

This Mushroom Compound Is a Longevity Powerhouse

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✓ Fact Checked

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STORY AT-A-GLANCE

- › Ergothioneine, a sulfur-containing amino acid found in mushrooms, is a powerhouse when it comes to promoting longevity
- › Out of 112 measured plasma metabolites, ergothioneine is the metabolite most significantly associated with lower morbidity and mortality, being associated with a lower risk of coronary artery disease, stroke and death of all causes
- › In 2005, scientists discovered that most human tissues have a highly specific carnitine-based transporter for ergothioneine, which suggests humans are designed to eat and reap specific benefits from mushrooms
- › Ergothioneine has antioxidant, anti-inflammatory, antimutagenic and cytoprotectant properties, and research shows depletion of ergothioneine leads to higher oxidative stress and cell death
- › Mushrooms that contain ergothioneine include pine mushrooms, oyster mushrooms, shiitake, king boletes, porcini, chanterelles, lion's mane and Enokitake, just to name a few. Porcini, shiitake, oyster, maitake and king oyster typically contain the highest amounts

In the Nutrition Facts video above, Dr. Michael Greger reviews the scientific literature showing that ergothioneine, a sulfur-containing amino acid found in mushrooms, is a real powerhouse when it comes to promoting longevity.

For example, he cites a 2020 study¹ published in the journal *Heart*, which found that out of 112 measured plasma metabolites:

"Ergothioneine was the metabolite most significantly associated with lower morbidity and mortality, being associated with a lower risk of CAD [coronary artery disease], stroke, death of all causes, and death of cardiovascular causes."

The authors concluded that "higher ergothioneine was an independent marker of lower risk of cardiometabolic disease and mortality, which potentially can be induced by a specific healthy dietary intake."

Mushrooms that contain ergothioneine include pine mushrooms, oyster mushrooms, shiitake, king boletes, porcini, chanterelles, lion's mane and Enokitake,² just to name a few.

Porcini, shiitake, oyster, maitake and king oyster typically contain the highest amounts. White button mushrooms also contain it, but in far lower amounts. Greger presents some comparative data on these mushrooms in his video.

We Were Made to Eat Mushrooms

As noted by Greger, ergothioneine was largely ignored until 2005, when scientists discovered that most human tissues have a highly specific carnitine-based³ transporter for ergothioneine.⁴

This transporter is even chronobiologically upregulated before mealtimes. These facts strongly indicate that mankind was designed to eat and reap specific benefits from mushrooms. But what are those benefits, exactly?

One of the mechanisms of action that make ergothioneine so beneficial for health is its antioxidant properties,^{5,6} which are similar to that of glutathione.⁷ As an antioxidant, it reduces cellular damage by gobbling up harmful free radicals.

It has an extra edge over many other antioxidants, however, because it accumulates in tissues and organs after ingestion,⁸ and can help prevent oxidative damage in those tissues over a long period of time.⁹

What's more, the tissues in which it tends to accumulate the most are tissues that also tend to be more prone to free radical damage, such as the lenses of your eyes and liver, as well as tissues that are more sensitive to damage in general, such as bone marrow, seminal fluid and blood.

“ Ergothioneine has antioxidant, anti-inflammatory, antimutagenic and cytoprotectant properties, and research shows depletion of ergothioneine leads to higher oxidative stress and cell death.”

Mushrooms May Protect Mitochondrial Health

Remarkably, it may even accumulate in, and protect, your mitochondria,¹⁰ the tiny organelles inside your cells that produce cellular energy in the form of ATP. As explained in a 2021 paper:¹¹

"Early studies suggested (but did not rigorously establish) that OCTN1 is found in the mitochondria, allowing ET [ergothioneine] accumulation in this organelle. Indeed, ET could protect mitochondrial DNA from oxidative damage due to hydrogen peroxide or UV exposure.

Since then, few studies have investigated the intracellular localization of OCTN1 and ET. Mitochondrial dysfunction is implicated in a wide range of disorders and the therapeutic benefits of ET have been suggested to be mediated through protection of this organelle.

We recently demonstrated that ET protects mitochondrial morphology in transgenic Drosophila models of PD [Parkinson's disease] (unpublished data).

Definitive evidence of ET uptake and accumulation in the mitochondria is required."

Ergothioneine – A Longevity Vitamin?

Ergothioneine also has anti-inflammatory, antimutagenic¹² and cytoprotectant¹³ properties. In short, it protects your cells against all sorts of damage. "Depletion of ETT (ergothioneine) leads to augmented oxidative stress and cell death," one study notes.¹⁴

As such, the authors suggested it might represent a new vitamin. However, as explained by Greger, vitamins are classified as such "by the manifestation of overt dietary deficiency diseases," and no such diseases have been identified for ergothioneine. Or have they?

"Perhaps deficiency diseases are staring us in the face," Greger says. Low plasma levels of ergothioneine have been linked to frailty, cardiovascular disease, mild cognitive impairment, dementia and Parkinson's disease,^{15,16} for example, all of which are rampant.

Others have suggested ergothioneine might be better classified as "longevity vitamin."¹⁷ While some vitamins may not be essential for life, "longevity vitamins" appear to be crucial for extended health- and life span, and ergothioneine fits that bill.

