



We are taught that the digestive system's role is to process food—to break it down, extract the nutrients, and eliminate what is not needed. Over the last twenty years or so, an equally important, but counter-intuitive role that has been discovered is the gut's influence on the nervous system. Better stated, it is *part* of the nervous system.

The colloquial phrase, "I have a gut feeling", is actually true—we really do think and feel with our gut. More so, as a second brain, the gut has a say in every function that is "controlled" by the brain—including sleep, hormones, immune system (including resistance to infection, allergy and autoimmune disease), and perceptual and musculoskeletal systems (pain, movement, coordination, etc).

In Chinese Medicine, there are several meridians that "represent" various organs of the gut, including the stomach, small and large intestine, liver and gall bladder. Imbalance of any of these energetic systems correlates with emotional and physiological dysfunction. Likewise Ayurvedic (Indian) medicine uses the addition and deletion of specific foods and herbs to "re-program" the gut, and thereby affect emotional and physical health.

Most people appreciate the effect of the mind on the gut. For example, they will have diarrhea before a stressful exam or presentation, or their bowels will slow down when in a strange place. However, the effect of the gut on the mind is less obvious, but extremely important. Many children and adults are stuck in anxiety, depression or OCD, or have significant cognitive problems with attention or memory, and blame their brains, genetics, or circumstances, without appreciating the potential for improvement if the gut is considered a part of the root cause. They often will not see long-lasting relief until the gut is examined and treated. Even conventional medicine recognizes a role of the gut in autism¹. Even when there are no obvious gut symptoms the gut can be central to a chronic problem.

Women will also experience the effect of hormones on the gut—often their bowel patterns will speed or slow with phases of their cycle. But just as the hormones affect the gut, the gut affects the hormones.

Many of the medications that are used to "manage" (mask) symptoms of mind dysfunction, such as anti-depressants, stimulants, sedatives and hormones can affect the gut, making the situation worse in the long-term.

Finally, there is science that helps understand these relationships, and gives validity to working extensively on diet and gut function to affect virtually every function of the body, especially the mind.

Brief Anatomy of the Gut

We are a tube within a tube, with the gut representing one long 25+ foot long tube starting at the mouth and ending at the anus. By definition the contents of this tube are external to the body. The gut works in part as a filter, letting in the good stuff and keeping out the bad stuff.

Within the wall of the intestines, there are two layers of nerve networks—called the "intrinsic plexus". This nervous system has more nerve cells than the spinal cord,

and not only controls the function of the gut, but communicates with the "extrinsic" nervous system—the spinal cord, autonomic nervous system and brain (see below). There are also patches of immune cells called Peyer's patches.

The liver, gallbladder, and pancreas are parts of the digestive system, as they help with the processing of virtually all foods. The blood stream of the gut cycles back to the liver for processing.

A Brief Physiology of the Gut

The process of digestion requires a huge amount of mechanical and biochemical work. Approximately 25% of the body's total energy goes toward digestion. Not to disrespect our mothers, but we are supposed to lose our appetites when sick to divert this energy to healing.

Peristalsis is the process by which muscles in the gut wall propel food along its length. This requires synchrony of the muscles, which is coordinated by the intrinsic and extrinsic nervous systems. Conditions such as gastroparesis and achalasia occur when the nervous system is damaged and food doesn't move properly along the tube.

The gut lining also secretes several quarts of digestive fluids and lining cells per day; most are later re-absorbed in the large intestine. The quantity and composition of these fluids are again controlled by the intrinsic and extrinsic nervous systems.

The gut also contains trillions of bacteria and yeast, up to 5 pounds, a farm of up to 400 different organisms, which aid in digestion and in the production of important substances, including vitamins B7 and B12.

At least 50% of the immune system resides within the gut—like farmers—monitoring the population of bacteria and yeast, and programming the immune system to react or not react to various critters and compounds.

The liver, pancreas, small intestines and even the stomach also have endocrine functions—they release chemical messengers (hormones) into the bloodstream to affect the entire body.

The liver receives the blood from the intestines and has the job of processing most compounds that come from within and without. When the liver is overwhelmed, a toxic situation can affect mind, often called "fog"².

Neurotransmitters and Neuro-hormones

The way a nerve communicates with other nerves or tissues locally is through the release of chemicals called neuro-transmitters. There are also neuro-hormones that are released into the blood stream. Twenty years ago there were only four or five known neurotransmitters. Now we know of hundreds, if not thousands. These compounds range from very simple molecules such as nitrous oxide to single amino acids to complex molecules such as opiates.

The main neurotransmitter of the gut is serotonin. Serotonin is also the main target of most of the newer antidepressants, beginning with Prozac, also called SSRI's or "Selective Serotonin Reuptake Inhibitors". They essentially increase the levels of serotonin in the nervous system, which, in select patients, can help with depression,

anxiety, PMS, and other mind-body symptoms.

