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## **The Healing Power of Medicinal Mushrooms** *Immune Support For Cancer, Colds and Lifelong Health*

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## Introduction to Medicinal Mushrooms

Mushrooms are truly magical. Humankind's relationship with mushrooms dates beyond time immemorial. We have always used mushrooms as food and medicine. In fact, many mushrooms have long been used throughout Asia for medicinal purposes. There are at least 270 species of mushroom that are known to have various therapeutic properties. The practice of using mushrooms in Chinese herbal medicines has been recorded in early records of the *Materia Medica*. The earliest book on medicinal compounds in China, the *Shen Noug's Herbel* (100-200AD), recorded the medicinal effects of several mushrooms, including *Ganoderma lucidum*, *Poria cocos*, *Tremella fuciformis* and others.

Although mushrooms are still harvested in their natural habitats, our ability to cultivate many different mushroom species has improved greatly over the past few decades. As a result, large numbers of scientific studies on medicinal mushrooms over the past three decades, especially in Japan, China and Korea, have confirmed the traditional uses and also demonstrated new applications for health benefits.

## Health Benefits of Medicinal Mushrooms

While much attention in recent years has focused on various immunological and anti-cancer properties of certain mushrooms, they also offer other potentially important health benefits, including antioxidants, anti-hypertensive and cholesterol-lowering properties, liver protection, as well as anti-inflammatory, anti-diabetic, anti-viral and anti-microbial properties. These properties have attracted the interest of many pharmaceutical companies, which are viewing the medicinal mushroom as a rich source of innovative biomedical molecules. Many polysaccharide-bound proteins produced by fungi (mushrooms are fungi) have been classified as anti-tumor chemicals by the US National Cancer Institute.

And now let's look at some of the more important medicinal mushrooms in this report. Let's start with how mushrooms help your immune system.

## Medicinal Mushrooms and the Immune System

Medicinal mushrooms nourish your body at a fundamental level—your immune system. Researchers at Harvard University in the 1980's observed the immune-boosting properties of the cell wall polysaccharide component of medicinal mushrooms. A polysaccharide is a glucose (sugar) molecule. This specific type of long chain molecule with glucose side chains is called a beta-glucan. Beta-glucan molecules have a "lock and key" relationship with the surface receptors of important immune cells called macrophages. Macrophages literally engulf anything your body identifies as a harmful pathogen—a virus, bacteria, and so on. This linking-up process with the

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beta-glucan molecule stimulates macrophage activity, because the beta-glucan molecules latch onto the surface of macrophage cells and act as fuel. Continued research found other receptor sites on other immune cells, such as the natural killer cells, and neutrophils, which demonstrated that different shaped beta-glucan molecules produced different immune responses that dramatically improved immune responses to a number of medical conditions and diseases.

## Your Immune System

The immune system is found throughout your body and is made up of many types of cells. It spans the boundaries of all your body's vital systems and helps maintain the proper function of these systems, helping to clear away foreign invaders such as microbes (bacteria, viruses, parasites), and abnormal cells such as cancer. Your immune system includes the circulation and lymphatic systems. The lymphatic system circulates the tissue fluids that bathe your body's cells in nutrients and chemical messengers. Here's a brief description of these immune cells.

**Lymphocytes** are white blood cells formed in the lymphoid tissue. They can destroy foreign particles or microbes and produce chemicals (cytokines) that act as messengers to stimulate or suppress other immune cells.

**Macrophages** engulf and digest abnormal cells (malignant or virus-infected) and foreign particles (antigens). They then move to lymph nodes to activate cells called T-cells.

**T-Cells**, also called T-lymphocytes, are involved in specific immune responses. There are many subtypes, including helper T-cells, suppressor T-cells, cytotoxic T-cells and delayed hypersensitivity T-cells.

**Natural Killer Cells (NK)** – “explode” abnormal cells and foreign particles (antigens). The NK cells attach themselves to the surface of microbes or tumor cells and inject them with substances that cause a chemical reaction that makes them explode.

**Neutrophils** are white blood cells that are similar to macrophages. They are the most abundant type of white blood cells and form an integral part of the immune system. During the acute phase of inflammation, particularly as a result of bacterial infection, neutrophils leave your blood vessels and migrate toward the site of inflammation. They are the predominant cells in pus, accounting for its whitish/yellowish appearance.

**Cytokines** are a large class of glycoproteins (sugar proteins) that are used by your body as signals or messengers that communicate between cells, very much like hormones and neurotransmitters. While hormones are released from specific organs into the blood and neurotransmitters are released by nerves, cytokines are released by many types of cells. They play a central role in your immune system and can have effects on both nearby cells or throughout your body. Sometimes these effects are strongly dependent on the presence of other chemicals and cytokines, such as interferon, interleukin-2, interleukin-12 and tumor necrosis factor. Each has specific functions, but that's too detailed for the purposes of understanding how mushrooms work with your immune system.

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## And Now ... Medicinal Mushroom Varieties

Below is a brief description of eleven popular medicinal mushroom varieties: *Coriolus versicolor* (Turkey Tails), *Ganoderma lucidum* (Reishi), *Agaricus blazei* (add the common name Himematsutake), *Cordyceps sinensis* (Caterpillar Mushroom), *Polyporus umbellatus* (add the common name Zhu Ling), *Grifola frondosa* (Maitake), *Poria cocos* (add the common name Fuling), *Tremella fuciformis* (White Wood Ear), *Auricularia auricular* (Wood Ear), *Lentinus edodes* (Shiitake), *Hericium erinaceus* (Lion's Mane).

