

The Vagus Nerve – How Inflammation Can be Controlled by the Brain

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I read an article yesterday that has me extremely excited about the implications. The article is called "Hacking the Nervous System" by Gaia Vince (<http://mosaicscience.com/story/hacking-nervous-system>). In the article, the author describes the experience of a woman who suffered from severe, debilitating rheumatoid arthritis and her eventual treatment with a device that minimized inflammation by simply stimulating the vagus nerve. What this means, is that by activating the vagus nerve, which works through the parasympathetic nervous system, we can greatly influence inflammation and the immune system. The role of the brain on body inflammation can be profound. If you suffer from digestive complaints, high blood pressure, depression, or any inflammatory condition, please read on. Let me explain the possible implications step-by-step.

What is the vagus nerve?

First, the vagus nerve is the longest nerve in the body, which originates in the brain as cranial nerve ten, travels down the neck, and then passes around the digestive system, liver, spleen, pancreas, heart, and lungs. This nerve is a major player in the parasympathetic nervous system, which is the 'rest and digest' part (opposite to the sympathetic nervous system, which is 'fight or flight').

Vagal tone

The tone of the vagus nerve is key to activating the parasympathetic nervous system. Vagal tone is measured by tracking your heart rate alongside your breathing rate. Your heart rate speeds up a little when you breathe in, and slows down a little when you breathe out. The bigger the difference between your inhalation heart rate and your exhalation heart rate, the higher your vagal tone. A higher vagal tone means that your body can relax faster after stress.

What is high vagal tone associated with?

High vagal tone improves the function of many body systems, causing better blood sugar regulation, reduced risk of stroke and cardiovascular disease, lower blood pressure, improved digestion via better production of stomach basic and digestive enzymes, and reduced migraines. Higher vagal tone is also associated with better mood, less anxiety, and more stress resilience. One of the most interesting roles of the vagus nerve is that it essentially reads the gut microbiome and initiates a response to modulate inflammation based on whether or not it detects pathogenic versus non-pathogenic organisms. In this way, the gut microbiome can affect your mood, stress levels, and overall inflammation.

What is low vagal tone associated with?

Low vagal tone is associated with cardiovascular conditions and strokes, depression, diabetes, chronic fatigue syndrome, cognitive impairment, and much higher rates of inflammatory conditions. Inflammatory conditions include all autoimmune diseases (rheumatoid arthritis, inflammatory bowel disease, endometriosis, autoimmune thyroid conditions, lupus, and more).

How do we increase vagal tone?

In the article above, vagal tone was increased through a device that stimulated the vagus nerve. The good news is that you have access to this on your own, but it does require regular practice. To some degree, you are genetically predisposed to varying levels of vagal tone, but this still does not mean that you cannot change it. Here are some ways to tone the vagus nerve:

- Slow, rhythmic, diaphragmatic breathing. Breathing from your diaphragm, rather than shallowly from the top of the lungs stimulates and tones the vagus nerve.
- Humming. Since the vagus nerve is connected to the vocal cords, humming mechanically stimulates it. You can hum a song, or even better repeat the sound 'OM'.
- Speaking. Similarly speaking is helpful for vagal tone, due to the connection to the vocal cords.
- Washing your face with cold water. Cold water on your face stimulates the vagus nerve.
- Meditation, especially loving-kindness meditation that promotes feelings of goodwill towards yourself and others. A 2010 study by Barbara Fredrickson and Bethany Kik found that increasing positive emotions led to increased social closeness and an improvement in vagal tone.
- Balancing the gut microbiome. The presence of healthy bacteria in the gut creates a positive feedback loop through the vagus nerve, increasing its tone.

The implications of such simple and basic practices on your overall health, and in particular on inflammation are far-reaching. If you suffer from an inflammatory condition, digestive upset, high blood pressure, or depression, a closer look at vagal tone is highly recommended. We have known for years that breathing exercises and meditation are helpful for our health, but it is so fascinating to learn the mechanism by which they work. I hope this short article has inspired you to begin a meditation practice, as it has for me, and to look for other means to manage the body's inflammatory response.

Forsythe P, Bienenstock J, Kunze WA. Vagal pathways for microbiome-brain-gut axis communication. *Adv Exp Med Biol.* 2014;817:115-33.

Kok, B, Fredrickson, B, Coffey, K, et al. How Positive Emotions Build Physical Health: Perceived Positive Social Connections Account for the Upward Spiral Between Positive Emotions and Vagal Tone. *Psychological Science* 2013 24: 1123