## Improving Cognitive Function and Brain Health in Healthy People

Lion’s mane mushroom, or Hericium erinaceus, is garnering significant interest among medical and pharmacological researchers due to its molecules that exhibit both neurotrophic and neuroprotective properties [1]. Neuroprotective actions refer to the protection of nerve cells from damage and degeneration, while neurotrophic effects support the growth and survival of neurons. Collectively, these properties suggest that lion's mane mushroom holds promising potential for enhancing cognitive function and overall brain health. Research into the compounds within lions mane are showing strong potential for improving cognitive function and brain health.

Although research is still in its formative stages, there is compelling evidence supporting the therapeutic benefits of lion’s mane mushroom compounds, which include antibiotic, antioxidant, antifatigue, and antisenescence properties. Particularly striking are the promising early results concerning the use of these compounds in treating neurodegenerative diseases such as Alzheimer's and Parkinson's, as well as mood disorders like depression and anxiety. Nonetheless, there remains much to learn about how these compounds operate, their actual effectiveness, and their interactions within the human body.

At Markwood Mushrooms, we are optimistic that ongoing research into lion's mane mushroom will eventually yield new treatments for cognitive impairments. However, our focus lies elsewhere. We are committed to harnessing the recognised therapeutic potential lions mane to enhance the well-being of healthy adults. We believe in the potential of this remarkable mushroom to boost overall cognitive performance and brain health in individuals who are already well. Thus, our goal is to empower individuals to achieve an even greater level of cognitive health and vitality through the natural benefits of lion's mane.

## What might lions mane do for our cognitive function and brain health?

For over twenty years, the bulk of the research into lions mane has focused upon its effect on mice. These studies consistently provide compelling evidence of positive improvement in cognitive behaviour. Rats administered with lion's mane (or compounds extracted from lions mane) have shown significant improvements in maze navigation and object recognition tasks, which are specifically designed to assess memory and spatial learning. Studies involving older rats are particularly noteworthy, for they consistently demonstrate significant cognitive improvements in geriatric mice. These behavioural enhancements suggest that lion's mane can help mitigate memory deficits and enhance learning abilities in rats. But what about humans?

Research into the cognitive effects of lion's mane mushroom has broadened from animal models to human studies, though the number of these studies remains relatively low. Nevertheless, the early results are extremely promising. The majority of this research has targeted older adults with mild cognitive impairment, such as early-stage dementia or early-stage Alzheimer's disease. These impairments are often precursors to more severe neurodegenerative conditions. In these studies, participants who consumed lion's mane supplements for several months showed significant improvements in memory, concentration, and overall cognitive flexibility.

These positive outcomes (improved memory, concentration, cognitive flexibility) have also been observed in healthy older adults experiencing normal age-related cognitive decline, as well as in young adults with healthy cognitive function. These findings suggest that lion's mane could be instrumental in supporting cognitive health across different age groups. For the elderly, it has the potential to delay or mitigate the symptoms of age-related cognitive decline. In younger individuals, lion's mane may help maintain and potentially enhance cognitive function.

### What is it in Lion’s Mane that improves cognitive function and brain health?

Lion's mane mushroom contains a remarkable mix of about 70 different “secondary metabolites.” Secondary metabolites are compounds that are not directly responsible for the mushroom’s normal growth, development, or reproduction. Three groups of these secondary metabolites of particular interest to researchers in brain health and cognitive function — erinacines, hericenones, and ergothioneine (ERGO). This is not to say that these groups of compounds are the only compounds that impact upon cognitive function and brain health. Rather, these compounds seem to be the focus of current research efforts.

**Erinacines** are unique compounds found in the mycelium of the lion's mane mushroom. Several erinacines (A, B, C, D, E, F, G, H, I, J, K, L) have been isolated. Erinacine A is particularly notable because it stimulates the production of nerve growth factors (NGF) in the brain and nervous system. NGF are essential proteins that help neurons grow and maintain their connections, which is vital for transmitting signals throughout the nervous system effectively. Studies in rats have shown that erinacine A can increase the levels of NGF in critical areas of the brain such as the hippocampus and locus coeruleus. The hippocampus is involved in forming and retrieving memories, while the locus coeruleus influences physiological responses to stress and panic. Erinacine A has also been found to be protective against oxidative stress in the brain, which has been linked to stroke, anxiety and depression. Among the various compounds in lion's mane, erinacine A is particularly promising for potentially improving conditions related to neurodegenerative diseases such as Alzheimer’s and Parkinson’s.