### *Coriolus versicolor* (Turkey Tails)

*Coriolus versicolor* ("multicolored mushroom"), also known as *Trametes versicolor*, is a mushroom readily found in woodlands in China and Europe and is the most commonly found polypore in the oak woods of the Pacific Coast in the U.S. It grows in clusters or tiers on fallen hardwood trees and branches, frequently in large colonies. As its name implies, it is often multicolored, with contrasting concentric bands, variously appearing in shades of white, gray, brown, black, blue or even red. It has a thin, velvety fruiting body, usually 2- 7 cm wide, fans out into wavy rosettes, giving rise to its popular name, Turkey Tails.



- **Description:** Multicolored polypore found in USA, Europe and China.
- **Active constituents** Its principal active ingredients are two polysaccharides with Beta-1, 4-glucan as its principle constituents. It is used as one of the primary anti-cancer agents in Japan, primarily in the proprietary form known as Krestin®. *Coriolus* also contains various sterols, including beta-sitosterol and ergosterol.
- **Uses: Anti-cancer action:** PSK has been shown to be effective against several cancers, including cervical cancer, in combination with other therapeutic agents; appears to enhance the effect of radiation therapy; PSP significantly lessened the side effects of conventional medical protocols used in the treatment of cancers of the esophagus, stomach and lungs, as well as significantly increasing the rate of remission in esophageal cancers.  
**Cardiovascular health:** Lowered cholesterol in animal studies.

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**Immune enhancement:** PSK increases interferon production, as well as scavenging superoxide and hydroxyl free radicals, has demonstrated anti-viral activity, possibly even inhibiting HIV infection.

**Miscellaneous uses:** Improvement of symptoms and increased immunity has been reported in cases of recurrent genital herpes, in uncontrolled studies improvement has been reported in the symptoms of lupus and rheumatoid arthritis; useful for the treatment of infections or inflammation of the respiratory, urinary and digestive tracts, as well as for hepatitis B and other liver problems

## ***Ganoderma lucidum* (Reishi)**

*Ganoderma lucidum* (“shining skin”) is a visually striking polypore with a hard woody texture and a shiny, varnished appearance. It primarily grows on oaks, plum trees and other hardwoods, and has a 2-20 cm semi-circular or kidney-shaped cap, variously colored white, yellow, blue, red, purple or black. *Ganoderma* species are found worldwide, though the Chinese and Japanese species have been studied the most extensively for their therapeutic value. It is somewhat rare in the wild, and so in recent years has been commercially cultivated, making it more widely available. In the West it is usually known by its Japanese name, *reishi*.



- **Description:** Polypore with a hard, woody, shiny, varnished appearance. Found worldwide.
- **Active constituents:** Has a wide variety of active components, including alkaloids, proteins, amino acids, polysaccharides (including Beta-D-glucans), ergosterol and other sterols, triterpenes, nucleotides (including adenosine), volatile oils, minerals, vitamins and lipids.
- **Uses:** *Athletic performance:* Enhances oxygenation of the blood, reducing and preventing altitude sickness in high altitude mountain climbers.  
*Cardiovascular health:* Lowers cholesterol levels, reduced blood and plasma viscosity in a controlled study of patients with high blood pressure and high cholesterol.  
*Immune enhancement:* Potent action against sarcoma, stimulates macrophages and increases levels of tumor-necrosis factor (TNF- $\alpha$ ) and interleukins.  
*Immunopotential:* Anti-HIV in *in vitro* and *in vivo* animal studies; protects against ionizing radiation.  
*Liver health:* Reduced liver enzyme levels (SGOT and SGPT) in hepatitis B patients.



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**Respiratory health:** 60-90 % of 3,000 patients with chronic bronchitis showed clinical improvement, especially older patients with bronchial asthma. Regenerates bronchial epithelium (bronchial tract lining).

**Miscellaneous uses:** Analgesic, anti-inflammatory; liver detoxification and protective actions.

## ***Agaricus blazei* (Himematsutake)**

*Agaricus blazei* (“mushroom of the sun”) is unusual among the medicinal mushrooms, in that it is not native to Asia. In fact, it was exported from Brazil by the Japanese to be commercially cultivated. It is a mushroom that thrives in warmer climates, grows directly out of the ground, and has the appearance of a classic mushroom, with a slightly pear-shaped stalk and domed, gilled cap.



- **Description:** “Mushroom of the sun,” classic shaped mushroom, domed cap, native to Brazil.
- **Active constituents:** Highest known levels of Beta-1,3-glucans; polysaccharides, sterols (including ergosterol).
- **Uses: *Anti-cancer effects:*** Has demonstrated powerful anti-tumor activity in animal studies.

