# Inflammation

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### Though inflammation is a part of the immune system, it has such enormous effects on health and wellbeing, and has warranted such a high profile and prominence in modern medicine, that it gets its own Chapter.

A condition of ongoing inflammation in the body can be detrimental to health and mood and shorten lifespans. There's evidence that inflammation, promoted in part by such factors as obesity, smoking, and a sedentary lifestyle, contributes to some of the most challenging and deadly diseases of our time, including rheumatoid arthritis, cancer, heart disease, diabetes, asthma, and even Alzheimer's disease. Moreover, chronic inflammation can lead to accelerated aging, and researchers have coined the term "inflammaging" to emphasize the point.Recent science shows that inflammation, as measured in blood markers such as C reactive protein (CRP), Interleukin 6 (IL-6), and Interleukin 1-B(Il-1β), is implicated in many more health issues than previously thought. We will be looking at these markers again and again in this Chapter, part of the vocabulary of inflammation.

Follow the Money. There is intense interest in finding safe and effective solutions to this widespread condition. It seems that almost weekly researchers discover new links between chronic inflammation and a common disease or disorder. For example, the presence of these proteins suggests a novel "connection" between inflammation and autism spectrum disorder. The Proceedings of the National Academy of Sciences [published a study](https://www.pnas.org/content/early/2019/10/01/1906817116) that found children's brains with autism spectrum disorder contain an overabundance of inflammation-stimulating markers.

If we can tame inflammation, we go a long way in ensuring our health and feeling of wellbeing and combating aging. Something that I'm sure is appealing to us all.

From Rheumatoid Arthritis, to Inflammatory Bowel Disease Inflammation can take many forms, and it can have a pernicious role in mental health leading to depression and worse. We now have the tools to measure inflammation, which allows us to track it to develop strategies to prevent it and keep it in check. We will see how acupuncture and other strategies stimulate the body's homeostatic feedback systems to decrease inflammation through the language of science.

So let's first look at two dramatic instances of inflammation getting out of control. One instance is sepsis, a deadly condition often in response to a bacterial of viral infection. The patients are typically in the ICU, requiring the highest level of intervention and management, and can end up with organ damage to the lungs, kidneys, or other organs. The inflammation is triggered but can't be turned off and often leads to spinning out of control and death.

Or let’s consider Covid 19. You may have heard the term "cytokine storm" in the context of Covid. "In late May, tenOever's team shared its findings in the biweekly journal Cell. Their article argued that this imbalanced immune response gives severe COVID-19—which can sometimes cause blood clots, strange swelling in children, and ultra-inflammatory "cytokine storms"—the character of an autoimmune disorder. As the virus spreads unchecked through the body, it drags a destructive immune reaction behind it. Individuals with COVID-19 face the same challenge as nations during the pandemic: if they can't contain small sites of infection early—so that a targeted response can root them out—they end up mounting interventions so large that the shock inflicts its own damage.[[1]](#endnote-1)

It would be cavalier to say that acupuncture has any role in these awful, extreme instances of inflammation, though some animal studies might argue the opposite. But for the most part, once sepsis or florid Covid 19 takes root, we need all the Dr. One's and Dr. Twos' we can find and all of the miracles of modern medicine.

However, there are still many stealth destabilizing effects of low grade, chronic inflammation, which Dr. One's laws might curtail. We see that inflammation is subject to the law of balance, just as all the other conditions in this book. But furthermore, inflammation has something to do with each and every condition in this book. It can affect your longevity, it can affect your mood, it can affect your immune system, and it can affect pain. Not only that, but inflammation is reflected in your autonomic balance. In fact, Heart Rate Variability, the complexity measure that reflects the subtle balance of the autonomic nervous system is highly correlated with the level of inflammation in the body. The higher the inflammation in the body, the more unhealthy the Heart Rate Variability.

