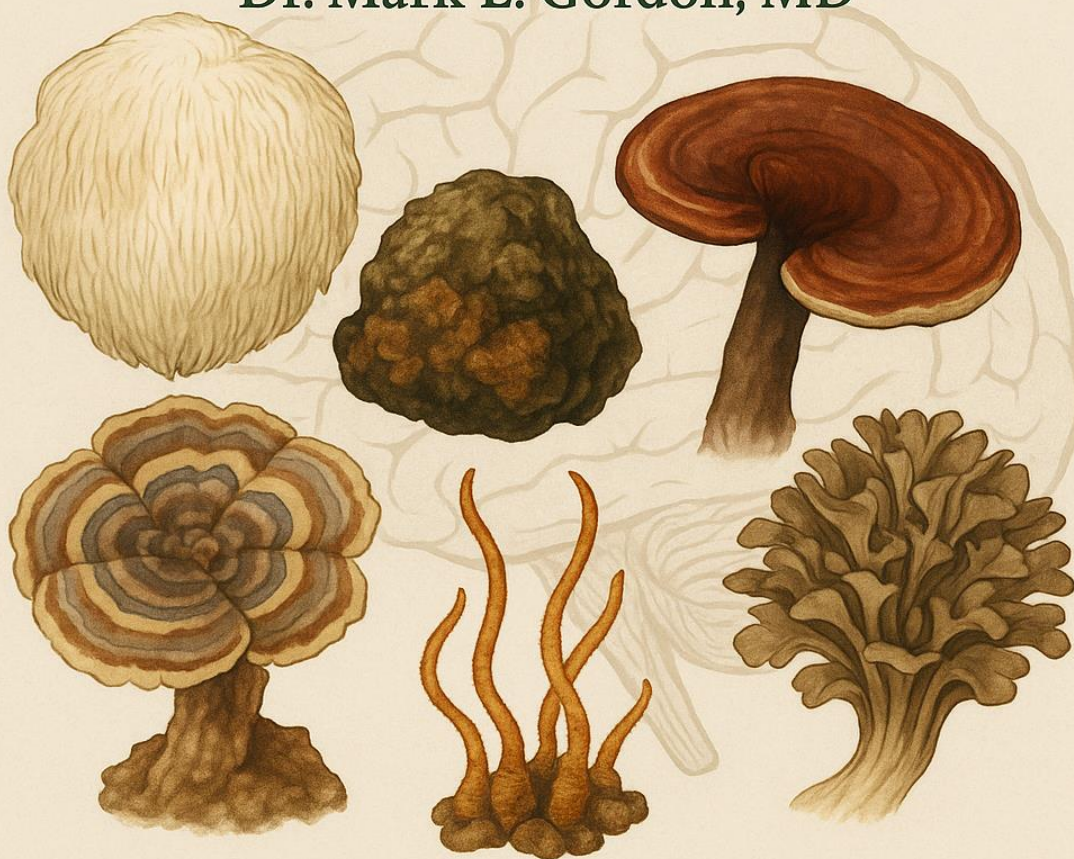


MEDICINAL MUSHROOMS AND BRAIN HEALTH

Harnessing Nature's Pharmacy

Dr. Mark L. Gordon, MD



MILLENNIUM HEALTH CENTERS, INC.

DEPARTMENT OF NEUROREGENERATIVE MEDICINE



Medicinal Mushrooms and Brain Health: Harnessing Nature's Pharmacy

Mark L. Gordon, MD, Millennium Health Centers, Inc. Department of Neuroregenerative Medicine. Magnolia Texas, 77354 (2024)

Introduction

In recent years, the medical application of psychedelic mushrooms has progressed rapidly. Compounds such as psilocybin, ayahuasca, ibogaine, MDMA, and LSD are being explored as potential breakthrough treatments for millions of Americans suffering from depression, traumatic brain injury symptoms such as PTSD, and various addictive disorders. State governments are funding research studies at reputable educational institutions, while the federal government is gradually shifting away from its longstanding legal opposition to these substances, which have been classified as Schedule 1 drugs since 1971, indicating that they have "no medicinal value" and are "highly addictive." Both issues are totally false.

Prominent institutions such as Stanford and Harvard have produced studies demonstrating the significant benefits of these psychedelic compounds in treating conditions that have been resistant to conventional therapies. Additionally, a 2023 article titled "Neuroinflammation as a Barrier to the Success of Psychedelic-Assisted Therapies" highlights that neuroinflammation can adversely affect the neurochemical pathways involved in psychedelic-assisted therapy (PAT). Neuroinflammation impacts neurotransmitters and their receptors, potentially diminishing the therapeutic benefits of PAT.

