



## Role of Gut Microbiome in Mental Health: Mushrooms as Natural Probiotic Stimulants

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### Abstract

The gut microbiome is increasingly recognized as a regulator of both digestive and mental health through the gut-brain axis. Mushrooms, particularly *Herichium erinaceus* (Lion's Mane), have gained scientific interest for their rich bioactive profile and probiotic-stimulatory potential. Extracts of Lion's Mane contain polysaccharides, phenolics, and flavonoids that selectively enhance *Lactobacillus* growth, modulate gut microbiota, and protect the intestinal lining via antioxidant and anti-inflammatory effects. This dual activity strengthens the gut barrier while promoting neurotransmitter regulation, thereby linking gut health to emotional resilience. With their prebiotic and neuroprotective properties, medicinal mushrooms offer promising natural alternatives for future nutraceutical and mental health applications.

**Keywords:** Gut Microbiome; Gut-Brain Axis; Medicinal Mushrooms; *Herichium Erinaceus*; Probiotic Stimulants; Mental Health

### Introduction

Mood swings and mental health disorders have traditionally been attributed to hormonal or psychological imbalances. However, recent evidence highlights the gut microbiome as a central contributor to emotional stability through the gut-brain axis. Beneficial microbes influence neurotransmitter production, including serotonin, dopamine, and GABA, thereby regulating mood and cognition. Dysbiosis caused by poor diet, antibiotics, or stress can disrupt this balance, leading to anxiety, irritability, and depression.

Despite this knowledge, mental health interventions remain predominantly brain-centered. Incorporating dietary strategies, probiotics, prebiotics, and nutraceuticals into therapeutic approaches may restore microbial balance and support psychological well-being. Mushrooms, long valued in traditional medicine, represent an underexplored natural source of prebiotic and anti-inflammatory compounds that may contribute to gut and mental health.

### Methodology

Bioactive compounds from *Herichium erinaceus* were extracted using two approaches:

- Soxhlation with ethanol-water (40:60).
- Maceration with ethanol, acetic acid, and distilled water (15:8.5:76.5).
- Probiotic stimulation was assessed by culturing *Lactobacillus* strains in MRS broth supplemented with extracts. Growth was measured spectrophotometrically at 600 nm after 0, 24, and 48 h.
- Anti-inflammatory activity was determined using the egg albumin denaturation assay, with diclofenac sodium as the reference standard. Percentage inhibition of protein denaturation was calculated to evaluate efficacy.

## Results and Discussion

Early findings indicate that chronic gut inflammation disrupts the gut–brain axis, leading to neuroinflammation and altered neurotransmitter signaling. Inflammation-associated leaky gut permits translocation of lipopolysaccharides (LPS), elevating systemic cytokines that interfere with serotonin and dopamine pathways—mechanisms strongly linked to depression and anxiety. Lion’s Mane extracts demonstrated significant probiotic stimulation, supporting the growth of *Lactobacillus* strains, and exhibited up to 80% inhibition of protein denaturation, suggesting potent anti-inflammatory activity. These properties highlight a twofold role: (i) nourishing beneficial microbes through polysaccharides and prebiotic fibers, and (ii) safeguarding the gut lining by reducing oxidative and inflammatory stress. Similar effects have been reported for other medicinal mushrooms, including Reishi, Shiitake, and Maitake, reinforcing their traditional therapeutic use.

## Conclusion

The gut microbiome is a pivotal determinant of both physiological and psychological health. By refining microbial balance, fortifying the intestinal barrier, and modulating neurotransmitter activity, probiotics and prebiotics play a central role in mental well-being. Lion’s Mane mushroom emerges as a promising natural probiotic stimulant with dual benefits: enhancing gut microbial resilience and indirectly stabilizing mood through the gut–brain axis. Integrating such traditional remedies with modern scientific insights may offer holistic, side-effect-free strategies for addressing mood disorders and promoting mental health.