Did you know your gut, actually contains MORE neurotransmitters than your brain? In fact, the gut has a brain of its own. It is called the “enteric nervous system” and it is a very sophisticated piece of your biology that is wired to your brain in intricate ways.

Messages constantly travel back and forth between your gut-brain and your head-brain, and when those messages are interfered with in any way your health will suffer.

Neurotransmitters are the brain’s chemical messengers. They regulate your physical, psychological, and emotional experience. Balance between the neurotransmitters influences your brain function, mood, pain response, and athletic performance. Along with hormones, just about all functions in the body are controlled by neurotransmitters. “Neuro” means nerve, so neurotransmitters take information from one nerve to another in the body, they influence our minds and physical abilities. With neurotransmitters, the goal is balance.

For example, you want excitatory, energizing neurotransmitters active in the morning to wake you up, and calming, inhibitory neurotransmitters firing at night so you can sleep.

Neurotransmitters are largely responsible for our behavior, attitude, and energy. They control our ability to focus, and our drive to work. As mentioned, if we have low neurotransmitters, or if they are imbalanced, we may feel sluggish, tired, unfocused, temporarily depressed, or overly stimulated at the wrong time. More severe imbalance will put you at risk for depression, mental disorders, physical problems, or drug abuse. Additionally, any inflammatory condition such as diabetes or even prediabetes will interfere with neurotransmitter production. For health and well being it is essential that you prevent inflammation and strive for overall balance between the neurotransmitters.
Over 50 neurotransmitters have been identified or are suspected as potential candidates. The four most well known and understood neurotransmitters are dopamine, serotonin, GABA, and acetylcholine. Drugs such as antidepressants as well as cocaine and heroin will alter or mimic neurotransmitter function, influencing our physical and mental function. Equally, foods and supplements can support or inhibit neurotransmitter function, just not to the same degree as drugs. Neurotransmitters are often confused with or talked about in conjunction with hormones. They are actually different, but very similar to hormones. The essential distinctions are the following:

• A primary difference between neurotransmitters and hormones is where they come from in the body. Neurotransmitters are released by a nerve. Hormones are released by an endocrine gland.

• Aside from being released by different sources, the distance a neurotransmitter travels is less than a micrometer, whereas hormones can travel a much greater in the blood to attach to a hormone receptor on a cell.

• Neurotransmitters are secreted from a nerve pre-synapse that is part of one cell to a postsynapse on the target cell—it’s all about synapses with neurotransmitters. Neurotransmitters take action immediately. Hormones are secreted by a gland and enter the blood stream. They either attach to a hormone receptor on a cell or are metabolized and excreted by the body.

• Hormones can be chemically synthesized and taken in drug form by an individual. Neurotransmitters can only be made in the body. Drugs can mimic neurotransmitter activity or bind to neurotransmitter receptors so that the neurotransmitter itself cannot exert its influence, but the neurotransmitters can only be made in the body.

• An important distinction is that some chemicals, such as adrenaline, are both neurotransmitters and hormones. Here’s how it works: adrenaline is a hormone when released by the adrenal gland into the bloodstream. The hormone adrenaline is called epinephrine, and it goes to the heart to influence heart rate. Adrenaline is a neurotransmitter when it is released from a presynaptic nerve and acts on a nearby cell. The neurotransmitter adrenaline is called norepinephrine.

In Depth Look At How Neurotransmitters Are Made and Released

Neurotransmitters are made either on the nerve or in the cell from which they are released. The gut and brain make a lot of neurotransmitters, which is why gut health and brain detoxification are both essential for neurotransmitter balance. You can ensure gut health by taking a probiotic—healthy bacteria for the gut—and possibly a digestive enzyme if you have low stomach acid.

Nutrients such as omega-3 fish oils and carnitine can help detoxify the brain of heavy metals that get in the way of optimal neurotransmitter production. A neurotransmitter is released after a presynaptic cell is told to release it by an action potential.

Once released, the neurotransmitter travels a miniscule distance and attaches to a specific receptor on a cell. On each cell there are multiple receptors that the neurotransmitter can bind to. Whether the
neurotransmitter triggers a response that is stimulating or diminishing depends on the type of receptor that the neurotransmitter binds to.

The electrolytes, potassium, sodium and calcium, are all necessary for the action potential to function and for neurotransmitters to release and bind effectively. If your electrolytes are imbalanced, your neurotransmitters won’t work quite right and mood, brain, and physical function can be altered.

**The Four Major Neurotransmitters:**

There are four major neurotransmitters that are very important for brain health and physical performance.