Let's consider two familiar chronic conditions of inflammation

Rheumatoid Arthritis

Rheumatoid Arthritis is an autoimmune inflammatory condition characterized by swollen painful, warm and red joints during a flare of the disease. These qualities happen to be the hallmarks of the ancient *Celsus, who described inflammation in the 1st century AD as rubor, calor, tumor, dolor* 0r redness, heat, pain, swelling, and redness. These patients also have an ongoing inflammatory process with heightened inflammatory markers, so they are more likely to have shortened lifespans due to heart attacks and cancer. So the disease is not just limited to the joints.

Inflammatory Bowel Disease

Another common inflammatory condition is inflammatory bowel disease or IBD. This is a situation where the GI tract is in a constant state of inflammation and it can lead to gastrointestinal distress, constipation and other uncomfortable conditions

So acute inflammation is an essential survival mechanism in response to any kind of intruder that breaches the body's integrity, be it a virus or bacteria, or a splinter or acupuncture needle. Typically, the body responds and then gets back in balance, and you go on your merry way. However, sometimes there is ongoing inflammation that is below the surface. It's as though the initial inflammation was a wildfire that has been put out but still has hidden embers burning underneath. These embers are walled off, constantly releasing smoke or inflammatory substances. The body can not heal itself because the inflammation is hidden.

Dr. One's emphasis on balance is at play here, with the body requiring just enough immune response, but not too much, which can lead to the ultimate spinning out of control🡪 death from conditions such as overwhelming reaction to infection in the form of sepsis.

Acute inflammation

#### **Process of Acute inflammation.** Inflammation occurs when tissues are injured by bacteria, trauma t0 heat, or any other cause. Acute inflammationcomes on rapidly, usually within minutes, but is typically short-lived. This cycle returns the affected area to a state of balance, and inflammation dissipates within a few hours or days. These messengers cause blood vessels to leak fluid into the tissues, causing [swelling](https://medlineplus.gov/ency/article/003103.htm) (tumor.) This helps isolate the foreign substance from further contact with body tissues. The chemicals also attract white blood cells called phagocytes that "eat" germs and dead or damaged cells. The rubor, or redness occurs because of increased blood flow to the region.. Dolor, or pain, occurs because the messengers released aggravate pain receptors.

#### Process of Chronic Inflammation:

#### The problem comes when there is ongoing inflammation that continues unabated. Macrophages, a type of immune cell, are constantly surveilling for injury and foreign invaders and release inflammatory messengers such as Tumor Necrosis Factor (TNF), Interleukin 6 (Il-6), and Interleukin 1-β (Il1-β) when they encounter intruders. When the body can't heal the hidden inflammation, the body stays out of balance in a constant state of global inflammatory response.

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So as you can imagine, western Western medicine is looking for agents to target production of certain inflammation producing chemicals such as Il-6. But here, we are interested in the principles of Dr. One. Dr. One believes in using the body's own homeostatic systems because inflammation is a global state in the body, it is subject to the laws of complexity science. And remember, complexity science dictates that small interventions can have outsized effects. Since inflammation is involved in the the myriad homeostatic feedback loops in the body from the autonomic nervous system, to the Hypothalamic Pituitary Axis, to the ever-present Immune system, Dr. One's principles apply to inflammation just as with other conditions. We can imagine that if we can decrease the inflammatory messengers, there will be less pain, better mood, less likelihood of cancer and heart disease and longer life. It all goes together.

## How do we employ the Laws of Dr. One?

The ancients had no concept of inflammation, no vocabulary for it. But the concepts of balance, prevention, and hormesis can all be applied to the problems caused by inflammation.

#### Inflammation and Balance

Do No Harm. The first law of maintaining balance

There are time-honored anti-inflammatory medications, of course. One example is aspirin, in use since the 1890's an anti-inflammatory and antipyretic (fever lowering) medication.

