

Ergothioneine: The Mushroom's Stealth Ingredient

Analysis by [Dr. Joseph Mercola](#)

✓ Fact Checked

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STORY AT-A-GLANCE

- › Mushrooms are high in ergothioneine and glutathione, both powerful antioxidants. Ergothioneine may hold the key to linking healthy soil to healthy food and therefore to healthy people
- › Regenerative farming practices produce plants with higher levels of ergothioneine and livestock from regenerative farms had lower ratios of omega-6 to omega-3 fatty acid
- › Although not everyone eats mushrooms, everyone has ergothioneine throughout their body, which data links to lower incidences of neurodegenerative diseases. Testing also shows crops absorb ergothioneine from fungal mycelium threads
- › Regenerative farming practices avoid sewage sludge, toxic pesticides and GMO seeds, and instead practice strategies that protect soil health, reduce water usage, prevent soil erosion and reduce exposure to foodborne illness and drug-resistant disease

Mushrooms have been used in traditional medicine for decades. But it wasn't until 1970 that mushrooms were officially distinguished from flora and recognized in their own biological kingdom.¹

Researchers have discovered fungal threads that exist below the surface of the soil play a key role in promoting healthy foods.² Those threads are called mycelium and are part of the reproductive stage of fungi. Growing mycelium can break down lignin found in plant material, improve the soil or warn plants of an imminent attack. In fact, mycelium has been described as “the internet of the forest, the wood wide web, the archetype of community.”³

Those who study fungi believe they are closer in nature to animals than they are to plants. The amino acid that has linked healthy soil to healthy people is ergothioneine, found commonly in mushrooms. According to the US Department of Agriculture,⁴ on average, people eat about 3 pounds of fresh mushrooms every year.

Mushrooms are rich in the antioxidants ergothioneine and glutathione. One paper in the journal *Molecules* wrote of the amino acid ergothioneine in the human body,⁵ "ET [ergothioneine] is concentrated in mitochondria, suggesting a specific role in protecting mitochondrial components, such as DNA, from oxidative damage."

Mushrooms also contain usually high levels of glutathione,⁶ important for the detoxification of heavy metals and other contaminants⁷ and also called "the master antioxidant."⁸ One researcher from Penn State Center for Plant and Mushroom Products for Health said:⁹

"What we found is that, without a doubt, mushrooms are the highest dietary source of these two antioxidants [ergothioneine and glutathione] taken together, and that some types are really packed with both of them."

Researchers have been studying the relationship between mushroom consumption and a variety of health conditions. Robert Beelman, from Penn State Center for Plant and Mushroom Products for Health, points out that in countries where people have more ergothioneine in their diet, researchers have found:¹⁰

"... lower incidences of neurodegenerative diseases, while people in countries like the United States, which has low amounts of ergothioneine in the diet, have a higher probability of diseases like Parkinson's Disease and Alzheimer's."

Researchers are unsure if this is correlation or causation, but the strength of the evidence is enough to suggest that ergothioneine is a necessary part of optimizing health and wellness.

Healthy Soil = Healthy Food = Healthy People

Legend has it that the founder of the Rodale Institute and promoter of organic farming once wrote “Healthy Soil = Healthy Food = Healthy People” on a chalkboard. Although the concept is logical, scientists had not made an evidentiary connection until recently.

Civil Eats¹¹ spoke with David Montgomery, a geomorphologist from the University of Washington, and his wife Anne Biklé, who together wrote an upcoming book “What Your Food Ate.” The book delves into the science behind soil health and how it impacts the health of crops, livestock and, ultimately, the end consumer, humans.

Montgomery believes that “In some ways, science has been catching up to the idea,”¹² that Rodale proposed over 50 years ago. In their research for the book, Montgomery and Biklé studied the products of nine matched pairs of regenerative and conventional farms.

Their results were published in Environmental Science, January 27, 2022.¹³ The team measured eight pairs of regenerative and conventional farms in eight states in the U.S. Each regenerative farm was paired with a neighboring conventional farm that planted the same crop variety. The regenerative farms combined no-till, diverse rotations and cover crops.

