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ORIGINAL PAPER

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THERAPEUTIC POTENTIAL OF LION'S MANE MUSHROOM (*HERICIUM ERINACEUS*) IN THE TREATMENT OF DEPRESSION AND DEPRESSIVE SYMPTOMS: NEUROBIOLOGICAL MECHANISMS AND HEALTH BENEFITS

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ABSTRACT

Depression, a condition affecting over 300 million individuals worldwide, is characterised by the limited efficacy of current pharmacological treatments. Lion's mane [Hedgehog soprano] (*Hericium erinaceus*, HE) has demonstrated notable neuroprotective and antidepressant properties, believed to result from its modulation of the gut-brain axis and its anti-inflammatory effects. This literature review which includes studies from PubMed, Web of Science, and Scopus published over the past decade, examines the impact of HE on neurotransmitter systems, neuroprotection, inflammation, and gut microbiota. The findings suggest that HE stimulates nerve growth factor (NGF) production, which promotes neurogenesis, and modulates the gut microbiota, which in turn influences the synthesis of key neurotransmitters such as serotonin and dopamine. Furthermore, HE exhibits anti-inflammatory effects by reducing pro-inflammatory cytokines. Both preclinical and clinical studies support its antidepressant effects. However, further research is needed to determine optimal dosages, clarify the underlying mechanisms of action, and assess potential drug interactions.

Keywords: Hedgehog soprano, *Hericium erinaceus*, gut-brain axis, mood disorders, neuroprotection, microbiota

INTRODUCTION

Despite advances in the treatment of depression, its global prevalence continues to rise (WHO, 2022; Goodwin et al., 2022). Affecting nearly 300 million people, depression severely impairs social and occupational functioning, and is associated with a 30-fold increased risk of suicide (Ko et al., 1995; Zhang et al., 2019). Although numerous antidepressant options are available, approximately 50% of patients do not respond adequately to treatment, and many experience side effects (Ashton et al., 2005; Hodgson et al., 2015). Furthermore, relapse occurs in up to 60% of cases, and residual symptoms persist in roughly half of patients (Culpepper et al., 2015; Leistner and Menke, 2020). Increasingly, depression is understood as a multifactorial disorder involving dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, inflammatory processes, and altered neurotransmitter signalling (Zheng et al., 2023), underscoring the need for integrative, multi-targeted therapeutic approaches.

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Hericium erinaceus (HE) has attracted attention for its neuroprotective and potentially antidepressant effects, primarily due to its ability to stimulate nerve growth factor (NGF) production (Chong et al., 2019; Li et al., 2018). Its ability to cross the blood-brain barrier, along with its demonstrated efficacy in treating neurodegenerative conditions such as Alzheimer's and Parkinson's disease highlights its therapeutic promise (Skubel et al., 2022; Zhu et al., 2017). The gut-brain axis – linking the gut microbiome with the central nervous system – plays a central role in mood regulation, and its disruption has been implicated in the pathogenesis of depression (Yao et al., 2015; Ryu et al., 2018). Through modulation of the gut microbiota, alongside anti-inflammatory and antioxidant effects, HE may help restore balance within this axis (Kuo et al., 2016; Chiu et al., 2018).

This review examines the role of *Hericium erinaceus* in the treatment of depression, with a focus on its regulatory effects on the gut-brain axis. These insights may support the development of novel therapeutic strategies integrating pharmacological, dietary and probiotic interventions (Liu et al., 2019; Vigna et al., 2019).

MATERIAL AND METHODS

We performed a systematic review of both randomized controlled trials and observational studies published over the past 10 years, along with one study from 15 years ago, highlighting the long-standing interest in the effects of *Hericium erinaceus* (HE) on mental health and cognitive function. We searched PubMed, Web of Science and Scopus for English-language articles. Eligible studies involved adult humans (≥18 years) or murine models. They assessed the effects of *Hericium erinaceus* mycelium, its bioactive constituents, or both on depression, mood regulation, and cognitive performance – focusing on antidepressant, anxiolytic, neuroprotective, and anti-inflammatory outcomes. The complete search strategy is shown in Figure 1.

RESULTS

The gut-microbiota-brain axis

The gut microbiome, a complex community of microorganisms, plays a crucial role in overall health, including the regulation of cognitive and emotional functions (Priori et al., 2024; Magalhães-Guedes, 2020; Chong et al., 2019). Dysbiosis – an imbalance in the microbiota – disrupts the gut-brain axis and can lead to nervous system alterations and mental problems (Magalhães-Guedes, 2020).

