Functional Medicines Views on "The Gut-Brain Axis In Health and Disease!"

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The brain is the most nutrient-dependent, energy-dependent and toxin- and stress-vulnerable organ in the body. The gut and the brain are very tightly linked. In the gut-brain axis, damage to one is often damage to the other.

Concussion is a good example. When a blow to the head or severe jolt causes a concussion, the damage to the neurons has a parallel in damage to the gut lining. The tight junctions of the lining almost immediately open up and become permeable. This produces inflammatory cytokines that can penetrate the blood-brain barrier, leading to additional brain inflammation. In other words, when the gut is on fire, so is the brain.

If the sudden intestinal permeability caused by a concussion goes untreated, the concussion symptoms will be worse, due to the additional inflammation. The gut permeability may not resolve by itself, which could contribute to making the concussion symptoms linger on for weeks instead of days. Intestinal permeability may also play a role in those patients who go on to develop post-concussion syndrome by causing ongoing brain inflammation.

So, in addition to treating the concussion itself with nutrition, the intestinal permeability, particularly the release of occludin and zonulin, needs to be immediately addressed.

The intercellular permeability of the gut lining can be treated through repair and regeneration with xanthohumol. A natural phenol derivative of hops, xanthohumol has a very extensive (more than 250 publications in preclinical science) record of efficacy and safety. In the brain, xanthohumol acts as an antioxidant and anti-inflammatory; it also helps with the biogenesis of mitochondria in damaged neurons. In the gut, the polyphenols are strongly anti-inflammatory. They modify the inflammatory kinases in favor of antioxidant pathways and, just as important, block the kinases in the cell-damaging inflammatory pathways for tumor necrosis factor, COX-2, and others.

On a chronic level, we know that neurodegenerative diseases such as Alzheimer's, depression, and anxiety may not be exclusively triggered within the brain. When the intestinal barrier is breached, so is the blood-brain barrier. Inflammation from circulating gut-derived lipopolysaccharides (LPS) pass through the blood-brain barrier and have been linked to a number of neurodegenerative disorders. In particular, LPS stimulates the production of IgA, IgG, and IgM antibodies that can cross-react with tissues and induce autoimmune disease and neurodegeneration.

Treating brain inflammation caused by gut inflammation starts with removing the cause through a modified elimination food plan and the removal of pathogens. Anti-inflammatory supplements, such as berberine, and digestive enzymes, such as lipase and amylase, help restore the gut lining. The next step is to reinoculate and regenerate the gut with a powdered nutritional supplement if needed, continuation of the modified elimination diet, and the addition of probiotics, vitamin D, alpha-lipoic acid, and specialized pro-resolving mediators (SPMs). Xanthohumol is also very helpful for regenerating intestinal mucosa.

Once the process is underway, retesting is important to see the gains and make any necessary adjustments to the treatment plan. As healing progresses, retaining the gains with a better diet and appropriate supplements becomes the focus of treatment.

Healing the intestinal barrier is only half the equation. The brain inflammation needs to be treated as well. Low-level laser therapy (LLLT) is a valuable tool for improving neurological function. In concussion patients, it has been shown to help reduce inflammation, modulate oxidative stress and nitric oxide production, and down-regulate pro-inflammatory microglial cytokine expression.

LLLT is also valuable for reducing inflammation of the vagus nerve. The longest of the cranial nerves, the vagus is often called the great wanderer for the way is wanders through the visceral organs. A major function of the vagus nerve is preventing inflammation. In the gut, the vagus nerve endings sense the chemical signals of inflammation, such as cytokines and tumor necrosis factor, and send messages to the brain telling it to release anti-inflammatory neurotransmitters via the cholinergic anti-inflammatory pathway. When the brain-gut axis is disrupted, the vagus nerve is affected and the messages back and forth are garbled or don't get through at all. Decreased vagal nerve activity has some serious effects on the gut. Hydrochloric acid and pancreatic enzyme secretion is reduced, as is bile secretion. The parietal cells in the stomach, which are responsible for producing intrinsic factor, don't work as well, leading to reduced absorption of B vitamins.

We know that post-injury vagal nerve stimulation (VNS) after a concussion can help prevent the breakdown of epithelial cells in the gut and keep the tight junctions from opening. This only works when administered within 90 minutes of the injury, however. Later on, stimulation of the vagus nerve with LLLT using 405 nm violet light can help to restore communications and reduce inflammation.

Treatment modalities such as those discussed here help repair the integrity of the gut lining and the blood-brain barrier. They're a hopeful new approach to restoring the functionality of the gut-brain axis and returning the body to harmony.

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