**Mushrooms, shiitake**

Long a symbol of longevity in Asia because of their health-promoting properties, shiitake mushrooms have been used medicinally by the Chinese for more than 6,000 years. More recently, their rich, smoky flavor has endeared them to American taste buds. These exotic hearty mushrooms can now be found in supermarket shelves across the U.S. throughout the year.

Like other mushrooms, these specialty mushrooms are as mysteriously unique as they are delicious. While often thought of as a vegetable and prepared like one, mushrooms are actually a fungus, a special type of living organism that has no roots, leaves, flowers or seeds.

**What's New and Beneficial about Shiitake Mushrooms**

* Although immune system support has often received much of the spotlight in shiitake mushroom research, recent study results involving support of the cardiovascular system have caught the attention of many researchers. In particular, recent studies have shown the ability of shiitake mushrooms to help protect us against cardiovascular diseases (including atherosclerosis) by preventing too much immune cell binding to the lining of our blood vessels. In order for immune cells and other materials to bind onto our blood vessel linings, certain protein molecules—called adhesion molecules—must be produced and sent into action. By helping to block the adhesion molecule production process, substances in shiitake mushrooms can help protect our blood vessels. (The adhesion molecule production that is partially blocked by shiitake mushroom components includes the adhesion molecules ICAM-1, VCAM-1, and E-selectin.)
* Shiitake mushrooms have long been recognized as a very good, non-animal food source of iron. But a recent preliminary study has determined that the bioavailability of iron from shiitake mushrooms may be even better than we thought. Although conducted on laboratory animals (female rats) rather than humans, this study found the iron in dried shiitake mushroom to be equally as bioavailable as supplemental iron in the form of ferrous gluconate. (Ferrous gluconate is a very commonly used low-dose iron supplement.) While we don't usually spotlight research on laboratory animals, we found this result to be especially promising for individuals who consume little or no animal products and are often looking for foods that can supply valuable amounts of bioavailable iron.
* Shiitake mushrooms can be one of the most sustainable foods in your diet! While the majority of shiitake mushrooms produced worldwide have been grown on sawdust block in a non-natural setting, it is fully possible for shiitake mushrooms to be produced on natural hardwood logs in a forest setting. This approach to shiitake mushroom production is called "forest farming" and it has become an especially popular way of growing shiitake mushrooms in the U.S, where there are now more than 200 shiitake mushroom growers. Unfortunately, forest farming is not a requirement for organic certification of shiitake mushrooms. However, all of the plant crop standards in the National Organics Program regulations apply to shiitake mushroom production, and so the combination of these two features—certified organic shiitake mushrooms that have also been forest farmed—can make a great food choice in terms of sustainable agriculture. Just look for the USDA's organic logo on your shiitake mushrooms to determine if they are certified organic. Then check for information about forest farming on the packaging. If no information is provided, there is a good chance that your shiitake mushrooms were not forest farmed. For this reason, we encourage you to ask your store staff or contact the product manufacturer to determine if your shiitake mushrooms were grown on hardwood logs in a natural forest environment.

**WHFoods Recommendations**

People do not usually consider including mushrooms as part of their meals for their nutritional content. However, shiitake mushrooms are rich in B vitamins—they are an excellent of pantothenic acid, a very good source of vitamin B2, and a good source of vitamin B6, niacin, choline, and folate. Additionally, they are concentrated in minerals, being an excellent source of selenium and copper, a very good source of zinc, and a good source of manganese. They are also a good source of vitamin D (in the D2 form) and dietary fiber. They also provide a wide variety of unique phytonutrients. To maximize their flavor and the retention of their nutrients it is important to not to overcook them. That's why we recommend Healthy Sauteeing shiitake mushrooms for just 7 minutes to bring out their best flavor while maximizing their nutrient retention. For more on our Healthiest Way of Cooking shiitake mushrooms see the How to Enjoy section below.

