Biocidin Botanicals®

Gut-Brain Axis Protocol

"Clinical, epidemiological, and immunological evidence suggest that enteric microbiota extensively and profoundly influences the gut-brain relationship (i.e., mental state, emotional regulation, neuromuscular function, and regulation of the HPA)."[1]

The gut-brain axis (GBA) connects the network of nerves in the gastrointestinal (GI) tract (known as the enteric nervous system) and central nervous system through multiple communication pathways. It is bidirectional, meaning the microbiome and gastrointestinal tract influence the brain and the brain, in turn, affects the gastrointestinal tract.

This type of bidirectional communication is called "microbial endocrinology" or "interkingdom signaling," and describes the symbiotic and pathogenic relationships between the bacteria and mammalian host.[1] It does this in the following ways:

- Anatomically, through the vagus nerve and the nerves within the GI tract, as well as through modulation of the intestinal and blood-brain barrier (BBB) permeability
- Endocrinologically, through the hypothalamic-pituitary-adrenal (HPA) axis and hormone-metabolizing microbes
- Metabolically, through production of mediators and signaling molecules
- Immunologically, through the GI lymphatics and response to mediators, and microglial activation
- Epigenetically

These pathways combine through the autonomic nervous system and the HPA axis to create the GBA, allowing the gut to influence mood, cognition, and mental health, while the brain influences intestinal activities such as motility, immune activity, and serotonin metabolism.[2] The microbiome exerts both direct and indirect effects on the emotional and cognitive activity of the brain. In fact, fluctuations in the microbiome are associated with the following:

- Mood disorders (e.g., anxiety, depression)
- Neurocognitive illness (e.g., dementia, Parkinson's, multiple sclerosis)
- Autism spectrum disorders
- Attention deficit/Hyperactivity disorders
- Sleep disturbance

[1] https://pubmed.ncbi.nlm.nih.gov/24997034/
[2] https://pubmed.ncbi.nlm.nih.gov/31043907/

Additionally, GI illness such as functional GI disorders (e.g., nausea, vomiting, pain, dyspepsia, reflux, constipation) and GI disease (e.g., irritable bowel syndrome, inflammatory bowel diseases Crohn's/ulcerative colitis) often present with psychological conditions associated with the microbiome.[1]

Evidence of the role of microorganisms in neurological health has resulted in the term "psychobiotics"– defined as probiotics that, upon ingestion in adequate amounts, yield a positive influence on mental health. Because prebiotics have a demonstrated benefit to mental health and support the growth of specific commensal bacteria with psychophysiological effects, prebiotics can be included in the definition of psychobiotics.[3]

