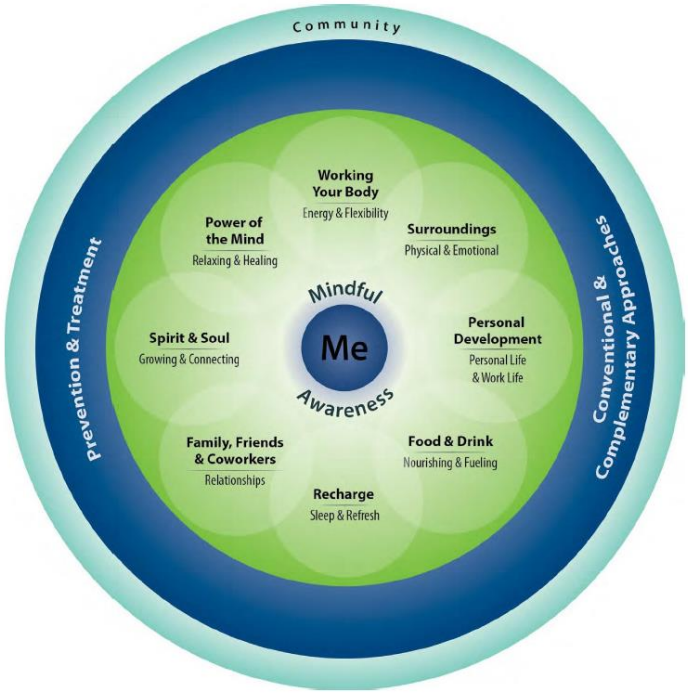
WHOLE HEALTH: CHANGE THE CONVERSATION

Advancing Skills in the Delivery of
Personalized, Proactive, Patient-Driven Care

Mycomedicinals (Mushrooms) for Cancer Clinical Tool



This document has been written for clinicians. The content was developed by the Integrative Medicine Program, Department of Family Medicine, University of Wisconsin-Madison School of Medicine and Public Health in cooperation with Pacific Institute for Research and Evaluation, under contract to the Office of Patient Centered Care and Cultural Transformation, Veterans Health Administration.

Information is organized according to the diagram above, the *Components of Proactive Health and Well-Being*. While conventional treatments may be covered to some degree, the focus is on other areas of Whole Health that are less likely to be covered elsewhere and may be less familiar to most readers. There is no intention to dismiss what conventional care has to offer. Rather, you are encouraged to learn more about other approaches and how they may be used to complement conventional care. The ultimate decision to use a given approach should be based on many factors, including patient preferences, clinician comfort level, efficacy data, safety, and accessibility. No one approach is right for everyone; personalizing care is of fundamental importance.

WHOLE HEALTH: CHANGE THE CONVERSATION
Mycomedicinals (Mushrooms) for Cancer
Clinical Tool

Medicinal mushrooms, also known as "mycomedicinals," and mushroom-derived polysaccharide preparations have been studied as immune modulators and adjuvant agents in cancer treatment. Mycomedicinals have been found to modify tumor response and improve immune function, primarily in patients with solid tumors. Mushrooms contain biologically active polysaccharides in their fruit bodies, or mycelia. The β-glucans of mushrooms resemble bacterial cell walls and complex with complement on macrophages to activate an immune response triggering the release of various cytokines that are active in tumor inhibition. This clinical tool describes several different mycomedicinals and the research related to their use.

Mushrooms have a cell wall made of chitin, which is the same fiber contained in the shell of a lobster. Chitin is indigestible by humans but contains the bioactive β-glucans and polysaccharides. Hot water extraction is the only proven method for breaking down the chitinous cell walls and releasing the bioactive polysaccharide structurally intact and undamaged. This is performed by simmering or boiling the mushroom in water for 20 to 120 minutes.

Note: *Please see the module on Dietary Supplements for more information about how to determine whether or not a specific supplement is appropriate for a given individual. Supplements are not regulated with the same degree of oversight as medications, and it is important that clinicians keep this in mind. Products vary greatly in terms of accuracy of labeling, presence of adulterants, and the legitimacy of claims made by the manufacturer.*

Coriolus (Trametes) versicolor (Yun Zhi or Turkey Tail)

Over 400 in vitro and animal studies of *Coriolus versicolor* extract have demonstrated that it stimulates the immune system, inhibits the growth of cancer cells, and acts as a strong anti-oxidant. Polysaccharide krestin (PSK) and polysaccharide peptide (PSP) are bioactive extracts of *C. versicolor*. In Japan, PSK is an anticancer drug currently used as a cancer treatment along with surgery, chemotherapy, and radiation therapy. It is used as adjunctive treatment for esophageal, lung, stomach, breast, and colon cancer. PSP was discovered more recently and has been studied mainly in China.

A systematic review and meta-analysis of 13 clinical trials analyzing survival in cancer patients taking 1 to 3.6 grams of PSK or PSP per day for 1 to 36 months found that those taking *C. versicolor* had a 9% absolute reduction in 5-year mortality, resulting in one additional patient alive for every 11 patients treated. The effects were more evident in patients with breast, gastric, or colorectal cancer.[1]

A study found that stage II and III colorectal cancer patients who received conventional therapy along with 3 grams of PSK per day had a greater percentage of 5-year disease-free

survival and a decreased relative risk of regional metastases.[2] A meta-analysis of three trials involving 1,094 subjects with colorectal cancer confirmed that those who took PSK showed a significant improvement in overall survival and disease-free survival.[3] In a meta-analysis of 8,009 gastric cancer patients from eight randomized controlled trials (RCTs), those taking PSK had increased survival.[4]

Grifola frondosa (Maitake)

Grifola frondosa is an edible mushroom extensively used in traditional Asian medicine for numerous health-promoting purposes. Maitake means "dancing mushroom." The maitake D-fraction is the bioactive extract that has been widely studied as an adjunct to conventional radiation and chemotherapy. It acts as a biologic response modifier, providing T-cell dependent immune enhancement and activation that enhanced antitumor effect. Maitake is often used to reduce the side effects of chemotherapy and make it more effective. It is most effective against breast, prostate, and liver cancer.