**Mushrooms, Shiitake, cooked  
0.50 cup  
(72.50 grams)**

**Calories: 41  
GI:** [**not available**](http://www.whfoods.com/genpage.php?tname=faq&dbid=32)

**NutrientDRI/DV**

[copper](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=53)72%

[pantothenic acid](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=87)52%

[selenium](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=95)33%

[vitamin B2](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=93)9%

[zinc](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=115)9%

[manganese](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=77)8%

[vitamin B6](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=108)7%

[vitamin B3](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=83)7%

[choline](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=50)6%

[fiber](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=59)6%

[vitamin D](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=110)5%

[folate](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=63)4%

**Health Benefits**

Shiitake, maitake, and reishi mushrooms are widely referred to as "medicinal mushrooms" due to their long history of medical use, particularly in oriental medicine traditions. It's important to distinguish, however, between extracts and medicinal preparations made from these mushrooms and their appearance as whole foods in an everyday diet. Most of the medicinal research on shiitake mushrooms has been conducted on laboratory animals or on individual cells studied in a laboratory setting. There are hundreds of lab and animal studies that clearly document the medicinal properties of shiitake mushroom extracts. As important as these studies are in a medical context, they are still very different from studies that examine shiitake mushroom as a common and beloved food.

In contrast to the wealth of medicinal research on shiitake mushrooms, there are very few studies on shiitake mushrooms in the human diet. Among the human dietary studies that do exist, however, there is a clear message about shiitake mushrooms: they can provide us with some fantastic health benefits. Below are areas of health support that make the top of our list for shiitake mushrooms when enjoyed as a whole food.

**Immune Support**

No health benefit is better documented for shiitake mushroom than immune support. In fact, the immune support track record for this mushroom is fascinating. On the one hand, numerous studies have shown the ability of whole shiitake mushrooms to help prevent excessive immune system activity. On the other hand, an equal number of studies have shown the ability of shiitake mushrooms to help stimulate immune system responses under certain circumstances. In other words, from a dietary perspective, shiitake mushrooms appear able to enhance immune function in both directions, giving it a boost when needed, and cutting back on its activity when needed. It's important to note that dietary shiitake mushroom intake—unlike intake of medicinal shiitake extracts—has not been shown to be strongly suppressive of the immune system or strongly activating. From our perspective, this finding makes sense. We wouldn't want our everyday foods to strongly suppress or strongly activate any body system. What we would want from our foods is support of body systems under a variety of circumstances—and that is exactly what we get from shiitake mushrooms with respect to our immune system.

One especially interesting area of immune system support involves the impact of shiitake mushrooms on immune cells called macrophages. Among their many important activities, macrophage cells are responsible for identifying and clearing potentially cancerous cells from the body. In order to carry out this task, they need to be "activated" in a particular way. (In more scientific terms, their activated phenotype needs to reflect a higher level of interleukin 1-beta and tumor necrosis factor alpha, and a lower level of interleukin 10.) Shiitake mushrooms are able to help macrophage cells achieve this activated profile so that they can do a better job clearing potentially cancerous cells. Researchers refer to this result as an "anti-cancer immunity" that is enhanced by shiitake mushroom intake.

The most famous immune-supportive components in shiitake mushrooms are its polysaccharides. (Polysaccharides are large-sized carbohydrate molecules composed of many different sugars arranged in chains and branches.) Although many fungi are well-known for their polysaccharides, no single fungus has been more carefully studied than the shiitake mushroom. We know that this fungus is unique in its variety of polysaccharides, and especially its polysaccharide glucans. (Glucans are polysaccharides in which all of the sugar components involve the simple sugar glucose.) Among the glucans contained in shiitake mushroom are alpha-1,6 glucan, alpha-1,4 glucan, beta-1,3 glucan, beta-1,6 glucan, 1,4-D-glucans, 1,6-D-glucans, glucan phosphate, laminarin, and lentinan. Shiitake mushrooms also contain some important non-glucan polysaccharides, including fucoidans and galactomannins. The immune-related effects of polysaccharides in shiitake mushrooms have been studied on laboratory animals under a wide variety of circumstances, including exercise stress, exposure to inflammation-producing toxins, radiation exposure, and immunodeficiency. Under all of these circumstances, the polysaccharides in shiitake mushrooms have been shown to lessen problems. There is also some evidence that shiitake mushrooms' polysaccharides can help lower total cholesterol levels.

**Cardiovascular Benefits**

The cardiovascular benefits of shiitake mushrooms have been documented in three basic areas of research. The first of these areas is cholesterol reduction. d-Eritadenine (also called lentinacin, or lentsine, and sometimes abbreviated as DEA) is one of the most unusual naturally occurring nutrients in shiitake mushrooms that has repeatedly been shown to help lower total blood cholesterol. This nutrient is actually derived from adenine—one of the building blocks (nucleotides) in the mushroom's genetic material (DNA). The beta-glucans in shiitake mushrooms are also very likely to contribute to its cholesterol-lowering impact.