Other long-trusted over-the-counter anti-inflammatory medications such as Ibuprofen, or Naprosyn can be quite effective and safe if used over a few days. They can be brutal to the GI tract, however. (GI doctors say that orthopedic surgeons and rheumatologists keep them in business because of the havoc wrought by anti-inflammatory medications.)

We now have biologics, or monoclonal antibodies, which can be highly effective, but limited to certain illnesses.

And, of course, we need to mention corticosteroids such as Prednisone, which have extremely powerful anti-inflammatory action and severe side effects if taken for long periods of time*.[[2]](#footnote-1)*

All of the above-mentioned medications have their own dangers. If taken for acute inflammation they can be safe and beneficial. But when taken for chronic inflammation, they cause problems of their own and can destabilize the system into spinning out of control. Dr. One and Dr. Two need to carefully evaluate the risk/benefit of these medications when advising patients.

Hormesis The second law of Dr. One

Acupuncture.Harnessing our body's own feedback to fight inflammation

When the body senses an intruder, such as a bee sting or an acupuncture needle, nerves signal the brain, which reacts through the two branches of the autonomic nervous system to keep the inflammation from spinning out of control. The brain also uses the hypothalamic-pituitary-adrenal axis, the body's source of cortisol. The sympathetic (fight/flight) nervous system plays a role here to decrease the release of chemicals (cytokines) that lead to more inflammation (Tumor Necrosis Factor (TNF), Il1B, IL 6) and increase those that decrease inflammation (IL10). But lab and clinical evidence shows that the parasympathetic nervous system (rest/digest) plays the leading role in reducing inflammation . This vagal, parasympathetic rest/digest outflow affects the major organ systems AND tissue macrophages (cells which are part of the immune surveillance system.). It tells them to stop making the inflammatory messengers. This feedback system was named the Cholinergic Anti-inflammatory pathway by our colleagues in the field of Neuromodulation, led by Dr. Kevin Tracey.

#### The Cholinergic Anti-inflammatory feedback loop

Tracey's group discovered in the early 2000's[[3]](#endnote-2) the vagus nerve activity through a particular receptor (α7nACh receptor) was able to inhibit the potentially fatal inflammatory response in animals to toxins resembling septic shock. Sepsis is a situation, as we mentioned, where the increased inflammation can damage vital organs such s lungs and kidneys, leading to a lethal feedforward, vicious cycle response leading to an imbalance leading to inflammatory cytokines causing tissue death. And can lead to the ultimate imbalance 🡪 death. ICU physicians dread the appearance of sepsis in their patients since it is devilishly tough to treat.

Tracey's group focused on the vagus portion of this feedback system, reasoning that by stimulating the vagus nerve, they could decrease inflammation more safely than intervening with acetylcholine or an acetylcholine equivalent. Acetylcholine, the chemical that binds to the α7nACh receptor carries significant side effects. Tracey found and published in Nature the finding that vagal stimulation led to a decrease  in flammatory markers.*[[4]](#endnote-3)*

This one particular subunit of the receptor for acetylcholine, the α7 subunit ((α7nAChR) is found in macrophage cells of the immune system involved in surveillance.Macrophages sense and respond to pathogens and other environmental challenges and participate in tissue repair after injury but most relevant to our discussion they release inflammatory cytokines such as TNF, IL-6, and Il-1B. . [[5]](#endnote-4) When this receptor ((α7nAChR) on macrophages is stimulated it decreases these inflammatory messengers Direct stimulation of the vagus nerve through implanted electrodes can reduce inflammation in conditions like rheumatoid arthritis through acetylcholine stimulating the α7nAChR receptors on macrophages which then stop emitting the inflammatory messengers. So though direct vagal nerve stimulation, which is now big business, would not be considered a hormetic intervention in Dr. One's toolkit, it harnesses the body's homeostatic feedback systems. But these efforts have not met with uniform success, and there can be complications from the implantation process. Man ≠ Machine even when tinkering with some of the most subtle of levers.