***Anti-microbial properties:*** Has been shown to have anti-bacterial effects, especially against *Salmonella*.

***Cardiovascular effects:*** Regulates cholesterol and blood sugar levels in animal studies.

***Immune enhancement:*** Has been shown to increase interferon and interleukin activity.

## ***Cordyceps sinensis* (Caterpillar Mushroom)**

*Cordyceps sinensis* (“Chinese club-head”) also known as Caterpillar Mushroom or fungus, is found in high mountainous regions of China, and elsewhere in Asia. Its popular name derives from its peculiar mode of growth: it grows as a parasite on insect larvae and caterpillar cocoons, which it uses a food source. It also grows on truffles, though commercially farmed *cordyceps* are grown on a rice medium. Its finger-like fruiting body is generally 4-11 cm long.

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- **Description:** “Chinese club-head,” parasitic on insect and caterpillar larvae, found throughout mountain regions of Asia.
- **Active constituents:** Several polysaccharides include CO-N, SN-C and CO-1, all of which have demonstrated anti-tumor activity. It also contains approximately 25% protein, as well as 8% fats (13% saturated and 82% unsaturated), adenosine and other nucleotides, vitamin B12, and cordycepic acid, an alternate structure of quinic acid.
- **Uses:** *Anti-aging:* functions as a restorative tonic, safe for use by the elderly.  
*Athletic enhancement:* improves athletic performance; was used by Chinese athletes who won 12 of the 16 events they entered, breaking 5 world records, at the 1994 World Championships in Rome, Italy.  
*Cholesterol regulation:* lowers LDL and increases HDL cholesterol; lowers triglycerides.  
*Immune enhancement:* has immune regulating and stimulating properties; increases phagocyte, macrophage and NK cell function; enriches the bone marrow; has demonstrated anti-tumor activity.  
*Sexual enhancement:* helps restore low libido.

## *Polyporus umbellatus* (Zhu Ling)

*Polyporus umbellatus* (“umbrella-like polypore”), also known as *Grifola umbellata*, is a white-to-gray mushroom that grows in dense rosettes from a single stem. It is found in deciduous woodlands in China, Europe and Eastern and Central North America, growing from dead tree stumps or the roots of birches, maples, beeches and willows.



- **Description:** “Umbrella-like polypore.” white to grey color, found in Europe, China, N. America.

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- **Active constituents:** Ergosterol, soluble polysaccharide I (Gu-I),  $\alpha$ -hydroxy-tetracosanoic acid, biotin, protein and various minerals (including potassium, calcium, magnesium and iron).
- **Uses: *Anti-cancer actions:*** Used in the treatment of lung and other cancers; has demonstrated pronounced anti-tumor activity in *in vitro* and *in vivo* animal studies; helps reduce the side-effects of chemotherapy.  
***Immune enhancement:*** stimulates and enhances the performance of the immune system and accelerates production of IgM and strengthens the power of monocytes.  
***Liver health:*** can help alleviate symptoms of chronic hepatitis; was used as part of an herbal formula that cured 17 of 39 patients with cirrhosis of the liver, and brought about significant improvement in 19 others.  
***Miscellaneous uses:*** has demonstrated antibiotic activity *in vitro* against *straphylococcus aureus* and *E. coli*, may help promote hair growth.

## ***Grifola frondosa* (Maitake)**

*Grifola frondosa* (“leaf-like braided fungus”) is a polypore that grows in colonies of overlapping fan- or leaf-shaped caps, massed together at the base of deciduous trees (typically oak, elm, maple or beech) or on stumps, often in clusters weighing 5-10 pounds. The caps, or fruiting bodies, are 2-7 cm in diameter and range in color from gray to brown. In the west *Grifola* is commonly known by its Japanese name, *maitake* (“dancing mushroom”), as well as by the popular name, Hen of the Woods. It grows in temperate forests in parts of Europe and China, Northeastern Japan and the U.S. (mainly in the Northeast).



- **Description:** Leaf-like, braided polypore fungus often weighing 5-10 lbs. US, Europe, China.
- **Active constituents:** Over 25% protein, various polysaccharides, including Beta-1, 3- and 1, 6-glucans, B-complex and other vitamins, high molecular weight polymers, nucleotides, unsaturated fatty acids, phospholipids, and sterols, such as ergosterol. One of its protein-bound polysaccharides, the D-fraction, is being extensively studied for its potent anti-tumor and immune-regulating effects.
- **Uses: *Anti-cancer actions:*** Has demonstrated anti-cancer effects in 63 patients with lung, stomach and liver cancers, as well as leukemia; has been shown to be protective against the harmful effects of chemotherapy, has inhibited breast cancer growth and metastasis in



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animal studies, and is the subject of ongoing human clinical trials with breast, prostate and colorectal cancer patients;

**Cardiovascular health:** Reduced high blood pressure in animal studies,

**Immune enhancement:** stimulates macrophage, NK cell, T cell and interleukin-1 activity; has demonstrated powerful anti-HIV activity in *in vitro* studies in both the U.S. and Japan, preventing up to 97% destruction of T-helper cells;

**Miscellaneous uses:** reduces blood sugar; protects the liver; helps with recovery from hepatitis B.

## ***Poria cocos* (Fuling)**

*Poria cocos* (“coconut shaped fungus”), also known as *Wolfiporia cocos*, is a tough tuberous fungus that grows underground from a sclerotium on the roots of conifers and hardwoods. It somewhat resembles a white sweet potato, and is widely used as a food, as well as a medicine, by native peoples across its geographical range, which spans Eastern Asia, parts of Australia, West Africa and the southeastern region of the U.S. A single *poria* has been known to weigh as much as 30 pounds, and it was used by Native Americans (who knew it as *tuckahoe*) to make a form of bread, known by the white settlers as Indian Bread.



