity in 23 recovered cancer patients. Six months of listening to Mozart reduced seizures in children.

Mindfulness meditation
Yoga postures and deep breathing exercises spur the relaxation response.

Practicing forgiveness
A study of 60 healthy women found that imagining forgiving a transgressor led to higher heart rate variability.

A good massage, including shoulder, head and neck massages
Self-massage helps, too.

Sleeping on the right side
This way of getting your Zs strengthens your parasympathetic nervous system, experts say.