The gut microbiota contributes to the synthesis of neurotransmitters such as serotonin and dopamine, as well as omega-3 fatty acids, all of which help regulate mood (Zheng et al., 2023; Chong et al., 2019). Communication within the gut-brain axis occurs through neurotransmitters, pro-inflammatory cytokines and the immune system (Magalhães-Guedes, 2020; Priori et al., 2024). Cytokines from the gut can affect the central nervous system, leading to mood disorders, stress responses, and depression (Zheng et al., 2023; Li et al., 2018; Kuo et al., 2016). Dysbiosis, triggered by poor diet, stress, infections or antibiotics, can further impair the axis, resulting in symptoms such as low mood, anxiety or depression (Vigna et al., 2019; Chong et al., 2019) (Fig. 2).

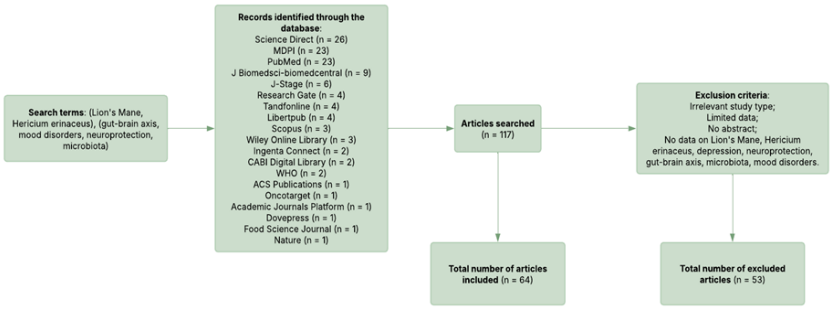

Fig. 1. Search strategy used to identify relevant studies
Source: author's own compilation.

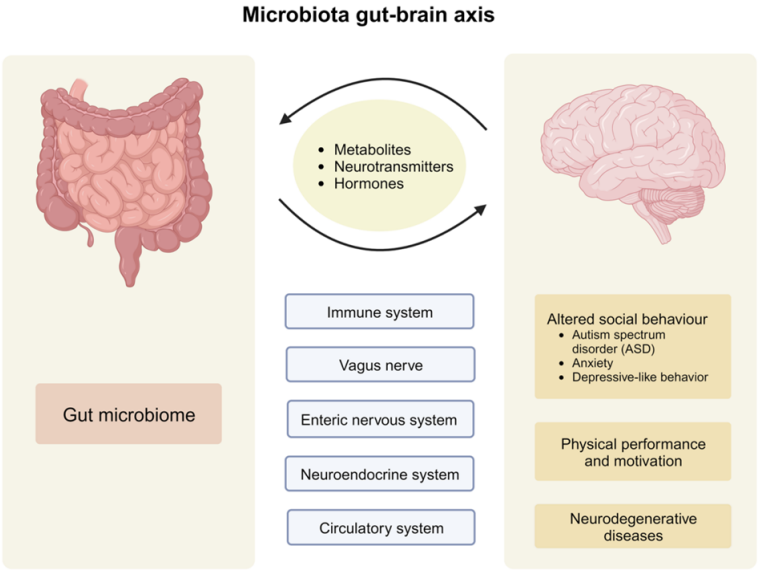

Fig. 2. Gut microbiota-gut-brain axis communication, illustrating the involvement of multiple systems and resulting behavioural and physiological effects (reproduced from Loh et al., 2024)

The gut-microbiota-brain axis is a bidirectional system that integrates the central nervous system (CNS) and the enteric nervous system (ENS), facilitating signal exchange between the brain and the gut microbiome via neuronal, endocrine, immune pathways, and gut microbiota metabolites (Carabotti et al., 2015; Zhu et al., 2017). Key functions include regulating gastrointestinal activity and linking cognitive and emotional processes with peripheral mechanisms such as immune response, gut permeability, and enteroendocrine signalling (Kasarello et al., 2023).

The microbiota communicates with the CNS through the immune system, vagus nerve, ENS, neuroendocrine system, and circulatory system. Its ability to synthesise neurotransmitters (e.g., serotonin, dopamine, GABA) and metabolites that influence neuronal function is crucial (Loh et al., 2024). These interactions affect social behaviour, and mood regulation, and may play a role in the pathogenesis of anxiety disorders, depression and neurodegenerative diseases (Carabotti et al., 2015).