They are: **acetylcholine, dopamine, GABA and serotonin.** Acetylcholine and dopamine are energizing neurotransmitters, whereas GABA and serotonin are relaxing neurotransmitters. In order to have adequate energy in the morning, you want to have more dopamine and acetylcholine. At night it’s ideal to have more serotonin and GABA to be able to go to sleep. The nutrients you eat will influence your neurotransmitter levels, which is the reason I always stress the importance of eating meat protein in the morning—protein boosts dopamine and acetylcholine. Carbohydrates will help raise serotonin and allow you to go to sleep, which is why eating a small amount of carbs can be ideal in the evening.

**Acetylcholine**

Acetylcholine was the first neurotransmitter to be discovered in 1921, and anyone who has studied exercise physiology knows that acetylcholine is necessary for muscle contractions. It is the primary neurotransmitter for the motor neurons that innervate muscle. Acetylcholine is also responsible for memory and optimal brain function.

Acetylcholine affects heart rate, digestion, secretion of saliva, and bladder function. It is linked to Alzheimer’s disease and there is loss of almost 90 percent if acetylcholine in people with the disease. This neurotransmitter also improves the number and sensitivity of androgen and insulin receptors, making it critical that athletes have adequate acetylcholine to maximize energy production and anabolic response.

Acetylcholine is made out of choline, which is a B vitamin. Choline is related to cholesterol and is necessary for fat metabolism as well. Foods high in choline are eggs, soy, and organ meats. It can also be taken as a supplement and is found in most high-quality B complexes.

**Dopamine**

Dopamine is responsible for motivation, interest, and drive. When you have low dopamine, you won’t feel energized, may have low energy, poor concentration, and low sex drive. It is involved in muscle control and function, making it highly important for athletes. But, you don’t want too much or too little
because even though low levels can make you unmotivated or inhibit performance, high levels are involved in mental problems and attention disorders.

Dopamine is involved in Parkinson’s Disease and looking at how the mechanism behind it can illustrate how neurotransmitters actually work. In Parkinson’s, the dopamine transmitting neurons die in a part of the brain, meaning the brains of people with Parkinson’s contain no dopamine. Drugs called dopamine agonists are given to people with Parkinson’s, and these drugs are able to stimulate dopamine receptors directly.

Dopamine levels are very vulnerable to poor sleep, stress, sugar, and caffeine intake. Dopamine is directly affected by oxidative stress and inflammation, and ensuring you have adequate antioxidant intake will help you achieve ideal levels of dopamine. Dopamine is synthesized from the amino acid tyrosine. Foods that contain tyrosine are almonds, avocados, dairy and meat, and sesame seeds, among others.

**GABA**

GABA (gamma aminobutyric acid) is important for managing anxiety and stress. It regulates the energizing neurotransmitters, dopamine and norepinephrine, and also supports serotonin. If you feel overwhelmed, you don’t have enough GABA. The nutrient taurine is an amino acid that calms the nervous system because it supports GABA production. Taurine will allow your body to manage anxiety so that your thoughts don’t go spiraling out of control and you don’t get the associated hormone spikes of cortisol and adrenaline that go with anxiety and stress. Taurine is found in animal products, and taurine deficiency is a well-known problem for vegetarians, which will lead to neurotransmitter imbalances and higher levels of anxiety, stress, and unhappiness.

**Serotonin**

Serotonin is the feel good neurotransmitter that is directly involved in mood and emotion. It is essential for optimal brain function. Low serotonin is linked to depression, problems with anger, obsessive-compulsive disorder, insomnia, and suicide. It is also involved in pain perception, body temperature regulation, blood pressure, and hormonal activity.

As mentioned, eating carbohydrates can raise serotonin. Eating carbs will trigger insulin to be released from the pancreas. Insulin in the blood will clear out the amino acids except tryptophan.

When the amino acid tryptophan (found in high concentrations in Turkey and in milk) is elevated, it enters the brain and is turned into serotonin if you have adequate levels of B vitamins. Once serotonin is elevated, it reduces pain, decreases appetite, and produces a sense of calm, allowing you to go to sleep.

Neurotransmitters, Athletic Performance, And Strength Training: Physical fatigue is either due to fatigue in the muscles, or in those parts of the nervous system that activated the involved muscles. Research physiologists determine the source of fatigue by distinguishing whether it is due to impairment of contractile protein function, or a decrease in the magnitude of the activation signal. Neurotransmitters influence both of these abilities.
Muscle function and physical performance will be impaired when neurotransmitters are exhausted. A disturbance in the balance between the neurotransmitters serotonin, dopamine, and norepinephrine, GABA, and others can lead to fatigue when exercising, especially when training for a long period of time. Research into the role neurotransmitters play on fatigue has been inconclusive. In animals, there is evidence that a depletion of dopamine from training can result in a decline in work capacity in animals, but this hasn’t been proven in humans. For best results you want to strive for balance in the neurotransmitters. Ensure your gut is healthy, you don’t have any major nutrient deficiencies, eat optimal protein, and focus on minimizing inflammation to support your neurotransmitter function.