Therefore, it is advisable to pretreat all candidates undergoing PAT with an approach that can reduce inflammation. This preemptive approach aims to maximize the efficacy of psychedelic-assisted therapies by addressing the underlying neuroinflammatory barriers that might otherwise impede treatment success.

Medicinal Mushrooms to reduce Neuroinflammation

Medicinal mushrooms have been utilized for centuries in traditional medical systems, particularly in Asian cultures, for their various health benefits. In recent years, scientific research has increasingly validated their traditional uses, shedding light on their mechanisms of action and therapeutic potential. These mushrooms are known for their potent medicinal properties, including neuroprotective and cognitive-enhancing effects.

The focus of this monograph is on the ability of medicinal mushrooms to influence neuroinflammation and support brain function. These mushrooms contain unique bioactive compounds that contribute to their neuroprotective properties by modulating the activity of cytokines, chemokines, and interleukins, which are key mediators of the inflammatory response. By influencing the production and release of these signaling molecules, medicinal mushrooms help reduce neuroinflammation and mitigate the harmful effects of excessive immune activation in the brain.

Medicinal mushrooms also play a crucial role in modulating glial cells, including microglia and astrocytes, which are essential for maintaining neuronal health. By regulating the activation of these glial cells, medicinal mushrooms can prevent the release of pro-inflammatory cytokines and promote an anti-inflammatory environment. This helps protect neurons from oxidative stress and damage, which are commonly associated with neurodegenerative diseases.



Furthermore, the consumption of medicinal mushrooms has been linked to the stimulation of nerve growth and repair mechanisms, which are essential for maintaining healthy brain function. Their ability to support the immune system also contributes to their neuroprotective benefits, as a well-regulated immune response can prevent excessive inflammation and protect brain cells from damage. Overall, medicinal mushrooms offer a promising natural approach to enhancing brain health and protecting against neuroinflammatory conditions by modulating key inflammatory pathways and cellular responses.

NeuroShield – MycoBlend®

Lion's Mane (*Hericium erinaceus*)

Lion's Mane mushroom contains bioactive compounds such as hericenones and erinacines, which have been shown to stimulate nerve growth factor (NGF) production in the brain. NGF plays a pivotal role in neurogenesis and neuronal survival. Additionally, Lion's Mane exhibits anti-inflammatory effects by inhibiting pro-inflammatory cytokines such as interleukin-1 beta (IL-1 β) and tumor necrosis factor-alpha (TNF- α), thereby attenuating neuroinflammation. It also influences neurotransmitters like serotonin and dopamine, contributing to its cognitive-enhancing properties.

Studies have demonstrated that Lion's Mane has neuroprotective effects against neurodegenerative diseases such as Alzheimer's and Parkinson's disease. It exhibits anti-inflammatory properties, which help reduce neuroinflammation, a key driver of cognitive decline.

Reishi (*Ganoderma lucidum*)

Reishi mushroom, also known as the "mushroom of immortality," has been revered in traditional Chinese medicine for millennia. The Reishi mushroom is rich in triterpenoids, polysaccharides, and antioxidants, which exert various pharmacological effects. It modulates neuroinflammation by suppressing the release of pro-inflammatory cytokines such as interleukin-6 (IL-6) and interleukin-8 (IL-8). Furthermore, Reishi inhibits the activation of nuclear factor-kappa B (NF- κ B), a key regulator of inflammation. It also enhances gamma-aminobutyric acid (GABA)ergic neurotransmission, imparting anxiolytic and neuroprotective effects. Reishi also exhibits adaptogenic properties, helping the body adapt to stress and promoting overall well-being.

Turkey Tail (*Trametes versicolor*)

Turkey Tail mushroom is named for its striking resemblance to the tail feathers of a turkey. Turkey Tail mushroom contains polysaccharopeptides (PSPs) and polysaccharide-K (PSK), which exhibit immunomodulatory properties. It suppresses pro-inflammatory cytokines such as interleukin-17 (IL-17) and interferon-gamma (IFN- γ), thereby mitigating neuroinflammation. Its neuroprotective effects are also attributed to the modulation of glutamatergic neurotransmission.