This feedback system is key to the effectiveness of acupuncture in suppressing inflammation. It also explains the benefits of many nonmedical interventions such as heat shock proteins (as discussed in the Longevity chapter), exercise as hormetic, and breathing, biofeedback, meditation since they all can stimulate vagal activity of the parasympathetic nervous system which then feeds back on the macrophages telling them to stop producting inflammatory cytokines.

#### Acupuncture and Anti-inflammatory effects

The receptor for acetylcholine found in the macrophages (α7nAChR) has been key to understanding this significant way that acupuncture helps us to heal. We know that acupuncture on one of the most commonly used acupuncture points, Stomach 36, can reduce Tumor Necrosis factor (TNF), Interleukin 6, Il-6 and Interleukin 1β , IL1-B with mitigation of lung and kidney damage in septic rodents.[[6]](#endnote-5)

The cytokine that was NOT reduced in Tracey's original study was Interleukin 10, Il10, an **anti**-inflammatory cytokine (not a pro-inflammatory cytokine like Il 6 and 1-β.) Interestingly acupuncture has been shown to increase [[7]](#endnote-6) IL-10.

Il-10 is also linked to [myokines](https://en.wikipedia.org/wiki/Myokine), produced with exercise. Exercise provokes an increase in circulating levels of IL-10, suggesting that [physical exercise](https://en.wikipedia.org/wiki/Physical_exercise) fosters an environment of anti-inflammatory cytokines.[[38][39]](https://en.wikipedia.org/wiki/Interleukin_10#cite_note-pmid11192058-38)

#### So lets think about this. we know that the hormetic of acupuncture actually increases anti-inflammatory messengers and decreases inflammatory messengers, and it decreases inflammatory messengers through the autonomic nervous system. So it sets cascades of effects into motion, triggering the body's homeostatic mechanisms to achieve a global effect.

#### Inflammation and Hormesis and Old Friends

In the Chapter on Immunology we discussed the phenonomen of old friends. How the removal of parasites in Sardinia led to an overactive immune response leading to an increase in autoimmune diseases on the island.

As unlikely as it sounds, the lack of other old friends, animal dander, and dirt, can lead to increased stress leading to inflammation. A [recent](https://www.colorado.edu/today/2018/04/30/how-growing-pets-dust-may-boost-mental-health) study led by Stefan Reber at the University of Ulm in Germany revealed a connection between good emotional health and growing up around dirt. Forty men were brought to the lab and put through a stress test, where they had to give a speech and solve complex math problems in front of stone-faced scientists in white coats. Those who grew up in cities without the benefit of being repeatedly challenged by a "dirty" hormetic environment showed exaggerated, prolonged elevation of the inflammatory compound interleukin 6 (Il-6) and muted activation of the anti-inflammatory compound interleukin 10 (Il-10). "People who grew up in an urban environment had a much-exaggerated induction of the inflammatory immune response to the stressor, and it persisted throughout the two-hour period," Lowry said.

The ones from rural environments reported feeling stressed but did not show the dramatic increase in their inflammatory cytokines.

So, exposure to animals, dirt and dander is a hormetic challenge to the immune system that can prevent an overactive inflammatory response in the face of an intense psychological challenge. So think about this. The immune challenge of dirt and animal dander leads to less inflammation later in life. If you have less immune reaction to a stress challenge, you are sturdier and less likely to spin out of control.

Now let's remember the beagle experiment and the horse experiment in the Chapter on stress. After acupuncture, even though the animals physically startled after a surprise, their stress levels showed a minimal reaction to the startle. The test subjects here reacted similarly. The ones who had been exposed to dander hormetic challenges growing up still experienced stress, but importantly their inflammatory markers did not spike dramatically.

This is what we can call an example of radical prevention. Even though the effect may be small, avoiding a brief spike in inflammation, we know that it all spins together. If you are that much more stable, it may very well lead to more stability down the road because of the nature of complexity. Remember, small inputs can have outsized results. Indeed, animals given acupuncture and then injected with a vehicle causing sepsis had much better survival rates than those with no acupuncture. The effect appears to last for days—prevention in action.

