How to Use Mushrooms

to Fight Aging, Boost Immunity, Beat Stress, and More!

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Contents

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How to Use Mushrooms to Fight Aging, Boost Immunity, Beat Stress, and More: Introduction

Did you know that more than 100 species of mushrooms are presently being studied all over the world to uncover their unique and varied health benefits?

Modern research scientists are now confirming what many ancient cultures have known for centuries – that mushrooms contain within them some of the most potent, yet safest compounds ever found in nature.[1] These compounds are either produced in the "mycelium" (the fine wooly-web of cells) or the "fruit bodies" they give rise to – which we typically know and understand as mushrooms.

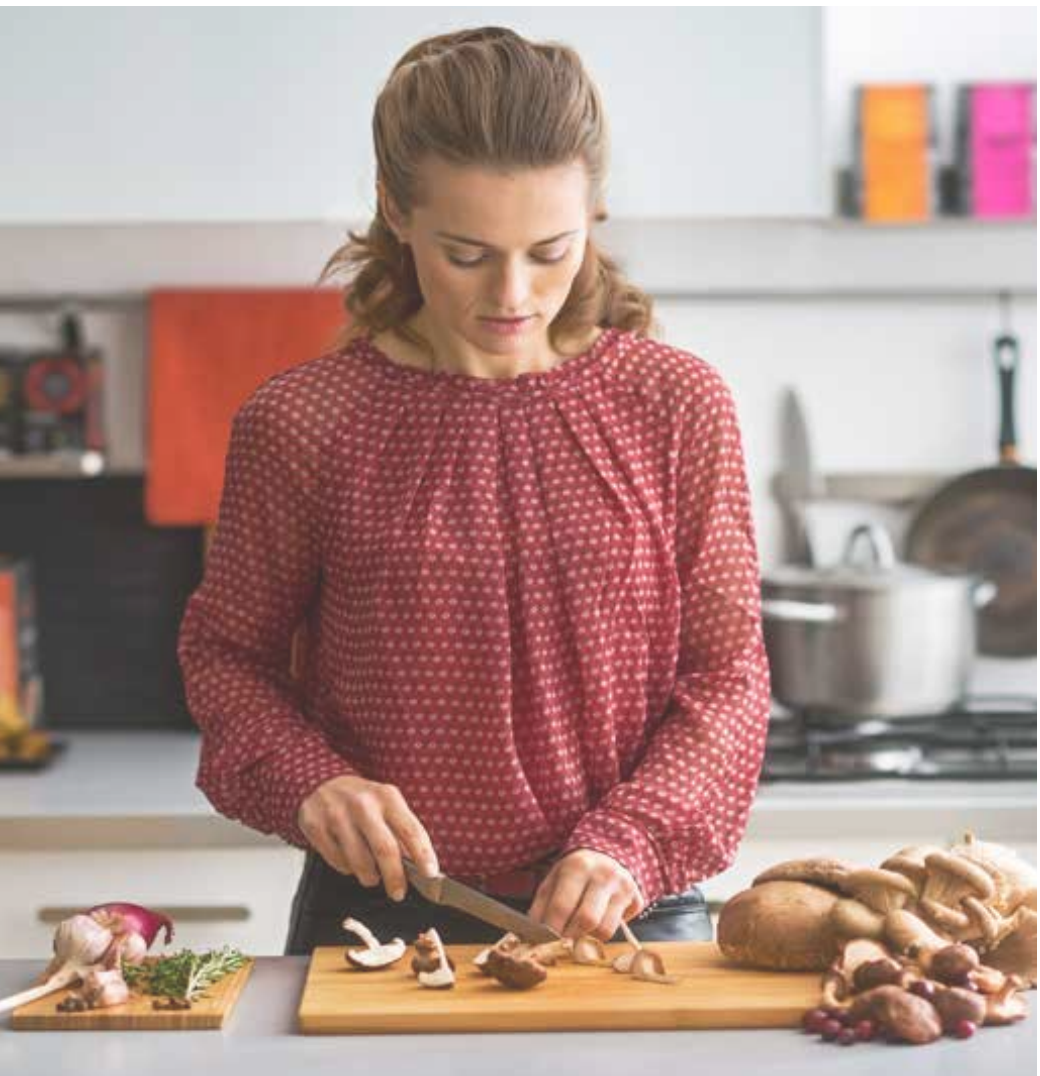
As stated by Paul Stamets, the American mycologist (mushroom specialist), author, and advocate of medicinal mushrooms in the introduction to his groundbreaking book *MycoMedicinals: An Informational Treatise on Mushrooms*: "What is striking is that most of these mushrooms and their ingredients cause very few side effects – if at all – even at very high doses."[2]

We, as humans, are part of the animal kingdom. It turns out that evolutionarily speaking, fungi are relatively closely related to the animal kingdom, which is why experts believe many of the naturally occurring ingredients that help mushrooms defend themselves against their enemies also support our body's defense mechanisms.[3] Indeed, Paul Stamets bluntly states that, "Fungi are central to the host defense of the planet and its people."

Increasingly, mushrooms are being seen as more than just tonics recommended by alternative healers and traditional health systems. Instead they are earning a well-deserved reputation as a legitimate way to help boost the immune system and the body's healthy inflammatory response. Promisingly, mixtures made from multiple mushroom species show a greater immune-strengthening effect, relative to ingredients from any one mushroom species alone.[4]

Discover 3 types of beneficial mushrooms:

- The so-called **"polypore" mushrooms** including **chaga** *(Inonotus obliquus)*, **reishi** *(Ganoderma lucidum)*, and **turkey tail** *(Trametes versicolor or Coriolus versicolor)*. Polypore mushrooms are shelf- or hoof-shaped, and are typically attached to trees or their roots.[5] Typically tough in texture, polypore mushrooms have been used by shamans and traditional healers for centuries. Native peoples long ago discovered they could be boiled to make a rich tea with health-supporting effects.
- **Gilled mushrooms** including **shiitake** *(Lentinula edodes)* and **lion's mane** *(Hericium erinaceus)*, the ball-shaped mushroom with cascading icicle-like spines. Gilled mushrooms are believed to have evolved from polypores and can be found everywhere: from fields to forests, from the tropics to the Arctic.
- And finally, a truly bizarre parasitic fungus with potent properties that can only live on caterpillar larvae, known as **cordyceps** *(Cordyceps sinensis)*. Famed in China for nearly 2,000 years as an aphrodisiac, the sudden growth of this fungus on dead larvae was viewed as magical by the Chinese and was believed to impart immortality to the dead.[6]



Read on to learn more about these varied and interesting fungi and how including them in your daily diet, either as food or supplements (from verified sources only), can greatly benefit your health and quality of living.

Chaga
(*Inonotus Obliquus*)

Chaga, also called clinker fungus and cinder conk – scientific name *Inonotus obliquus* – has been in use for many years as part of traditional folk therapy. In parts of Russia and some Baltic countries, chaga is used as a cleansing agent for stomach issues and also to support heart and liver health.

In recent years, this rare fungus – which grows mainly on birch, but also on beech, elm, and ash trees in cold climates and looks like a large growth of burnt bark – is being carefully studied to fully understand its many health benefits.

Chaga contains many potent compounds, including protein-bound polysaccharides, triterpenoids, and other steroid-based compounds such as betulin and inotodiol, inositols (related to vitamin B), and melanin.[7] Chaga supports the activity of the immune system, along with having antioxidant properties.[8, 9]

Let's take a closer look at some of chaga's reported health benefits.

Antioxidant

Oxidation produces harmful free radicals which can damage the body's cellular structures and contribute to the development and progression of many health issues. Therefore, elimination or inactivation of free radicals and / or preventing their excess generation greatly benefits health.

Chaga is known to have strong antioxidant properties.[10,11] For instance, Hu and colleagues concluded in a 2016 study that a chaga polysaccharide "possessed strong antioxidant activity for scavenging free radicals."[12] Further, in their 2012 study, Mishra and colleagues wrote that an extract of chaga in water reduced "expression of inflammatory mediators."[13]

These and other results suggest that chaga can potentially be used to reverse the damage caused by harmful free radicals because of its antioxidant properties, along with reducing inflammation.

Blood Sugar

A 2017 study by Wang and colleagues aimed to characterize a novel polysaccharide complex obtained from chaga mushroom. After treatment with the polysaccharide complex for 4 weeks, "body weight, fasting blood glucose levels, plasma insulin levels of the diabetic mice were significantly reduced."[14] Further, even at high doses of this novel polysaccharide complex, "organ tissues maintained organized and integrity in the sub-acute toxicity study."[15] In other words, organs were not damaged.

Similarly, in a 2010 laboratory study, Xu and colleagues stated that an extract of chaga in alcohol possessed "significant antihyperglycaemic, antilipidperoxidative, and antioxidant effects in alloxan-induced diabetic mice."[16]

Supporting Immune System Activity

In a 2015 study on mice, Chen and colleagues showed that a chaga polysaccharide was able to induce rapid increases in the numbers of T lymphocytes and macrophages, along with ramping up levels of naturally occurring immune compounds known as cytokines.[17]

In other words, chaga supports the overall activity of the immune system. Indeed, as far back as 2005 researcher Kim had tested the immune-stimulating effect of chaga extract on bone marrow cells in chemically immunosuppressed mice.[18] As reported in the journal *Mycobiology*, giving chaga extract daily for 24 days increased the numbers of white blood cells made in the bone marrow, known as granulocytes. This treatment also increased the numbers of macrophages.[19]

All of these results indicate that chaga extract has great potential as an immune system enhancer and would be a valuable asset in keeping patients healthy.