Another basic area of cardiovascular support involves the interaction between our cardiovascular system and our immune system. Recent studies have shown that shiitake mushrooms can help protect us against cardiovascular diseases (including atherosclerosis) by preventing too much immune cell binding to the lining of our blood vessels. In order for immune cells and other materials to bind onto our blood vessel linings, certain protein molecules—called adhesion molecules—must be produced and sent into action. By helping to block the adhesion molecule production process, substances in shiitake mushrooms can help protect our blood vessels. (The adhesion molecule production which is partially blocked by shiitake mushroom components includes the adhesion molecules ICAM-1, VCAM-1, and E-selectin.)

A final basic area of cardiovascular benefits involves antioxidant support. Chronic oxidative stress in our cardiovascular system (ongoing, oxygen-based damage to our blood vessel linings) is a critical factor in the development of clogged arteries (atherosclerosis) and other blood vessel problems. One of the best ways for us to reduce our risk of chronic oxidative stress is consumption of a diet rich in antioxidant nutrients. Shiitake mushrooms are a very good source of three key antioxidant minerals: manganese, selenium, and zinc. They also contain some unusual phytonutrient antioxidants. One of the best studied is ergothioneine (ET). This unique antioxidant is derived from the amino acid histidine, although it's unusual since it contains a sulfur group of molecules that are not present in histidine itself. In studies on ET and our cells' oxidative stress levels, one fascinating finding has been the special benefits of ET for cell components called mitochondria. Mitochondria use oxygen to produce energy for the cell. Heart cells have greater concentrations of mitochondria than most any other cell type in the body. For this reason, researchers believe that ET may be one of the key nutrients from shiitake mushrooms that provide us with cardiovascular support.

**Anti-Cancer Benefits**

Most of the research on shiitake mushrooms and cancer has been conducted on laboratory animals or on individual cells in a laboratory setting and has involved mushroom extracts rather than whole mushrooms in food form. For this reason, our understanding of the anti-cancer benefits of shiitake mushrooms as a whole, natural food is still preliminary. But based on research to date, we believe that adding shiitake mushrooms to your diet is likely to offer you anti-cancer benefits, especially with respect to prevention of prostate cancer, breast cancer, and colon cancer.

Medicinal extracts from shiitake mushrooms have been studied much more extensively than the whole food itself. In cell and laboratory animal experiments, numerous components of shiitake mushrooms have been show to help block tumor growth, sometimes by triggering programmed cell death (apoptosis) in the cancer cells. These components have been collectively referred to as "anti-tumor mycochemicals" provided by shiitake mushrooms. Researchers have speculated that more than 100 different types of compounds in shiitake mushrooms may work together to accomplish these anti-tumor results. While the unique polysaccharides in shiitake mushrooms were first thought to be its primary anti-cancer compounds, scientists are now convinced that shiitake provides many non-polysaccharide substances that have anti-tumor effects.

**Other Benefits**

The special combination of antioxidants found in shiitake mushrooms together with their highly flexible support for immune system function make them a natural candidate for providing us with protection from a variety of problems involving oxidative stress and immune function. This includes rheumatoid arthritis (RA), an area that has begun to interest shiitake mushroom researchers. Although research in this area is preliminary, we expect to see large-scale human studies confirming the benefits of shiitake mushrooms for prevention of RA.

Medicinal extracts from shiitake mushrooms have well-documented effects on a variety of micro-organisms, including bacteria, fungi, and viruses (including human immunodeficiency virus-1, or HIV-1). While we have yet to see large-scale human studies on whole food intake of shiitake mushrooms and decreased susceptibility to colds, flu or other problems related to unwanted activity of micro-organisms, this is a very likely area for future food research and discovery of health benefits.

**Description**

Shiitake mushrooms have brown, slightly convex caps that range in diameter from about two to four inches in diameter. They belong to the basidiomycete family of fungi. Until the early 1990's, they were widely known by their scientific genus-species name of *Lentinus edodes*. However, during the late 1980's and early 1990's this genus-species name for shiitake mushrooms was largely phased out and replaced by a new genus-species name, *Lentinula edodes*.

The common name for this mushroom, "shiitake," comes from the Japanese language. "Shii" in Japanese refers to wood belonging to the Pasania species of tree on which shiitake mushrooms naturally grow. "Take" simply translates as "mushroom." You may sometimes also hear shiitake mushroom being referred to as the "Black Forest mushroom," and they do indeed grow naturally in that German mountain range.