### Case Study: Inflammatory Bowel Disease

### To use a case study for further illustration, a patients' story looking at a common inflammatory condition, inflammatory bowel disease.

BD is a high-powered financial consultant in her 40s working for a huge company and has high-profile, high net worth clients. She is "windex" clean, no drinking, no coffee, exercises regularly (good posterior heaven)and looks half her age( probably good anterior and posterior heaven) (which, of course is a great thing unless you're in her kind of business). Nonetheless, she has had lifelong issues with constipation. When she came to see me, she often had only once-a-week regularity. Travel, dietary disruption, and long workdays all contributed to the problem, and she was given a diagnosis of Irritable bowel Disease at one point. She was referred to me by another patient, and because of her disciplined lifestyle, she was able to keep her appointments weekly. Within a month of sessions, her regularity had improved to daily. She still maintains her visits as often as her work schedule allows, at least monthly. And we see as in BD's case though acupuncture can be helpful in acute inflammation, sprained ankle, it's often in the chronic stealth inflammation where acupuncture can help stimulate the system to heal the vicious cycle.

This case illustrates the concept of the sturdiness of resilience, just as with the study on farmers and city dwellers. Factors that used to throw off her regularity do not anymore, and it is again a sort of radical prevention. She found a solution through acupuncture to deal with her condition in a way that does not cause problems of its own.

We should not be surprised at her successful treatment. Animal studies show Electroacupuncture increases gut function and decreases inflammation through [[8]](#endnote-7) the α7Achr pathway discovered by Dr. Tracey.

So we see that the parasympathetic or vagal pathway can be key for anti-inflammatory activity. To better understand how acupuncture was so effective in helping BD, let us consider one of the most commonly used acupuncture points in acupuncture practice, Stomach 36 to examine the intimate relationship between vagal activity and acupuncture.

### The Curious Case of Stomach 36 Acupuncture Point

Stomach 36 is one of the most commonly used acupuncture points by Dr. One. He uses both for gastrointestinal conditions like constipation and immune issues such as allergy.

Stomach 36 is located on the tibialis anterior, 3 inches below the kneecap on the leg. The teaching is, that by stimulating this point, the patient will derive the most nourishment from their food by strengthening the stomach, leading to robust health. Stomach 36 is also one of the most often used points in research in animals and humans, and it is easy to find the analog point in animals, even small animals. Studies in animals and humans show that Stomach 36 increases the emptying of the stomach and increases gut transit times alleviating constipation. The inflammation in BD's case is systemic, and stimulating the vagus with acupuncture helped improve her gut transit[[9]](#endnote-8) times, and probably lessened her inflammation overall. The pressures of her high-powered job increases her stress response which affects her gut. Still, by countering this stress response with increased vagal activity with acupuncture, which also decreases her inflammation, she is more resilient and tougher. The corollary to the farmers undergoing a challenge, or the beagles. Her gut brushes off the stress and does its "business."

We can look to a study on animals using acupuncture on Stomach 36,. showing that the acupuncture decreased inflammatory markers via the vagus nerve and promoted gastrointestinal motility through the α7Achr pathway.[[10]](#endnote-9) Another group showed similar triggering of the α7Achr pathway in mice with induced acute pancreatitis[[11]](#endnote-10) So ancient practice provides a way to trigger the body's own homeostatic healing mechanisms through vagal stimulation sought by Tracey and his colleagues.

But the fact remains that acupuncture doesn't always work, and often requires multiple treatments. It has tremendous potential, but it is not as reliable as we would hope. But from a recent study, we may have some clues as to how we may be able to improve acupuncture's results.