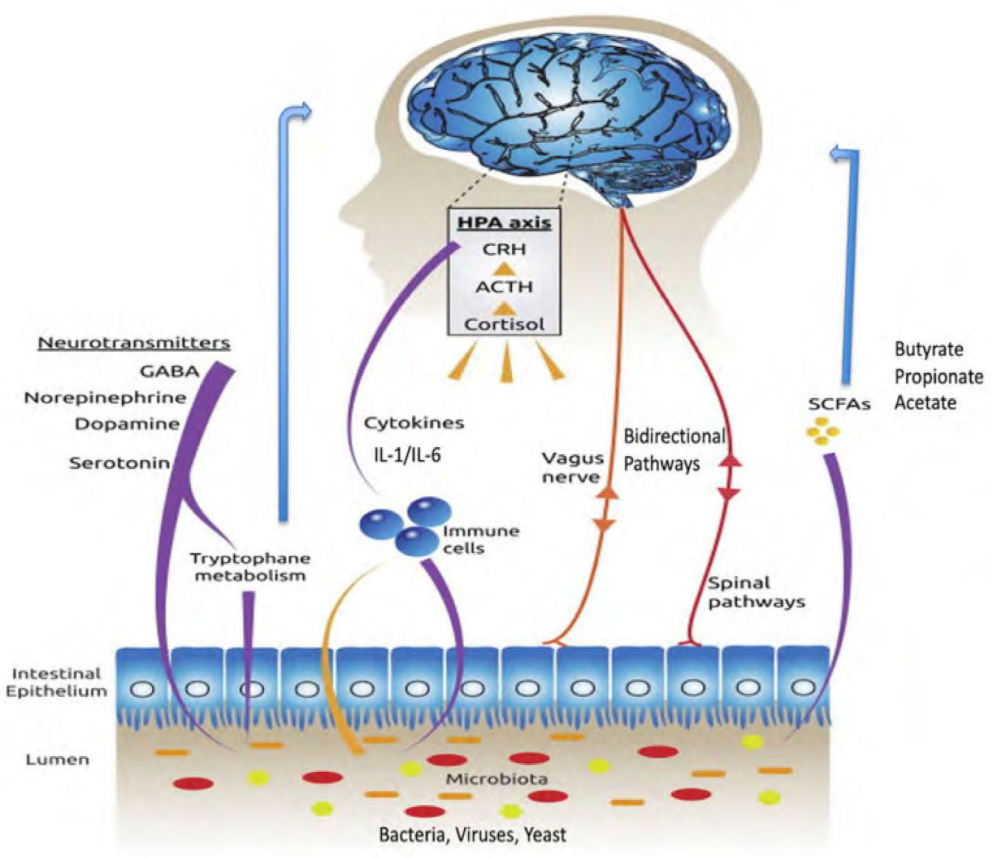

Figure 1: Connections within the brain-gut-microbiota axis, including the vagus nerve, and SCFAs such as butyrate, cytokines, and tryptophan. Modified from Ref. [20] 2015 Springer Nature: More than a gut feeling: the microbiota regulates neurodevelopment and behavior. Neuropsychopharmacology 2015; 40: 241–242. Abbreviations: HPA, hypothalamic–pituitary–adrenal; CRH, corticotrophin-releasing hormone; ACTH, adrenocorticotropic hormone; GABA, gamma aminobutyric acid; SCFAs, short-chain fatty acids.[4]

[3] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6521058/
[4] https://pubmed.ncbi.nlm.nih.gov/35890040/

Physiology and Clinical Relevance

Both the HPA axis and the intestinal microbiota show rapid and profound developmental changes during the first years of life.[5] Balanced flora reduces basal HPA axis activity and stress-induced corticosterone levels. Gut microbiota is critical for determining the HPA-axis setpoint.[6]

Serotonin, a well-known neurotransmitter involved in mood, is predominantly made in the lining of the gut and influences hypothalamic CRH, altering the expression of serotonin receptors, possibly leading to altered HPA function.[6]

Additionally, enteric bacterial diversity and composition uniquely influence the release of gut peptides.[6] Several of the same peptides and their receptors that are released into the gut are also widely expressed in the brain or signal to the brain, where these peptides play well-established roles in the neurobiology of anxiety and depression.

Gut Peptides Influenced by the Microbiome with Effects in the Brain[7]	
Glucagon-like peptide (GLP-1)	Governs appetite, satiety, and insulin sensitivity.
Cholecystokinin (CCK)	Supports gastric motility, bile release, and enzyme production. May play a role in anxiety and panic disorders.
Peptide YY (PYY)	Influences appetite and gastric motility.
Ghrelin	Governs appetite, fat storage, and glucose balance.
Corticotropin-releasing factor (CRF)	Influences stress response, increases anxiety, and suppresses appetite.
Oxytocin	Important in childbirth, bonding, depression, anxiety, post-traumatic stress, and anorexia.

Risk Factors for Disruption in the GBA

- Medications
    - Antibiotic use – maternally or in infancy
    - Antidepressants – may have antimicrobial effects[7]
- Early life stress – affects HPA axis and microbiome development
- Chronic stress – disrupts intestinal barrier integrity[6] and microbiome composition
- Poor diet
- Environmental toxins and exposures

[5] https://pubmed.ncbi.nlm.nih.gov/28918360/
[6] https://pubmed.ncbi.nlm.nih.gov/29134359/
[7] https://www.yourhormones.info/hormones/