Health Benefits of Ergothioneine

While research into the health benefits of ergothioneine is still in its infancy, ergothioneine has been shown to:

Support healthy brain function, cognition¹⁸ and mood¹⁹ – As noted in the review paper "Ergothioneine in the Brain":²⁰

"Ergothioneine (ERGO) ... is easily absorbed from the gastrointestinal tract and distributed to various organs, including the brain. This is primarily

because its entry into brain cells is mediated by the ERGO-specific transporter OCTN1/SLC22A4 ...

The existence of OCTN1 and uptake of ERGO into the brain parenchymal cells may suggest that ERGO and its transporter play a pivotal role in brain function. Oral administration of ERGO has antidepressant activities in mice.

Furthermore, repeated oral administration of ERGO and ERGO-containing food extract tablets enhance memory function in mice and humans, respectively.

ERGO also protects against stress-induced sleep disturbance and neuronal injury induced by amyloid β in rodents. In vitro observations suggest that ERGO benefits brain function through both its antioxidative activity and by promoting neurogenesis and neuronal maturation."

Eating two or more portions of mushrooms per week has been shown to reduce your risk of mild cognitive impairment by more than half, compared to one portion a week or less.²¹

Another study found people who consumed mushrooms three times a week or more had a significantly lower risk of developing dementia, over a period of six years, compared to those who only ate mushrooms once a week or less.²²

A third study found seniors with early-stage Alzheimer's disease who consumed one-third to a full teaspoon of powdered lion's mane mushroom per day for several months saw mild but measurable improvement in their cognitive function and Activities of Daily Living scores, compared to placebo.²³

As noted in the 2022 review paper, "Decline of Ergothioneine in Frailty and Cognition Impairment":²⁴

"In frail elderly people, whose ageing organs undergo functional decline, there is a correlation between ergothioneine levels and cognitive ... decline. In patients suffering from dementia, including Alzheimer's disease with

hippocampal atrophy, deteriorating cognitive ability is correlated with declining ergothioneine levels.

S-methyl-ergothioneine, trimethyl-histidine and three other trimethyl-ammonium compounds also decrease sharply in dementia, whereas compounds such as indoxyl-sulfate and quinolinic acid increase, possibly exacerbating the disease.

Using these opposing dementia markers, not only diagnosis, but also therapeutic interventions to mitigate cognitive decline may now become possible."

Bolster the immune response, thereby reducing your risk of infections.²⁵

Protect cardiovascular health by reducing oxidative stress, inflammation and lipid peroxidation.²⁶

Improve atherosclerosis.²⁷

Protect skin and mitochondrial DNA from UV-related damage.²⁸

Promote eye health and protect against age-related macular degeneration (AMD) and vision loss by neutralizing free radicals and lowering oxidative stress in the retina.²⁹

Protect and maintain the health of your central nervous system by promoting neuronal stem cell differentiation.³⁰

Protect fertility in men when taken two weeks before administration of the anticancer drug cisplatin, which is known to cause testicular damage resulting in infertility.³¹

Slow or prevent fibrosis by modulating levels of inflammatory cytokines and mitigating oxidative damage in tissues.³²

Lower your risk of cancer, in particular breast cancer.³³

A Cup of Mushrooms a Day May Keep the Doctor Away

A 2019 study³⁵ published in *Nutrition Today*, which compared ergothioneine intakes between various countries, found the lowest estimated daily consumption in the U.S., at 1.1 milligrams per day, and the highest in Italy, at 4.6 mg per day. A primary factor in this outcome was believed to be Italians' preference for ergo-rich porcini mushrooms.

However, even just adding white button mushrooms to your daily diet, which has among the lowest amounts of ergothioneine, can more than double your blood level.

A retrospective study³⁶ in *Plant Foods for Human Nutrition*, which looked at how daily mushroom consumption might affect Type 2 diabetes risk factors, found that eating 1 cup of white button mushrooms a day raised ergothioneine concentrations from a mean of 317 nanograms per milliliter at baseline to 677 ng/mL at the end of 16 weeks. Participants with metabolic syndrome also experienced significant:

"... increases in the antioxidant marker ORAC (oxygen radical absorption capacity) and anti-inflammatory hormone, adiponectin and significant decreases in serum oxidative stress inducing factors, carboxymethyllysine (CML) and methylglyoxal (MG)."

A Promising Therapeutic for Longer, Healthier Life Span

In closing, consider the following final thoughts presented in the paper "Ergothioneine, Recent Developments":³⁷

"The unique chemistry of ET [ergothioneine] gives rise to its high stability and ability to accumulate in the body, enabling a wide range of cytoprotective and disease mitigating properties."

While associations have been made between low blood levels of ET and various human disorders, there is much still unknown. Nevertheless, the uptake in the fetus and infant, the near, if not fully, ubiquitous presence in tissues and the avid retention by the body are strong evidence that ET plays a critical role in human development and health.

Numerous animal studies have also demonstrated its benefits, whereas preventing uptake through silencing OCTN1 appears to worsen pathology in these disease models.

It remains to be seen whether supplementation in humans, especially the elderly or the subset of individuals with lower blood levels of ET (due to polymorphic variants of the transporter or diet), could reduce the risk of age-related and other diseases, or act as a therapeutic by slowing or halting disease progression.

The safety profile of ET and regulatory approvals facilitate such studies. With the rapid surge in interest, it is undoubtedly exciting times for this unique ... compound."

Sources and References

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- ⁴ [PNAS April 5, 2005; 102\(14\): 5256–5261](#)
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