When maitake D-fraction was given to patients receiving chemotherapy for several different cancers, response rates increased from 12% to 28%, and chemotherapy side effects were reduced.[5] Another study, among numerous others, suggests a direct antitumor effect of maitake D-fraction with induction of apoptosis observed in breast cancer cell lines.[6]

Ganoderma lucidum (Reishi)

Reishi is also called the "mushroom of immortality." *Ganoderma lucidum* stimulates macrophage production and activates the production of natural killer, T-cells, and tumor necrosis factor, but is not directly tumoricidal. A Cochrane review of five RCTs concluded that *G. lucidum* could be administered as an alternative adjunct to conventional treatment in consideration of its potential of enhancing tumor response and stimulating host immunity. Patients who had been given *G. lucidum* with chemo/radiotherapy were more likely to respond compared to conventional treatment alone. *G. lucidum* treatment alone did not demonstrate the same regression rate as that seen in combined therapy. *G. lucidum* increases the percentage of CD3, CD4, and CD8 by 2% to 4% at a dose of 5.4 grams daily for 12 weeks. Four of the studies showed that patients in the *G. lucidum* group had improved quality of life.[7]

Lentinula edodes (Shiitake)

A polysaccharide extract active hexose correlated compound (AHCC) of the *Lentinula edodes* mushroom has been tested in several human trials. Eleven advanced cancer patients who were given 3 grams per day of AHCC for 1 month in an uncontrolled trial showed a 2.5 times increase in natural killer cell activity, and over half had a tumor response.[8] Statistically significant increases in lymphocyte percentage, albumin levels, general physical health status, and maintenance of activities of daily living were reported in advanced liver cancer patients who were given AHCC instead of placebo.[9] A cohort of 269 hepatocellular cancer patients who received curative resection was assigned to receive

either 3 grams of AHCC daily or control after surgery. The treated group had a significantly longer disease-free interval, and increased overall survival.[10]

Summary

Mycomedicinals are best absorbed when taken on an empty stomach. The typical dose of mycomedicinals varies from 800 mg to 3,000 mg of the active polysaccharide per day. It is important to use a hot water extract for the aforementioned reasons. Mycomedicinals rarely cause side effects, but should be used with caution in patients with leukemia and lymphoma, after a bone marrow transplant, and on immunosuppressants due to the immune modulation function of mushrooms.

Whole Health: Change the Conversation Website

Interested in learning more about Whole Health?
Browse our website for information on personal and professional care.

http://projects.hsl.wisc.edu/SERVICE/index.php

This clinical tool was written by Srivani Sridhar, MD, integrative medicine family physician at SwedishAmerican Medical Group, Rockford, IL. Dr. Sridhar is currently developing an Integrative Oncology program at the SwedishAmerican Regional Cancer Center.

References

1. Eliza W, Fai C, Chung L. Efficacy of Yun Zhi (Coriolus versicolor) on survival in cancer patients: systematic review and meta-analysis. *Recent Pat Inflamm Allergy Drug Discov.* 2012;6(1):78-87.

2. Ohwada S, Ogawa T, Makita F, et al. Beneficial effects of protein-bound polysaccharide K plus tegafur/uracil in patients with stage II or III colorectal cancer: analysis of immunological parameters. *Oncol Rep.* 2006;15(4):861-868.

3. Sakamoto J, Morita S, Oba K, et al. Efficacy of adjuvant immunochemotherapy with polysaccharide K for patients with curatively resected colorectal cancer: a meta-analysis of centrally randomized controlled clinical trials. *Cancer Immunol Immunother.* 2006;55(4):404-411.

4. Oba K, Teramukai S, Kobayashi M, Matsui T, Kodera Y, Sakamoto J. Efficacy of adjuvant immunochemotherapy with polysaccharide K for patients with curative resections of gastric cancer. *Cancer Immunol Immunother.* 2007;56(6):905-911.

5. Konno S. Synergistic potentiation of D-fraction with vitamin C as possible alternative approach for cancer therapy. *Int J Gen Med.* 2009;2:91.

6. Soares R, Meireles M, Rocha A, et al. Maitake (D fraction) mushroom extract induces apoptosis in breast cancer cells by BAK-1 gene activation. *J Med Food.* 2011;14(6):563-572.

7. Jin X, Ruiz Beguerie J, Sze DMy, Chan G. Ganoderma lucidum (Reishi mushroom) for cancer treatment. *Cochrane Database Syst Rev.* 2012;6.

8. Ghoneum M, Wimbley M, Salem F, McKlain A, Attallah N, Gill G. Immunomodulatory and anticancer effects of active hemicellulose compound (AHCC). *Int J Immunother.* 1995;11(1):23-28.

9. Cowawintaweewat S, Manoromana S, Sriplung H, et al. Prognostic improvement of patients with advanced liver cancer after active hexose correlated compound (AHCC) treatment. *Asian Pac J Allergy Immunol.* 2006;24(1):33-45.

10. Matsui Y, Uhara J, Satoi S, et al. Improved prognosis of postoperative hepatocellular carcinoma patients when treated with functional foods: a prospective cohort study. *J Hepatol.* 2002;37(1):78-86.