As you might expect, they found produce from regenerative farms was far healthier, testing for higher levels of certain minerals, vitamins and phytochemicals. A comparison of the level of unsaturated fatty acid in beef and pork raised on a regenerative farm against a conventional farm revealed the meat from a regenerative farm had higher levels of omega-3 fats and a lower ratio of omega-6 to omega-3 fat. They concluded:¹⁴

“Despite small sample sizes, all three crop comparisons show differences in micronutrient and phytochemical concentrations that suggest soil health is an under appreciated influence on nutrient density, particularly for phytochemicals not conventionally considered nutrients but nonetheless relevant to chronic disease prevention.

Likewise, regenerative grazing practices produced meat with a better fatty acid profile than conventional and regional health-promoting brands. Together these comparisons offer preliminary support for the conclusion that regenerative soil-building farming practices can enhance the nutritional profile of conventionally grown plant and animal foods.”

Could Fungi Be the Connection?

Although not everyone eats mushrooms, everyone has ergothioneine in their body.¹⁵ Importantly, mushrooms are the leading dietary source of ergothioneine. Beelman began asking the question, that if not everyone eats mushrooms, then how is everyone getting ergothioneine in their body?¹⁶

Ergothioneine is only synthesized by some bacteria and fungi. Scientists have found it in nearly all human tissue and body fluids and recognize it as a powerful antioxidant. Low levels have also been measured in some diseases, which has suggested that a deficiency may trigger some disease processes.¹⁷

Beelman and his colleagues hypothesized that ergothioneine from mushrooms was being absorbed into crops through the underground association with mycelium. Ergothioneine can be found in the fruiting body of the fungi, the mushroom, and along the mycelium.

When animals eat plants rich in ergothioneine, it gets into the meat. Beelman hypothesized that this may be how the amino acid is found throughout the human population.

They collaborated with the Rodale Institute to measure levels of ergothioneine in oats and separated the crops based on how intensely the soil had been tilled.¹⁸ Conventional farmers used tillage to help prepare the soil for planting and to kill weeds. The drawback is that it negatively affects soil health in several ways:¹⁹

- Tilling breaks up soil structure that provides a framework and prevents runoff.

- Aerating the soil increases biological activity and rapid decomposition of organic matter, which releases CO₂.
- Tilling destroys the habitat of the microorganisms living within the top two inches of the soil surface, which play an important role in decomposing organic matter and nutrient cycling. This includes reducing fungal biomass.
- Tilling makes the soil more vulnerable to compaction, which in turn reduces water, air and space for plant roots and soil organisms.

The results were not surprising. The data showed oats grown on conventionally tilled land had 33% less ergothioneine than no-till grown grain. The team moved on to do a similar analysis of how tillage may affect ergothioneine levels in soybean, corn and oats. The results revealed that concentrations of ergothioneine rose as the intensity of tilling the land decreased.

In speaking to Civil Eats, Beelman believes that this demonstrates a cohesive link from soil to crop to human health. "When you till the soil, you reduce the amount of ergothioneine that gets into the crop. Nobody had actually shown a specific connection. I think this does," he said.²⁰

Regenerative Practices Protect Soil and Prevent Erosion

Regenerative farming practices go far beyond avoiding sewage sludge, toxic pesticides and GMO seeds. Instead, regenerative agriculture and livestock management is the next stage of organic farming and helps regenerate environmental health by paying attention to soil and animal health, the climate and rural livelihood.

Steering committee member for Regeneration International, Vandana Shiva, puts it this way: "Regenerative agriculture provides answers to the soil crisis, the food crisis, the climate crisis, and the crisis of democracy."²¹

[Regeneration International](#) was founded in 2014 and announced at a press conference during a massive climate march in New York City. The goal of the organization is to

fundamentally change the conversation about the climate crisis and incorporate regenerative and organic food, farming and land use into the dialogue.

Ultimately, regenerative agriculture looks at land management as a network that should nourish people and the environment. The practices can differ from region to region, but the foundational principles are built on a dynamic system that is meant to restore the earth, address inequity and leave the water, land and climate in better shape for the next generations.

