

# STRESSED AND ANXIOUS?

YOUR GUT MAY BE TELLING YOU SOMETHING



It has already been determined that the gut and the brain are closely connected, and that this interaction plays an important part not only in gastrointestinal function, but also in certain emotional circumstances and in intuitive decision-making.

Think of the last time you were in a stressful situation—maybe you had stomach upset or loose bowels. You were in an emotional situation and your brain told your gut “something is not right.” Recent neurobiological insights into this gut-brain crosstalk have revealed a complex, bidirectional (back and forth interactive) communication system.

This bidirectional crosstalk can influence the proper maintenance of gastrointestinal homeostasis and digestion, motivation and higher cognitive functions. Moreover, disturbances of this system have been implicated in a wide range of disorders, including functional and inflammatory gastrointestinal disorders, obesity and eating disorders.<sup>1</sup>

## GUT-BRAIN AXIS INVOLVES MULTIPLE BODY SYSTEMS

Signals from organs in the body communicate to affect the body and its various functions. Included are:

1. **Central Nervous System (CNS)** - Controls most functions of the body and mind. It consists of two parts: the brain and the spinal cord, which is responsible for muscle movement, pain receptors, movement, etc.
2. **Enteric Nervous System (ENS)** - One of the main divisions of the nervous system, it includes the millions of nerve fibers imbedded in the digestive tract and colon.
3. **Endocrine System** - Collection of glands that produce hormones and regulate metabolism, growth and development, tissue function, sexual function, reproduction, sleep, mood, etc.
4. **Immune System** - Made up of a network of cells, tissues and organs that work together to protect the body. Most important are white blood cells, and immune factors that combine to seek out and destroy disease-causing organisms or substances.
5. **Autonomic Nervous System (ANS)** - The part of the nervous system that regulates function of all organs, such as heart, lungs, kidney, bladder, etc.
6. **Pituitary/Adrenal Axis** - Our central stress response system. The pituitary gland and brain are interconnected by hormones.
7. **Intestinal bacteria and their metabolites** - Healthy microbes support the gut lining making the GI tract physiologically more healthy, which has a positive effect on the CNS. Conversely, harmful microbes are detrimental to the GI tract and produce toxins that negatively impact the CNS.

Through this back and forth communication network, signals from the brain can influence the motor, sensory and secretory functions of the gastrointestinal tract, and messages from the gastrointestinal tract can influence brain function.<sup>1</sup>

## BEHAVIORAL DISORDERS LINKED TO GUT MICROBIOTA

There are various mood and nerve disorders that affect behavior, which can be characterized by impaired social interaction and communication. Emerging data has indicated a link between gut microbiome and behavioral disorders.<sup>2</sup>

Studies are indicating that disruption of gut microbiota may promote the over-colonization of gut microbes that produce destructive nerve toxins contributing to bad mood and depression. Changes in gut microbiota or specific gut bacteria strains that exist within the gut of humans or animals have been implicated in certain neurological behavioral disorders.<sup>2</sup>

Several studies in humans evaluating the gut microbiome illustrated a greater number of bacterial species from the *Clostridium* genus were present in fecal samples of young people with mood disorders. Furthermore, gut microbiome-mediated metabolism may also have an impact on nerve behavioral conditions. When urinary and fecal samples were gathered from test subjects with neurological behavioral conditions, the microbes were very different than normal test subjects.<sup>2</sup>

## GUT-BRAIN INTERACTION SHOWS LINK TO EMOTIONAL FACTORS

Mild depression is a major form of mood disorder that results from neural psychiatric disturbance involving the nerves, or immunological dysfunction. Probiotic treatment has shown to help lessen depression in animals. Species of *Lactobacillus* bacteria, which produce lactic acid, have been particularly characterized as antidepressants.<sup>2</sup>

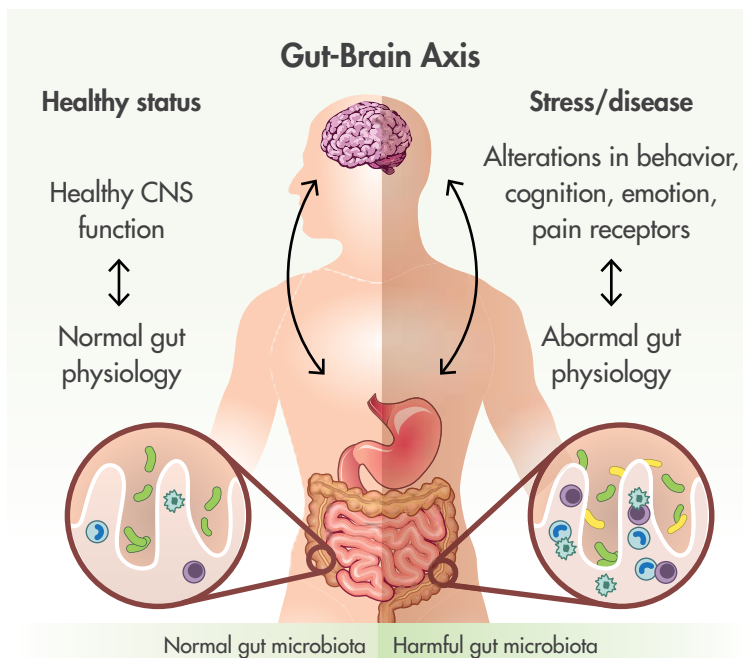
Species of *Bifidobacterium*, which has been shown to increase when fructo-oligosaccharides (FOS) are consumed as prebiotics, have also been shown to be potent antidepressants in some studies. Certain strains of *Bifidobacterium* were shown to alleviate depression in animals. Mechanisms involved include a reduction of inflammatory agents, regulation of tryptophan metabolism (the amino acid that turns into serotonin, the happy hormone) and CNS neurotransmitters.<sup>2</sup>