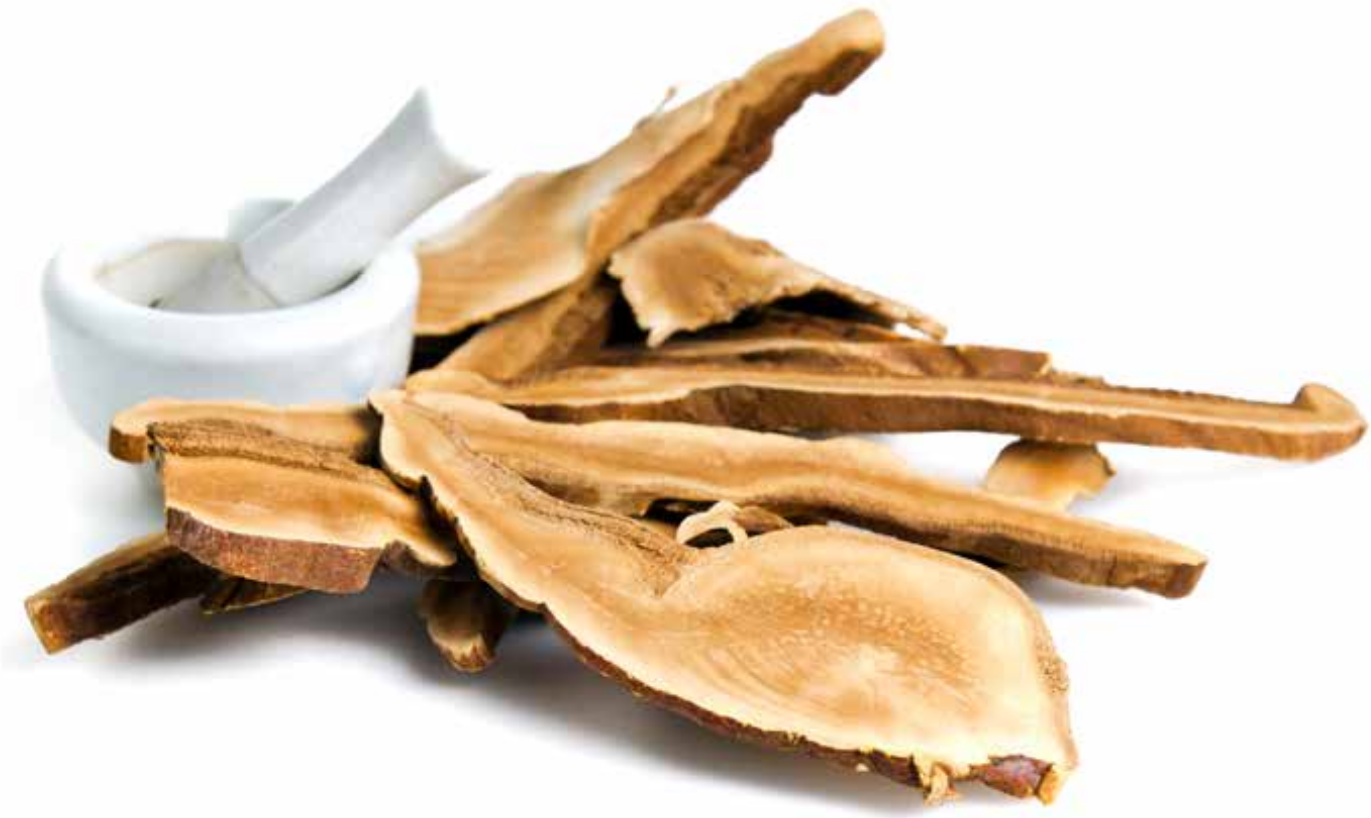
Reishi
(*Ganoderma Lucidum*)

The health benefits of reishi, also known as mannentake, lingzhi, or ling chi – scientific name *Ganoderma lucidum* – were first documented approximately 2,200 years ago, in China's oldest medical book *Divine Husbandman's Classic on Pharmacology*.[20]

Used for over 2,000 years by sages and shamans and known in China as the "spirit plant," reishi has the reputation of relaxing and fortifying both mind and body. This fungus holds a very important place in the traditional medical systems of China, Japan, and Korea.[21-23]

Reishi is found in many parts of the world, growing mainly on dead and dying deciduous woods. It comes in two varieties, "red reishi" and the rare "deer horn shaped reishi." Once reserved solely for royalty because it was believed to extend their life and improve health, the smooth upper surface of this fungus looks lacquered when wet. Because of this aspect of its appearance, reishi is sometimes known as "varnished conk."[24]

While reishi mushrooms have traditionally been prepared as teas or infusions, modern preparations include capsules, tinctures, and fractionated extracts of mushrooms, mycelium, and spores. Reishi is also added to chocolate bars, candies, energy drinks, and even coffee blends.[25]



Reishi is also now one of the few mushroom species whose DNA has been fully sequenced. The remarkable feature of the reishi genome is its rich diversity of genes coding for so-called "cytochrome P450 enzymes." Indeed, the presence of these enzymes may be one of the main reasons why reishi consumption confers benefits to human health. Observed beneficial effects include aiding the body in ridding itself of toxins more efficiently, countering free radicals, and increasing the liver's metabolic efficiency.[26]

Many potent compounds have been discovered in reishi mushrooms. These include more than 100 distinct polysaccharides such as beta-glucans and other forms of glucans, over 100 distinct triterpenoids and other steroid-based compounds such as ganoderic and ganoderenic acids, as well as ganoderans and Ling Zhi-8 protein.[27]

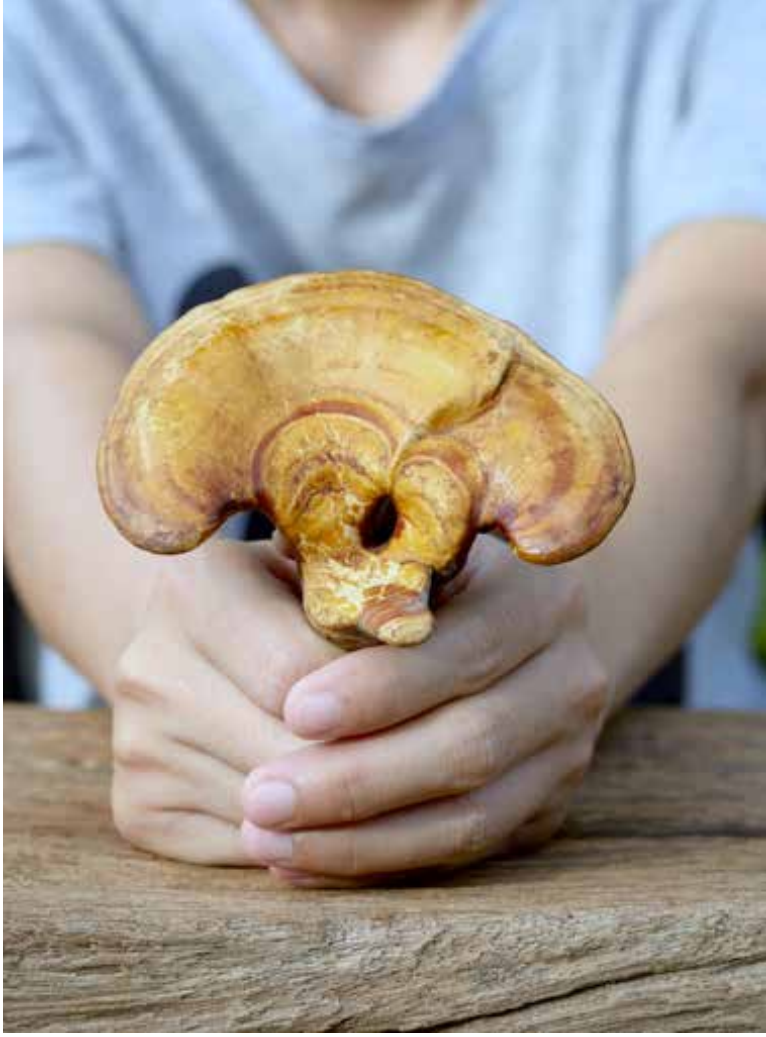
Reishi has antioxidant properties and helps to maintain the activity of the immune system. It is also routinely given to people to support a healthy inflammatory response.[28, 29] Triterpene compounds in reishi have been shown in lab testing to support blood pressure within a normal range.[30,31]

Let's take a closer look at reishi's reported health benefits.

Antioxidant and Pro-Immunity

Triterpenoid compounds in reishi have been shown to have antioxidant and pro-immunity properties. In a 1995 rat study, a reishi extract neutralized harmful free radical activity and supported healthy liver function.[32]

Multiple reishi polysaccharides have been shown to have pro-immune properties.[33] In fact, health experts believe that reishi can help to counter some of the symptoms of aging, thanks to its ability to fight free radicals and reduce cellular damage associated with oxidative stress.[34]



Supporting Immune System Activity

Reishi has earned a reputation for supporting the immune response in a number of ways, including by supporting the production of natural killer (NK) cells, macrophages, T lymphocytes, and natural bioactive compounds known as cytokines.[35]

A 1995 study by Chen and colleagues examined the effects of reishi extract on mice exposed to harmful gamma radiation, which normally damages the thymus, an organ of the immune system in which T lymphocytes are made.[36] Their study results indicated that "the relative thymus weight in groups D and E (which had been treated with reishi and Krestin / PK-4 extracts, respectively) were higher than group C (no treatment) on day 28 after gamma-irradiation."[37]

In other laboratory experiments, reishi polysaccharides have been shown to activate macrophages, T lymphocytes, and cytokine production.[38] In a 2003 study, treatment for 12 weeks with a polysaccharide fraction extracted from reishi was seen to support immune function in patients.[39,40]

Turkey Tail

(*Trametes Versicolor, Coriolus Versicolor*)