Regenerative farming practices focus on improving soil health, sequestering carbon using minimal or no-till practices and planting cover crops.²² Each of these strategies helps to improve the land yield and the nutrition of the crops grown. Cover crops²³ are planted to help protect the soil from erosion and inhibit weed growth. This also reduces the need for herbicides.

Cover crops primarily get planted in fields that would otherwise not have a cash crop planted. They increase biodiversity and can act as a living mulch to reduce weed growth. Other practices include crop rotation and diversity, which is a far cry from the monoculture crop planting practice by conventional farmers.

Crop rotation helps replenish the nutrients removed from the soil when you continually replant the same crop. Regenerative farms may also incorporate livestock,²⁴ allowing them to graze on cropland when cover crops are growing. This varies the animal's diet, increases their nutrient intake and is good for the topsoil.

Top Reasons to Support Regenerative Farming Practices

As Beelman and his colleagues have shown, the health of the soil in which your food is grown is directly related to your health. This begs the question of how the burgeoning warehouse farming market could possibly meet your nutritional needs. Some manufacturers are producing prefabricated buildings, specific LED plant lights and 20-foot towers to grow fruits and vegetables.²⁵

The production uses sensors to optimize water, light and temperature, and the producers claim they do not use or need synthetic fertilizers, herbicides, pesticides or GMO seeds. Some claim the yields are far higher than on traditional farms. And while Successful Farming²⁶ believes the one inefficient component is electricity use, as Beelman has demonstrated, growing crops is not only about the size of the plant that shows up above ground.

In 2014 Maria-Helena Semedo of the Food and Agriculture Organization of the United Nations warned that at the current rate of topsoil degradation, all the world's topsoil will be gone in less than 60 years.²⁷ At that point, growing food will become next to impossible.

The good news is there are many reasons to choose to support regenerative farmers and the crops they produce, or to choose regenerative practices in your own garden at home. The practice helps rebuild the topsoil, which is essential for growing crops.

Regenerative farming practices also help protect water sources and reduce agricultural water demand. Conventional agricultural practices promote water waste using flood irrigation and the destruction of soil quality. As a result, one-third of the largest groundwater aquifers are already nearing depletion,^{28,29} as we're extracting water at a far faster pace than the aquifers can refill.

Montgomery and Biklé showed in their small sample study that animals grazing on regenerative farms produced meat with a lower omega-6 to omega 3 ratio. Another benefit is the lower risk of foodborne illness and drug-resistant disease in regenerative farm livestock. The foods associated with the greatest number of foodborne illnesses are all factory-farmed, with CAFO chicken leading the pack.

Between 2009 and 2015 there were 5,760 reported foodborne outbreaks in the U.S.,³⁰ resulting in 100,939 illnesses, 5,699 hospitalizations and 145 deaths. Of these, chicken was responsible for 12% of all illnesses.

The reason contamination with drug-resistant microbes is common in CAFOs is the dependence on and overuse of antibiotics in the livestock.³¹ Organic grass fed

standards, on the other hand, do not permit the use of antibiotics,³² which is why grass fed beef is less likely to be contaminated with drug-resistant bacteria.

Take Time to Move Beyond ‘Too Little, Too Late’

Regenerative agriculture prevents environmental pollution and restores damaged ecosystems, as well as benefiting the farmer and helping build sustainable local economies. Healthy soil, healthy plants, healthy animals, healthy people, healthy climate, healthy societies – our physical and economic health, our very survival as a species, are directly connected to the soil, biodiversity and the health and fertility of our food and farming systems.

Regenerative organic farming and land use can move us back into balance, back to a stable climate and a life-supporting environment.

It's time to move beyond degenerate farming practices, land use, energy policies, politics and economics. It's time to move beyond "too little, too late" mitigation and sustainability strategies powered by “green opportunities” to grow plants without sunlight and produce meat without animals. It's time to inspire and mobilize a global army of regenerative farmers before it's too late.

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