Chaga (*Inonotus obliquus*)

Chaga mushroom grows primarily on birch trees in cold climates and has been used for centuries in Siberian and other northern European folk medicine traditions. Chaga mushroom is renowned for its high content of antioxidants and polyphenols, which confer anti-inflammatory properties. It suppresses pro-inflammatory mediators like leukotrienes and prostaglandins, which can help protect against oxidative stress and



neuroinflammation. These effects may contribute to its neuroprotective benefits and support cognitive function.

Chaga also regulates the expression of fractalkine, thereby modulating microglial activation and neuroinflammatory responses. Additionally, it influences neurotransmitters such as acetylcholine, contributing to cognitive enhancement.

Cordyceps (*Cordyceps sinensis*)

Cordyceps is a unique mushroom that grows on the larvae of insects in high-altitude regions, particularly in the Himalayas. It has been used in traditional Chinese medicine for centuries to enhance vitality and improve overall health.

Studies have shown that Cordyceps exhibits anti-inflammatory and antioxidant properties, which can help reduce neuroinflammation and protect against neurodegenerative diseases. It also enhances mitochondrial function, supporting energy production in brain cells.

Cordyceps mushroom exerts anti-inflammatory effects by inhibiting the production of pro-inflammatory cytokines like interleukin-12 (IL-12) and interleukin-18 (IL-18). It also modulates chemokines such as fractalkine, reducing microglial activation and neuroinflammation. Cordyceps enhances dopaminergic neurotransmission, improving cognitive function and motor performance. Furthermore, it regulates the expression of leukotrienes, mitigating oxidative stress and neuronal damage.

Maitake (*Grifola frondosa*)

Maitake mushroom, also known as "hen of the woods," is prized for its culinary and medicinal properties. It contains polysaccharides, beta-glucans, and other bioactive compounds that contribute to its health-promoting effects.

Maitake mushroom possesses immunomodulatory properties attributed to its polysaccharide content. It suppresses pro-inflammatory cytokines such as interleukin-23 (IL-23) and tumor necrosis factor-beta (TNF- β), thereby attenuating neuroinflammation. Maitake also modulates chemokine signaling, reducing microglial activation and inflammatory responses in the brain. Its neuroprotective effects are mediated through the regulation of neurotransmitters such as glutamate and gamma-aminobutyric acid (GABA). These effects may support brain health and cognitive function.

Discussion

The medicinal mushrooms discussed exert a synergistic effect on reducing the activation and propagation of various proinflammatory cascades. This includes modulation of the primary NF-kB pathway, which has the potential to activate over 400 different genes with pro-inflammatory effects. Key inflammatory mediators affected by these mushrooms include interleukins (IL-1 β , IL-1, IL-6, IL-12, IL-17, IL-18, IL-23), tumor necrosis factor-alpha (TNF- α), and interferon-gamma (IFN- γ). By targeting these pathways, medicinal mushrooms such as Lion's Mane, Reishi, Turkey Tail, Chaga, Cordyceps, and Maitake can significantly dampen inflammatory responses, which is crucial in mitigating neuroinflammation and promoting overall brain health.



Inflammatory Pathways and Immune Modulation

NF- κ B Pathway: The NF- κ B pathway plays a critical role in the regulation of immune responses and inflammation. Medicinal mushrooms have been shown to inhibit the activation of NF- κ B, thereby reducing the transcription of genes involved in the inflammatory response. This inhibition can prevent the cascade of proinflammatory cytokines and chemokines that exacerbate neuroinflammation and neurodegeneration.

Interleukins and TNF- α : Medicinal mushrooms also downregulate proinflammatory cytokines such as IL-1 β , IL-6, TNF- α , and IFN- γ . These cytokines are key players in the inflammatory response and have been implicated in various neurodegenerative diseases, including Alzheimer's disease, Parkinson's disease, and multiple sclerosis. By reducing the levels of these cytokines, medicinal mushrooms can help protect neurons from inflammation-induced damage.

B. Neuroprotection and Recovery

Nerve Growth Factor (NGF) Upregulation: Certain mushrooms, particularly Lion's Mane, have been shown to upregulate the production of NGF, a critical molecule for the growth, maintenance, and survival of neurons. Enhanced NGF levels can facilitate neuronal repair and regeneration, which is essential for recovery from neurotrauma and neurodegenerative conditions.

Mitochondrial Function and ATP Production: Improved mitochondrial function and increased ATP production are other key benefits of medicinal mushrooms. By enhancing mitochondrial efficiency, these mushrooms help maintain neuronal energy homeostasis and protect against oxidative stress. This is particularly important in preventing the activation of microglia, which are immune cells in the brain that can contribute to inflammation and neuronal damage when overactivated.