Other mushrooms with Asian roots that are also becoming more popular are reishi (*Ganoderma lucidum*) and maitake (*Grifola frondosa*). Reishi mushrooms usually have an antler or rounded, fan shape; the most popular type of reishi is red in color, although that is just one of the six colors in which they grow. Maitake mushrooms grow in a formation of clustered brownish fronds of fan-shaped petals and are commonly known as "Hen of the Woods." These types of mushrooms are available in food markets specializing in Asian foods.

**History**

Shiitake (as well as reishi and maitake) mushrooms have grown wild since prehistoric times. Their therapeutic value has been prized in Asian countries, where they originated, for thousands of years. They play a critical role in Asian medicinal traditions and were noted in some of the first books on herbal medicine written thousands of years ago. In the past few decades, these mushrooms have become more popular in the United States as a result of an expanding body of scientific research supporting their numerous health benefits. The U.S. is currently home to approximately 200 commercial growers of shiitake mushrooms, and nearly half of those growers use forest farming to produce shiitake mushrooms in a natural forest setting using downed hardwood trees as the cultivation medium.

Although Japan was at one time the world's largest producer of shiitake mushrooms, that distinction now goes to China, which produces over 80% of all commercially sold shiitake mushrooms. Japan, Korea and Taiwan also produce shiitake mushrooms, as does the United States. One quickly growing market for shiitake mushrooms is Brazil, which currently produces more shiitake mushrooms than any other South American country.

**How to Select and Store**

Shiitake mushrooms are available in many grocery stores throughout the country. If your local store does not carry fresh reishi or maitake mushrooms, investigate the Asian food stores in your area as they oftentimes carry these specialty mushrooms.

Look for mushrooms that are firm, plump and clean. Those that are wrinkled or have wet slimy spots should be avoided.

The best way to store loose shiitake mushrooms (as well as maitake or reishi mushrooms) is to keep them in the refrigerator in a loosely closed paper bag. They will keep fresh for about one week. Dried mushrooms should be stored in a tightly sealed container in either the refrigerator or freezer where they will stay fresh for six months to one year.

**How to Enjoy**

**A Few Quick Serving Ideas**

* Shiitake mushrooms are traditionally added to miso soup.
* Healthy saute mushrooms with onions and garlic. Serve as a side dish or as a topping for chicken, beef, lamb or venison.
* To give your vegetable stock an extra depth, add dried shiitake mushrooms.
* For a quick and easy Asian pasta dish, healthy saute shiitake mushrooms with snap peas and tofu. Season to taste and serve over buckwheat soba noodles (or your favorite type of pasta).

**WHFoods Recipes That Feature Shiitake Mushrooms**

* [Poached Eggs Over Collard Greens & Shiitake Mushrooms](http://www.whfoods.com/genpage.php?tname=recipe&dbid=108)
* [5 Spice Onion Soup](http://www.whfoods.com/genpage.php?tname=recipe&dbid=79)
* [Shiitake Mushroom Seaweed Soup](http://www.whfoods.com/genpage.php?tname=recipe&dbid=63)
* [15-Minute Steamed Halibut with Bok Choy](http://www.whfoods.com/genpage.php?tname=recipe&dbid=135)
* [15 Minute Healthy Sauteed Chicken & Bok Choy](http://www.whfoods.com/genpage.php?tname=recipe&dbid=120)
* [5-Spice Chicken in a Bowl](http://www.whfoods.com/genpage.php?tname=recipe&dbid=17)
* [Miso Stir-Fry](http://www.whfoods.com/genpage.php?tname=recipe&dbid=42)
* [Spicy Healthy Sautéed Tofu](http://www.whfoods.com/genpage.php?tname=recipe&dbid=162)
* [Spicy Vegetable Tart](http://www.whfoods.com/genpage.php?tname=recipe&dbid=201)
* [Asian Mushroom Saute](http://www.whfoods.com/genpage.php?tname=recipe&dbid=91)
* [Healthy Sautéed Shiitake Mushrooms](http://www.whfoods.com/genpage.php?tname=recipe&dbid=316)