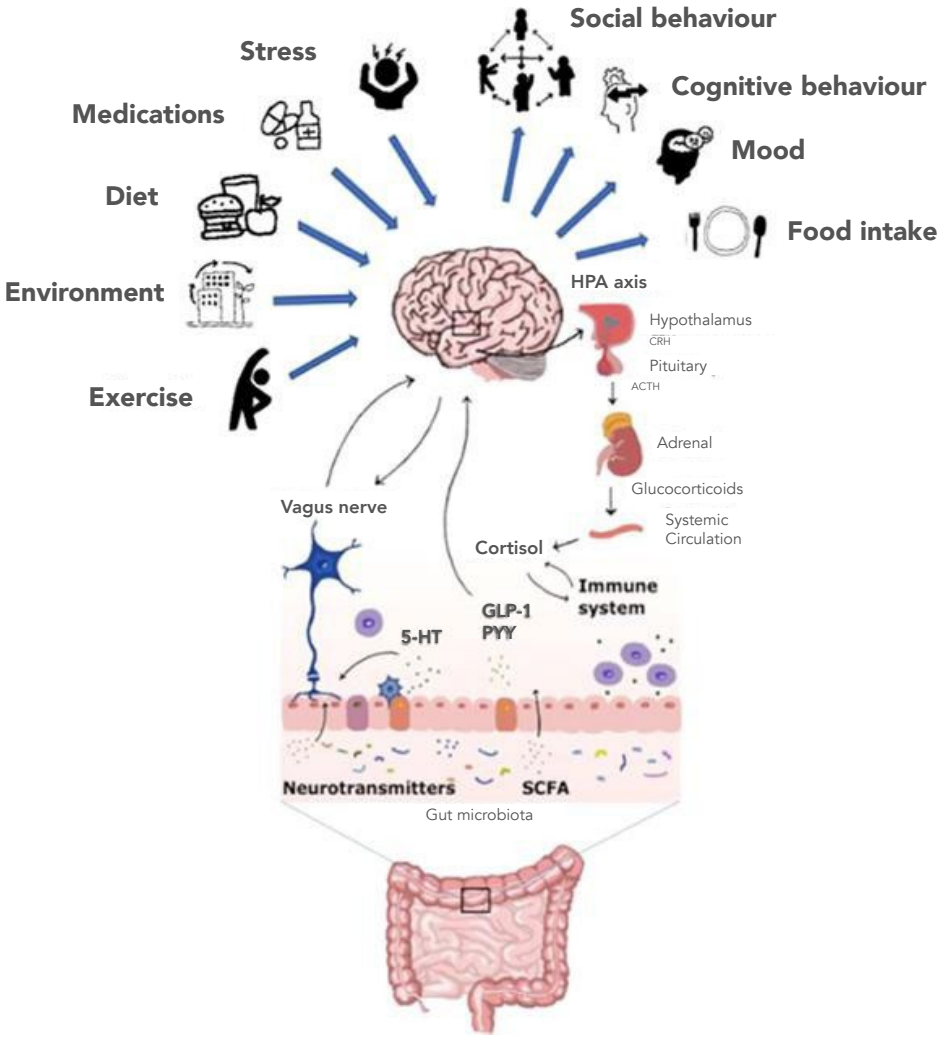

Figure 2: https://www.sciencedirect.com/science/article/abs/pii/S0963996921007924

Clinical Pearl #1 - Mold and yeast can contribute

Mold exposure or overgrowth of fungal microorganisms in the microbiome (mouth, GI, skin) can contribute to inflammation and immune dysregulation, and also influence the GBA. See our mold protocol for more information.

Clinical Pearl #2 - Don't forget the oral microbiome!

Poor oral health and periodontitis are associated with increased risk of dementia and Alzheimer's disease. Additionally, oral dysbiosis is associated with neuroglial activation, anxiety, depression, insomnia, brain fog, and poor concentration. Include a basic oral exam and questionnaire as part of your physical exam, and address oral dysbiosis. See our oral health protocol for more information.

Clinical Pearl #3 - Include Detoxification Support

Most toxins are eliminated primarily through the liver via bile and the kidneys via the urine. Bile is released into the small intestines and these bile-bound toxins are destined for excretion in the stool. It is important to ensure healthy bile production and flow for optimal digestive function and toxin elimination.

Additionally, biofilms may harbor bacterial metabolites and toxins, including mycotoxins, and when biofilms are broken these toxins and metabolites may cause damage to the surrounding tissues or transient increases in inflammation. Including a binder, such as Biocidin Botanical's G.I.Detox®+, can prevent the reabsorption of toxins and reduce the burden on the liver, making detoxification more efficient, improving the patient experience, and promoting compliance.

Optimize liver and kidney function

Additionally, consider including botanicals, such as those found in Liver GB+™, to support the liver and kidneys, including:

Artichoke	Stimulates bile flow, enhances fat digestion, supports detoxification, liver and kidney health
Milk Thistle	Enhances absorption, detoxification, and digestion, protects liver and kidneys
Turmeric	Helps support & stimulate bile flow, protects and supports the liver and kidneys
TUDCA	Supports healthy bile flow and gallbladder health, protects and supports the liver, thins bile, protects kidneys
Ginger	Improves production and flow of bile, promotes gastric emptying and reduces intestinal transit time, helps ease indigestion, belching, gas, and feelings of fullness after eating, and protects kidneys

Biocidin Botanicals Case Study

The following case study was conducted by Dr. Pamela Hyde. The patient is an elderly woman with dementia. She was prescribed the Bioclear® Cleansing Program (BCP) as part of a supplement schedule spanning seven months. During that time, when she discontinued the BCP her symptoms returned and fluctuated. When the BCP was resumed, symptoms and brain health improved.