The central nervous system and the HPA axis

The hypothalamic-pituitary-adrenal (HPA) axis is central to the stress response. Activation begins in the limbic system (amygdala, hippocampus, hypothalamus), leading to cortisol from the adrenal cortex. The process involves:

- activation of limbic structures by stress and emotion, initiating the HPA axis response in the paraventricular nucleus (PVN) of the hypothalamus
- release of corticotropin-releasing factor (CRF), which stimulates the pituitary gland to secrete adrenocorticotropic hormone (ACTH)
- synthesis of glucocorticoids (e.g., cortisol) in the adrenal cortex, influencing various stress-related physiological processes (Leistner and Menke, 2020).

Autonomic communication and its effects on the gut

Activation of the HPA axis affects the gut via autonomic neural pathways:

- afferent and efferent neural pathways connect the brain to the enteric nervous system (ENS), muscles and intestinal mucosa
- this impacts intestinal motility, mucosal permeability, immunity and mucus secretion (Carabotti et al., 2015).

Influence of the gut microbiota

The gut microbiota affects both gastrointestinal and CNS function through neuronal pathways and bioactive metabolites, including the production of neurotransmitters such as serotonin, dopamine, and GABA (Loh et al., 2024). The bidirectional communication between the CNS and the gut microbiota enables reciprocal regulation of gut and CNS function through microbiota-derived neuroactive metabolites (Loh et al., 2024). Figure 3 illustrates the interplay of neural and endocrine pathways in response to environmental stimuli and gut activity. Figure 4 demonstrates how stress, emotions, physical activity, and neurodegenerative disorders affect microbiota composition, which in turn influences CNS function (Carabotti et al., 2015). This dynamic feedback underscores the importance of integrating central and peripheral processes to maintain both physical and mental health.

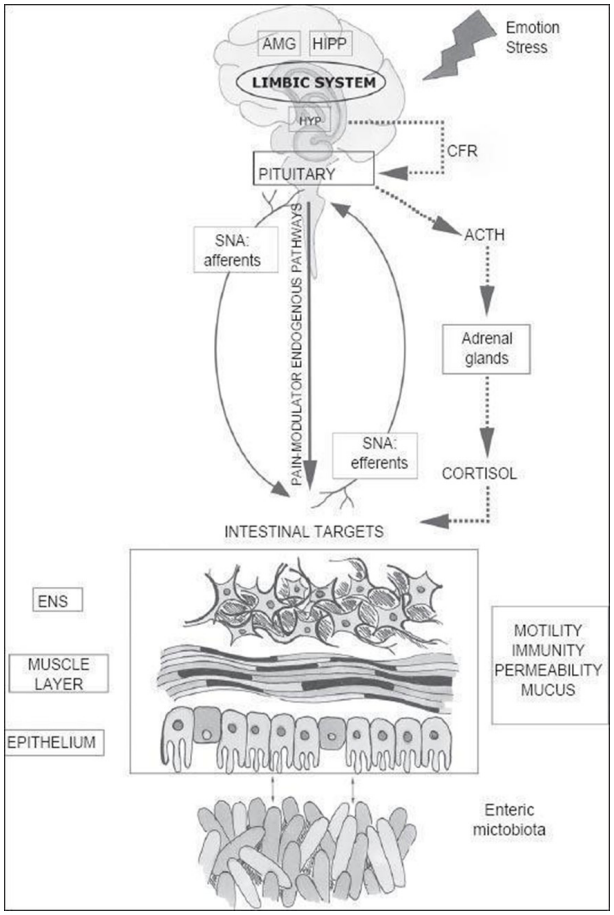

Fig. 3. Interaction between neural and hormonal communication pathways enabling the regulation of gut activity and responses to environmental stimuli (reproduced from Carabotti et al., 2015)

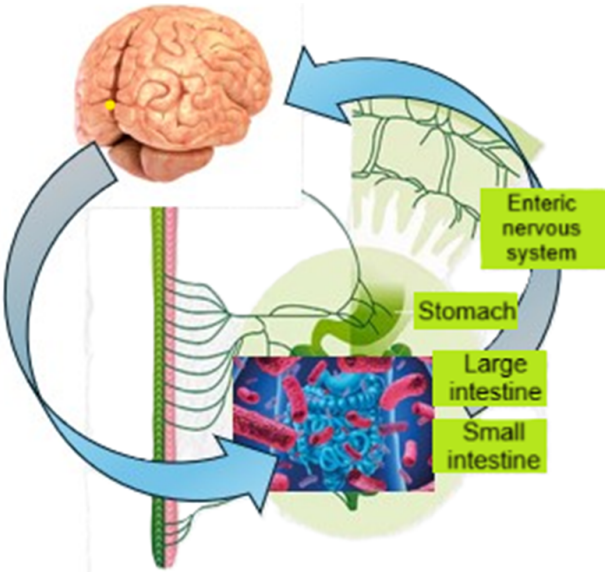

Fig. 4. The microbiota-gut-brain axis
Source: illustration created by the author.