- **Description:** “Coconut shaped fungus,” sweet-potato like, found in US, Asia, Africa and Australia.
- **Active constituents:** *Poria* contains various polysaccharides, triterpenes, resins, ergosterol and other sterols, as well as choline, phospholipids, fatty acids (including lauric and caprylic acid) and several minerals (including potassium, calcium and iron).
- **Uses: Anti-cancer actions:** Has been demonstrated to inhibit tumor growth in animal studies.

**Immune enhancement:** Pachyman, one of its polysaccharides, and poriatin, a triterpene extract, have been shown to increase macrophage activity in animal studies, animal studies suggest that poriatin may be helpful with autoimmune conditions.

**Liver health:** An extract of *poria* is reported to have cured 11 patients, and produced significant improvement in 16 others, in a trial of 30 people with chronic viral hepatitis, the sclerotium is currently used in China to treat jaundice.

## ***Tremella fuciformis* (White Wood Ear)**

*Tremella fuciformis* (“trembling fungus”) is a translucent white jelly fungus that grows on deciduous trees (oak, maple, poplar, willow) in temperate climates worldwide. It has a shapeless,

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gelatinous fruiting body, usually 5-10 cm across, often with wavy ridges. In drier weather it dehydrates to the point of invisibility, only to swell up again when it rains. Although rather flavorless it is widely eaten in Asia.



- **Description:** The “trembling mushroom,” a translucent, white jelly-like fungus found worldwide.
- **Active constituents:** Polysaccharides, glycoproteins, sterols (including ergosterol), fatty acids (lauric, palmitic, oleic, linoleic and others) and phospholipids (including phosphatidylcholine and phosphatidylserine).
- **Uses:** *Anti-cancer effects:* Has demonstrated anti-tumor properties in animal and *in vitro* studies, stabilizes white blood cell levels in cancer patients undergoing chemotherapy or radiation, and stimulates white blood cell activity, increased natural killer cell activity in animal studies.  
*Cardiovascular effects:* Lowered LDL-cholesterol in animal studies.  
*Immune enhancement:* Increases macrophage phagocytosis, has demonstrated enhanced resistance to bronchitis.  
*Liver support:* In a clinical trial a polysaccharide extract demonstrated a success rate of 56.3% for a group of patients with chronic active hepatitis and 76.9% for patients with chronic persistent hepatitis.

## *Auricularia auricular* (Wood Ear)

*Auricularia* (“wood ear”) is a type of jelly fungus that is found growing either on live trees or fallen logs in the dense deciduous and coniferous forests of southern China. The fruiting body is a broad cup, sometimes shaped like a human ear, approximately 10 cm in diameter. The surface is smooth and glossy, with a light brown coffee-like color. It is harvested in summer and fall.



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- **Description:** A jelly fungus, ear shaped fruiting body, light brown color, native to China.
- **Active constituents:** Polysaccharides (mannan, glucuronic acid and methyl pentose), lecithin, cephalin, ergosterol, sphingomyelin.
- **Uses:** **Antioxidant activity:** Increases SOD activity in key organs such as the brain and liver, and inhibits MAO activity in the brain.  
**Cardiovascular health:** Has an anticoagulant effect, inhibiting blood platelet aggregation.  
**Cholesterol levels:** Promotes healthy levels of cholesterol, triglycerides, and lipids.  
**Digestive enhancement:** Promotes the health of the cells that line the stomach, without interfering with gastric acid secretion and pepsin activity; has a protective effect on the pancreatic islet cells which secrete insulin.  
**Immune enhancement:** Stimulates DNA and RNA synthesis by human lymphocytes.  
**Wound healing:** Stimulates the healing of wound margins.

## *Lentinus edodes* (Shiitake)

*Lentinula edodes* (“pliable edible mushroom”) is a light amber gilled mushroom that grows on fallen broadleaf trees, such as beech, oak, chestnut and alder. It grows wild in such Asian countries as China and Japan, where it has been prized both for its culinary and medicinal properties for millennia. It has been cultivated for at least a thousand years, and is probably the first mushroom ever to be farmed. *Lentinula* is best known in the West by its Japanese name, *shiitake* (“fragrant mushroom”).



- **Description:** Light amber, gilled mushroom that grows on fallen trees throughout Asia.
- **Active constituents:** It is the source of two very well-studied extracts of proven pharmacological value: lentinan, a cell wall polysaccharide rich in Beta-glucans; and LEM (*Lentinula Edodes* Mycelium Extract), a protein-bound polysaccharide complex., over 25% proteins (dry weight), contains all the essential amino acids (lysine and arginine are especially plentiful), B-complex vitamins, vitamin C, ergosterol, minerals (including calcium, magnesium, potassium, phosphorus and zinc), enzymes, carbohydrates and lipids.
- **Uses:** **Anti-cancer effects:** Lentinan, in combination with chemotherapeutic agents, has demonstrated an anti-tumor effect in human clinical trials, as well as an increase in survival time in patients with breast and gastric cancers.  
**Anti-microbial effects:** Lentinan has been shown to be protective against various bacteria, viruses (including influenza) and parasites. Lignin derivatives have also demonstrated activity *in vitro* against herpes simplex I and II, polio, measles and mumps.