**Safety**

**Shiitake Mushrooms and Purines**

Shiitake mushrooms contain naturally-occurring substances called purines. Purines are commonly found in plants, animals, and humans. In some individuals who are susceptible to purine-related problems, excessive intake of these substances can cause health problems. Since purines can be broken down to form uric acid, excess accumulation of purines in the body can lead to excess accumulation of uric acid. The health condition called "gout" and the formation of kidney stones from uric acid are two examples of uric acid-related problems that can be related to excessive intake of purine-containing foods. For this reason, individuals with kidney problems or gout may want to limit or avoid intake of purine-containing foods such as shiitake mushrooms. For more on this subject, please see ["What are purines and in which foods are they found?"](http://www.whfoods.com/genpage.php?tname=george&dbid=51)

**Nutritional Profile**

**Introduction to Food Rating System Chart**

The following chart shows the nutrients for which this food is either an excellent, very good or good source. Next to the nutrient name you will find the following information: the amount of the nutrient that is included in the noted serving of this food; the %Daily Value (DV) that that amount represents (similar to other information presented in the website, this DV is calculated for 25-50 year old healthy woman); the nutrient density rating; and, the food's World's Healthiest Foods Rating. Underneath the chart is a table that summarizes how the ratings were devised. Read detailed information on our [Food and Recipe Rating System](http://www.whfoods.com/genpage.php?tname=faq&dbid=22).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Mushrooms, Shiitake, cooked 0.50 cup 72.50 grams**  **Calories: 41 GI:** [**not available**](http://www.whfoods.com/genpage.php?tname=faq&dbid=32) | | | | |
| **Nutrient** | **Amount** | **DRI/DV (%)** | **Nutrient Density** | **World's Healthiest Foods Rating** |
| [copper](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=53) | 0.65 mg | 72 | 32.0 | excellent |
| [pantothenic acid](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=87) | 2.61 mg | 52 | 23.1 | excellent |
| [selenium](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=95) | 17.98 mcg | 33 | 14.5 | excellent |
| [vitamin B2](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=93) | 0.12 mg | 9 | 4.1 | very good |
| [zinc](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=115) | 0.96 mg | 9 | 3.9 | very good |
| [manganese](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=77) | 0.15 mg | 8 | 3.3 | good |
| [vitamin B6](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=108) | 0.12 mg | 7 | 3.1 | good |
| [vitamin B3](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=83) | 1.09 mg | 7 | 3.0 | good |
| [choline](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=50) | 26.68 mg | 6 | 2.8 | good |
| [fiber](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=59) | 1.52 g | 6 | 2.7 | good |
| [vitamin D](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=110) | 20.30 IU | 5 | 2.2 | good |
| [folate](http://www.whfoods.com/genpage.php?tname=nutrient&dbid=63) | 15.22 mcg | 4 | 1.7 | good |

|  |  |
| --- | --- |
| **World's Healthiest Foods Rating** | **Rule** |
| excellent | DRI/DV>=75% OR Density>=7.6 AND DRI/DV>=10% |
| very good | DRI/DV>=50% OR Density>=3.4 AND DRI/DV>=5% |
| good | DRI/DV>=25% OR Density>=1.5 AND DRI/DV>=2.5% |