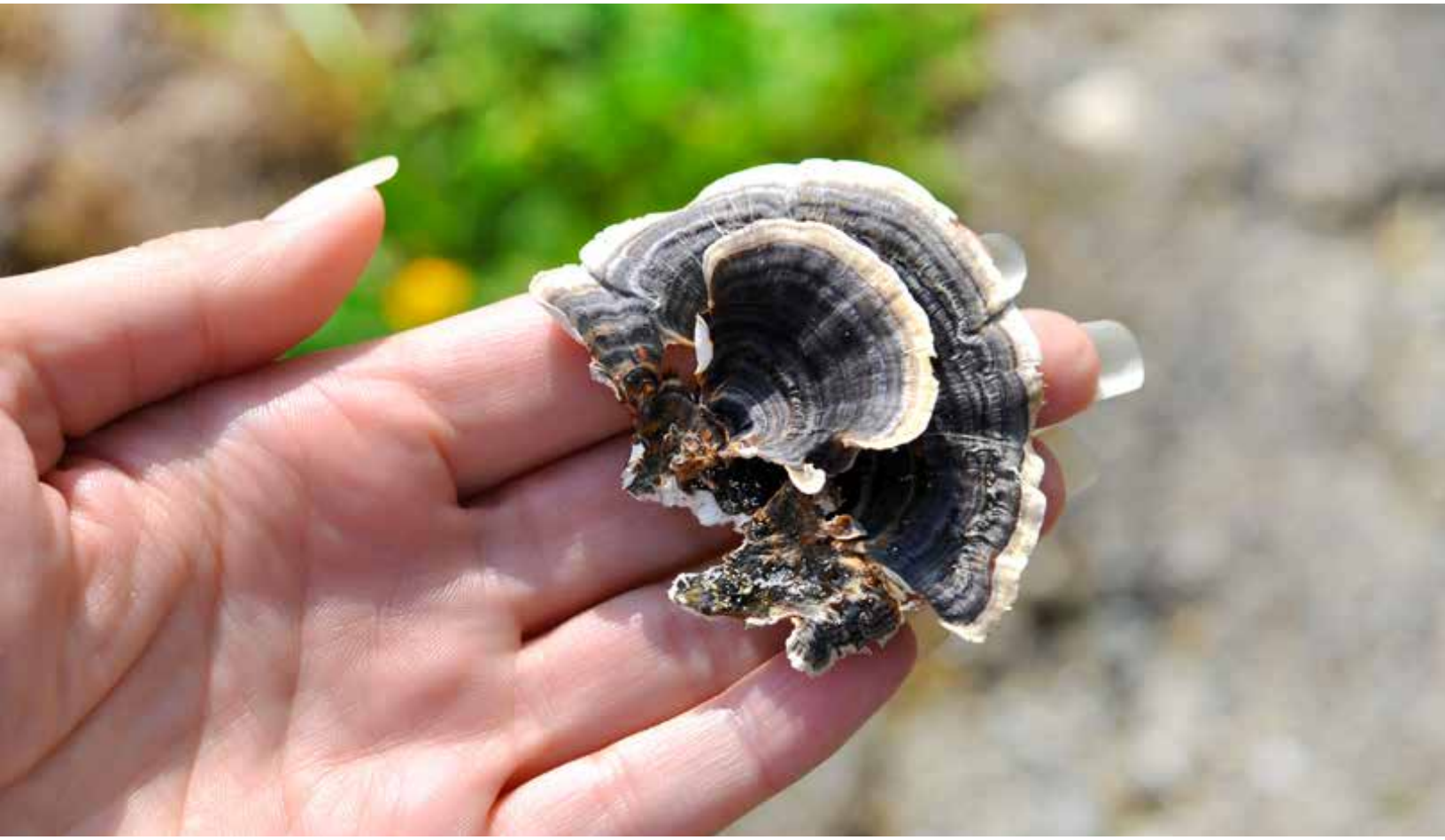
Brewed for thousands of years as a wellness tea and tonic in China, the turkey tail mushroom, also known as yunzhi – scientific name *Trametes versicolor* or *Coriolus versicolor* – holds substantial potential as a modern day health booster. All the evidence indicates that this multi-colored fungus, which grows widely in forests around the world, can help to support the immune system and a healthy inflammatory response.[41,42]

Turkey tail contains many potent compounds including polysaccharides known as beta-glucans, a protein-bound polysaccharide known as PSK (brand name Krestin), polysaccharopeptide (PSP), and ergosterol (provitamin D2) derivatives.[43]

Let's take a closer look at some of turkey tail's many studied health benefits.

Krestin

Turkey tail is the source of the drug Krestin, which is responsible for several hundred million dollars of sales in Asia. Krestin has been shown to support the immune system and maintain the body's healthy inflammatory response.[44]



A 2012 Phase 1 clinical trial of women with breast cancer reported in the journal *ISRN Oncology* showed that turkey tail extract supported the activity of natural killer (NK) cells, while also increasing T-lymphocyte and T-cell counts in women.[45] The higher the dose of turkey tail extract, the greater the numbers of T cells found in the study participants' blood.

Similarly, numerous studies and clinical trials have confirmed that polysaccharopeptide (PSP) can support the immune system, help to maintain healthy energy levels, and support the digestive system.[46]

Shiitake
(*Lentinula Edodes*)

Shiitake, also known as black forest mushroom – scientific name *Lentinula edodes* – is native to Japan, Korea, and China and is one of the most popular and best studied mushrooms around today.[47,48] Both fresh and dried forms of shiitake mushrooms are common ingredients in East Asian cooking, and have become so in demand that they can often be readily found in grocery stores across North America.

In recent years, this exotic fungus, which grows naturally on dead and dying broad-leaf Asian oaks and beeches, is being carefully studied to understand its many health benefits.

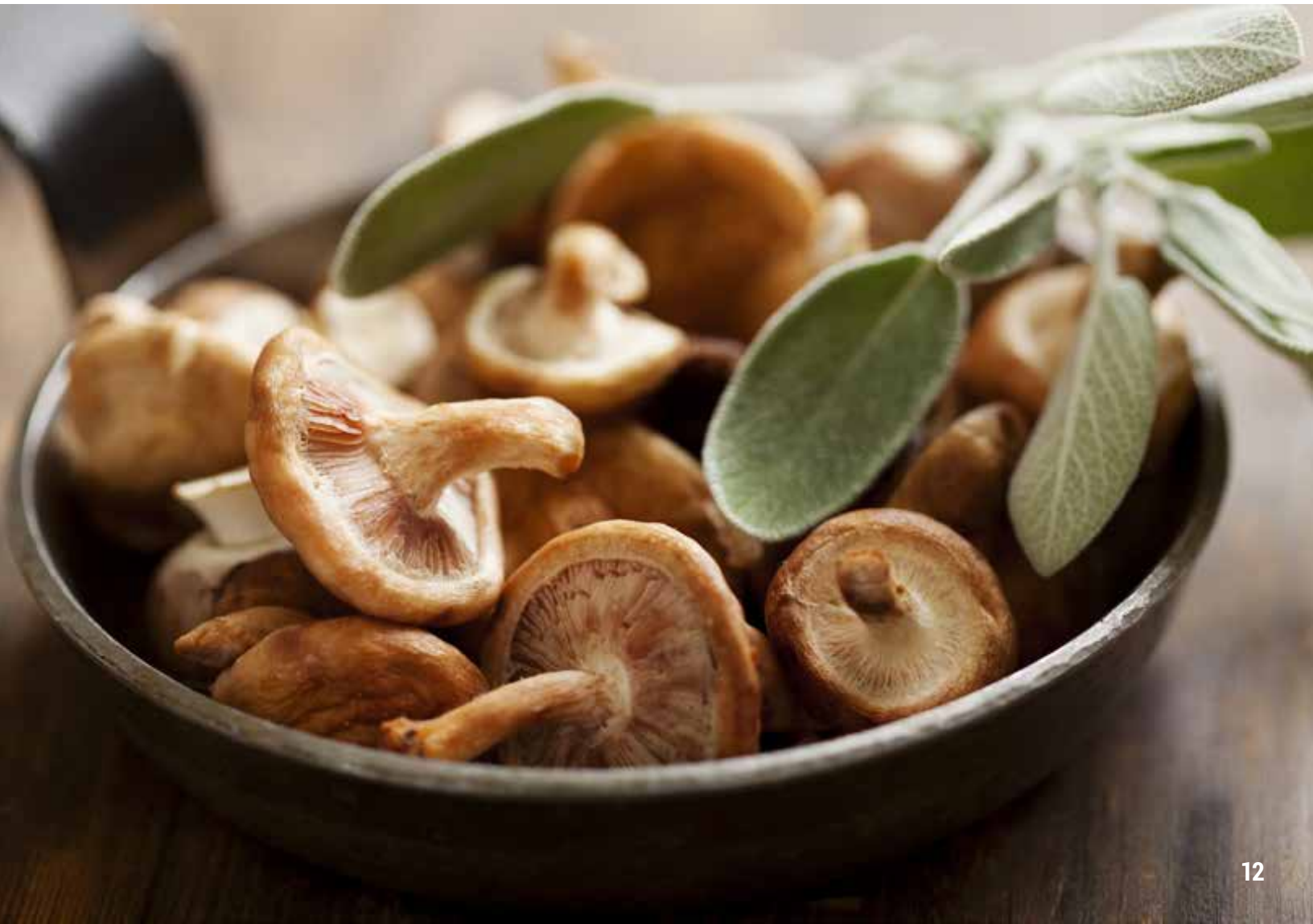
Shiitake contains numerous potent compounds, including the polysaccharide beta-D-glucan known as “lentinan,” “LEM,” and others, eritadinene, glycoproteins, and ergosterol (provitamin D2 derivative).[49]

Next up are just some of lentinan and shiitake's extensively researched health benefits.

Lentinan

Shiitake contains lentinan, a polysaccharide known scientifically as 1,3-beta glucan. Some of the beneficial properties of shiitake can be attributed to lentinan, which is believed to enhance many aspects of the immune system. In fact, lentinan has been described as "a unique class of immunopotentiator" that helps to improve the quality of life and extend survival, with very few side effects.[50,51] As a result, lentinan has been approved as a complementary therapy in Japan.