In a fascinating and groundbreaking development, a study published in late 2021 in the prestigious journal Nature found that Stomach 36 is close to a hindlimb nerve with specific markers (protein Prokr2).[[12]](#endnote-11) When these markers are found on a nerve, they predict whether that nerve will directly stimulate vagal activity[[13]](#endnote-12). We know that there is a general vagal effect needling the body, but this is more specific and powerful. What this means is that some peripheral nerves will stimulate more vagal activity than others. This study shows that Dr. One was using the correct point for all these centuries, Stomach 36, when tackling problems of gastrointestinal distress and improving immunity.

When I read about this study, I immediately started using electoacupuncture at stomach 36 on patients and measuring their HRV, assuming that the needling would improve vagal activity. In fact, the opposite occurred, and I saw a spike in sympathetic activity. As it turns out, this is an additional aspect of the study. The type of stimulation to the nerve matters greatly. If it's too intense, you get too much sympathetic overdrive, and it needs to be low-intensity stimulation. The hope is that we can have improved results and more streamlined, user-friendly treatment with more study and more sophisticated means of acupuncture point stimulation.

The ancients had no idea they were triggering sophisticated immune response systems and control from the limbs to the brain and back to the vagus and macrophages. But that is what they were doing.

### Inflammation and Autonomic Balance

Remember from previous chapters that we can evaluate the autonomic nervous system with a complexity tool that can capture the subtle homeostatic systems in the body, Heart Rate Variability (HRV). This was the measure used in the beagles and in the horse startle experiments. An overall measure of HRV as a measure of stress turns out to be relevant to the inflammatory state of a person.

#### Rheumatoid arthritis

In rheumatoid arthritis patients for example, their autonomic balance is often unhealthy with too much flight/fight and not enough rest/digest. But researchers are considering whether **the autonomic imbalance is an inherent part of the disease** and not a result of ongoing pain and disability.

"Autonomic imbalance seems to be an early finding, rather than the result of chronic inflammation, in patients with [rheumatoid arthritis] RA. In a prospective cohort study, …individuals at risk of RA who subsequently developed arthritis had significantly higher resting [heart rates] HRs than healthy subjects ([24](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7750536/#B24)). This finding is in agreement with those from other studies, which reflect **reduced (parasympathetic nervous system activity) PNS (vagal) activity** and hence an impaired inflammatory reflex, in patients with RA ([25](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7750536/#B25), [26](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7750536/#B26)). *The early impairment of the PNS in RA, even before the fulfillment of the disease classification criteria (*[*27*](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7750536/#B27)*), is consistent with the correlation between increased inflammatory status and decreased parasympathetic activity observed in healthy subjects in large observational studies (*[*28*](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7750536/#B28)*–*[*30*](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7750536/#B30)*)*. Another study looked at RA and autonomic balance and inflammatory markers and found that the lower and more unhealthy the HRV of the subjects the higher the inflammatory markers (Il-6 and CRP.) Keep in mind that Il-6 is decreased with acupuncture as shown by numerous studies. [[14]](#endnote-13) These findings suggest that lower HRV is associated with increased inflammation and independently associated with increased reported pain in rheumatoid arthritis sufferers. [[15]](#endnote-14) In this context, Tracey's group's use of vagal stimulation is particularly appropriate. But of course, this is a "cool toy" and we could easily argue that using noninvasive methods such as acupuncture, meditation, and other interventions and increasing parasympathetic activity may help too.

Even in people without rheumatoid arthritis, the levels of inflammatory markers [C-reactive protein (CRP) and IL-6] are inversely related to HRV in young adults ([29](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7750536/#B29)), and circulating TNF level is an independent predictor of depressed HRV ([31](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7750536/#B31)), reinforcing the concept of a complex dialog between immunity and the ANS.[[16]](#endnote-15)

In the next Chapter we will be considering mood disorders and the rules of Dr. One. But an essential aspect of it all spinning together, is that Mood disorders are increasingly regarded as inflammatory conditions. Patients with Rheumatoid arthritis often have depressive symptoms and complications of atherosclerosis and heart attacks (presumably due to increased inflammation), leading to higher mortality in these patients. The depression can be destabilizing and lead to spinning out of control since the patients might be less likely to adhere to treatment and therapy. The presence of depression decreases the patients' quality of life and overall outcomes. [[17]](#endnote-16) Doing what we can to improve autonomic balance with Dr. One's treatments and strategies may help prevent and reverse this spinning out of control.