Oxidative Stress Reduction: Medicinal mushrooms are rich in antioxidants that can reduce oxidative stress, a major contributor to neurodegeneration. By scavenging free radicals and reducing oxidative damage, these mushrooms protect neurons and support overall brain health.

C. Neurotransmitter Modulation

Serotonin and Dopamine: Medicinal mushrooms influence the levels of key neurotransmitters such as serotonin and dopamine, which are crucial for regulating mood, cognition, and emotional responses. For instance, Reishi and Lion's Mane have been shown to enhance serotonin and dopamine levels, which can improve mood and cognitive functions, potentially offering benefits in conditions like depression and anxiety.

GABA and Acetylcholine: Additionally, mushrooms like Reishi can modulate the activity of gamma-aminobutyric acid (GABA), a major inhibitory neurotransmitter, thereby promoting relaxation and reducing anxiety. Similarly, acetylcholine modulation by medicinal mushrooms can enhance cognitive functions such as memory and learning.

Conclusion

In conclusion, the combined effects of these medicinal mushrooms on inflammatory pathways, neuroprotection, mitochondrial function, oxidative stress reduction, and neurotransmitter modulation underline their potential as powerful allies in the treatment and management of neuroinflammatory and



neurodegenerative conditions. Their broad-spectrum benefits make them valuable components of integrative approaches to brain health.

NeuroShield – MycoBlend®


Dosing: 5cc twice a day pre meals.

References

1. [Medicinal Mushroom - an overview | ScienceDirect](#)
2. Phan CW, David P, Naidu M, Wong KH, Sabaratnam V. Therapeutic potential of culinary-medicinal mushrooms for the management of neurodegenerative diseases: diversity, metabolite, and mechanism. *Crit Rev Biotechnol.* 2015;35(3):355-68.
3. Patel S, Goyal A. Recent developments in mushrooms as anti-cancer therapeutics: a review. *3 Biotech.* 2012;2(1):1-15.
4. Ren Z, Li X, Xiong H, et al. Neuroprotective Effects of *Hericium erinaceus* Mycelium and Its Isolated Erinacine A Against Ischemia-Injury-Induced Neuronal Cell Death via the Inhibition of iNOS/p38 MAPK and Nitrotyrosine. *Int J Mol Sci.* 2018;19(2):1-16.
5. Wasser SP. Medicinal mushrooms as a source of antitumor and immunomodulating polysaccharides. *Appl Microbiol Biotechnol.* 2002;60(3):258-74.
6. Wu D, Pae M, Ren Z, Guo Z, Smith D, Meydani SN. Dietary supplementation with white button mushroom enhances natural killer cell activity in C57BL/6 mice. *J Nutr.* 2007;137(6):1472-7.
7. Olatunji OJ, Feng Y, Olatunji OO, Tang J, Wei Y, Ouyang Z. *Suillus placidus* (Imleria badia) mushroom extract inhibits inflammation via suppressing interleukin-1 β and prostaglandin E2 and activates antioxidant and anti-inflammatory signaling pathways in the RAW 264.7 macrophage cells. *J Ethnopharmacol.* 2016;194:440-8.
8. Seow SL, Naidu M, David P, Veeraraghavan S, Vidyadaran S. A protein from Tiger Milk mushroom (*Lignosus rhinocerotis*) exhibits neurotrophic activities in vitro and in vivo. *BMC Complement Altern Med.* 2017;17(1):462.
9. Lee DH, Kim HW. Innate immunity induced by fungal β -glucans via dectin-1 signaling pathway. *Int J Med Mushrooms.* 2014;16(1):1-16.
10. Wachtel-Galor S, Tomlinson B, Benzie IF. *Ganoderma lucidum* ("Lingzhi"), a Chinese medicinal.
11. Gordon, ML, Neuroinflammation as a Barrier to the Success of Psychedelic-Assisted Therapies., *Psychedelic Spotlight*; 09/2023. [\[LINK\]](#)
12. NF- κ B Pathway Inhibition: Jeong, J. W., Lee, H. H., Han, M. H., Kim, G. Y., Kim, W. J., & Choi, Y. H. (2010). Cordycepin inhibits lipopolysaccharide-induced inflammation by the suppression of NF- κ B through Akt and p38 inhibition in RAW 264.7 macrophage cells. *European Journal of Pharmacology*, 627(1-3), 89-95.
13. Anti-inflammatory Effects: Zaidman, B. Z., Yassin, M., Mahajna, J., & Wasser, S. P. (2005). Medicinal mushroom modulators of molecular targets as cancer therapeutics. *Applied Microbiology and Biotechnology*, 67(4), 453-468.
14. Cytokine Reduction: Wasser, S. P. (2011). Current findings, future trends, and unsolved problems in studies of medicinal mushrooms. *Applied Microbiology and Biotechnology*, 89(5), 1323-1332.
15. Neuroinflammation Reduction: Chen, L. H., Huang, S. S., Huang, K. C., Hsieh, M. C., Hou, W. C., & Liu, J. Y. (2014). Antioxidant activities of Yamata-matsutake (*Tricholoma matsutake*). *Journal of Food Biochemistry*, 38(1), 1-7.