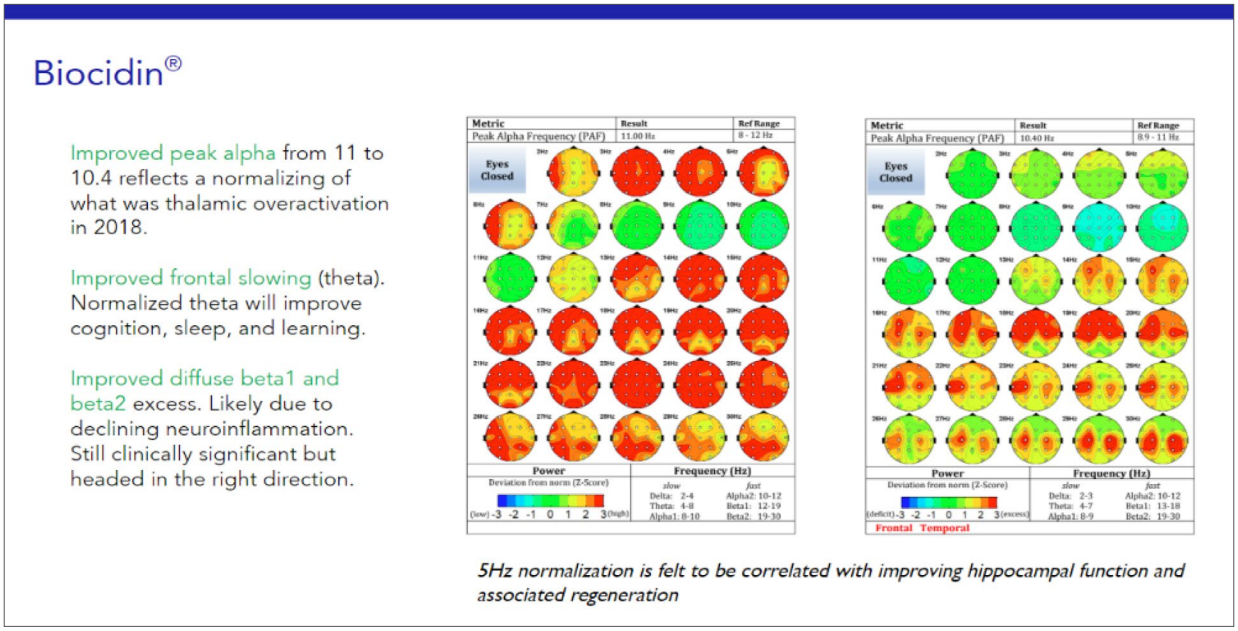

Figure 3. Improvement in brain health following the long term use of the Bioclear™ Microbiome Detox Program (Biocidin® Liquid, GI Detox™+, and Proflora™ 4R) to address the GI microbiome.

Restoring and maintaining balance in the microbiome offers a vital therapeutic target for patients with mental or neurological health concerns. Botanicals offer a powerful, easily tolerated solution, and can set the stage for long term well-being.

Lifestyle Recommendations

- Support your treatment with simple yet effective lifestyle recommendations. Check out the list contained in the Bioclear® Microbiome Detox Program Lifestyle Guide.
- Adopt a low-inflammation diet (Modified paleo, Mediterranean, etc.), that includes a high intake of non-starchy vegetables.
- Add prebiotics and resistant starches to support the growth of commensal bacteria in the gut.
- Support the vagus nerve – cold shower/plunge, deep breathing, gargling, singing, humming, chanting, meditation, laughing, exercise, massage.

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Therapeutic Plan Suggestions

Gut-Brain Axis Support		
CORE PROTOCOL		
Biocidin® Liquid or Capsules	Titrate to 15 drops 2x/day	Titrate to 2 caps 2x/day
G.I. Detox+®	2 capsules at bedtime. 1 hour away from food, supplements, and medications. Temporarily increase dose to 2 capsules 2-3x/day if Herxheimer reaction observed/worsens.	
Proflora® 4R	1 capsule any time	
G.I. InnerCalm®	1 stick pack mixed in water, 1-2 times daily, taken any time	
ADDITIONAL SUPPORT		
Biocidin® LSF	May be required in addition to the liquid/capsules. Titrate to 3 pumps 2x/day.	
Liver GB+™	1 capsule 2x/day	
Biotonic®	20 drops 2x/day	
Motility Assist™	1-2 capsules per day, before bedtime	
Olivirex®	Titrate to 3 capsules 2x/day for fungal/yeast presence	

Additional Therapeutics

Bacopa	Gotu Kola
Ginkgo	Lion's Mane mushroom

Questions?

For clinical questions, email clinical@biocidin.com

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*These statements have not been evaluated by the Food and Drug Administration. These products are not intended to diagnose, treat, cure or prevent any disease.