Similar probiotics were shown to help alleviate mild depression, which often occurs after a heart attack. These probiotics helped improve post-heart attack depression through reduction of pro-inflammatory proteins, in addition to restoration of barrier integrity in the lining of the gastrointestinal tract. It has also been shown that a diet formulation containing high levels of omega-3 polyunsaturated fatty acids (PUFAs) was helpful towards alleviating depression.<sup>2</sup>

## MILD ANXIETY AND STRESS RESPONSES

Mild anxiety and stress are common forms of mood disorders that result from alterations in the nervous, endocrine and immunological systems. Exposure to stressors such as chemical, biological or environmental stimuli can trigger stress and anxiety responses, which also involves activation of the pituitary system affecting the brain.<sup>2</sup>

Conditions that involve anxiety and stress have been perceived in drastic and mild types of intestinal dysfunctions, underscoring the role of gut-brain signals such as neurotransmitters and immune factors.



Studies have shown that a normal and healthy gut microbiota affects nerves, nerve junctions, and increased serotonin (the happy hormone). Gut-associated infections or bacteria can exacerbate anxiety. In contrast, beneficial probiotics can help improve anxiety. Specific species of *Lactobacillus* and *Bifidobacterium* genera have shown sedative effects.<sup>2</sup>

## DIGESTIVE+++ CONTAINS GOOD MICROBES TO SUPPORT YOUR GUT

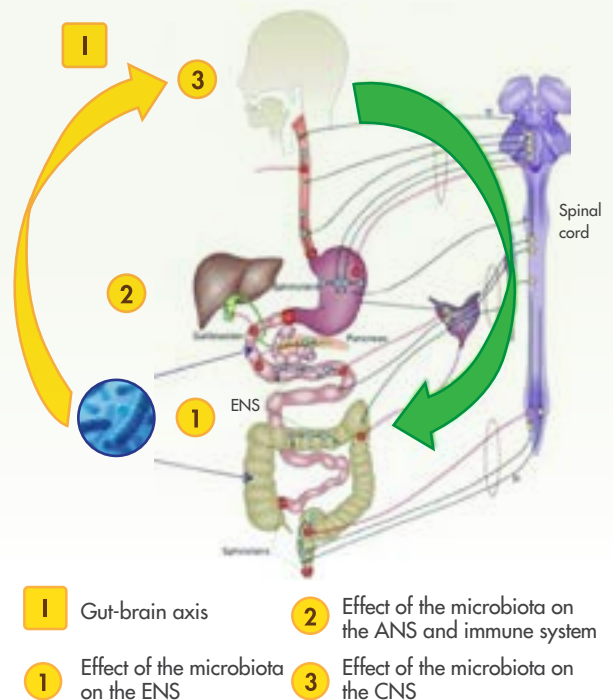
The DIGESTIVE+++ formula consists of the *Lactobacillus* strain of the gut microbe called *Bacillus Coagulans*. The prebiotic blend has fructooligosaccharides and Jerusalem artichoke, which enhance the colonization of *Bifidobacterium* in the gut and colon. Both of these strains of good microbes may help support a happy disposition, good mood and less anxiety, as new research is showing these benefits. DIGESTIVE+++ also contains a full range of digestive enzymes at all pH ranges to fully digest and assimilate the vitamins, minerals and cofactors from the foods we eat. It also helps break down fats and proteins to support their complete digestion and assimilation. Take one gel capsule with every meal to keep your GI tract healthy and support a happier mood and feeling of well-being!

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### Gut-Brain Axis with Nerve Systems



These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure or prevent any disease.

## REFERENCES

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3. Delphine M. Saulnier, Yehuda Ringel, Melvin B. Heyman, 3 Jane A. Foster, 4, 5 Premysl Bercik, et al. The intestinal microbiome, probiotics and prebiotics in neurogastroenterology. *Gut Microbes.* 2013 Jan 1; 4(1): 17-27.