A Few Essential Nutrients For Optimal Neurotransmitter Function

Nutritional deficiencies such as low omega-3s, inadequate B vitamins, taurine, and carnitine can lead to neurotransmitter imbalance. I already touched on the importance of B vitamins and taurine, but will describe a few nutrients that can ensure optimal neurotransmitter balance.

DHA-rich fish oil is essential for brain function and neurotransmitter balance. The omega-3 fatty acids DHA and EPA increase blood flow in the brain and enables the connection between the pre-synaptic nerve and the post-synaptic nerve, meaning your brain is able to make connections better. DHA-rich omega-3s don’t elevate any of the neurotransmitters, but they allow for proper communication between the nerves.

Carnitine is a compound found in animal products that enables the brain to process fish oil. Combined with adequate DHA-rich fish oil, carnitine supports neurotransmitter pathways. It can also help detoxify the brain of heavy metals.

Curcumin is a super anti-inflammatory that comes from the spice turmeric. When paired with DHA-rich fish oil, it helps detoxify the brain and the gut. It can support neurotransmitter function due to its antioxidant abilities.

Probiotics are tiny live bacteria that naturally occur in the gastrointestinal tract. Probiotics directly affect nutrient absorption and they lower chronic inflammation, while supporting your body’s ability to produce neurotransmitters.

Most of us (including most doctors) do not recognize or know that digestive problems wreak havoc in the entire body, leading to allergies, arthritis, autoimmune disease, rashes, acne, chronic fatigue, mood disorders, autism, dementia, cancer, and more.

So having a healthy gut means more than simply being free of annoyances like bloating or heartburn! It is absolutely central to your health. It is connected to EVERYTHING that happens in your body.
The health of your gut determines what nutrients are absorbed and what toxins, allergens, and microbes are kept out. It is directly linked to the health of your whole body.

Intestinal health could be defined as the optimal digestion, absorption, and assimilation of food. But that is a big job that depends on many other factors. Let’s look at a few of them …

First, there are bugs in your gut that form a diverse and interdependent ecosystem like a rainforest. In fact, there are 500 species and 3 pounds of bacteria in your gut which form a HUGE chemical factory that helps you digest your food, regulate hormones, excrete toxins, and produce vitamins and other healing compounds that keep your gut and your body healthy.

This ecosystem of friendly bacteria must be in balance for you to be healthy. Too many of the wrong bacteria, like parasites and yeasts, or not enough of the good ones, like Lactobacillus or Bifidobacteria, can seriously damage your health. So keeping a healthy balance of bugs in your intestines is one factor to good gut health.

Second, there is your gut-immune system. Your entire immune system — and the rest of your body — is protected from the toxic environment in your gut by a lining that is only ONE cell-thick layer. If spread out, this lining would take up a surface area the size of a tennis court.

If that barrier is damaged, you can become allergic to foods you may normally be able to digest perfectly well, you will get sick, your immune system will become overactive, and it will begin producing inflammation throughout your body.

Filtering out the good molecules from the bad molecules and protecting your immune system is yet another important factor in gut health.

Messages constantly travel back and forth between your gut-brain and your head-brain, and when those messages are interfered with in any way your health will suffer.

Your gut also has to get rid of all the toxins produced as byproducts of your metabolism, which your liver dumps into bile. If things get backed up when you are constipated, you will become toxic and your health will suffer.

And last but not least, your gut must break down all the food you eat into its individual components, separate out the vitamins and minerals, and shuttle everything across the one cell-thick layer mentioned above so it can get into your bloodstream and nourish your body and brain.

Your gut has quite a lot to manage. Even in perfect world it is hard to keep all of this in balance. But in our modern world there are endless insults that can knock our digestive systems off balance; it is that much more difficult to maintain excellent digestive health.
How to Know if Your Gut is Out of Balance

To fix your digestion, you first need to understand what is sending your gut out of balance in the first place. The list is short:

· Our low-fiber, high-sugar, processed, nutrient-poor, high-calorie diet, which causes all the wrong bacteria and yeast to grow in our gut and damages the delicate ecosystem in your intestines.

· Overuse of medications that damage the gut or block normal digestive function – things like acid blockers (Prilosec, Nexium, etc.), anti-inflammatory medication (aspirin, Advil and Aleve), overuse of antibiotics, steroids and hormones

· Undetected gluten intolerance, celiac disease or low grade food allergies to foods such as dairy, eggs, or corn.

· Chronic low-grade infections or gut imbalances with overgrowth of bacteria in the small intestine, yeast overgrowth, parasites, or even more serious gut infections

· Toxins like mercury and mold toxins, which damage the gut

· Lack of adequate digestive enzyme function, which can come from acid-blocking medication use, or zinc deficiency

· Stress, which can alter the gut nervous system, cause a leaky gut, and change the normal bacteria in the gut.

What happens then is obvious. You get sick both physically and mentally.