Characteristics of *Hericium erinaceus*

Hericium erinaceus (HE), also known as "Lion's mane," or "Hedgehog Soprano" (Fig. 3), is a medicinal and culinary fungus native to East Asia (Chong et al., 2019). Beyond its use in vegetarian diets, it has a long-standing history in folk medicine (Nagano et al., 2010). HE exhibits anti-inflammatory, anti-diabetic, hypolipidemic and antioxidant effects (Chong et al., 2019).

Polysaccharides (Li et al., 2021) and immunomodulatory proteins (Li et al., 2011; Ko et al., 1995) in HE support intestinal microbiota balance and intestinal barrier function. Erinacines (Chen et al., 2016; Yao et al., 2015) stimulate NGF synthesis, promoting neuronal regeneration and enhancing neuropsychic function – suggesting potential in treating depression, anxiety (Kuo et al., 2016) and neurodegenerative diseases (Skubel et al., 2022).

Bioactive constituents in HE – such as phenols, sterols, terpenoids and cerebrosides (Deshmukh and Sridhar, 2021) – support gastrointestinal function and immune regulation (Thongbai et al., 2015), making it a promising candidate for gut-brain axis-related therapies.

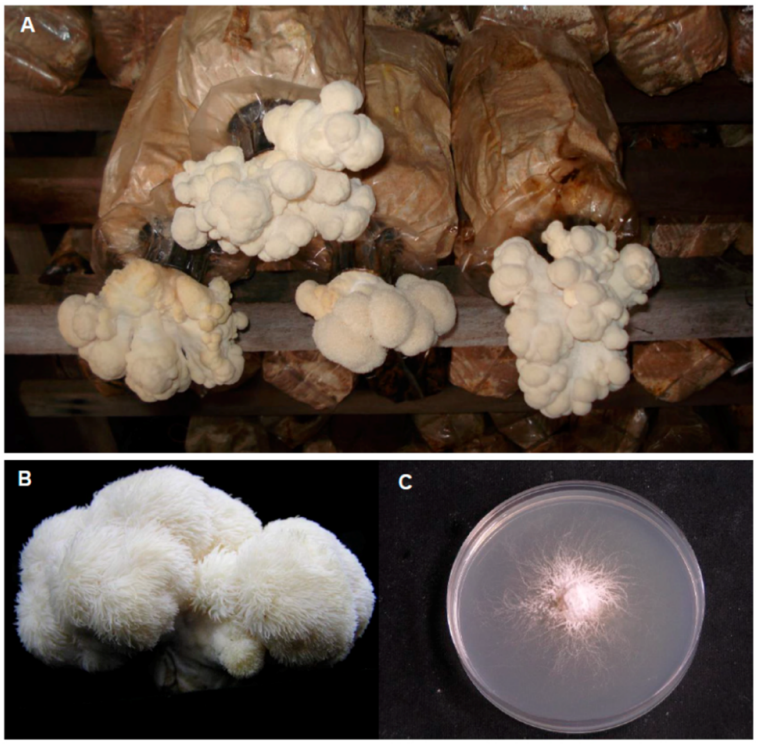

Fig. 5. Fruiting bodies of *Hericium erinaceus* grown in a tropical climate in Malaysia (A, B) and mycelium (C) cultivated on potato dextrose agar (reproduced from Chog et al., 2019)

Secondary metabolites in *Hericium erinaceus* include erinacines, hericenones, steroids, alkaloids, and lactones. Hericenones are primarily found in the fruiting bodies, while erinacines are abundant in submerged mycelium cultures (Li et al., 2021; Skubel et al., 2022). HE also contains 61.3–77.5 g of sugars per 100 g, including β-glucans, α-glucans and glucan-protein complexes (Li et al., 2018; Li et al., 2021).