Every strand of DNA in the body's cells is equipped with built-in protective caps known as telomeres, which prevent DNA strands from unraveling. As we grow older, our telomeres gradually shorten because the enzyme responsible for maintaining telomere integrity – known as telomerase – gets less active with age. This is now known to be one of the factors that contributes to the signs and symptoms of aging. Excitingly, lentinan has been shown to affect the expression of telomerase, thereby helping to slow down signs of aging.[52]



Supporting Immune System Activity

In a 2008 study, Israilides and colleagues showed that extracts of both the fruiting body and mycelial of shiitake mushrooms were able to enhance the proliferation of rat thymocytes directly.[53] Thymocytes are an early form of T lymphocytes, which are a type of white blood cell that actively participate in the immune response to infections. In other words, shiitake supports the activity of the immune system.

A 2015 study published in the *Journal of the American College of Nutrition* set out to determine whether consumption of whole, dried shiitake mushrooms could actually improve immune function.[54] A total of 52 men and women aged 21 to 41 years participated in a 4-week study, consuming either 5 or 10 grams of mushrooms daily.

The study results showed that eating shiitake for 4 weeks supported the numbers of T cells and natural killer (NK) cells in these participants, which were also more active than normal.[55]

The authors of the study stated, "The changes observed in cytokine and serum CRP levels suggest that these improvements occurred under conditions that were less inflammatory than those that existed before consumption." In other words, shiitake consumption supports the body's healthy inflammatory response.[56]

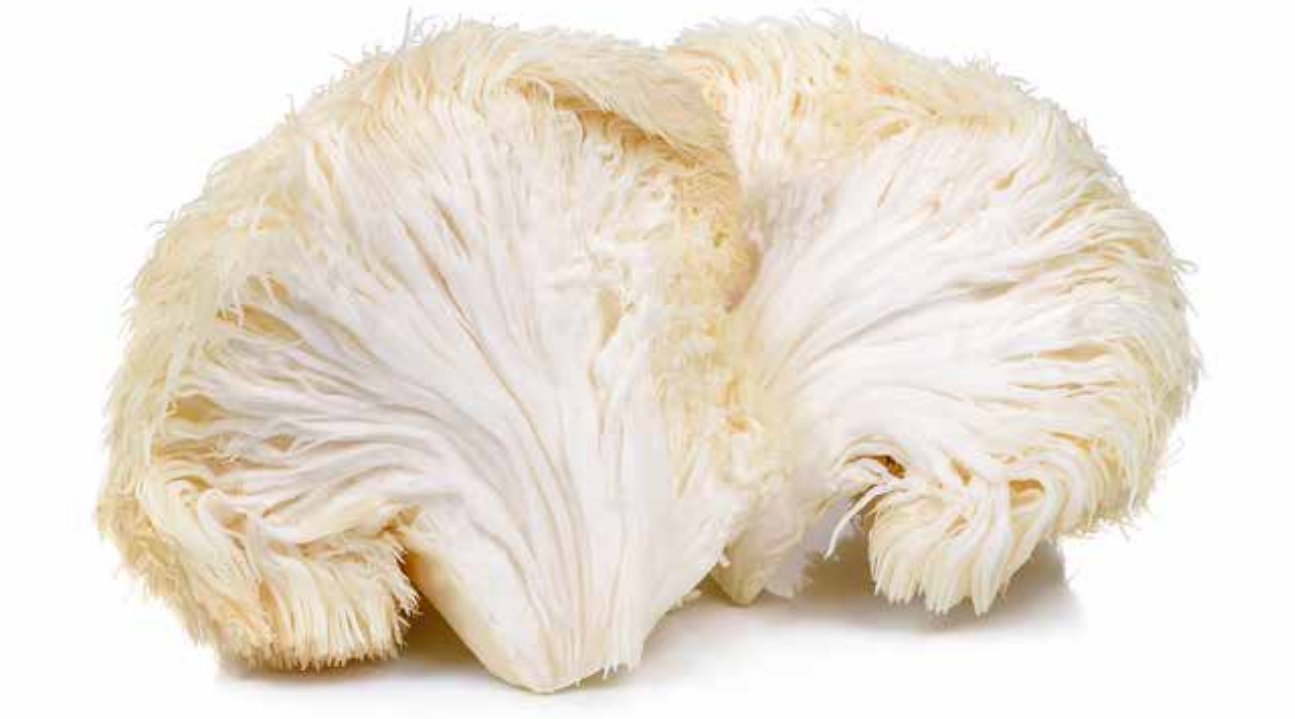
Lion's Mane
(*Hericium Erinaceus*)

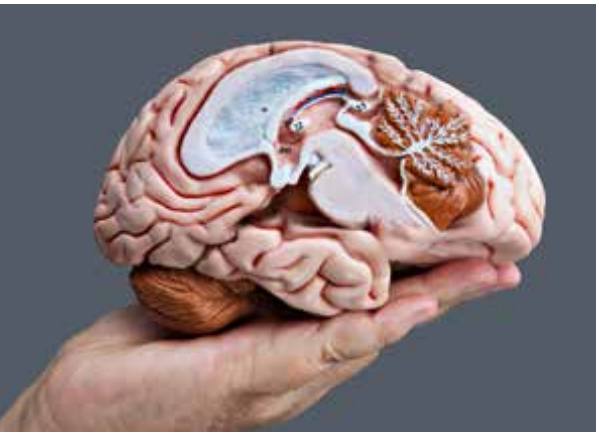
This ball-shaped mushroom with cascading icicle-like spines known as lion's mane, monkey's head, and Yamabushitake – scientific name *Hericium erinaceus* – is a tasty, edible mushroom with a long history of use in traditional Chinese medicine.[57,58]

Once reserved for royal families, this nutritious mushroom is made up of 20 percent protein and is considered by many to be a gourmet dish, with a taste similar to popular sea foods such as lobster and shrimp. Paul Stamets, the well-known author and long-time advocate of supplemental mushrooms, writes, "Lion's mane tastes best when caramelized in olive oil, deglazed with saké wine, and then finished with butter to taste."[59]

Lion's mane is found growing naturally on dying and dead trees in Europe, North America, China, and Japan. It contains many potent compounds, including protein-bound polysaccharides such as beta-D-glucans, galactoxyloglucan, glucoxylan, mannoglucoxylan, and xylan – as well as hericenones, erinacines, and ergosterol (provitamin D2) derivatives. It has recently been the focus of many scientific and medical studies for its powerful brain supportive effects.[60-62]

According to Stamets, "Lion's mane may be our first 'smart' mushroom. It is a safe, edible fungus that appears to confer cognitive benefits on our aging population."[63] With clear benefits for the brain's physiology and function, this healthful fungus with its many newly emerging beneficial properties will no doubt make the news in a big way.





Let's take a closer look…

Brain Support, Part 1

Naturally occurring compounds known as hericenones and erinacines in lion's mane have been shown to activate a peptide in the body known as "nerve growth factor," or NGF.[64,65] NGF is necessary for the growth, maintenance, and survival of nerve cells in the brain and nervous system known as neurons.

Indeed, these naturally occurring compounds stimulate neurons to re-grow, along with triggering a process known as re-myelination, which helps to keep neurons healthy and maintains their ability to conduct electrical signals efficiently.[66-68]

In a small clinical study from Japan published in 2009, Mori and colleagues stated that "a double-blind, parallel-group, placebo-controlled trial was performed on 50- to 80-year-old Japanese men and women diagnosed with mild cognitive impairment in order to examine the efficacy of oral administration of Yamabushitake (*Hericium erinaceus*)."[69]

Typical symptoms of mild cognitive impairment include problems with memory, language, thinking, and judgment and this condition is considered to be an intermediate stage between the normal mental decline typically seen with aging and the more serious dementias such as Alzheimer's disease.

In the clinical study, test subjects in the Yamabushitake group were given four 250 mg tablets containing 96 percent of Yamabushitake (lion's mane) dry powder three times a day for 16 weeks. After the study period was up, these subjects were observed for a further four weeks.

Interestingly, Mori and colleagues wrote that "at weeks 8, 12, and 16 of the trial, the Yamabushitake group showed significantly increased scores on the cognitive function scale compared with the placebo group. The Yamabushitake group's scores increased with the duration of intake, but at week 4 after the termination of the 16 weeks intake, the scores decreased significantly."[70]

In other words, Yamabushitake's cognitive benefits were seen only as long as the study subjects kept consuming the mushrooms – and the longer they consumed them, the better the subjects performed.

Further, the authors stated that, "laboratory tests showed no adverse effect of Yamabushitake. The results obtained in this study suggest that Yamabushitake is effective in improving mild cognitive impairment."[71]

The results of this study and others appear to clearly show that lion's mane can support brain health.[72-74]

Brain Support, Part 2

Another interesting study was carried out by Mori and colleagues on a mouse model of Alzheimer's disease.[75] Similar to the human disease, messy clumps of proteins known as beta-amyloid plaques form in the fatty membranes that surround brain cells and interfere with brain function in this mouse model.

First, the researchers taught the mice to use a maze in a laboratory setting. As beta-amyloid plaques developed in their brains, the mice gradually lost their ability to memorize the maze.

