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INCREDIBLE SHIITAKE MUSHROOM

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ABSTRACT:

Mushrooms are the fleshy, spore bearing fruiting body of a fungus that do not undergo photosynthesis. Some mushrooms or mushroom extracts which are used or studied as possible treatments for diseases are known as medicinal mushrooms. Medicinal mushrooms have played a prominent role in improving health of people, since ancient times. Now days the interest in the use of mushrooms is increasing but not much progress has been reported in this field. Medicinal mushrooms have bright future in the field of health. Some selected mushrooms have shown remarkable results by enhancing immune system of the body and by treating many diseases, and Shiitake is one of them. It's an edible fungus native to China and other parts of Asia. Shiitake has a history of medicinal uses. The mushroom is used as anticarcinogenic, anti inflammatory, anti oxidant, acts as antifungal, antibacterial, antiviral, the mushroom can also prevent thrombosis formation, and is used in case of cardiovascular disorders. This article has been written to throw some light on Shiitake mushroom, which has many nutritional values. Many Shiitake preparations come in market containing the active ingredients which can replace many other marketed synthetic medicines and may prove to have promising results with fewer side effects.

KEY WORDS: Medicinal mushrooms, Shiitake mushroom, Polysaccharides, Lentinan.

INTRODUCTION:

A mushroom is the fleshy, spore bearing fruiting body of a fungus, typically produced above the ground on soil or an its food source. The word "mushroom" is most often applied to those fungi that have stem, a cap and gills or pores on the underside of the cap[1]. According to the definition of Chang and Miles mushrooms are 'a macrofungus with a distinctive fruiting body, which can be either hypogeous or epigeous, large enough to be seen with the naked eye and to be picked by hand.'[2]

For millennia mushrooms have been valued as edible and medical provisions for humankind. With the popularization of mushroom farming and industrialization, mushroom production worldwide continues to increase. Mushroom production can convert the huge lignocellulosic waste materials into a wide diversity of products (edible or medicinal food, feed and fertilizers), protecting and regenerating the environment [3]. The mushroom conversion has been named the 'non-green revolution'.[4,5].

MEDICINAL MUSHROOMS: Medicinal mushrooms are mushrooms, or mushroom extracts, that are used or studied as possible treatments for diseases [6]. In Asia, medicinal mushrooms have played a prominent role in good health for over 2000 years. Certain medicinal mushrooms such as Shiitake, Maitake and Reishi have a history of medicinal use spanning millennia in parts of Asia [6].

SHIITAKE: Shiitake are a decomposing fungus native to china and other parts of asia[7] and are traditionally well known edible mushrooms of high nutritious value. Raw or dried forms, used in Chinese curative powers of shiitake mushroom, are legendary. . It was stated in Ri Young Ben Cao, vol.3 (1620), written by Wu-Rui of the Ming Dynasty, "Shiitake accelerates vital energy, wards off hunger, cures cold and defeats body fluid energy."[12]

Shiitake mushrooms have excellent nutritional values. Their raw fruit bodies include 88-92% water, proteins, lipids, carbohydrates as well as vitamins and minerals [12].

History:- The Japanese syllable 'Shii' refers to the type of host tree, perhaps oak or a tree in the same family as birch in America. 'Take' means the fruit of the mushroom. In a natural forest, shiitake spores are released from fruiting mushrooms in spring or autumn. For centuries the Chinese picked shiitake wild and dried them. The Japanese learned to cultivate them. They placed fresh mushrooms on dead log and let itself inoculate[7].

One ancient physician called it "The Elixir Of Life." During the Ming Dynasty (1368-1644) the shiitake was believed to keep people vigorous and young. Because of the special power of the shiitake, it was decreed in ancient oriental history that only the emperor and his family could eat them. It was widely known as the "Emperor's Food." During times of war, only the most trusted of the guards were assigned to guard the shiitake supply[8]. Shiitakes are deeply rooted in Asian history with the first mention of them dating back to 199 AD, when natives of Kyushu presented the emperor with the gift of the prized woodland gathering[9].