Official end of Chapter

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[Anti-inflammatory Effect Acupuncture via the Vagus Nerve.pdf](file:///C:\Users\Kristen\Dropbox\Nobel\Ebook%202020\Inflammation\Antiinflammatory%20Effect%20Acupuncture%20via%20the%20Vagus%20Nerve.pdf)The key markers for acute inflammatory processes are: IL1, IL6 and TNF alpha. These all decrease in majority cases with ACP and EA. From Sandro Silverio Lopes chapter on acupuncture and immunity

#### So it is a worthwhile area to discuss for active prevention in maintaining toughness sturdiness resilience stability.

##### Lixing Lao study[[18]](#endnote-17)

###### We saw that in beagles, horses preemptive acupuncture prevents stress activation, this study shows that acupuncture after cold stress decreases both the markers of inflammation and the behaviors

Law of Balance [[19]](#endnote-18)

### Old friends the challenge of old friends. There is evidence for two kinds of immune response. If there

### Heat shock

(Heat shock proteins also bind to the α7nAChReceptor[[20]](#endnote-19))

### Exercise[[21]](#endnote-20)

## Concept of systems and systems biology

1. How the Coronavirus Hacks the Immune System

   *At a laboratory in Manhattan, researchers have discovered how SARS-CoV-2 uses our defenses against us.*

   **By**[**James Somers**](https://www.newyorker.com/contributors/james-somers)

   November 2, 2020 [↑](#endnote-ref-1)
2. From Harvard pamphlet [↑](#footnote-ref-1)
3. Molecular Medicine Volume 9 number 5-8 May-August 2003 [↑](#endnote-ref-2)
4. [Nature.](https://www.ncbi.nlm.nih.gov/pubmed/10839541) 2000 May 25;405(6785):458-62.

   [VAGUS NERVE STIMULATION ATTENUATES THE SYSTEMIC INFLAMMATORY RESPONSE TO ENDOTOXIN.](https://www.ncbi.nlm.nih.gov/pubmed/10839541)

   [Borovikova LV](https://www.ncbi.nlm.nih.gov/pubmed/?term=Borovikova%20LV%5BAuthor%5D&cauthor=true&cauthor_uid=10839541)1, [Ivanova S](https://www.ncbi.nlm.nih.gov/pubmed/?term=Ivanova%20S%5BAuthor%5D&cauthor=true&cauthor_uid=10839541), [Zhang M](https://www.ncbi.nlm.nih.gov/pubmed/?term=Zhang%20M%5BAuthor%5D&cauthor=true&cauthor_uid=10839541), [Yang H](https://www.ncbi.nlm.nih.gov/pubmed/?term=Yang%20H%5BAuthor%5D&cauthor=true&cauthor_uid=10839541), [Botchkina GI](https://www.ncbi.nlm.nih.gov/pubmed/?term=Botchkina%20GI%5BAuthor%5D&cauthor=true&cauthor_uid=10839541), [Watkins LR](https://www.ncbi.nlm.nih.gov/pubmed/?term=Watkins%20LR%5BAuthor%5D&cauthor=true&cauthor_uid=10839541), [Wang H](https://www.ncbi.nlm.nih.gov/pubmed/?term=Wang%20H%5BAuthor%5D&cauthor=true&cauthor_uid=10839541), [Abumrad N](https://www.ncbi.nlm.nih.gov/pubmed/?term=Abumrad%20N%5BAuthor%5D&cauthor=true&cauthor_uid=10839541), [Eaton JW](https://www.ncbi.nlm.nih.gov/pubmed/?term=Eaton%20JW%5BAuthor%5D&cauthor=true&cauthor_uid=10839541), [Tracey KJ](https://www.ncbi.nlm.nih.gov/pubmed/?term=Tracey%20KJ%5BAuthor%5D&cauthor=true&cauthor_uid=10839541). <https://ksparrowmd.com/vagus-nerve-stimulation-attenuates-the-systemic-inflammatory-response-to-endotoxin-17254-2/> (tracey article from 2000) [↑](#endnote-ref-3)
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    [↑](#endnote-ref-9)
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18. [↑](#endnote-ref-17)
19. Not for use, but to stash