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**Cardiovascular health:** Has been shown to decrease serum cholesterol levels, helps lower blood pressure.

**Immune enhancement:** Has immunopotential properties, increasing the activity of peritoneal macrophages, NK cells, helper T cells, tumor necrosis factor, and interleukin 1. LEM may be useful in the treatment of AIDS, as it inhibits the cytopathic effect of giant cell formation, and may interrupt the initial stages of HIV infection.

**Liver support:** Has demonstrated liver protective action, both LEM and a polysaccharide fraction have been useful in treating hepatitis B.

**Miscellaneous uses:** Lentinan successfully reversed drug-resistant tuberculosis in 3 patients.

## ***Hericium erinaceus* (Lion's Mane)**

*Hericium erinaceus* ("spiny hedgehog") is a snow-white, globe-shaped fungus composed of downward cascading, icicle-shaped spines. Its striking appearance gives rise to its various common names, Lion's Mane, Monkey's Head and Hedgehog Fungus. It grows up to 40 cm in diameter on dead or dying broadleaf trees — such as oak, walnut, maple and sycamore — and is found in China and Japan, as well as parts of Europe and North America. It is considered a gourmet mushroom, long popular with forest folk, with a flavor variously described as reminiscent of lobster or eggplant.



- **Description:** Snow white, globe-shaped with cascading spines. Found worldwide.
- **Active constituents:** 16 amino acids (7 of which are essential), as well as various polysaccharides, including PHE (a polysaccharide), which are being researched for their immune-modulating and anti-tumor properties.
- **Uses: *Anti-cancer effects:*** Helps in the treatment of esophageal and gastric cancers, may extend the life-span of cancer patients.

***Digestive enhancement:*** Promotes proper digestion; effective against gastric and duodenal ulcers and gastritis.

***Immune enhancement:*** Protects the gastrointestinal tract against environmental toxins, inflammation and tumor formation, an extract was used as part of a protocol that helped increase T and B lymphocytes in mice.

***Miscellaneous uses:*** Enhances overall energy and vigor, stimulates nerve growth factor.

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## REFERENCES AND RESEARCH

1. Adachi K, Nanba H, Otsuka M, Kuroda H. Blood pressure lowering activity present in the fruit body of *Grifola frondosa* (maitake). *Chem Pharm Bull* 1988;36:1000-6.
2. Bobek P. Cholesterol-lowering effect of the mushroom *Pleurotus ostreatus* in hereditary hypercholesterolemic rats. *Ann Nutr Metab* 1991;35(4), 191-219.
3. Borchers AT, Stern JS, Hackman RM, Keen CL, Gershwin ME. Mushrooms, tumors, and immunity. *Proc Soc Exp Biol Med*. 1999 Sep;221(4):281-93.
4. Chang R. Functional properties of edible mushrooms. *Nutr Rev*. 1996 Nov;54(11 Pt 2):S91-3.
5. Cheung NK, Modak S, Vickers A, Knuckles B. Orally administered beta-glucans enhance anti-tumor effects of monoclonal antibodies. *Cancer Immunol Immunother*. 2002 Nov;51(10):557-64.
6. Ebina T, et al. Antitumor effect of a peptide-glucan preparation extracted from *Agaricus blazei* in a double-grafted tumor system in mice. *Biotherapy* 1998;11(4):259-265.
7. Gordon M, et al. A placebo-controlled trial of the immune modulator, lentinan, in HIV-positive patients: a phase I/II trial. *J Med*, 1998;29(5-6):305-330.
8. Grube BJ, Eng ET, Kao YC, Kwon A, Chen S. White button mushroom (species *Agaricus bisporus*) phytochemicals inhibit aromatase activity and breast cancer cell proliferation. *J Nutr*. 2001 Dec;131(12):3288-93.
9. Guangwen Y, Jianbin Y, Dongqin L, et al. Immunomodulatory and therapeutic effects of lentinan in treating condyloma acuminata. *CJIM* 1999;5:190-2.
10. Guo FC, Williams BA, Kwakkel RP, Li HS, Li XP, Luo JY, Li WK, Verstegen MW. Effects of mushroom and herb polysaccharides, as alternatives for an antibiotic, on the cecal microbial ecosystem in broiler chickens. *Poult Sci*. 2004 Feb;83(2):175-82.
11. Hirasawa M, Shouji N, Neta T, Fukushima K, Takada K. Three kinds of antibacterial substances from *Lentinus edodes* (Berk.) Sing. (Shiitake, an edible mushroom). *Int J Antimicrob Agents*. 1999 Feb;11(2):151-7.
12. Ho CY, Kim CF, Leung KN, Fung KP, Tse TF, Chan H, Lau CB. Differential anti-tumor activity of *coriolus versicolor* (Yunzhi) extract through p53- and/or Bcl-2-dependent apoptotic pathway in human breast cancer cells. *Cancer Biol Ther*. 2005 Jun;4(6):638-44.
13. Hobbs C. *Medicinal Mushrooms*. Santa Cruz, CA: Botanica Press, 1995.
14. Jiang J, Slivova V, Sliva D. *Ganoderma lucidum* inhibits proliferation of human breast cancer cells by down-regulation of estrogen receptor and NF-kappaB signaling. *Int J Oncol*. 2006 Sep;29(3):695-703.
15. Jin H, Zhang G, Cao X, et al. Treatment of hypertension by ling zhi combined with hypotensor and its effects on arterial, arteriolar and capillary pressure and microcirculation. In: Nimmi H, Xiu RJ, Sawada T, Zheng C. (eds). *Microcirculatory Approach to Asian Traditional Medicine*. New York: Elsevier Science, 1996, 131-8.
16. Jones K. Reishi mushroom: Ancient medicine in modern times. *Alt Compl Ther* 1998;4:256-66. Review.
17. Jones K. Shiitake: A major medicinal mushroom. *Alt Compl Ther* 1998;4:53-9.
18. Kammatsuse K, Kajiwara N, Hayashi K. Studies on *Ganoderma lucidum*: I. Efficacy against hypertension and side effects. *Yakugaku Zasshi* 1985;105:531-3.
19. Kidd PM. The use of mushroom glucans and proteoglycans in cancer treatment. *Altern Med Rev*. 2000 Feb;5(1):4-27. Review.
20. Kim HM, et al. Stimulation of humoral and cell mediated immunity by polysaccharide from mushroom *Phellinus linteus*. *Int J Immunopharmacol*, 1936;18(5):295-303.
21. Kim HS, Kacew S, Lee SM. In vitro chemopreventive effects of plant polysaccharides (*Aloe barbadensis* miller, *Lentinus edodes* *Ganoderma lucidum* and *Coriolus versicolor*. *Carcinogenesis*, 1999;20(8):1637-1640.