Key active compounds include:

a. **hericenones:** hericenones (A–K) from HE fruiting bodies stimulate NGF synthesis in mouse astroglia cells (Chong et al., 2019; Mori et al., 2008), although their effect on human cells is less pronounced (Mori et al., 2008)
b. **erinacines:** erinacines, cyan diterpenoids, stimulate NGF production and hold therapeutic potential for neurodegenerative diseases and peripheral neuropathy (Li et al., 2018). 15 erinacines have been identified, eight of which exhibit neuroprotective properties, including the reduction of amyloid β deposition (Chen et al., 2016)
c. **polysaccharides:** HE polysaccharides exhibit antitumour, immunomodulatory, antioxidant and neuroprotective activities (Wang et al., 2018). They promote nervous system function and protect neurons from degeneration, making them promising candidates for the treatment of neurodegenerative diseases (Chong et al., 2019)
d. **immunomodulatory proteins:** fungal immunomodulatory proteins (FIPs) are a group of low-molecular-weight, non-enzymatic proteins capable of modulating immune responses. Their mechanisms include macrophage activation, T cell proliferation, and regulation of cytokine secretion, which together help balance pro-inflammatory and anti-inflammatory processes (Li et al., 2011). The detection of these proteins in HE aligns with its traditional use in folk medicine and suggests potential

applications in immunomodulatory therapy (Qiu et al., 2024).

Evaluating the effects of *Hericium erinaceus* on the nervous system

Table 1 presents a selection of pre-clinical and clinical studies investigating the neurological effects of *Hericium erinaceus*:

a. **antidepressant effects:** *Hericium erinaceus* (HE) exhibits antidepressant effects by enhancing neuroplasticity and modulating neurotransmitters such as serotonin, dopamine and norepinephrine (Chiu et al., 2018; Ryu et al., 2018). Additionally, it reduces inflammation, activates neuroprotective pathways, and promotes neurogenesis in the hippocampus (Chiu et al., 2018). HE supplementation does not cause adverse effects (Inanaga, 2014)
b. **monoaminergic modulation:** HE affects the balance of serotonin, dopamine and norepinephrine in the hippocampus, suggesting its therapeutic potential for depression treatment (Chiu et al., 2018). It may act as a monoamine oxidase (MAO) inhibitor or a monoamine receptor agonist
c. **NGF stimulation and hippocampal neurogenesis:** HE bioactive compounds, such as hericenones and erinacines stimulate nerve growth factor (NGF) secretion, promoting neuronal proliferation and neurogenesis in the hippocampus (Magalhães-Guedes, 2020; Priori et al., 2024). Regular supplementation improves cognitive function and neuronal regeneration (Ryu et al., 2018)
d. **neuroprotective effects:** HE protects against neuronal degeneration, particularly in dopaminergic neurons, making it valuable for treating neurodegenerative diseases such as Parkinson's and Alzheimer's. HE extracts reduce beta-amyloid (Aβ) burden and inflammation (Kuo et al., 2016; Tsai-Teng et al., 2016)
e. **BDNF pathway:** HE activates the BDNF/TrkB/PI3K/Akt/GSK-3β pathway, promoting neuroplasticity and neuronal function, suggesting its potential for treating depression and anxiety (Chiu et al., 2018)
f. **anti-inflammatory effects:** HE extracts exhibit potent anti-inflammatory effects by reducing pro-inflammatory cytokines and modulating the NF-κB pathway, which supports neuroplasticity and regeneration of the nervous system (Chiu et al., 2018)
g. **alleviating sleep disorders:** HE supplementation improves sleep quality, particularly in cases of stress and insomnia, indicating its therapeutic potential for sleep disorders associated with depression (Okamura et al., 2015; Vigna et al., 2019)
h. **cognitive disorders in the elderly:** Studies suggest that HE supplementation improves cognitive function in the elderly, especially in cases of comorbid depressive disorders, providing an alternative to pharmacological treatments (Inanaga, 2014).