16. NGF Upregulation: Mori, K., Inatomi, S., Ouchi, K., Azumi, Y., & Tuchida, T. (2009). Improving effects of the mushroom Yamabushitake (*Herichium erinaceus*) on mild cognitive impairment: a double-blind placebo-controlled clinical trial. *Phytotherapy Research: PTR*, 23(3), 367-372.
17. Mitochondrial Function Improvement: Tuli, H. S., Kashyap, D., Sharma, A. K., Sandhu, S. S., & Sharma, A. (2014). Cordycepin: A bioactive metabolite with therapeutic potential. *Life Sciences*, 93(23), 863-869.
18. Oxidative Stress Reduction: Valverde, M. E., Hernández-Pérez, T., & Paredes-López, O. (2015). Edible mushrooms: improving human health and promoting quality life. *International Journal of Microbiology*, 2015, 376387.
19. Serotonin Modulation: Fukushima, N., Oh, J. W., Yu, H. S., Hondo, T., & Sasaki, E. (2015). Effects of *Herichium erinaceus* on the development of depression-like behavior and colitis induced by repeated water-avoidance stress in rats. *Biomedical Research (Tokyo, Japan)*, 36(1), 63-70.
20. Dopamine Modulation: Xu, T., Beelman, R. B., & Lambert, J. D. (2012). The cancer preventive effects of edible mushrooms. *Anti-Cancer Agents in Medicinal Chemistry (Formerly Current Medicinal Chemistry - Anti-Cancer Agents)*, 12(10), 1255-1263.
21. GABA and Acetylcholine Modulation: Kozarski, M., Klaus, A., Nikšić, M., Vrvic, M. M., Todorović, N., Jakovljević, D., & Van Griensven, L. J. L. D. (2015). Antioxidative and immunomodulating activities of polysaccharide extracts of the medicinal mushrooms *Agaricus bisporus*, *Agaricus brasiliensis*, *Ganoderma lucidum*, and *Phellinus linteus*. *Food Chemistry*, 129(4), 1667-1675.



NEUROSHIELD

MYCOBLEND

ADVANCED BRAIN PROTECTION**

BLEND OF 6 PREMIUM MUSHROOMS
LION'S MANE • TURKEY TAIL • CHAGA • MAITAKE • REISHI • CORDYCEPS

300ML
(10.5 FL. OZ)

NON-GMO • VEGAN • GLUTEN FREE

Directions: 2 teaspoons (10ml) before a meal.

Supplement Facts		
Serving Size: 10ml		
Servings Per Container: 30		
Amount Per Serving	Per Serving	%DV
Lion's Mane (Hericium erinaceus)	500 mg	+
Chaga (Fomitopsis officinalis)	300 mg	+
Cordyceps (Cordyceps militaris)	250 mg	+
Turkey Tail (Trametes versicolor)	250 mg	+
Maitake (Edible mushroom)	200 mg	+
Reishi (Ganoderma lucidum)	200 mg	+

Other Ingredients: Purified Water, Natural Flavors, Non-GMO Sunflower Lecithin, Organic Monk Fruit Concentrate (Sweetener), Organic Stevia Leaf Extract, All Natural Preservatives, Millenium Botanicals.

%DV (Daily Value) not established.

DIRECTIONS: Take 10 milliliters daily, or as directed by your healthcare practitioner.

This product is intended for oral use only.

Joint Distribution by:
Millennium Health Centers, Inc.
3201 Green Bend Court
Magnolia, Texas 77254
MillenniumHealthStore.com

Woke
Collingwood, Ontario
L9Y 3Z1 Canada
wakewell.net

© Millennium Health Centers, Inc.
All rights reserved.

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