    ### Balance of bacterial immune function versus parasitic One type of inflammation, Hou explains, is designed to battle harmful bacteria or parasites. “If there’s an infection or an invading virus or bacteria, the body generates inflammation that destroys the invading agents,” he says. Meanwhile, there’s another type of inflammation that signals the body is recovering from injury. When the body is wounded, inflammation floods the injured area with cells and “cell-derived components” that repair, replace, or dispose of damaged tissue, says Valter Longo, a professor of biological sciences at the University of Southern California.

    When a person’s immune system is working as it should, these and other forms of inflammation are transitory; they flare up in response to a legitimate threat or injury, and they settle down when that threat or injury has been addressed. But there are countless ways in which the immune system’s many inflammatory processes can go haywire.

    In some cases, “inflammation that is normally designed to kill harmful viruses and bacteria can become misguided and start doing damage to healthy cells,” Longo explains. This form of inappropriate inflammation is present in people with autoimmune disorders such as Celiac disease and lupus, and there’s evidence that something similar may be going on in the brains of people with Alzheimer’s disease, he says. Some inflammation may be normal. But too much of it for too long can still be harmful. This seems to be the case when it comes to persistent inflammation caused by chronic stress or injuries.

    There’s evidence that imbalances in immune-system activity can lead to harmful or out-of-control forms of inflammation. Hou explains that one branch of the immune system deploys inflammation in an effort to protect the body from parasites, while a separate branch uses inflammation to attack harmful bacteria or microorganisms. “The body likes to balance these, so when one is turned on, the other is turned down or off,” he says.

    But if one of these branches becomes over- or under-active, the resulting imbalance can cause problems. This sort of imbalance may help explain why rates of some autoimmune disorders have skyrocketed in recent years. “In modern western societies, we’ve almost totally reduced exposure to worms and parasitic infections, and so as that part of the immune system is not used, the other part may be becoming hyperactive,” he explains. [↑](#endnote-ref-18)
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    When you needle with acupuncture it initiates an acute inflammatory response, and prods the body to go into healing mode. The patient often experiences this as itching or aching at the needle site, but then a relaxation state overall.

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    2. It is a system condition, meaning it is in the entire body, remedies that can treat the entire body are called for.

    3. There is a powerful connection between the nervous system, both the peripheral nervous system and central nervous system and inflammation

    <https://ksparrowmd.com/why-does-inflammation-seem-to-underlie-all-sickness-culprit-in-diseases-ranging-from-arthritis-to-depression/>

    ### Likewise, research has linked excessive inflammation to mental health conditions, including depression and bipolar disorder.

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    [Allfrom Ulloa\_Review\_NatureOct2021.pdf

    Whereas high-intensity ES of ST36 activates the sympathetic nervous system, which supports 'fight or flight' responses to stress, low-intensity stimulation activates the parasympathetic nervous system, which regulates physiological functions that occur during rest. (**And indeed this solved a puzzle for me that I had noted for years, that sometimes electroacupuncture at st36 lowers HRV not improves it. I had always chalked this up to chance and variability.) …** . The location of Prokr2-expressing neurons in the deep tissues below ST36 predicts that the anti-inflammatory effects of low-intensity ST36 ES depend on the deep innervations of the common peroneal nerve.}

    [↑](#endnote-ref-20)