Evaluation of the effects of *Hericium erinaceus* on the gastrointestinal tract and microbiome

Table 2 summarizes pre-clinical and clinical findings on the effects of *Hericium erinaceus* on gut health, with particular emphasis on modulation of the intestinal microbiota:

a. **effects on the intestinal microbiome:** *Hericium erinaceus* (HE) positively affects the intestinal microbiome, as confirmed by preclinical and clinical studies. Ren et al. (2022) demonstrated that polysaccharides from the fungus altered microbiota composition and improved the integrity of the intestinal barrier in macaques with ulcerative colitis. Similar effects were observed in studies conducted by Priori et al. (2023), where supplementation with *Hericium erinaceus* extract increased the abundance of beneficial bacteria from the *Clostridiaceae* and *Muribaculaceae* families while reducing pathogens levels. *In vitro* studies by Zhuan et al. (2023) indicated that HE polysaccharides exhibit a prebiotic effect, enhancing short-chain fatty acid (SCFAs) production and reducing the number of *Enterobacteriaceae*
b. **effects on intestinal barrier function:** HE Polysaccharides enhance intestinal barrier integrity. Wu et al. (2024) showed that supplementation with HE extracts in a laying hen model reduced lipopolysaccharide (LPS) translocation, suggesting improved intestinal barrier function. Likewise, Shao et al. (2019) observed that EP-1 polysaccharides in rats with ulcerative colitis modulated GPR41/43 receptors and increased SCFA production. Li et al. (2024) reported that polysaccharides

Table 1. Evaluation of the effects of *Hericium erinaceus* on the nervous system (author's ow table)

Pre-clinical studies					
Chiu et al., 2018	Mycelium of *Hericium erinaceus* enriched with erinacine A	Ethanol extract	100, 200 * and 400 * mg/kg daily for 4 weeks; P.O. (per os, orally)	50 male mice (10 per group) ICR (14-day depression model induced by restraint stress)	(1) Induction of BDNF/TrkB/PI3K/Akt/GSK-3β pathways (2) Inhibition of NF-κB signaling (3) Decreased levels of IL-6 and TNF-α (4) Increased levels of 5-HT, DA, NE
Ryu et al., 2018	*Hericium erinaceus*	Ethanol extract	10, 60* mg/kg daily for 4 weeks; P.O.	Male C57BL/6 mice (8 weeks old; Koatech, Kyungki-do, Korea)	(1) Increased number of PCNA+, Ki67, BrdU+ cells (2) Hippocampal Neurogenesis
Kuo et al., 2021	Mycelium enriched with erinacine A	Extracts from *Hericium erinaceus* and analysis of erinacine A	10.76 mg/day and 21.52 mg/day	C57BL/6 mice (8–10 weeks old, 20–28 g weight)	(1) Increased dopamine, NGF and GSH levels (2) Decreased motor dysfunction (3) Reduced apoptosis of dopaminergic neurons in the striatum and black matter
Chiu et al., 2018	Mycelium enriched with erinacine A	Ethanolic extract of the mycelium of *Hericium erinaceus*	200 and 400 mg/kg body weight	Male Institute of Cancer Research (ICR)	(1) Increased dopamine and serotonin levels (2) Decreased levels of IL-6 and TNF- α (3) Increased expression of BDNF, Tr κ B and PI3K in the hippocampus (4) Reduced immobilization time in the tail suspension test and forced swim tests; reduced entries and time spent in the open arm
Yao et al., 2015	Amycenone®, *Hericium erinaceus* fruiting body extract (0.5% hericenones and 6% amyloban)	Amycenone obtained from extracts of the *Hericium erinaceus*	50, 100 or 200* mg/kg amycenone (Amyloban® 3399), administered 60 minutes before injection of 0.5 mg/kg LPS; P.O.	Male adult C57BL/6N mice (body weight 20–28 g, Japan SLC, Inc., Hamamatsu, Japan)	(1) Attenuated LPS-induced increase in serum TNF-α concentration (2) LPS-induced increase in serum IL-10 concentration
Tsai-Teng et al., 2016	Mycelium enriched with erinacine A	HE-My and its ethanol extracts (HE-Et)	300 mg/kg body weight	5-month-old female APPswe/PS1dE9 transgenic mice	(1) Reduced amyloid plaque burden in the area encompassing the cortex and hippocampus (2) Increased NGF/proNGF ratio and promoted hippocampal neurogenesis (3) Restoration of nesting behaviour
Chen et al., 2016	Erinacine A Erinacine S	Erinacine S, and one diterpene cyathanexyloside, erinacine A, isolated from an ethanol extract of mycelium	30 mg/kg body weight	5-month-old female APPswe/PS1dE9 transgenic mice	(1) Reduced amyloid plaque burden in the cortex by both compounds (2) Increased IDE levels in the cortex

Tablle 1 – cont.