Some of these mice were then fed "a diet containing *H. erinaceus* over a 23-d[ay] experimental period. Memory and learning function was examined using behavioral pharmacological methods including the Y-maze test and the novel-object recognition test."[76]

As the authors state, "the results revealed that *H. erinaceus* prevented impairments of spatial short-term and visual recognition memory induced by amyloid (25-35) peptide. This finding indicates that *H. erinaceus* may be useful in the prevention of cognitive dysfunction."[77]

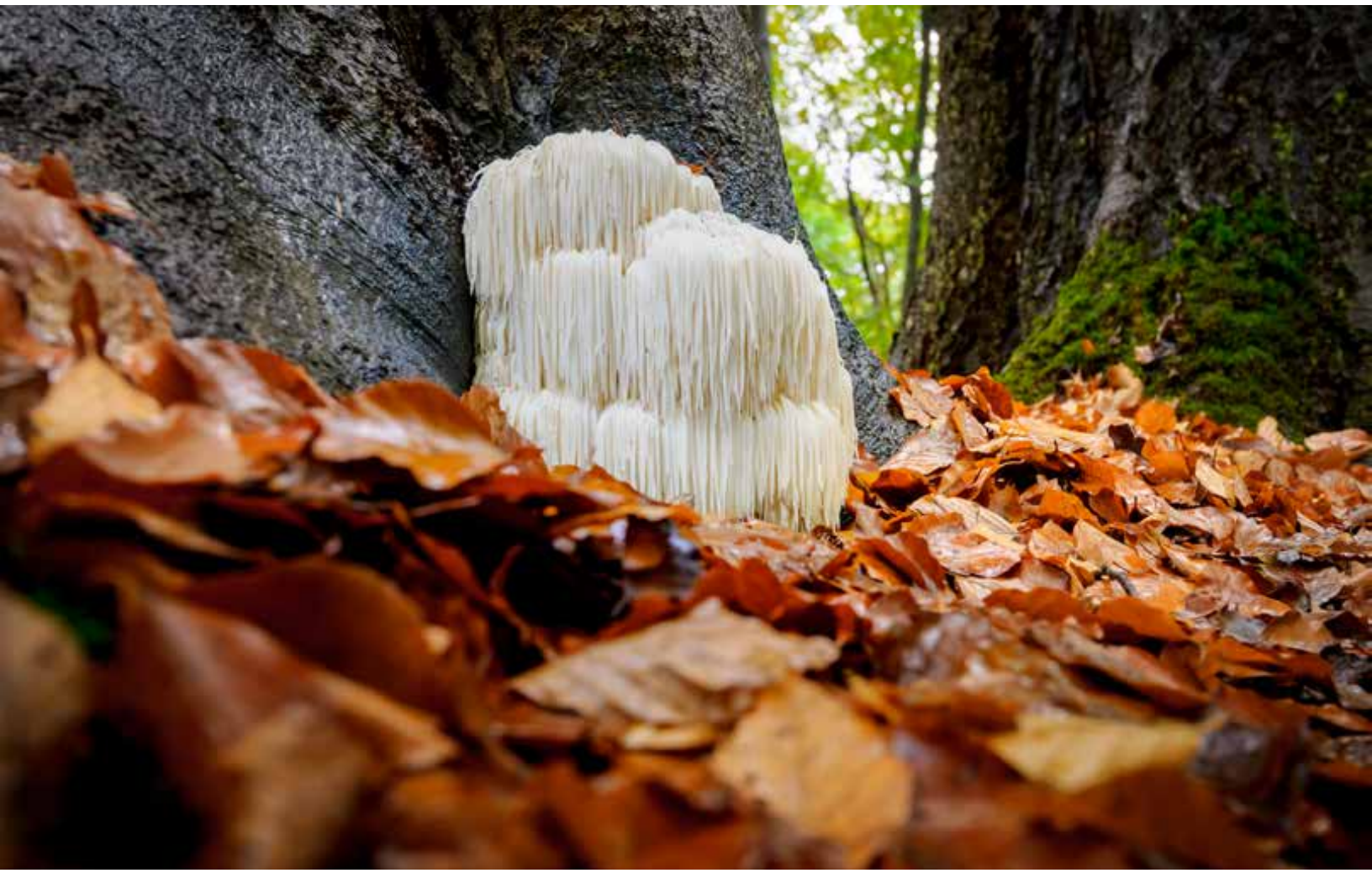
Short-term memory is our ability to hold a small amount of information in our minds in an active, readily available state for a short period of time. Visual recognition memory has to do with our ability to recognize previously encountered events, objects, or people, to "remember" them. Both of these types of memories are specifically lost in people with Alzheimer's disease.

Promisingly, lion's mane appears to support cognitive improvement, especially in age-related health conditions.[78-80]

Mood & Concentration

Lion's mane may also make you feel good simply by lightening your mood. In a small clinical study, 15 post-menopausal women who consumed lion's mane baked into cookies showed noticeably increased feelings of wellness relative to the women who didn't eat the cookies.[81,82] As the study authors state, their results show that consumption of lion's mane may possibly "reduce depression and anxiety."[83]

The lion's mane cookie group also showed a clear improvement in their ability to concentrate. In fact, Asian Buddhist monks are known to consume lion's mane tea before meditation to enhance their powers of concentration.



All of the available evidence indicates that lion's mane can help to support and maintain mental agility, mood, and concentration as we age.

Cordyceps
(*Cordyceps sinensis*)

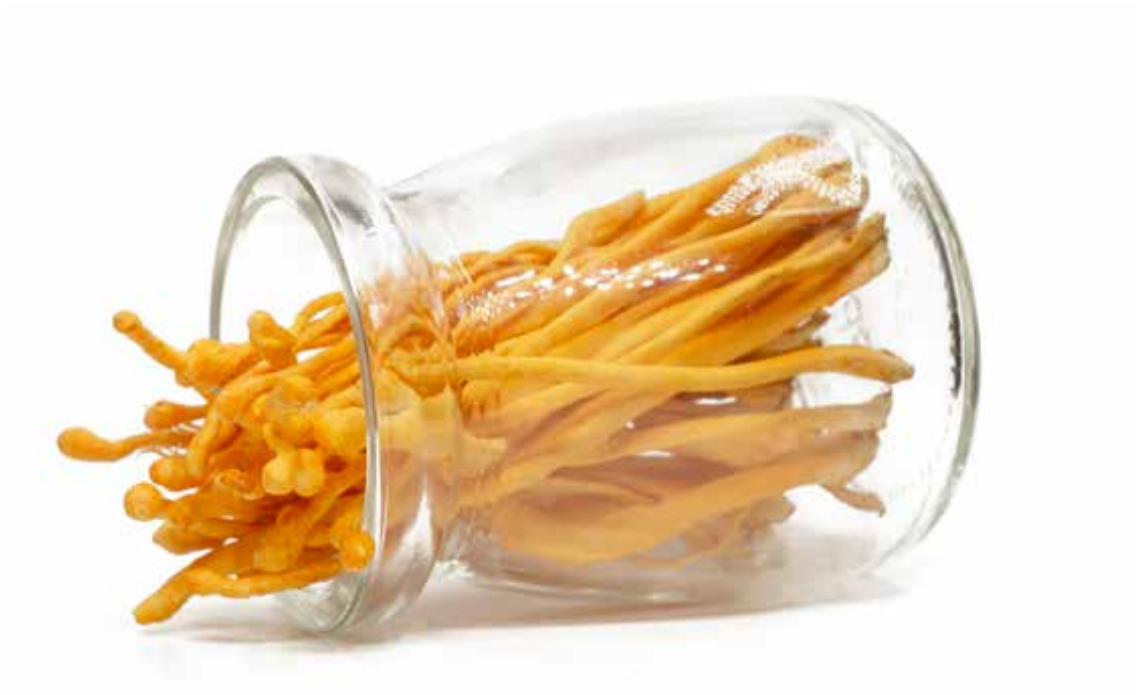
Cordyceps, also known as the caterpillar fungus, Dong Chong Xia Cao (summer grass, winter worm) – scientific name *Cordyceps sinensis* – has been a part of traditional Chinese and Tibetan medicine since at least the 15th Century.[84-86]

An extremely rare combination of a caterpillar and a fungus, it is found at very high altitudes in the Himalayas, on the Tibetan plateau, and other high-altitude locations around the world.[87]

Cordyceps was initially identified when Tibetan herders observed that yak, goat, and sheep that consumed this strange fungus became very strong and stout. This observation led to a deeper examination of its many health benefits. Traditional healers in Tibet and China claim that cordyceps promotes energy, appetite, stamina, libido, endurance, and sleeping patterns.[88]

The cordyceps mushroom has a truly bizarre life cycle. Being parasitic in nature, its spores land on the caterpillars of certain moth species and enters their bodies. The infected caterpillars bury themselves below the soil before they die. In summer, the fungus emerges from each infected caterpillar's head, looking like a thin, orange finger. As the fungus approaches maturity, it consumes most of its host, mummifying it.[89-91]

Cordyceps and its mummified host contain many potent compounds, including cordyceptin, cordycepic acid, polysaccharides, and sterols.[92] Studies have shown that cordyceps helps to support blood sugar levels in a healthy range. Other reported health benefits include supporting the heart, the immune system, and libido, along with benefiting exercise performance.[93-95]



Here are some of cordyceps' other reported health benefits in several published studies.

Blood Sugar Support

Multiple studies have shown that cordyceps can help to safely support blood sugar within the normal range. For instance, Kiho and colleagues claimed in a peer-reviewed 1996 study that a polysaccharide obtained from the mycelium (the name given to the network of fine white filaments seen in many mushrooms) of cordyceps showed "potent hypoglycemic (blood sugar lowering) activity in genetic diabetic mice," while "plasma glucose level was quickly reduced in normal and streptozotocin-induced diabetic mice."[96]

Not only that, administering this polysaccharide to normal mice "significantly increased the activities of hepatic glucokinase, hexokinase and glucose-6-phosphate dehydrogenase" – all liver enzymes that process glucose – and "lowered the plasma triglyceride level and cholesterol level in mice."[97]

Similarly, in another peer-reviewed study published in 2002, Zhao and colleagues fed a "mycelial fermentation product of Cordyceps" to normal rats for 17 days. After the study period, they observed "significantly reduced fasting blood glucose… by 27 percent and 24 percent."[98] Similarly, they stated that "fasting plasma insulin demonstrated a 37% decrease in the high dose treatment groups." Both of these results indicate that this particular cordyceps product may support better control and management of blood sugar levels within the normal range.