MEDICINAL USES OF SHIITAKE:

Anticarcinogenic and Antitumor properties:

Lentinan , a protein free, water soluble polysaccharide derived from the fruiting body of shiitake, was isolated in Japan in 1985 and was approved for the treatment of cancer, especially cancer of stomach. Lentinan's primary polysaccharides are β-1,6-D-glucans and β-1,3-D-glucans[10]. B- glucans can activate macrophage for nitric oxide synthesis and limulus factor G activation which are important cancer killing substances[11]. Lentinan, which can be taken orally [10], activates macrophages, T-helper cells, NK cells and other effector cells. It results in activation of immune system [11]. Purified polysaccharide shows strong tumour regression and even disappearance of sarcoma tumors in 5 weeks on animals [13]. It causes 80 % reduction in tumor size in mice[12]. Another orally active polysaccharide derived from Shiitake is LAM, from which a lignin rich fraction called JLS-18 was developed[10]. Both LEM and JLS-18 have strong anti-tumour properties [14]. Antitumor action of lentinan requires an intact T- cell component and that the activity is mediated through thymus- dependent immune mechanism. The induction of a marked increase in the amount of CSF, IL-1 and IL-3 by lentinan results in maturation, differentiation and proliferation of the immunocompetent cells for host defence mechanism[15]. Lentinan is able to restore the suppressed activity of helper T- cells in the tumor bearing host to their normal state, leading to complete restoration of humoral immune responses. It is suggested that the delayed type hypersentivity response at the tumor sites induced by lentinan and the subsequent infilteration of immune effector cells such as NK cells, cytotoxic T- lymphocytes, into the tumor burden are an important mechanism of antitumor action of lentinan[15]. Recent observation shows that lentinan inhibits hepatic metastasis an adenocarcinoma 26 bearing mice by activated Kupffer cells. Lentinan not only markedly prevents chemical and viral carcinogenesis, but also suppresses cancer metastasis and recurrence in animal models [15].

Antibacterial property:

Lentinan is therapeutically effective against Mycobacterium tuberculosis and Listeria monocytogenes[15]. Oxalic acid is an agent responsible for the antimicrobial effect of Lentinula edodes[3]. Mycelium free broth of L. edodes

grown in submerged liquid culture was bacteriostatic against Streptococcus pyogenes, Staphylococcus aureus and Bacillus megaterium[16]. Lentinan inhibits Candida albicans and S.aureus[17]. Lentinan helps to regulate the inflammatory response in the host when encounter pathogens. It also activates the complement system which split C3 into C3a and C3b, enhancing macrophage activation [11].

Antiviral property:

Lentinan is able to inhibit replication of Adenovirus type 12, Abelson virus and VSV- encephalitis virus[15]. Although lentinan itself has no ability to block HIV infection concomitant treatment with 3'-azido-3'-deoxythymidine suppresses the surface expression of HIV antigens more than does AZT alone[15]. Lentinula edodes naturally contain antiviral agents known as proteinase inhibitors. Anti HIV activities were reported for mycelia culture medium of L. edodes (LEM) and water soluble lignin in LEM[18,19]. Sulfated lentinan from L.edodes completely prevented HIV induced cytopathic effect[19]. The polysaccharide Lentinan demonstrates effects against influenza virus and polio virus as well as against some bacteria and parasites. These effects are mediated by immune system induction that even delays AIDS symptomatology appearance. This action would be linked to induction of increased level of interferon. L. edodes seems to be one of the most promising stimulator of immunofunctions. This mushroom is tested on HIV positive patients in the USA and in Japan[20].

Antioxidant property:

Oxidative damage caused by free radicals may be related to aging and diseases, such as atherosclerosis, diabetes, cancer and cirrhosis[21]. Antioxidant compounds reduce the action of reactive oxygen species (ROS) in damaged tissues during the recovery process[22]. Kitzberger et al used extracts of L. edodes obtained by organic solvents and supercritical fluids to test the antioxidant activity[23]. Cheung and Cheung[24] also reported the antioxidant activity of L. edodes against lipid peroxidation. They found that the low molecular weight sub fraction of water extracts of L. edodes had the highest antioxidant activity against lipid peroxidation of rat brain homogenate, with IC50 values of 1.05 mg/ml[23].

Shiitake enhance the host's antioxidant capacity or upregulating phase 1 and phase 2 enzymes involved in the metabolic transformation and detoxification of mutagenic compounds[25]. L. edodes is also inducer of Superoxide dismutase and Glutathione peroxidase, the two antioxidant enzymes[20]. Lentinula edodes filtrates and mycelia exhibit Aflatoxin inhibiting effects[26]. They act as an external stimulus effecting the antioxidant states in the toxin producing fungus and leads to inhibition of Aflatoxin[16].