Diling et al., 2017	Extracts from *Hericium erinaceus*	Polysaccharide, alcoholic extracts and whole extracts	Administered for 2 weeks induced by trinitro-benzene-sulfonic acid (TNBS) enema (150 mg/kg)	30 adult male Sprague–Dawley rats (weight 180–220 g) and 90 male Kunming mice (18–22 g)	(1) Improved gut microbiota structure (2) Reduced pro-inflammatory and increased anti-inflammatory microorganisms (especially in the group treated with alcohol extracts) (3) Improved IBD symptoms, such as frequent morphic index scores and tissue damage in the colonic mucosa (4) Normalised serum cytokine levels, including IL-1α, IL-2, IL-8, IL-10, IL-11, IL-12, TNF-γ, TNF-α, VGEF, MIP-α and M-CSF (5) Improved expression of Foxp3, NF-κB p65, TNF-α and IL-10 in colonic mucosal
			Clinical trials		
Nagano et al., 2010	*Hericium erinaceus* fruiting body	Aqueous extract	500* mg of *Hericium erinaceus* fruiting body powder (Aso Biotech Inc) per biscuit; 4 biscuits per day for 4 weeks; P.O.	30 female participants	Alleviation of depression and anxiety symptoms
Okamura et al., 2015	Amycenone®, extract from the fruiting body of *Hericium erinaceus* (0.5% hericenones and 6% amyloban)	Patented Extraction	1950 mg/tablet (Amyloban® 3399) 6 tablets, divided into 2 or 3 doses per day for 4 weeks; P.O.	8 healthy female participants	(1) Alleviation of depression, anxiety, and sleep symptoms (2) Increased free MHPG levels in saliva
Vigna et al., 2019	*Hericium erinaceus* (80% mycelium and 20% fruiting bodies)	Water and ethanol extract	1200* mg per capsule (A.V.D. Reform s.r.l.), 3 capsules/day for 8 weeks; P.O.	62 overweight or obese women and 15 obese men	(1) Alleviation of depression, anxiety, and sleep symptoms (2) Increased circulating pro-BDNF levels without significant changes in circulating BDNF levels
Inanaga, 2014	Amycenone®, extract from the fruiting body of *Hericium erinaceus* (0.5% hericenones and 6% amyloban)	Patented Extraction	1950 mg/tablet (Amyloban® 3399) 6 tablets, divided into 2 or 3 doses / day for 6 months; P.O.	1 male patient	Improvement of neurocognitive impairment

Indicator:*Dose of HE with a significant antidepressant effect.

Table 2. Evaluation of the effects of *Hericium erinaceus*–on the digestive system – the microbiome (author's own table)

Type of study	Author and year of issue	Materials tested	Dosage and duration	Research model	Physiological/mechanical effects
Pre-clinical *in vivo* study	Ren et al., 2022	Polysaccharides from mycelium	0.2 g/kg body weight, daily for 8 weeks	UC Japanese macaques	(1) Alleviation of UC pathology (2) Improvement of the intestinal barrier (3) Alteration of the intestinal microbiota (4) Reduction of inflammation
Pre-clinical *in vivo* study	Shao et al., 2019	Polysaccharides (EP-1)	1 g/kg body weight, daily for 14 days	Rats with acetic acid-induced UC	(1) Modulation of the gut microbiota (2) Increase in SCFAs (3) Decrease in inflammatory markers (4) Inhibition of GPR41/43 inflammasome pathway activation
Pre-clinical *in vivo* study	Priori et al., 2023	Standardised extract from *Hericium erinaceus*	oral supplementation, 1 mg dry weight supplement/mouse per day, 2 months	Male mice C57BL/6J	(1) Decrease in relative abundance of *Odoribacter*, *Clostridia* vadinBB60 and *Muribaculaceae* (2) Increase in relative abundance of the genera *Clostridia* UCG-014, *Lachnospiraceae*_NK4A136, and *Eubacterium xylanophilum*
Pre-clinical *in vivo* study	Ren et al., 2018	Polysaccharides (HECP)	0.3 g/kg body weight, daily for 10 days	C57BL/6 mice with IBD	(1) Reduction of oxidative stress markers and inflammation (2) Improvement of intestinal barrier integrity (3) Restoration of gut microbiota balance
Pre-clinical *in vivo* study	Li et al., 2024	Polysaccharides from the fruiting body	1 g/kg body weight, daily for 14 days	DSS-induced UC mice	(1) Inhibition of the NLRP3 inflammasome pathway (2) Reduction of oxidative stress (3) Increased antioxidant enzymes (4) Modulation of the gut microbiota
Pre-clinical *in vitro* and *in vivo* study	Wu et al., 2024	Polysaccharides (HEP)	0.5 g/kg body weight, daily for 6 weeks	Old laying hens	(1) Improved intestinal barrier integrity (2) Reduced penetration of LPS into the liver (3) Regulation of tryptophan metabolites (4) Reduced hepatic inflammation
In vitro fermentation test	Zhuang et al., 2023	Water- and alkali-soluble polysaccharides	–	Intestinal microbiota in a stool sample	(1) Regulation of SCFA production (2) Lowering of pH (3) Increase of butyrate-producing bacteria (e.g., *Faecalibacterium*) (4) Reduction of pathogenic bacteria
Clinical experiment	Tian et al., 2022	Mushroom fruiting body powder	5 g per day for 7 days	Healthy adults	(1) Increase in SCFA-producing bacteria (2) Reduction in intestinal pathogens (3) Increase in diversity of the intestinal microbiota