Diabetic nephropathy develops because of damage caused by high blood sugar levels on kidney function and is usually seen in long-term diabetes patients. In a promising 2016 study, Yu and colleagues administered a novel combination of powders of the fruiting bodies (the part of the mushroom from which its spores are produced) and mycelia of cordyceps to mice with induced diabetic nephropathy.[99] This treatment "significantly mitigated high blood glucose and renal dysfunction markers including serum creatinine and kidney-to-body weight ratio" after 8 weeks.[100]

Although clinical trials are still needed to understand the full extent of the efficacy and safety of cordyceps, these results indicate that extracts and compounds obtained from the caterpillar fungus are likely to be useful in the management of blood sugar levels.

Heart and Liver Support

In 1989, a study published in China by Mei and colleagues stated that alcohol extracts of cordyceps "can counteract the arrhythmias induced by aconitine or BaCl2 (barium chloride) in rats."[101] Further, it could "reduce the heart rate of anesthetic rats."[102] In fact, preparations made from cultured mycelia of cordyceps has been approved for the treatment of arrhythmias in China.[103]

In 2014, Liu and colleagues published a study stating that "oral administration of Cordyceps sinensis significantly attenuates the liver and heart injuries in CKD (chronic kidney disease) rats."[104]

Treatments to suppress the immune system are routinely used to prevent the body from rejecting a transplanted organ, for example a new heart after a heart transplant. However, the prolonged use of these so-called "immunosuppressants" after transplant surgery leads to significant problems of its own, including "risks of infection, malignancy, cardiovascular disease and bone marrow suppression."[105]

Excitingly, a 2008 laboratory study by Jordan and colleagues showed that an extract of cordyceps led to a "reduction in acute rejection when used in conjunction with a sub-therapeutic dose of [immunosuppressant medication] cyclosporine."[106] In other words, cordyceps may one day become an important component of post-organ transplant therapy.

Kidney Support

In China, cordyceps is routinely used to support kidney health.[107] For instance, in a 2004 study, Sun and colleagues examined the effects of applying a dry powder preparation of cordyceps mycelia known as "bailing capsule" after renal transplantation.[108] One hundred and twenty-one recipients of kidney transplants were randomly divided into two groups and treated with the immunosuppressant medication cyclosporin A, the synthetic steroid drug prednisone, and either another immunosuppressant drug azathioprine or bailing capsule and followed up for 1 to 2 years.[109]

The authors reported in a Chinese medical journal that while "there was no significant difference between the two groups in aspects of graft survival rate," bailing capsule (the cordyceps powder) treatment could "effectively prevent the reject response after renal transplantation, protect renal and liver function, stimulate hemopoietic function," along with having other beneficial actions.[110] They further stated that bailing capsule "is an ideal immunosuppressor after organ transplantation."

Similarly, Wojcikowksi and colleagues reported in a 2004 study that cordyceps was among the herbs that were potentially beneficial for kidney health because of "strong in vivo evidence of renal protection from toxic substances or drugs; potent, specific renal anti-oxidant effects; in vivo cancer antiproliferative effects specific to the kidneys; or in vivo evidence of being beneficial in renal disease or failure."[111]

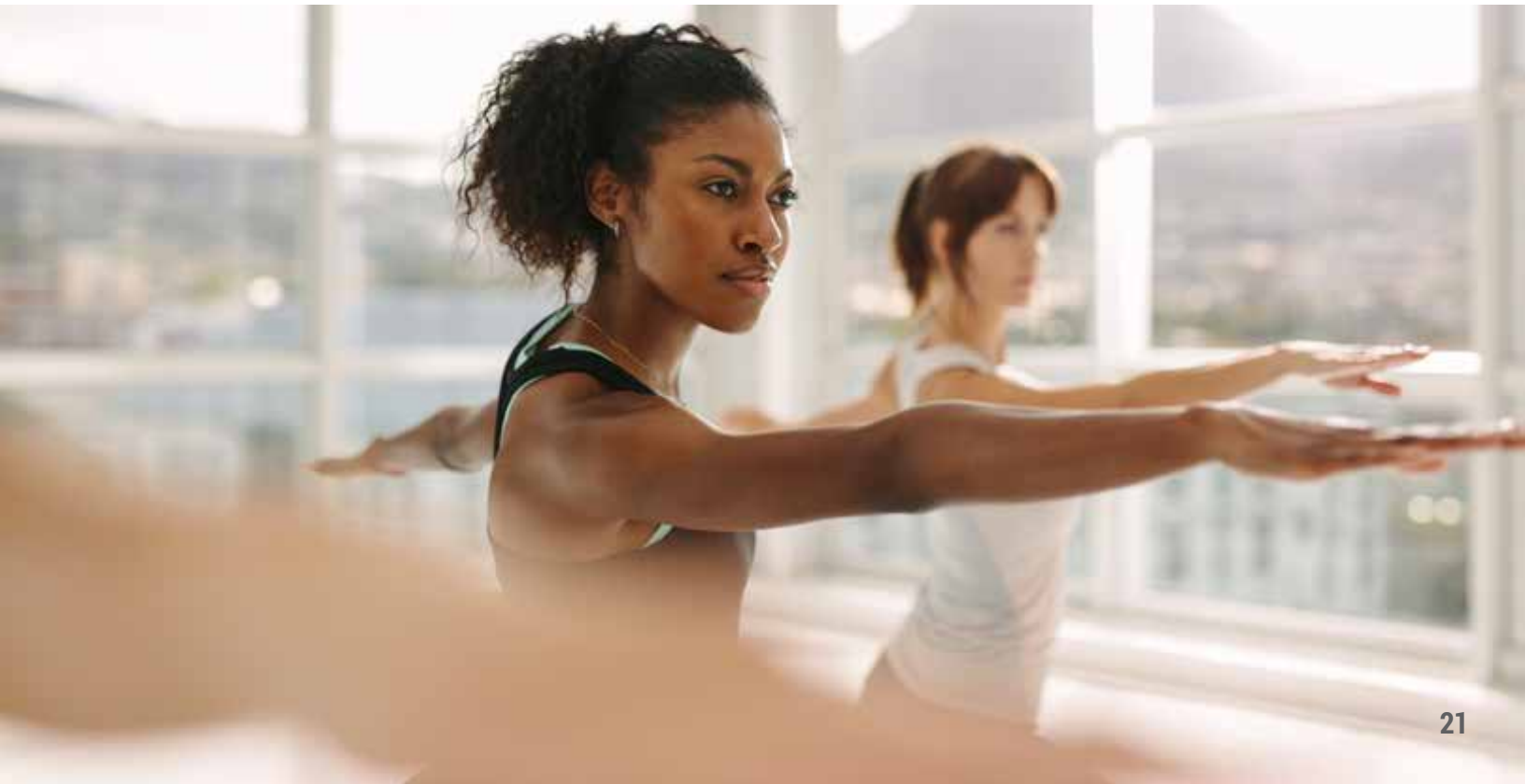
Exercise Performance

In a 2010 study, Chen and colleagues examined the effects of a Cordyceps extract known as Cs-4 on exercise performance in healthy elderly subjects. Twenty healthy, elderly subjects were enrolled in this trial and given either Cs-4 or placebo capsules three times a day for 12 weeks.[112]

According to the authors, "supplementation with Cs-4 (*Cordyceps sinensis*) improves exercise performance and might contribute to wellness in healthy older subjects."[113]

Cordyceps likely improves physical abilities and stamina because it contains adenosine and can stimulate production of ATP, one of the main sources of energy in the body's cells.[114]

Further, in 1994, Japanese researchers showed that cordyceps extracts dilated the aorta – the main artery in the body that supplies oxygenated blood to the entire circulatory system – by 40 percent. As a result this increased blood flow and greatly enhanced endurance.[115,116] Finally, supplementation with cordyceps was seen to improve performance in over 70 percent of long-distance runners in a Japanese study.[117,118]



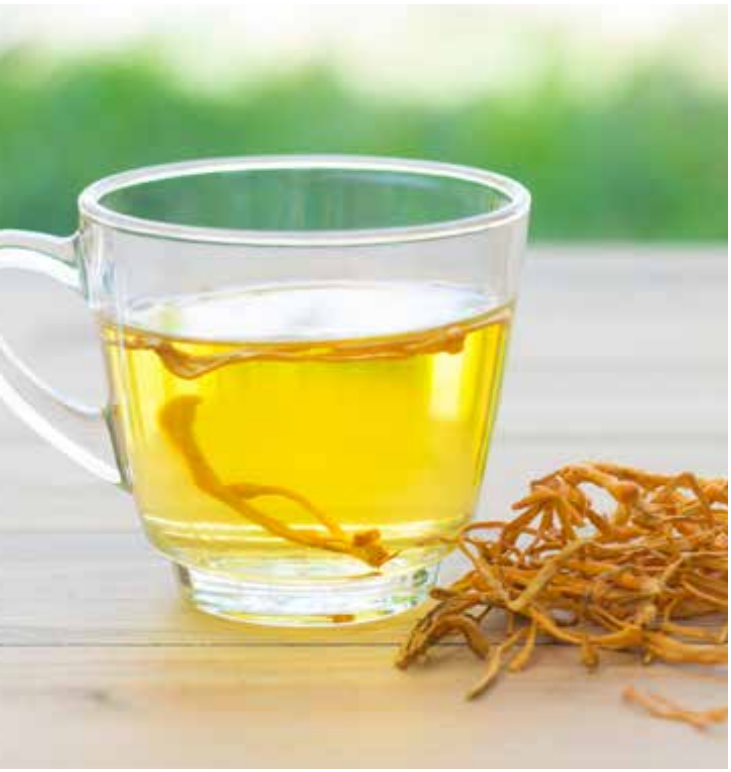
Libido

Cordyceps has traditionally been used for supporting libido and sexual function in many Eastern societies. Laboratory experiments on animals shows that cordyceps supports reproductive activity.[119,120]

Cordyceps has also been shown to support libido and sexual activity in both men and women, likely by enhancing testosterone release.[121]

Immune System Activity and Antioxidant Capacity

Animal studies have demonstrated that cordyceps also supports the immune system. In a 2012 study, Wang and colleagues examined the immune activation and reactive oxygen species neutralizing ability of cordyceps polysaccharides in laboratory experiments in mice.[122]



The results of this study showed that cordyceps polysaccharides were able to "overcome the CY-induced immunosuppression," along with supporting spleen lymphocyte activity and macrophage function. Further, the authors stated that these cordyceps polysaccharides "can also improve the antioxidation activity in immunosuppressed mice, significantly increase the superoxidase dismutase, catalase, and glutathione peroxidase levels and the total antioxidant capacity, and decrease the malondialdehyde levels in vivo."[123]

Superoxidase dismutase, catalase, and glutathione peroxidase are natural antioxidants present in mammals such as mice and human beings, while malondialdehyde is a naturally occurring reactive species that is used as a marker for oxidative stress.