Antifungal activity:

From the fruiting bodies of the Shiitake mushroom, a novel protein designated 'Lentin' with the potent antifungal activity was isolated in 2003[27]. Lentin inhibited mycelia growth in a variety of fungal species including Physalosporia piricola, Botrytis cinerea and Mycosphaerella arachidicola[27]. The polysaccharide Lentinan from Shiitake inhibits Candida albicans and S. aureus[17].

Cardiovascular effects:

The major cause of death in western countries is coronary artery disease. It is known that Shiitake mushroom is able to lower blood serum cholesterol via a factor known as Eritadenine. Apparently Eritadenine reduces blood serum cholesterol (BSC) in mice, not by the inhibition of cholesterol biosynthesis, but by the acceleration of the excretion of ingested cholesterol and its metabolic decomposition[12]. Hobbs[28,29] and Yang[30] et al have

shown that Shiitake mushrooms lowered BSC levels. Various studies have confirmed[28,29,31] that the mushroom can lower blood pressure and free cholesterol in plasma, as well as accelerate the accumulation of lipids in the liver by removing them from circulation.

Thrombosis prevention:

Thrombosis, has been shown to be significantly reduced by individuals consuming Shiitake mushroom oil [32]. The department of Agricultural and Biological Chemistry at Nihon University in Japan has demonstrated that the levels of Lenthionine found in Shiitake mushrooms inhibited platelet aggregation [32].

SHIITAKE PRODUCTS IN MARKET:

1) SHIITAKE EXTRACT[33]:

Shiitake extract have a beneficial effect on: Blood Pressure; Blood Sugar; Cholesterol; Kidney Tonic; Liver Tonic; Stress; Breast Cancer; Liver Cancer; Prostate Cancer. It is an excellent immune system booster and enhances cellular defenses[33].

2) SHIITAKE POLYSACCHARIDE FREEZING – DRYING POWDER CAPSULE [34]:

Strengthens the immune system, improves its ability to fight infection and disease such as influenza and other viral diseases. It even improves the immune status of individuals infected with HIV, the virus that can cause AIDS, has also been shown to have anti-cancer activity[34].

3) SHIITAKE MUSHROOM EXTRACT CAPSULE[35]:

It contains compounds known as alpha and beta-glucans which appears to have some positive effects in enhancing immune function, healthy cholesterol profiles and healthy blood pressure levels[35].

4) SHIITAKE MUSHROOM CAPSULE TABLET[36]:

It increases host's resistance to infections by viruses, bacteria and parasites. It is approved for the treatment of gastric cancer[36].

5) SHIITAKE POLYSACCHARIDE CAPSULE [37]:

Given for the treatment of: Immune dysfunction, Cholesterol, gallstone, rickets, hepatitis B, liver cirrhosis, cancer patients [37].

6) SHIITAKE POLYSACCHARIDE ELECTUARY [38]:

Enhances immunity, protects liver. It is an anti-cancer, anit-viral preparation, improves blood circulation, increases supply capacity of blood and oxygen to heart and lungs, increases physiological functioning of cell and organs[38].

8) SHIITAKE MUSHROOM P.E PLANT EXTRACT[39]:

It is found to be particularly valuable for treating all forms of hepatitis. It acts as a powerfully antiviral agent. It can also lower blood levels of cholesterol and lipids[39].

12) NATURAL SHIITAKE MUSHROOM EXTRACT[40]:

It is a hemostyptic[40].

14) SHIITAKE TEA BAG, SUPPLEMENT[41]:

Strengthens Immunity[41].

CONCLUSION:

Medicinal mushrooms have wondrous constituents which may give health benefits to humankind. Shiitake also have many health benefits. Lentinan, a water soluble polysaccharide extracted from shiitake, shows anti cancer activity, antibacterial activity, anti viral activity and anti fungal activity.

Eritadenine present in shiitake reduces blood serum cholesterol. Lenthionine present in shiitake inhibits platelet aggregation.

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REFERENCES:

1) Mushrooms. Wikipedia. 26 Oct. 2011. http://en.wikipedia.org/wiki/Mushroom(27 Oct 2011).