from HE fruiting bodies reduced intestinal barrier permeability in a model of DSS-induced intestinal inflammation

c. **anti-inflammatory properties:** HE demonstrates potent anti-inflammatory effects. Li et al. (2024) found that HE polysaccharides inhibit NLRP3 inflammasome activation, reducing inflammation and oxidative stress markers (ROS). Ren et al. (2018) reported similar findings in a mouse model of inflammatory bowel disease, where HECP polysaccharides improved microbiome diversity and reduced oxidative stress markers. Additionally, Wu et al. (2024) showed that HE modulates tryptophan metabolites, which impact inflammatory pathways
d. **effects on inflammatory bowel diseases:** HE polysaccharides may alleviate symptoms of inflammatory bowel diseases (IBD) such as ulcerative colitis (UC) and Crohn's disease. Ren et al. (2022) and Shao et al. (2019) demonstrated that polysaccharide supplementation improves microbiome composition, reduces inflammation and supports intestinal barrier function in UC. Tian et al. (2022) further reported that supplementation with HE fruiting body powder enhanced SCFA production and microbiome diversity, which may promote intestinal regeneration.

DISCUSSION

Hericium erinaceus demonstrates considerable therapeutic promise for the treatment of mood disorders, depression and neurodegenerative diseases. Its ability to modulate key neurotransmitters – serotonin, dopamine, and norepinephrine – has been associated with mood enhancement and a reduction in depressive symptoms (Chong et al., 2019; Kuo et al., 2016). Bioactive compounds such as erinacines and hericenones have been shown to stimulate hippocampal neurogenesis (Li et al., 2018; Kuo et al., 2016) and confer neuroprotective effects by attenuating oxidative stress and shielding neurons from beta-amyloid-induced damage (Chiu et al., 2018; Vigna et al., 2019).

In addition to these central nervous system effects, *Hericium erinaceus* exhibits anti-inflammatory properties (Li et al., 2018; Skubel et al., 2022) and modulates the gut microbiota (Li et al., 2021), thereby supporting mental health through immunological and neuroendocrine pathways. These multifaceted actions support its potential use in managing not only mood and neurodegenerative disorders (Chong et al., 2019; Li et al., 2018; Tsai-Teng et al., 2016), but also in improving sleep quality (Okamura et al., 2015) and alleviating stress-related symptoms (Kuo et al., 2016).

Despite promising preclinical and early clinical findings, further research is essential to elucidate the precise mechanisms of action, particularly regarding its effects on brain-derived neurotrophic factor (BDNF) signalling and other neurotrophic pathways (Chiu et al., 2018). Well-designed, large-scale clinical trials are needed to evaluate its efficacy and safety in the treatment of depression and neurodegenerative diseases (Chong et al., 2019; Li et al., 2018). In addition, investigations into its interactions with psychotropic medications, long-term safety profile, and development of formulations with enhanced bioavailability are critical. Exploring synergistic effects with established antidepressants and neuroprotective agents may also unlock new therapeutic strategies.

SUMMARY

Hericium erinaceus is an emerging natural therapeutic agent with significant potential in the treatment of depression, anxiety, mood dysregulation, and neurodegenerative diseases. Its diverse mechanisms of action – including neurotransmitter modulation, promotion of neurogenesis, anti-inflammatory activity, and gut-brain axis involvement – highlight its broad neuropsychological relevance. Nonetheless, further clinical and experimental studies are essential to fully validate and optimise its therapeutic applications.

DECLARATIONS

Data statement

All data supporting this study has been included in this manuscript.

Ethical Approval

Not applicable.

Competing Interests

The authors declare that they have no conflicts of interest.

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