In other words, cordyceps not only helps to neutralize harmful free radicals such as reactive oxygen species on its own, it also supports the activity of the body's naturally occurring antioxidant systems.

Maitake
(*Grifola Frondosa*)

Maitake ("dancing mushroom") – also known as kumotake ("cloud mushroom"), mushikusa, hen of the woods, ram's head, and sheep's head – scientific name *Grifola frondosa* – has been used for many years both as a food and medicine in parts of Japan, China, and Europe.[124, 125]

In modern times, this delicious, highly nutritious, soft-fleshed polypore fungus – which grows mainly on the stumps of or at the base of dead or dying deciduous hardwoods like oak, elm, maple, blackgum, and beech – is being carefully studied to fully understand its many health benefits.

Maitake contains many potent compounds, including beta-glucans, especially the D-fraction constituents, which have attracted a lot of attention.[126, 127] Maitake also contains long chain polysaccharides and N-acetylgalactosamine-specific lectin. [Note: Lectins are proteins which bind to specific long-chain sugars, which are known as polysaccharides.] Beta 1,6-glucan, a protein bound polysaccharide, has been identified as the active constituent in maitake.

Maitake has traditionally been used in Japan and China to help manage blood pressure (BP) and blood sugar levels within safe limits. Laboratory studies show that maitake also has antioxidant properties and can modulate the immune system by influencing both production and activity of multiple immune cells and immune factors. Studies are ongoing to find out whether maitake has similar effects in humans and early results are promising.

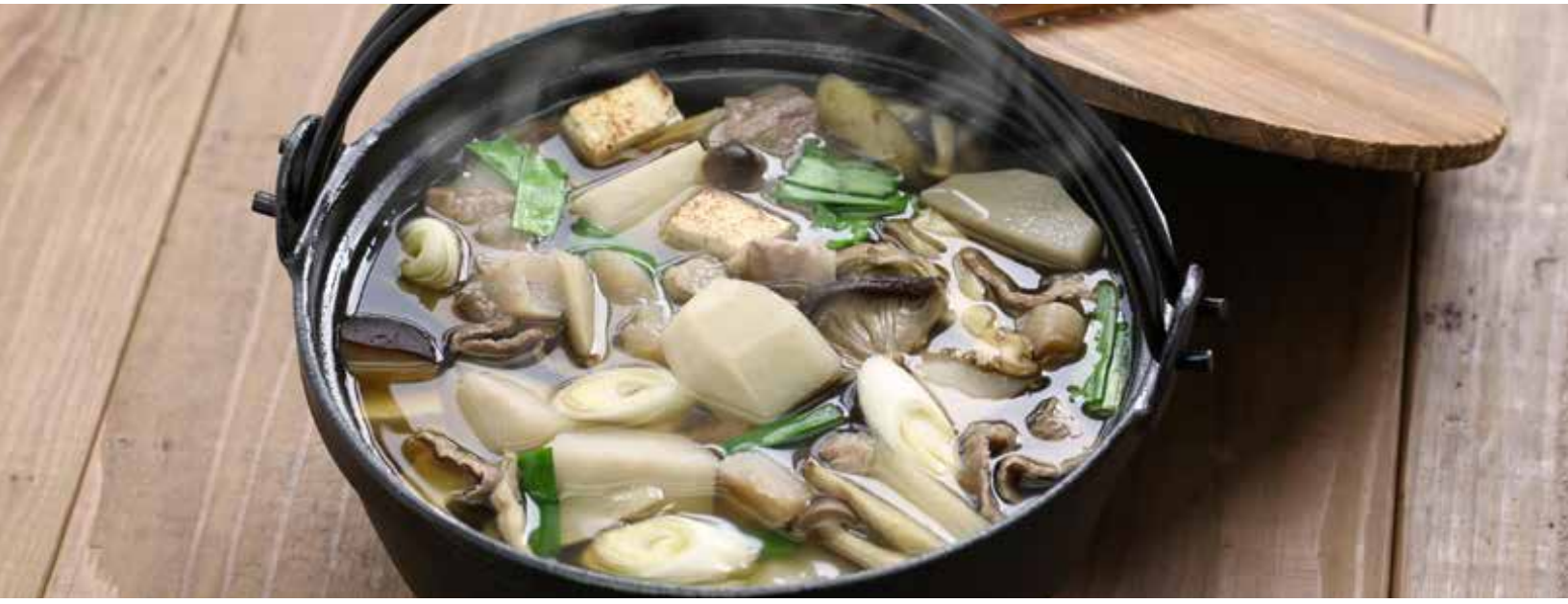
Let's take a closer look at some of maitake's health benefits.

Antioxidant

Oxidation generates free radicals which damage cellular structures and contribute to the development of health issues and aging. Therefore, elimination or inactivation of free radicals and, if possible, preventing their excess generation, can greatly benefit our health.

In a study published back in 2002, Zhang and colleagues showed that fatty acid components isolated from the filamentous part of maitake – known as mycelia – had antioxidant properties.[128] These fatty acids were also seen to block the actions of the enzyme cyclooxygenase (COX). Inhibiting COX activity is known to provide relief from inflammation and pain.[129] Indeed, in laboratory experiments, a water extract of maitake has been shown to help manage inflammation within safe levels by suppressing both the production and activity of an immune signaling molecule, or cytokine, known as TNF-alpha.[130]

Multiple polysaccharides isolated from maitake have also been shown to have antioxidant activity.[131,132] Promisingly, in a 2017 study, Chen and colleagues showed that consumption of polysaccharides from maitake can counter memory impairment in aged rats and literally alter specific structural elements in their brains.[133] Total enzymatic antioxidant capacity also increased in these animals.



Overall, these results clearly indicate that various naturally occurring compounds found in maitake can counter the damaging effects of harmful free radicals, along with helping to safely manage inflammation.

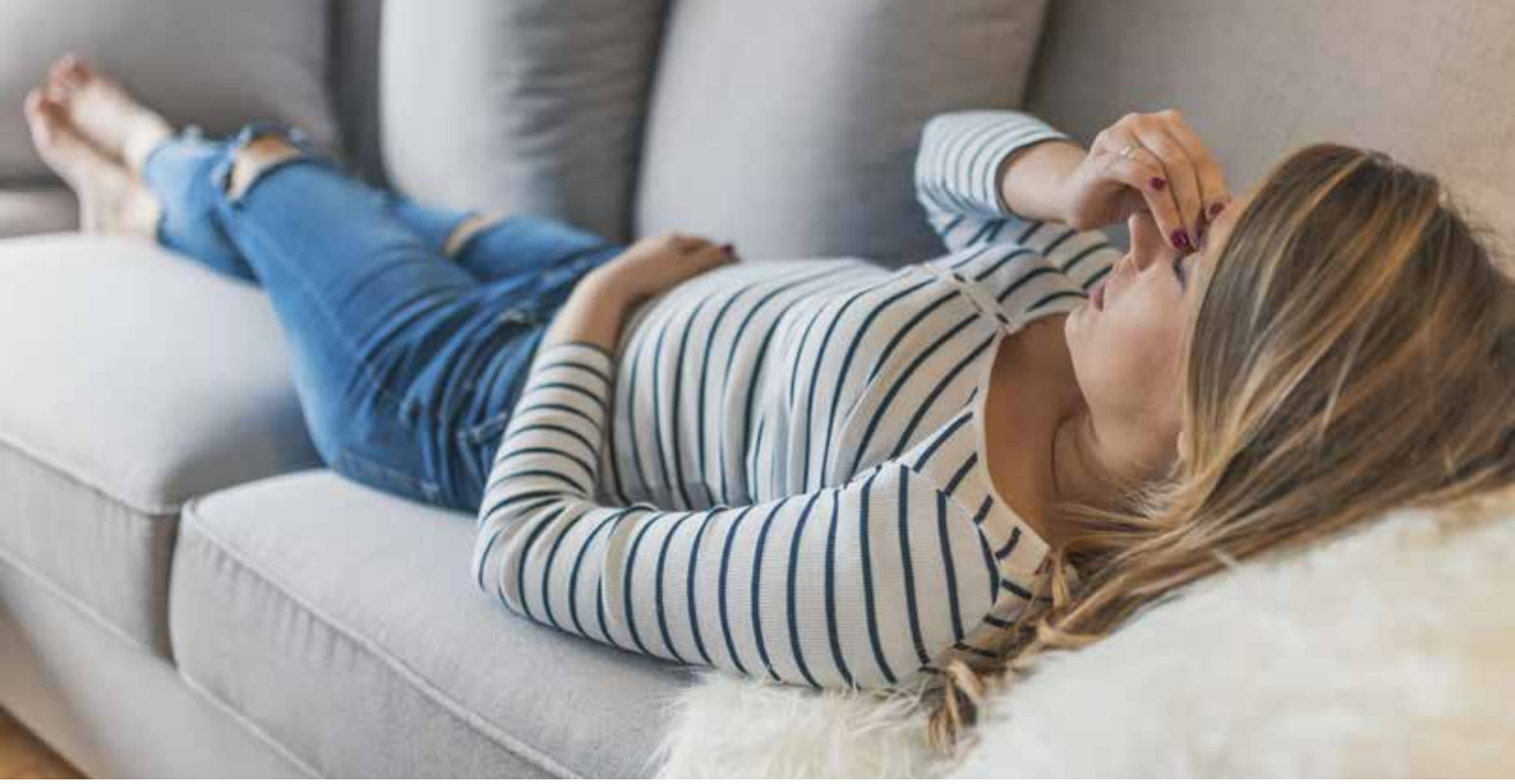
Blood Sugar

Powdered maitake was shown to help keep blood glucose levels within safe limits in laboratory mouse models;[134] indeed, a single dose reduced circulating blood sugar by 25 percent![135]

In a 2007 study, Hong and colleagues showed that a type of polysaccharide known as an alpha-glucan isolated from the fruiting body of maitake helped reduce body weight and manage blood sugar levels within safe limits in a laboratory mouse model of blood sugar dysfunction.[136] Further, this polysaccharide lowered blood levels of insulin, cholesterol, and blood fats. At the same time, both levels and activity of innate antioxidant enzymes were seen to be enhanced in these animals.