2)Lindequist Ulrike, Niedermeyer H.J Timo, J. Dieter- Wolf. The pharmacological potential of mushrooms. eCAM. 2005;2:285-299.

3) Fan Leefa, Pan Huijuan, Soccol Thomaz Andrea, Pandey Ashok, Soccol Ricardo Carlos. Advances in mushroom research in last decade. Food technol biotechnol.2006; 44:303-311.

4) S.T. Chang, Global impact of edible and medicinal mushrooms on human welfare in the 21st century: Nongreen revolution, Int. J. Med. Mushrooms 1999; 1:1–7.

5) S.T. Chang, Witnessing the development of the mushroom in China, Acta Edulis Fungi (Suppl.) 2005; 12:3–19.

6) Medicinal mushrooms. Wikipedia. 29 Oct 2011. http://en.wikipedia.org/wiki/Medicinal_mushrooms(27 Oct 2011)

7) Shiitake lore. Shiitake mushroom log.http://shiitakemushroomlog.com/shiitakelore.html(26 Oct 2011)

8) Health immune system. Discount-vitamins-herbs. 2001-2010. http://www.discount-vitamins-herbs.net/immunesystem.htm#mushrooms(27 Oct 2011)

9)Gabris linda. Shiitake mushrooms. backwoods home. 1998. http://www.backwoodshome.com/articles2/gabris96.html(25 Oct 2011)

10)Shavit elinor. Over the counter medicinal mushrooms. Fungimag. 2008-2010. http://www.fungimag.com/spring-09-articles/8_Elinoar_alt.pdf(25 Oct 2011)

11)Wong, Ka-wai, Creany. Immunomodulatory properties of the Chinese medicinal extract polysaccharide peptide. Hub HKU. 2010. http://hub.hku.hk/bitstream/10722/31215/11/FullText.pdf(28 Oct 2011)

12)Wasser P. Solomon. Shiitake(Lentinus edodes). Dog cancer. 2005. http://www.dogcancer.net.au/RP/shiitake.pdf(28 Oct 2011)

13)Yap, A.T.; Ng, M.L. Immunopotentiating properties of lentinan (1-3)-b-D-glucan extracted from culinary-medicinal shiitake mushroom Lentinus edodes (Berk.) Singer (Agaricomycetideae). Int. J. Med. Mushr. 2003;5:352–372.

14)Yamamoto, Y., H. Shiroo, K. Kono, and Y. Ohashi. Immunopotentiating activity of the water-soluble lignin rich fraction prepared from LEM: The extract of the solid culture medium of Lentinus edodes mycelia. Bioscience, Biotechnology, and Biochemistry1997; 61: 1909–12

15)Ooi.C.E.vincent, Liu Fang. Immunomodulation and anticancer activity of polysaccharide-protein complexes. Current medicinal chemistry. 2000;7:715-729.

16)Nikitina E. Valentina, Tsivileva M. Olga, Pankratov N. Alexei, Bychkov A. Nikolai. Lentinula edodes biotechnology- from lentinan to lectins. Food technol biotechnol.2007; 45:230-237.