**References**

* Bisen PS, Baghel RK, Sanodiya BS et al. Lentinus edodes: a macrofungus with pharmacological activities. Curr Med Chem. 2010;17(22):2419-30. Review. 2010.
* Brauer D, Kimmons T, and Phillips M. Comparison of Two Methods for the Quantitation of B-Glucans from Shiitake Mushrooms. Journal of Herbs, Spices, & Medicinal Plants, Volume 13, Number 3 (January 2007), pp. 15-26. 2007.
* Bruhn JN, Mihail JD, and Pickens JB. Forest farming of shiitake mushrooms: an integrated evaluation of management practices. Bioresour Technol. 2009 Dec;100(24):6472-80. Epub 2009 Jul 28. 2009.
* Chan GCF, Chan WK, and Sze DMY. The effects of -glucan on human immune and cancer cells. Journal of Hematology & Oncology 2009, 2:25 (10 June 2009). 2009.
* Chandra L, Alexander H, Traoré D et al. White button and shiitake mushrooms reduce the incidence and severity of collagen-induced arthritis in dilute brown non-agouti mice. J Nutr. 2011 Jan;141(1):131-6. Epub 2010 Nov 24. 2011.
* Christopher L, Traore D, and Kuvibidla S. Consumption of diets fortified with edible mushrooms alters IL-6 secretion in vivo and in vitro and spleen cell proliferation in dextran sodium sulfate (DSS)-treated mice. FASEB J. April 2010, 24; (Meeting Abstract Supplement) lb390. 2010.
* Driscoll M, Hansen R, Ding C et al. Therapeutic potential of various beta-glucan sources in conjunction with anti-tumor monoclonal antibody in cancer therapy. Cancer Biol Ther. 2009 Feb;8(3):218-25. Epub 2009 Feb 3. 2009.
* Falandysz J. Selenium in edible mushrooms. J Environ Sci Health C Environ Carcinog Ecotoxicol Rev. 2008 Jul-Sep;26(3):256-99. 2008.
* Fang N, Li Q, Yu S et al. Inhibition of Growth and Induction of Apoptosis in Human Cancer Cell Lines by an Ethyl Acetate Fraction from Shiitake Mushrooms. The Journal of Alternative & Complementary Medicine, Volume 12, Number 2 (March 2006), pp. 125-132. 2006.
* Gold MA, Cernusca MM, and Godsey LD. A competitive market analysis of the United States shiitake mushroom marketplace. Hort Technology, July 2008; 18: 489 - 499. 2008.
* Hearst R, Nelson D, McCollum G et al. An examination of antibacterial and antifungal properties of constituents of Shiitake (Lentinula edodes) and oyster (Pleurotus ostreatus) mushrooms. Complement Ther Clin Pract. 2009 Feb;15(1):5-7. Epub 2008 Dec 2. 2009.
* Kojima H, Akaki J, Nakajima S et al. Structural analysis of glycogen-like polysaccharides having macrophage-activating activity in extracts of Lentinula edodes mycelia. J Nat Med. 2010 Jan;64(1):16-23. Epub 2009 Aug 27. 2010.
* Kuvibidila S and French C. White button, shiitake, and portabella mushrooms inhibit the secretion of vascular endothelial growth factor (VEGF) and the proliferation of the androgen dependent LNCap prostate cancer cell line. FASEB J, Apr 2011; 25: 979.11. 2011.
* Martin KR and Brophy SK. Commonly consumed and specialty dietary mushrooms reduce cellular proliferation in MCF-7 human breast cancer cells. Exp Biol Med (Maywood). 2010 Nov 1;235(11):1306-14. Epub 2010 Oct 4. 2010.
* Ramberg JE, Nelson ED, and Sinnott RA. Immunomodulatory dietary polysaccharides: a systematic review of the literature. Nutrition Journal 2010, 9:54 (18 November 2010): 1-22. 2010.
* Rao JR, Smyth TJ, Millar BC et al. Antimicrobial properties of shiitake mushrooms (Lentinula edodes). Int J Antimicrob Agents. 2009 Jun;33(6):591-2. Epub 2008 Dec 31. 2009.
* Regula J, Krejpcio Z, and Staniek H. Bioavailability of iron from cereal products enriched with dried shittake mushrooms (Lentinula edodes) as determined by iron regeneration efficacy method in female rats. J Med Food. 2010 Oct;13(5):1189-94. 2010.
* Rop O, Mlcek J, and Jurikova T. Beta-glucans in higher fungi and their health effects. Nutr Rev. 2009 Nov;67(11):624-31. Review. 2009.
* Sasidharan S, Aravindran S, Latha LY et al. In vitro antioxidant activity and hepatoprotective effects of Lentinula edodes against paracetamol-induced hepatotoxicity. Molecules. 2010 Jun 23;15(6):4478-89. 2010.
* Spierings EL, Fujii H, Sun B et al. A Phase I study of the safety of the nutritional supplement, active hexose correlated compound, AHCC, in healthy volunteers. J Nutr Sci Vitaminol (Tokyo). 2007 Dec;53(6):536-9. 2007.
* Willcox DC, Willcox BJ, Todoriki H et al. . The Okinawan Diet: Health Implications of a Low-Calorie, Nutrient-Dense, Antioxidant-Rich Dietary Pattern Low in Glycemic Load. J. Am. Coll. Nutr., Aug 2009; 28: 500S - 516S. 2009.
* Xu B and Chang K. Total phenolic, phenolic acid, anthocyanin, flavan-3-ol, and flavonol profiles and antioxidant properties of pinto and black beans (Phaseolus vulgaris L.) as affected by thermal processing. Journal of Agricultural and Food Chemistry, 2009; 57: 4754-4764. 2009.
* Yarnell E and Abascal K. Holistic Approaches to Prostate Cancer. Alternative & Complementary Therapies, Volume 14, Number 4 (August 2008), pp. 164-180. 2008.

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