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22. Kim KC, et al. Ganoderma lucidum extract protects DNA from strand breakage caused by hydroxyl radical and UV irradiation. *Int J Mol Med*, 1999;4(3):273-277.
23. Kobayashi H, Matsunaga K, Oguchi Y. Antimetastatic effects of PSK (Krestin), a protein-bound polysaccharide obtained from Basidiomycetes: an overview. *Cancer Epidemiol Biomarkers Prev*, 1995;4(3):275-281.
24. Kodama N, Komuta K, Nanba H. Can maitake MD-fraction aid cancer patients? *Altern Med Rev*. 2002 Jun;7(3):236-9. Review.
25. Kubo K, Nanba H. Anti-hyperliposis effect of maitake fruit body (*Grifola frondosa*). I. *Biol Pharm Bull* 1997;20:781-5.
26. Kuznetsov OIu, Mil'kova EV, Sosnina AE, Sotnikova NIu. [Antimicrobial action of *Lentinus edodes* juice on human microflora] [Article in Russian] *Zh Mikrobiol Epidemiol Immunobiol*. 2005 Jan-Feb;(1):80-2.
27. Levy AM. Eosinophilia and Gastrointestinal Symptoms After Ingestion of Shiitake Mushrooms. *J Allergy Clin Immunol*. May1998;101(5):613-20.
28. Li C, Cao L, Zeng Q. Astragalus prevents diabetic rats from developing cardiomyopathy by downregulating angiotensin II type2 receptors' expression. *J Huazhong Univ Sci Technolog Med Sci*. 2004;24(4):379-84.
29. Li JF, et al. Study on the Enhancing Effect of Polyporus Polysaccharide, Mycobacterium Polysaccharide and Lentinan on Lymphokine-activated Killer Cell Activity in vitro. *Chung Kuo Chung Hsi I Chieh Ho Tsa Chih*. Apr1996;16(4):224-26.
30. Li KR, et al. Anti-atherosclerotic Properties of Higher Mushrooms (a Clinico-experimental Investigation. *Vopr Pitan*. Jan1989;1:16-19.
31. Lin YL, Lee SS, Hou SM, Chiang BL Polysaccharide purified from *Ganoderma lucidum* induces gene expression changes in human dendritic cells and promotes T helper 1 immune response in BALB/c mice. *Mol Pharmacol*. 2006 Aug;70(2):637-44.
32. Lin ZB. Cellular and molecular mechanisms of immuno-modulation by *Ganoderma lucidum*. *J Pharmacol Sci*. 2005 Oct;99(2):144-53.
33. Lin ZB, Zhang HN. Anti-tumor and immunoregulatory activities of *Ganoderma lucidum* and its possible mechanisms. *Acta Pharmacol Sin*. 2004 Nov;25(11):1387-95.
34. Liu F, et al. Immunomodulation and antitumor activity of polysaccharide-protein complex from the culture filtrates of a local edible mushroom, *Tricholoma lobayense*. *Gen Pharmacol*, 1996;27(4):621-624.
35. Liu M, et al. Induction of immunomodulating cytokines by a new polysaccharide-peptide complex from culture mycelia of *Lentinus edodes* *Immunopharmacology*, 1998;40(3):187-198.
36. Lu QY, Sartippour MR, Brooks MN, Zhang Q, Hardy M, Go VL, Li FP, Heber D. *Ganoderma lucidum* spore extract inhibits endothelial and breast cancer cells in vitro. *Oncol Rep*. 2004 Sep;12(3):659-62.
37. Mao SP, Cheng KL, Zhou YF. [Modulatory effect of *Astragalus membranaceus* on Th1/Th2 cytokine in patients with herpes simplex keratitis]. *Zhongguo Zhong Xi Yi Jie He Za Zhi*. 2004 Feb;24(2):121-3. Chinese.
38. Matsuoka H, Seo Y, Wakasugi H, et al. Lentinan potentiates immunity and prolongs survival time of some patients. *Anticancer Res* 1997;17:2751-6.
39. Mau JL, Lin HC, Chen CC. Antioxidant properties of several medicinal mushrooms. *J Agric Food Chem*. 2002 Oct 9;50(21):6072-7.
40. Nanba H. Immunostimulant activity in vivo and anti-HIV activity in vitro of 3 branched b-1-6-glucans extracted from maitake mushrooms (*Grifola frondosa*). VIII International Conference on AIDS, Amsterdam, 1992.
41. Nanba H, Hamaguchi AM, Kuroda H. The chemical structure of an antitumor polysaccharide in fruit bodies of *Grifola frondosa* (maitake). *Chem Pharm Bull* 1987;35:1162-8.
42. Ng T. A review of research on the protein-bound polysaccharide polysaccharopeptide, PSP) from the mushroom *Coriolus versicolor* (Basidiomycetes: Polyporaceae). *Gen Pharmacol*, 1998;30(1):1-4.