The gut releases serotonin in response to a carbohydrate meal—hence the temporary calming effect of cookies and sweets. Also, the amino acid tryptophan, present in high amounts in milk and turkey, is made into serotonin a basis for the calming effect of milk and cookies and thanksgiving dinner.

While we are taught that the mind “resides” within the brain, these new discoveries tell us that “mind” is simply the totality of the functioning of the body—which can be optimal, or for most of us, sub-optimal.

Evaluation of the Gut

Conventional evaluation of gut function is limited. The most common evaluation is endoscopy, when a scope is put in from above or below. This test looks at structure, not function. Sometimes the surface will tell the physician about function, such as when signs of inflammation are present. Also, a biopsy can be taken to look for infection or other cellular pathology.

Holistic medicine offers more functionally-oriented tests that can help identify organisms such as yeast, parasites and bacteria, as well as digestive efficiency, inflammation and allergy to foods.

Conventional and non-conventional labs can analyze various secretions, including saliva, gastric contents, and stool. All tests of digestive function are dependent upon timing—time of the day and what has been eaten and when over the last days and even months.

Several authors believe that certain food-based toxins, such as gluten, can persist within the gut for days, weeks or months, which makes evaluation difficult.

Oftentimes, the best way to evaluate gut function is to make a change in diet—by eliminating or adding certain foods and supplements and to monitor the subjective and objective effects of such changes. Again how this is done is critical, must be strategized, and can be sabotaged by just a single exposure (whether intentional or unknown) to certain foods and substances.

Treatment of the Gut

Treatment of the gut can be very simple or very complex. It's always best to start with the elimination of junk foods and chemicals, and to emphasize organic vegetables and fruits. After this, the use of nuts and seeds, grains, and animal products are based on a host of considerations for which there are umpteen different meal plans, which will be discussed in future articles.

Probiotics, good bacteria and yeast, are critical for proper gut function, and are harmed by antibiotics, chlorine, pesticides, aspirin-like drugs, and other agents. Most of us need to take probiotics on a regular basis².

Pre-biotics, agents that support the growth of healthy bacteria, as well as the integrity of the gut lining are often helpful. Stomach acid production decreases with aging and chronic stress and supplementation can help with a host of functions². Enzymes come in a huge variety and have different purposes. While fermented and raw foods can provide many of these agents, most of us need supplementation on a regular or intermittent basis.

There are specific herbal and nutritional agents that

also have specific functions—such as mastic to help with the stomach lining, glutamine for the intestinal lining, and naturally anti-bacterial and anti-yeast agents such as oregano oil, berberine and grapefruit seed extract. These agents should be used strategically because the timing and quantity can have an important effect on outcome.

Yoga, acupuncture and Ayurveda can affect the gut mechanically as well as energetically and for some patients are essential to achieve a long-lasting healing.

The effect of the gut on the mind has been known since ancient times; modern science is just now beginning to catch up. Using the best of both paradigms can help achieve long-lasting optimal mind function using natural means.

IMPORTANT NOTE: This educational material may not be used to make decisions about medical care without the oversight of an experienced practitioner.

Footnotes (see reading list for more information)

¹ <http://ebm.rsmjournals.com/cgi/reprint/228/6/639>

² See Dr. Cheikin's website, www.cheikin.com, for related articles on: Leaky Gut, Stomach Acid, Probiotics, Constipation, as well as other topics and holistic health information.

For More Information (Books followed by ISBN number)

- Dr. Cheikin offers workshops in several holistic health topics for adults and children. Please call for more information or to host a Workshop.
- Campbell-McBride, J: The Gut and Psychology Syndrome. ISBN-13: 978-0954852009. (available through Amazon.com)
- McCandless, Jaquelyn: Children with Starving Brains: A Medical Treatment Guide for Autism Spectrum Disorder, 4th Ed. Bramble, 2009. 1883-647-177.
- Pollan, Michael (2006). The Omnivore's Dilemma: A Natural History of Four Meals. New York: Penguin Press. ISBN 9781-5942-00823.
- Campbell, TC et al: China Study: The Most Comprehensive Study of Nutrition Ever Conducted and the Implications for Diet, Weight Loss... Benbella, 2005. 1932-100-385.
- Fenster, Carol: Special Diet Solutions: Healthy Cooking Without Wheat, Gluten, ... or Refined Sugar, 3rd Ed. Savory Palate, 2001. 1889-374-008 (out of print but very helpful book, others also good).
- Boutenko Victoria: Green for Life. Raw Family, 2005. 0970-481-969.
- Sivananda Center: The Sivananda Companion to Yoga. New York: Simon & Schuster, 1983. 0684-870-002.

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