Research has finally caught up to traditional medicine, and it is now beginning to confirm what has been known for centuries: The gastrointestinal (GI) tract is critical to a person’s physical and mental health. We have long understood the basics of how the GI tract digests foods, breaking it down into molecules small enough to be absorbed and then utilized as building blocks for almost every function in the human body. This article will touch on current research about the effects of our microflora on mental health via the gut-brain axis (GBA) and the hypothalamic-pituitary-adrenal axis (HPA).

The GBA is the bidirectional communication between the gut and the central nervous system (CNS). We can thank the Human Genome Project for the movement toward research on the importance of the GI system for mental health. Humans were found to have approximately 23,000 genes, a great deal less than expected based on our complexity. This led into the Human Microbiome Project, which found 1 trillion genes in the flora of our gut, and a possible explanation for the complexity of the human body: a symbiotic relationship with the 10-100 trillion bugs that live along with our 10 billion human cells.

The majority of research to date has been done with mice. However a growing body of evidence from human studies strongly suggests gut flora (bacteria) are partially responsible for our sense of well being. It was not long ago when we learned that 90% of serotonin in the body is produced by enterochromaffin cells (enterocytes) in the GI tract; now we are understanding that it is the flora on the enterochromaffin cells that produces a large percentage of precursors like tryptophan and other neurochemicals that affect our sense of well being.

The GBA is rather complex. What we know at this point is that gut bacteria regulate electrophysiological thresholds in the enteric nervous system neurons, affect vagal signaling, alter corticosteroid production, affect the production of inflammatory molecules including IL-10 and IL-6, and alter the immune system through cytokines like IL-18 and TNF-alpha. They appear to communicate with the body via the CNS, autonomic nervous system, neuroendocrine system (HPA/GBA), and immune system.

Mental health disease states that potentially can be improved by changes in the microbiota (an approach now termed psychobiotics) include depression and other mood disorders, anxiety, addictions, and schizophrenia. Improper gut flora has been associated with fibromyalgia, alcohol dependency, irritable bowel syndrome/small intestinal bacterial overgrowth, and obesity, as well.

Lactobacillus and Bifidobacterium are the most commonly researched gut bugs. Lactobacillus has been shown to produce acetylcholine and GABA, directly affecting depression and anxiety, and lowering the effects of the HPA. Bifidobacterium produces GABA, increases tryptophan (the precursor to serotonin), and increases brain-derived neurotrophic factor (BDNF). BDNF is a protein that encourages the growth and differentiation of nerve cells and synapses in the central and peripheral nervous systems. Also, Myobacterium vaccae has been shown to improve cognitive function and diminish anxiety-like behavior in animals.

Editor’s Note: Dr. Porter will give the keynote address at MPA’s Integrative Health Conference June 9. See the MPA website for details and to register.
Not all microflora are beneficial. For example, Bacillus species produces norepinephrine and dopamine and Escherichia coli increases norepinephrine in the body. More recent advances have linked CNS disorders like major depressive disorder to the gastrointestinal microbiome.

Research on the HPA axis shows that psychological stress can increase the permeability of the gastrointestinal lining, leading to a loss of gut microbiota and increased anxiety and depression. Studies have demonstrated that using probiotics prevents stress-induced increases in ACTH, corticosterone, adrenaline, and noradrenaline, attenuating the HPA axis, which can be hyperactive in depressed patients. Probiotics have also been shown to increase the expression of BDNF, increase tryptophan, and decrease inflammatory markers including IL-6, IL-1 beta, and TNF-alpha. The presence of inflammation in patients with depression is well-established. In one review of human research, 8 out of 10 studies reported decreased anxiety using probiotics alone, and they reported no serious adverse effects of the kind often seen with pharmaceuticals. The human research to date shows promising results in improving anxiety, mood, major depressive disorder, and the cognitive symptoms present in the latter.

The use of fermented food, a source of probiotics, in most traditional societies has been documented as far back as 10,000 years. Some research shows 25-30% less depression in societies with more traditional diets high in fermented foods and fiber. Fermentation enhances the bioavailability of important phytochemicals that have powerful antioxidant properties, and it decreases lipopolysaccharides. Small amounts of lipopolysaccharides, an endotoxin, stimulate depressive symptoms, interfere with blood sugar regulation, and increase inflammatory markers and oxidative stress.

In naturopathic medicine, the GI system has always been part of the therapeutic order addressed in every patient. It is my hope that nutritional psychiatry will become the first line of therapy for mild depression and anxiety in the near future. Ψ

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**References**


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... for, we are at risk of forgetting what we’ve learned. Stress can cause cognitive deficits by impairing optimal levels of arousal: we produce either too little or too much noradrenaline and dopamine (Arnsten, 2009). This impairment is shown to interrupt prefrontal cortex physiology and function.

This situation was demonstrated recently on live television at the 2017 Academy Awards. The two accountants responsible for the results had rehearsed how they would respond in case of a mistake. When a mistake was made on the final award, each “froze” and did not take action in the way they had rehearsed. This phenomenon has also been demonstrated in driving simulators at the U.S. Department of Transportation Volpe Research Center, where it was observed that individuals who practiced how to safely stop nevertheless failed to do so in a crisis simulation, “crashing” instead (J. POLLARD, private communication).

Just as with real-life pilots, applied psychologists must be prepared to submit to outside oversight and thorough inspection of our expert knowledge, ethical reasoning, and (often) split-second decision-making. The ongoing stress of this process can be significant, on top of the stress of an actual practice crisis or emergency.

The MPA Ethics Committee provides an anonymous platform for members to consult and receive support for questions and concerns related to our ethical responsibilities as psychologists. Ψ

**References**