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43. Oliva D. Cellular and physiological effects of *Ganoderma lucidum* (Reishi). *Mini Rev Med Chem*. 2004 Oct;4(8):873-9.
44. Ooi VE, Liu F. Immunomodulation and anti-cancer activity of polysaccharide-protein complexes. *Curr Med Chem*. 2000 Jul;7(7):715-29.
45. Qian ZM, Xu MF, Tang PL. Polysaccharide peptide (PSP) restores immunosuppression induced by cyclophosphamide in rats. *Am J Chin Med*, 1997;25(1):27-35.
46. Rajewska J, Balasinska B. Biologically active compounds of edible mushrooms and their beneficial impact on health. *Postepy Hig Med Dosw (Online)*. 2004 Oct 5;58:352-7.
47. Shamtsyan M, Konusova V, Maksimova Y, Goloshchev A, Panchenko A, Simbirtsev A, Petrishchev N, Denisova N. Immunomodulating and anti-tumor action of extracts of several mushrooms. *J Biotechnol*. 2004 Sep 30;113(1-3):77-83.
48. Shao BM, Dai H, Xu W, Lin ZB, Gao XM. Immune receptors for polysaccharides from *Ganoderma lucidum*. *Biochem Biophys Res Commun*. 2004 Oct 8;323(1):133-41.
49. Sheng BW, Chen XF, Zhao J, He DL, Nan XY. *Astragalus membranaceus* reduces free radical-mediated injury to renal tubules in rabbits receiving high-energy shock waves. *Chin Med J (Engl)*. 2005 Jan;118(1):43-9.
50. Shouji N, et al. Anticaries Effect of a Component From Shiitake (An Edible Mushroom). *Caries Res*. Feb2000;34(1):94-98.
51. Smania Junior A, Smania EF, Della Monache F, Pizzolatti MG, Delle Monache G. *Z Naturforsch [C]*. Derivatization does not influence antimicrobial and antifungal activities of applanoxidic acids and sterols from *Ganoderma spp*. 2006 Jan-Feb;61(1-2):31-4.
52. Sorimachi K, et al. Anti-viral activity of water-solubilized lignin derivatives in vitro *Agri Biol Chem*, 1995;54(5), 1337-1339.
53. Spellman K, Burns J, Nichols D, Winters N, Ottersberg S, Tenborg M. Modulation of cytokine expression by traditional medicines: a review of herbal immunomodulators. *Altern Med Rev*. 2006 Jun;11(2):128-50.
54. Suzuki H, et al. Immunopotentiating Substances in *Lentinus edodes* Mycelial Extract(LEM)-- Activation of Macrophage and Proliferation of Bone Marrow Cell. *Nippon Shokakibyo Gakkai Zasshi*. Jul1988;85(7): 1430.
55. Suzuki H, et al. Inhibition of the Infectivity and Cytopathic Effect of Human Immunodeficiency Virus by Water-soluble Lignin in an Extract of the Culture Medium of *Lentinus edodes* Mycelia (LEM). *Biochem Biophys Res Commun*. Apr1989;160(1):367-73.
56. Taguchi I. Clinical efficacy of lentinan on patients with stomach cancer: End point results of a four-year follow-up survey. *Cancer Detect Prevent Suppl* 1987;1:333-49.
57. Talorete TP, Isoda H, Maekawa T. *Agaricus blazei* (class Basidiomycotina) aqueous extract enhances the expression of c-Jun protein in MCF7 (human breast cancer cell line) cells. *J Agric Food Chem*. 2002 Aug 28;50(18):5162-6.
58. Wang HX, Liu WK, Ng T8, Ooi VE, Chang ST. Immunomodulatory and antitumor activities of a polysaccharide-peptide complex from a mycelial culture of *Tricholoma sp.*, a teal edible mushroom. *Life Sci*, 1995;57(3).269-281.
59. Wang HX, NG T8, Liu WK, Ooi VE, Chang ST. Polysaccharide peptide complexes from the cultured mycelia of the mushroom *Coriolus versicolor* and their culture medium activate mouse lymphocytes and macrophages. *Int J Biochem Cell Biol*, 1996;28(5):601 -607.
60. Wang SH, Wang WJ, Wang XF, Chen W. [Effect of *Astragalus* polysaccharides and berberine on carbohydrate metabolism and cell differentiation in 3T3-L1 adipocytes]. *Zhongguo Zhong Xi Yi Jie He Za Zhi*. 2004 Oct;24(10):926-8. Chinese.
61. Wasser SP. Medicinal mushrooms as a source of antitumor and immunomodulating polysaccharides. *Appl Microbiol Biotechnol*. 2002 Nov;60(3):258-74.

