The Role of Terrahydrite Supplementation to Support Brain Health and Mental Clarity

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The Gut-Brain Axis is a rapidly progressing field of research. Every month there is more data emerging from universities and private labs around the globe that continues to illuminate the role of gut microbes and intestinal function in neural health at all stages of development. Similarly, damage to the gut microbiome and the gut mucosal barrier through antibiotic and herbicide exposure has now been shown to be predictive of a wide variety of neurologic and mood disorders. [1,2]

The Gut-Brain Axis is comprised of four systems: the intestinal mucosal barrier (epithelial layer), the immune system (gastro-intestinal associated lymphatic tissue [GALT]), the enteric endocrine system (neurotransmitter production), and the nervous system which includes the enteric afferent sensory network, parasympathetic (relaxation, digestion, metabolism), and sympathetic (fight or flight) systems [see figure 1, figure 2]. Approximately 15% of this intestinal lining is composed of enteric endocrine cells, which produce over 90% of the serotonin and over 50% of the dopamine neurotransmitters. [3]

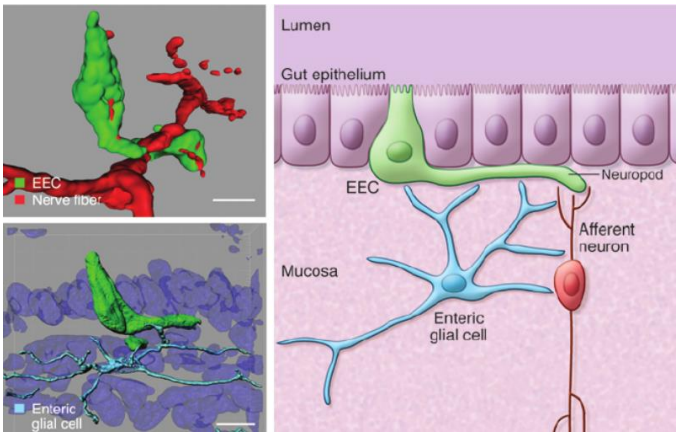


Figure 1. The enteric endocrine cells within the gut lining depicted in green in neuroimaging (left) and in the accompanying graphic (right), produce over 90% of the serotonin, and 50% of the dopamine produced in the body.

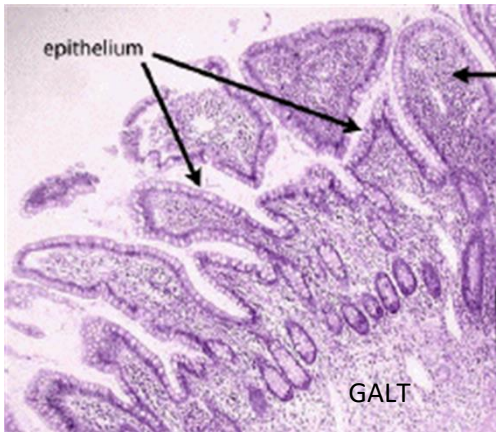


Figure 2. Histology cross section of the small intestine shows relationship of the epithelial barrier to the gastro-intestinal lymphatic tissue (GALT).

The function of each of the four elements of the gut-brain axis (microbiome, epithelial border, the GALT, and the enteric nervous system) is reliant on the tight junction network in the extracellular matrix of the intestines. These Velcro-like protein structures connect each adjacent epithelial cell to the next in order to create a single barrier that has a surface area of two tennis courts. Intestinal permeability is regulated by the structural integrity of these tight junctions. Tight junctions regulate the passage of large organic molecules between adjacent epithelial cells, and also to prevent the passage of microorganisms and other unwanted foreign

materials and toxins into our body. Therefore, defective intestinal barrier integrity can lead to leak of organic and inorganic compounds and overwhelm of the immune, endocrine, and neural systems.

Our laboratory at Biomic Sciences has been at the forefront of studying the relationship between the common herbicide, glyphosate, which is the functional ingredient of Round Up, and the vast majority of weed killers on the market. This organophosphate functions as an antibiotic in soil and human systems, and is a direct toxin to the tight junction system [see figure 3].

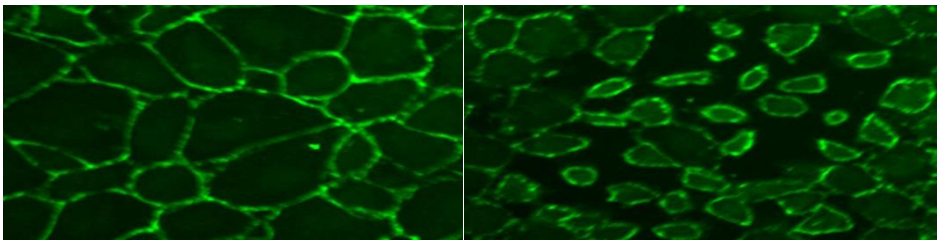


Figure 3. Immunofluorescent Microscopy highlighting the ZO1 protein element of the tight junctions that produce a cohesive layer of epithelial cells (left panel), and a damaged barrier 20 minutes following exposure to 20 ppm of glyphosate, the active ingredient in Round Up weed killer (right panel).