**Hericenones** are a group of bioactive compounds found in the fruiting body of lion's mane mushrooms. Researchers have isolated several hericenones—specifically A, B, C, D, E, F, G, H, I, and J—with hericenone C and D being particularly noteworthy. These compounds are known for their ability to reduce brain inflammation and manage oxidative stress, which can enhance mood and improve emotional regulation. Although some studies suggest that hericenone C and S can stimulate nerve growth factor (NGF) production, similar to erinacine A from the mushroom’s mycelium, this aspect remains a topic of debate among researchers. Nevertheless, the neuroprotective and mood-regulating properties of hericenones show considerable promise in treating mood disorders, such as anxiety and depression.

**Ergothioneine (ERGO)** is a powerful antioxidant found in both the fruiting bodies and the mycelium of the lion’s mane mushroom, and is well-known for its ability to protect nerve cells from damage caused by harmful molecules known as free radicals. Studies with rats have demonstrated that ERGO absorbs into brain tissue, offering substantial protection for neurons. Older rats receiving this antioxidant have shown significant improvements in memory and problem-solving skills. In humans, the body rapidly absorbs ERGO, which quickly reaches the brain. It is associated with strong neuroprotective properties and is therefore considered to have excellent potential as both a preventative and supportive treatment in managing degenerative brain diseases.

Table 1: Concentration of Key Compounds in Lion’s Mane Mushroom (Roda E, et al. 2019)

|  |  |  |
| --- | --- | --- |
| Compound | In Fruiting Body | In Mycelium |
| Erinacine A (µg/g) | - | 150 |
| Hericenone C (µg/g) | 500 |  |
| Hericenone D (µg/g) | <20 |  |
| Ergothioneine (ERGO) (µg/g)  | 340 | 580 |

Table 1 displays the relative concentrations of Erinacine A, Hericenone C and D, and Ergothioneine (ERGO) in an Italian strain of Lion’s Mane. Extracting these compounds from different strains yields somewhat different numbers, but the relative proportions remain comparable. In both studies, researchers found Erinacine A exclusively in the mycelium, while Ergothioneine (ERGO) appeared in both the mycelium and the fruiting body. Hericenone C and D were only found in the fruiting body.

So what do we know?

As it stands, research into lion's mane mushroom demonstrates this fungi’s profound potential for enhancing cognitive function across different age groups. Over two decades of studies, primarily on animal models and increasingly on humans, have illustrated the mushroom's capability to improve memory, focus, and overall cognitive flexibility. Notably, the research underscores the benefits of lion's mane not just for those with cognitive impairments but also for healthy individuals looking to maintain and enhance their mental acuity.

For younger adults, consistent supplementation with lion's mane has shown to significantly boost cognitive performance, possibly even preventing the early decline of these functions. This finding is crucial as it suggests that regular intake of lion's mane can contribute to prolonged cognitive health and vitality, setting a foundation for a healthier mental state throughout life. Meanwhile, for the elderly, lion's mane presents a promising natural intervention that could alleviate age-related cognitive decline, offering a beacon of hope for improving life quality and independence in later years.

Our understanding of the precise mechanisms through which lion's mane exerts these effects continues to evolve. As researchers delve deeper into the unique properties of erinacines, hericenones, and ergothioneine, we anticipate more refined strategies for leveraging these compounds. At Markwood Mushrooms, while we continue to support and anticipate further scientific breakthroughs, our immediate goal remains to harness these proven benefits to enhance the cognitive wellness of healthy adults. By incorporating lion's mane into daily health regimens, we aim to empower individuals to achieve peak mental performance and sustain their cognitive health well into the future