# BETTER HEALTH PUBLISHING®

62. Wasser SP, Weis AL. Therapeutic effects of substances occurring in higher Basidiomycetes mushrooms: a modern perspective. *Crit Rev Immunol.* 1999;19(1):65-96.
63. Wong CK, Bao YX, Wong EL, Leung PC, Fung KP, Lam CW. Immunomodulatory activities of Yunzhi (*Coriolus versicolor*) and Danshen (*Salvia miltiorrhiza*) in post-treatment breast cancer patients. *Am J Chin Med.* 2005;33(3):381-95.
64. Wu JY, Zhang QX, Leung PH. Inhibitory effects of ethyl acetate extract of *Cordyceps sinensis* mycelium on various cancer cells in culture and B16 melanoma in C57BL/6 mice. *Phytomedicine.* 2007 Jan;14(1):43-9.
65. Yamada Y, Nanba H, Kuroda H. Antitumor effect of orally administered extracts from fruit body of *Grifola frondosa* (maitake). *Chemotherapy* 1990;38:790-6.
66. Yesilada E, Bedir E, Calis I, Takaishi Y, Ohmoto Y. Effects of triterpene saponins from *Astragalus* species on in vitro cytokine release. *J Ethnopharmacol.* 2005 Jan 4;96(1-2):71-7.
67. Yue GG, Fung KP, Tse GM, Leung PC, Lau CB. Comparative studies of various *ganoderma* species and their different parts with regard to their antitumor and immunomodulating activities in vitro.. *J Altern Complement Med.* 2006 Oct;12(8):777-89.
68. Zhang YD, Shen JP, Zhu SH, Huang DK, Ding Y, Zhang XL. [Effects of astragalus (ASI, SK) on experimental liver injury *Yao Xue Xue Bao*]. 1992;27(6):401-6. Chinese.
69. Zheng R, Jie S, Hanchuan D, Moucheng W. characterization and immunomodulating activities of polysaccharide from *Lentinus edodes*. *Int Immunopharmacol.* 2005 May;5(5):811-20.
70. Zhou DH, Lin LZ. *Zhongguo Zhong Xi Yi Jie He Za Zhi.* [Effect of Jinshuibao capsule on the immunological function of 36 patients with advanced cancer] 1995 Aug;15(8):476-8. Chinese.
71. Zjawiony JK. Biologically active compounds from *Aphyllphorales* (polypore) fungi. *J Nat Prod.* 2004 Feb;67(2):300-10.

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## **About the Author: Isaac Eliaz, M.D., M.S., L.Ac**

Dr. Isaac Eliaz, a pioneer in the field of integrative medicine since the early 1980's, is a respected author, lecturer, researcher, product formulator and clinical practitioner.



Dr. Eliaz is a frequent guest lecturer on integrative medical approaches to health, immune enhancement, and cancer prevention and treatment. He has also taught several courses on Traditional Chinese Medicine for medical doctors and licensed acupuncturists. As an innovative formulator of dietary supplements, Dr. Eliaz developed and currently holds the patents for several of his unique herbal formulations. Many of these products are available through [EcoNugenics, Inc.](#) as well as from leading integrative medical professionals.

In order to substantiate nutritional approaches to health, Dr. Eliaz regularly participates in clinical studies and has been published in well-recognized, peer-reviewed journals. In addition, many of Dr. Eliaz' formulations have been submitted for validation in independent human clinical studies whose results have been published in peer-reviewed journals.

Dr. Eliaz continually studies, integrates and applies the best of health practices of both western medicine and complementary and alternative approaches. A native of Israel, Dr. Eliaz lived in the Far East and in Latin America before returning to study medicine at Tel Aviv University. While studying for his degree, Dr. Eliaz' interest turned towards the role of alternative therapies in daily health. This led to his eventual research and personal experience with yoga, shiatsu, and acupuncture as therapeutic modalities.

After graduating medical school in 1986, Dr. Eliaz established a highly successful clinical practice in Tel Aviv, utilizing his training in both western and eastern medicine. While maintaining a clinical practice, Dr. Eliaz pursued graduate studies in clinical herbology at Hebrew University of Jerusalem and classical Chinese medicine with teachers in Israel and Europe.

In 1989 Dr. Eliaz moved to the San Francisco Bay area in order to continue his studies at the American College of Traditional Chinese Medicine, earning a Master of Science degree in 1991. During this time he also energetically sought-out leading practitioners of alternative medicine to broaden his knowledge and experience. Since 1991 Dr. Eliaz has maintained a busy private practice in northern California that focuses primarily on integrative, holistic protocols for cancer patients.

The guiding mission of Dr. Eliaz' professional life is achieving the integration and synergy of multiple healing modalities from both ancient and modern paradigms into a holistic practice of medicine. It is the heart of his clinical practice, of his research, and a mission that he communicates with great passion and clarity.