In a recent study published in 2018, yet another polysaccharide isolated from maitake was shown to enhance multiple mechanisms of sugar management by insulin in laboratory experiments.[137]

It's important to note that maitake may have "a possible hypoglycemic effect" in people with blood sugar dysfunction.[138]



Supporting Immune System Activity

In multiple studies, maitake has been shown to have various complex actions on the immune system.[139] For instance, maitake's so-called "D-fraction" has been shown to activate CD4(+) T cells and CD8(+) T cells in a laboratory mouse model.[140] Both CD4(+) T cells and CD8(+) T cells are critical components of the immune system.

In a 2009 clinical trial, a polysaccharide extract from maitake was shown to have complex actions on the immune systems of 34 postmenopausal breast cancer patients.[141] These patients consumed maitake liquid extract at various doses twice daily for three weeks. None of the doses led to toxicity, although two patients withdrew from the trial because of minor side effects.

Interestingly, increasing doses of maitake was seen to enhance some parameters and reduce others. In other words, the polysaccharide extract boosted some aspects of the immune system, while suppressing others.

Similarly, in a phase II study, maitake was well tolerated and helped to enhance the function of immune cells known as neutrophils and monocytes in patients with myelodysplastic syndromes.[142] [Note: myelodysplastic syndromes are types of cancer that often progress to acute myeloid leukemia (AML).] Neutrophils are a type of white blood cell that form an essential part of our innate immune system, while monocytes are another type of white blood cell.

Based on these and other results, some researchers feel that randomized controlled clinical trials on the effects of maitake in humans are the logical next step.[143]

Conclusion

Mushrooms live in varied surroundings and come in different shapes and sizes. During their lifetime, they produce potent compounds, including the many hundreds, perhaps thousands of versions of complex carbohydrate molecules known as polysaccharides. Other compounds found in mushrooms include glycoproteins, ergosterols, triterpenes, and antibiotics.

One typical example of polysaccharides found in fungi are the beta-glucans. These and other polysaccharides support the activity of the immune system. Similarly, triterpenoid compounds found in various mushrooms potently maintain immune activity.

Research shows that a combination of two or more medicinal mushrooms is much more effective than any single species at activating the immune system. Studies are presently ongoing in laboratories around the world to determine the best combinations of these fungi to provide the desired wellness benefits.

A word of caution is necessary here. It is not advisable, unless you're a trained botanist or mycologist (an expert who specializes in the study of fungi), to begin harvesting wild mushrooms on your own. Many mushroom varieties look similar, and there are poisonous varieties of mushroom growing in the wild.

Instead, look for a manufacturer that offers 100 percent organic mushroom extracts and supplements, produced, stored, and packaged under strict guidelines to preserve their nutrient content and overall effectiveness, while also keeping you safe and healthy.

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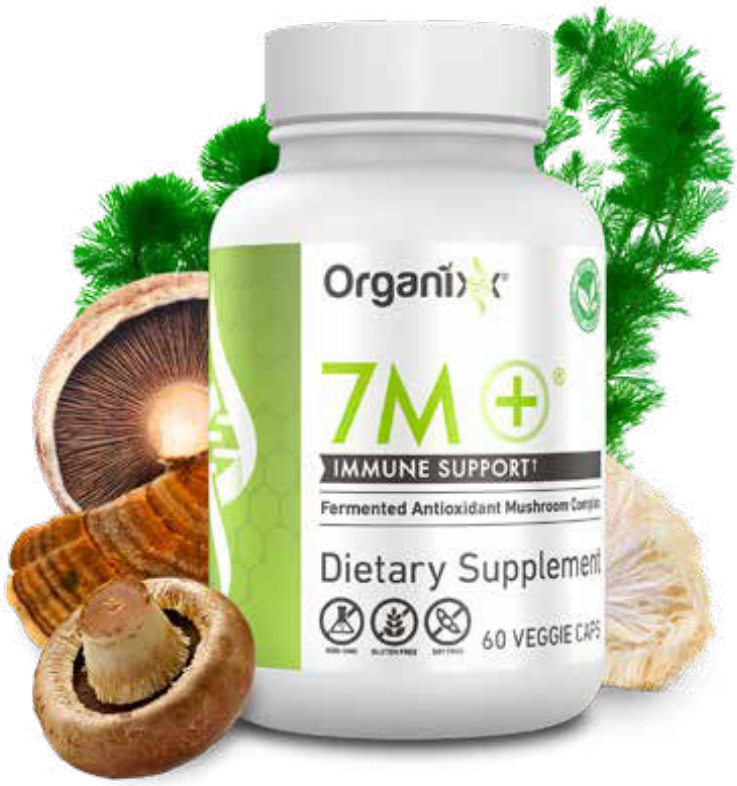

You've just read about the amazing health benefits contained in a wide variety of mushrooms. Asian cultures have been using them for centuries to promote good health and boost immunity.

And today, modern scientific research is showing that including a daily dose of mushrooms rich in antioxidants and beta-glucans can benefit your health and quality of life. To do your body the most good, you'll want to consume as many different kinds of mushrooms as you can.

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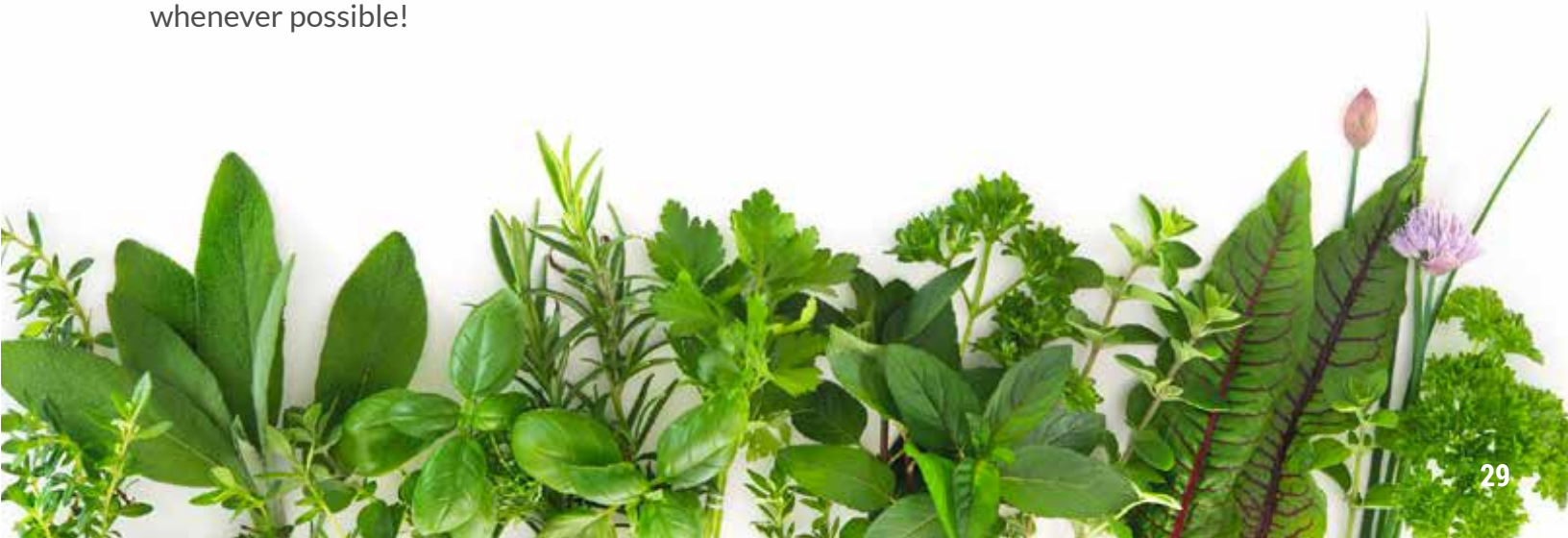

Glossary of Terms

Antioxidant – a molecule that prevents oxidation of other critical cellular molecules and structures, thereby preventing formation of free radicals that can damage the body's cells.

B cells / B lymphocytes – a type of white blood cell, part of the immune system, that makes antibodies.

Cytokines – a group of signaling proteins made and secreted by immune cells that have multiple biological effects in the body.

Macrophages – a type of white blood cell that engulfs and digests cellular debris, foreign substances, microbes, and abnormal cells.

Natural killer (NK) cells – part of the immune system's rapid response team to eliminate abnormal cells in the body.

Polysaccharides – naturally occurring complex carbohydrate molecules made up of a large number of sugar molecules chemically bound together. Many hundreds, perhaps even thousands of polysaccharides are found in mushrooms and fungi, many with health-enhancing properties.

T cells / T lymphocytes – a type of white blood cell that is part of the immune system's response to infections and injury.

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