We have also been able to demonstrate that glyphosate predisposes the epithelial lining to gluten-mediated injury to the epithelial barrier of the gut [Figure 4]. In both gut epithelial and the blood-brain endothelial barrier, we have demonstrated that Restore supports the natural protection and repair of the tight junctions with or without glyphosate present [See figure 5].

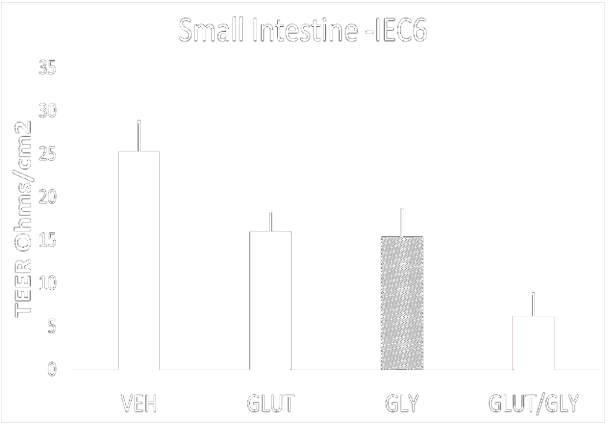
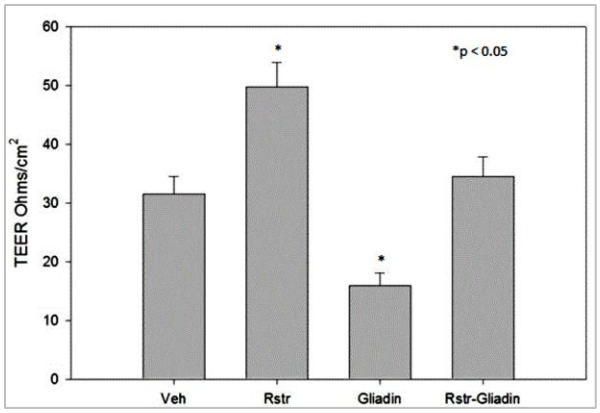


Figure 4. Transepithelial Electrical Resistance (TEER) functionally measures the protective function of the tight junction network, here in the small intestine epithelial cell model. Both Gluten (GLUT) and glyophosate (GLY) cause a moderate injury to the protective function of the small intestine, and the combination of the two (GLUT/GLY) produces an additive injury.



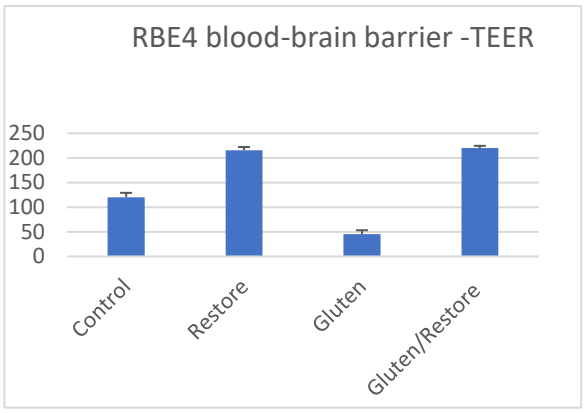


Figure 5. Transepithelial Electrical Resistance (TEER) functionally measures the protective function of the tight junction systems in the small intestine (left panel) and blood-brain barrier (right panel). In each you can see the effect of Restore improving the protective function of the control and the gluten (gliadin) injury.

This data evidences the powerful impact of the microbiome in its production of the terrahydrite family of molecules that function as the active ingredient in Restore. As we are exposed to antibiotics from our doctors, our food system, and now the water we drink, the air we breathe, and the rain that falls from our contaminated ecosystem, we become deficient in this critical support system to our barriers of the intestines and blood-brain barrier, making us vulnerable to injury from natural and man-made toxins of all varieties. Restore has become an important supplement in aiding the citizens of the developed and developing world that are consistently exposed to hebicides and pesticides in their food and environment. Through the direct support of the tight junction barriers of the gut and blood-brain barrier systems, as well as protection of the enteric endocrine and nervous systems that lies within the complex anatomy of the gut. Through these mechanisms Restore provides a new foundation of support for your healthy body and mind.

All of our science at Biomic Sciences is pushing an international agenda to discontinue herbicide management in large scale farming through the education of farmers to transition to regenerative agricultural practices for the recovery of human and planetary health.

References:

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