17)Wasse AL, Weis AL. Medicinal properties of substances occurring in higher basidiomycetes mushrooms: current perspectives (Review). International Journal of Medicinal Mushrooms. 1999; 1:31-62.
18)T. Ichimura, O. Watanabe, S. Maruyama, Inhibition of HIV-1 protease by water-soluble lignin-like substance from an edible mushroom Fuscoporia oblique, Biosci. Biotechnol. Biochem. 1998;62: 575–577.
19) R.A. Colins, T.B. Ng, Polysaccharopeptide from Coriolus versicolor has potential for use against human immunodeficiency virus type 1 infection, Life Sci.1997;60:383–387.
20)Poucheret Patrick, Fons Francoise, Rapior Sylvie. Biological and pharmacological activity of higher fungi: 20-year retrospective analysis. Cryptogamie Mycologie.2006;27:1-23.
21) Halliwell, B.; Gutteridge, J.M.C. Oxygen toxicity, oxygen radicals, transition metals and disease. Biochem. J. 1984;*219*:1–4.
22). Barros, L.; Baptista, P. Ferreira ICFR: Effect of Lactarius piperatus fruiting body maturity stage on antioxidant activity measured by several biochemical assays. Food. Chem. Toxicol. 2007;*45*:1731–1737.
23)Sreenivasan Sasidharan, Sugumaran Aravindran, Lachimanan.Y Latha, Ratnasamy Vijenthi, Dharamaraj Saravanan, Santhanam Amutha. In vitro antioxidant activity and hepatoprotective effects of Lentinula edodes against paracetamol-induced hepatotoxicity. Molecules. 2010; 15:4478-4489.
24)Cheung, L.M.; Cheung, P.C.K. Mushroom extracts with antioxidant activity against lipid oxidation. Food Chem. 2005;89:403-409
25)Lee IS, Nishikawa A. Polyozellus multiplex, a Korean wild mushroom, as a potent chemopreventive agent against stomach cancer. Life Sci. 2003;73:3225–3234
26)C. Fanelli, A.A. Fabbri, E. Finotti, P. Fasella, S. Passi, Free radicals and aflatoxin biosynthesis, Cell. Mol. Life Sci. 1984;40:191–193.
27)Ngai, P.H.K.; Ng, T.B. Lentin, a novel and potent antifungal protein from shiitake mushroom with inhibitory effects on activity of human immunodeficiency virus-1 reverse transcriptase and
proliferation of leukemia cells. Life Sci. 2003;73:3363–3374.
28) Hobbs, Ch. Medicinal Mushrooms: An Exploration of Tradition, Healing, and Culture. Botanica Press, Inc.: Santa Cruz, CA, USA, 1995;2:252.
29)Hobbs, Ch. Medicinal value of Lentinus edodes (Berk.) Sing. A literature review. Int. J. Med.Mushr. 2000;2:287–302
30) Yang, B.K.; Kim, D.H.; Jeong, S.Ch.; Das, S.; Choi, Y.S.; Shin, J.S.; Lee, S.Ch.; Song, Ch.H. Hypoglycemic effect of a Lentinus edodes exopolymer produced from a submerged mycelia culture. Biosci. Biotechnol. Biochem. 2002;66:937–942.
31)Mizuno, T. A development of antitumor polysaccharides from mushroom fungi. Food Food Ingred. J. Jpn. 1996;167:69–85.
32)The health benefits of shiitake mushrooms. Elements 4 health. 2011. http://www.elements4health.com/shiitake-mushrooms.html(28 Oct 2011)
33)Shiitake mushroom extract. Swanson vitamins. 2011. http://www.swansonvitamins.com/SWH121/ItemDetail (28 Oct 2011)
34)Shiitake polysaccharide freezing-drying powder capsule. Ycshennong en. 2011. http://ycshennong.en.made-in-china.com/product/PeSxNoibrqpM/China-Shiitake-Polysaccharide-Freezing-Drying-Powder-Capsule.html(28 Oct 2011)
35)Shiitake mushroom extract 90 capsules. Hnpoly en. 2011.http://hnpoly.en.made-in-china.com/product/RozJYPschlhS/China-Shiitake-Mushroom- Extract-90-Capsules.html(28 Oct 2011)

36)Shiitake mushroom capsules tablets OEM private label. Dietary supplements en. 2011. http://dietarysupplements.en.made-in-china.com/product/LbyJYfzjEXcZ/China-Shiitake-Mushroom-Capsules-Tablets-OEM-Private-Label.html(28 Oct 2011)

37)Shiitake polysaccharide capsule. Ycshennong en. 2011.http://ycshennong.en.made in china.com/product/gMSEKXHJYeYx/China-Shiitake Polysaccharide-Capsule.html(28 Oct 2011)
38)Shiitake polysaccharide-Electuary. Ycshennong en. 2011. http://ycshennong.en.made-in-china.com/product/HqXJApldgMUY/China-Shiitake- Polysaccharide-Electuary.html.(28 Oct 2011)
39)Shiitake mushroom PE plant extract. Alibaba. 1999-2010.
http://www.alibaba.com/product-gs/294335941/Shiitake_Mushroom_P_E_plant_extract.html(28 Oct 2011)
40)Natural shiitake mushroom extract. Alibaba. 1999-2010.
http://www.alibaba.com/product-gs/480382298/Natural_Shiitake_Mushroom_Extract.html(29 Oct 2011)
41)Shiitake tea bag supplement. Alibaba. 1999-2010.http://www.alibaba.com/product-gs/476804268/shitake_tea_bag_supplement.html(29 Oct 2011)