

Multiple health benefits of Active Hexose Correlated Compound, a unique, highly potent medicinal mushroom extract

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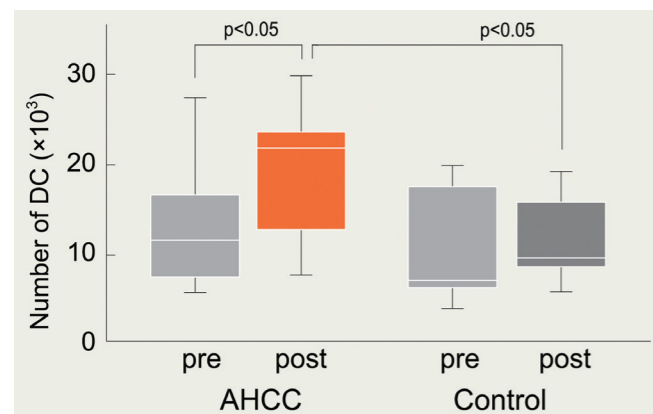
The beneficial effects of medicinal mushrooms such as Shiitake, Maitake, Reishi on human health and well-being are well recognized. Yet, not all mushroom extracts are alike. The biologically active polysaccharides present in raw mushrooms have a molecular weight of more than 100,000 Daltons, which is too large to be absorbed efficiently by the human body. Active Hexose Correlated Compound (AHCC®) is produced by a long-term culture process of mushroom mycelium, leading to the generation of smaller and unique polysaccharides with remarkable health-supporting properties.

AHCC® is produced through a unique, patented fermentation process

AHCC® was developed in the late 1980's by the Japanese biotechnology company Amino Up Chemical, in collaboration with scientists from the University of Tokyo. It started with the screening of hundreds of medicinal mushroom species, looking for those with the highest capacity to boost natural killer (NK) cell activity. A process of mycelium culture was then developed, during which enzymes from the mushroom's cells process the naturally occurring polysaccharides into smaller sized (5,000 Daltons) alpha glucans. These unique, specific compounds confer remarkable properties to AHCC®, which has become Japan's #1 specialty immune supplement and is used for a variety of applications including immune support, anti-viral defense, liver protection, reduction of cancer therapy side effects.

AHCC® and immune function support

The effects of AHCC® on immune function are extensively documented, with studies conducted in both rodents and humans. In one of these human studies, a double blind, placebo-controlled trial on healthy volunteers, AHCC® consumption for 4 weeks led to a significant increase of total dendritic cell number (Terakawa et al. 2008).



Comparison of dendritic cell numbers in AHCC® and control groups (from Terakawa et al. 2008).

Assessing the full effects of nutraceuticals on healthy subjects can be somewhat challenging, since the baseline values of immune parameters in these people are already optimal. One approach can be to perform trials on populations with altered immune function,

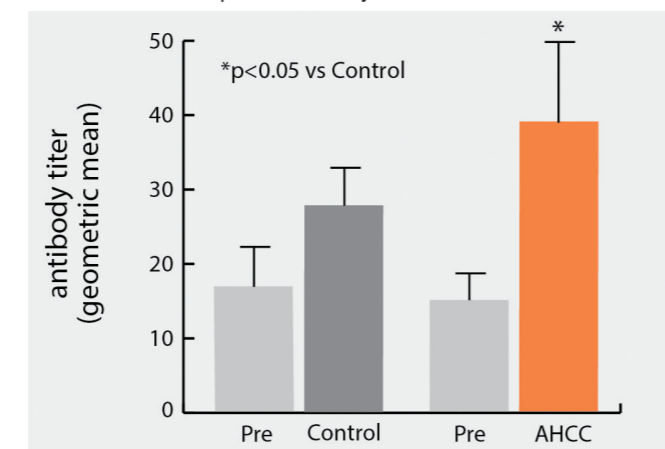
such as elderly people. One study performed on 30 healthy adults aged 50 years and more, taking AHCC® for 60 days, showed an effect of AHCC® treatment on CD4+ and CD8+ immune cells activity, with an increased production of cytokines IFN-γ and TNF-α (Yin et al. 2010).

Another recent study (Takanari et al. 2015) investigated the effects of AHCC® on the seasonal variations of immune competence. The study took place in Japan, at the beginning of the cold season (November and December), which is a period where people experience suppression of immune competence, leading to an increased risk of infection (suppression of local immune response in inflamed oral mucosa, decrease of NK cell number). In healthy volunteers consuming 1 g AHCC® daily for 4 weeks, the number of NK cells was maintained throughout the treatment whereas it decreased significantly in a placebo group. A score of immunological vigor, which integrates 7 different parameters related to immune cells (counts and ratios of several B and T cell subtypes) was also maintained in the AHCC® group, while it decreased significantly in the placebo group. Research continues to accumulate, confirming the role of AHCC® as an immune function enhancer, that will improve the ability of our body to fight against various types of infections.

Protection against infections

The positive effects of AHCC® on immune cell function suggest that it can confer protection against various external microbial infections. Multiple animal studies, reviewed in Miura et al., 2010, have indeed confirmed the protective effects of AHCC® against pathogens like *Candida albicans*, *Pseudomonas aeruginosa*, methicillin-resistant *Staphylococcus aureus*, as well as influenza virus and West Nile virus.

A remarkable study (Roman et al. 2013) investigated the influence of AHCC® treatment on the response to influenza B vaccine. In that study, healthy adults began AHCC® supplementation immediately after receiving a shot of influenza vaccine. Three weeks after the shot, the numbers of NK and CD8+ cells were higher in the AHCC®-treated group than in the control group; most interestingly, AHCC® supplementation also increased the titers of protective antibodies to influenza B. Therefore, it appears that AHCC® improves our body's protection against pathogens by modulating both natural and acquired immunity.



Influenza B antibody titers pre- and post-vaccination, in AHCC®-treated and control groups (from Roman et al. 2013).

Recently, new results have opened even more striking perspectives. A preliminary study performed at the MD Anderson Cancer Center in Houston suggested that AHCC® treatment could



lead to the eradication of human papillomavirus (HPV) in infected women (Smith et al. 2014). In a group of women which initially tested positive for HPV, known to be responsible for cervical cancer development, treatment with AHCC® for 3 to 6 months led to the disappearance of the virus in half of the subjects. A phase II study is ongoing to confirm this observation, which could represent a new aspect of AHCC®'s remarkable health benefits.

AHCC® and liver health

The liver has a wide array of functions including detoxification, metabolism of carbohydrates and lipids, production of bile acids. Liver dysfunctions can have far-reaching consequences on health; unfortunately, infections and poor lifestyle put a heavy burden on the liver, and diseases of this organ are quite common. Evidence from in vitro research and human clinical trials suggests that AHCC® can protect the liver from various types of damages: AHCC® improves the markers of liver damage (liver enzymes like ALT) in alcoholic fatty liver patients (Kim et al. 2014); in a double blind placebo-controlled study on hepatitis C patients, AHCC® treatment for 24 weeks prevented the increase of both HCV RNA and blood ALT seen in the control group (Chutaputthi et al. 2010). The exact mechanisms by which AHCC® exerts these beneficial actions are not known, but may include anti-viral action and modulation of pro- and anti-inflammatory factors in liver cells: in cultured hepatocytes for instance, AHCC® is able to inhibit the expression of iNOS, a pro-inflammatory gene involved in liver injury development (Matsui et al. 2011).

AHCC® as an adjuvant therapy for cancer treatment

The immune-supporting activity of AHCC®, as well as its capacity to protect the liver, make it a supplement of choice for use in combination with conventional cancer therapies. Indeed, chemotherapies and radiation weaken immune defenses, making patients more vulnerable to opportunistic infections; on the other hand, many chemotherapy drugs can cause significant liver damage. Several human clinical studies have looked whether AHCC® could limit these side effects, improve the patient's quality of life or even increase the efficacy of chemotherapy. One study followed the evolution of 269 hepatocellular carcinoma patients for up to 9 years after surgery; 113 of these patients took 3 g AHCC® per day all over the period. The AHCC®-treated group had a significantly longer no recurrence period and an increased overall survival rate than the control group (Matsui et al. 2002). Another study, involving 245 patients with gastric or colon cancer, gave similar results (Kawaguchi, 2009). A third study, with patients suffering from various types of cancer (colon, pancreas, lung,

ovary), focused on the reduction of chemotherapy adverse effects. AHCC® provided significant beneficial effects on hepatotoxicity and hematotoxicity; it also significantly improved several parameters related to global quality of life, including appetite loss and dyspnea (Ito et al. 2014).

Conclusion

AHCC® is one of the most researched immunomodulatory nutraceuticals, with close to 50 Pubmed references documenting its effects in various fields of medical science. As AHCC® works indirectly, by boosting the number and activity of immune cells, it shows a remarkably broad range of benefits with demonstrated efficacy in the fight against viral, bacterial, fungal infections as well as cancer cells. AHCC® has been used in more than 20 countries for more than 20 years, and has been proven to be safe and devoid of side effects.

Contact information

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References

- Chutaputthi et al., 2010. Presentation at the 18th International Congress on Nutrition and Integrative Medicine, July 2010, Sapporo, Japan.
- Ito et al., 2014. Reduction of adverse effects by a mushroom product, active hexose correlated compound (AHCC) in patients with advanced cancer during chemotherapy - The significance of the levels of HHV-6 DNA in saliva as a surrogate biomarker during chemotherapy. *Nut Cancer*, vol. 66(3), pp. 377-82.
- Kawaguchi, 2009. Improved survival of patients with gastric cancer or colon cancer when treated with active hexose correlated compound (AHCC): effect of AHCC on digestive system cancer. *Nat Med J.*, vol. 1(1).
- Kim et al., 2014. Effect of active hexose correlated compound (AHCC) in alcohol-induced liver enzyme elevation. *J Nutr Sci Vitaminol.*, vol. 60(5), pp. 348-56.
- Matsui et al., 2002. Improved prognosis of postoperative hepatocellular carcinoma patients when treated with functional foods: a prospective cohort study. *J Hepatol.*, vol. 37(1), pp. 78-86.
- Matsui et al., 2011. Active hexose correlated compound inhibits the expression of proinflammatory biomarker iNOS in hepatocytes. *Eur Surg Res.*, vol. 47(4), pp. 274-83.
- Miura et al., 2010. Basic and clinical studies on active hexose correlated compound. In *Biotechnology in functional foods and nutraceuticals*, CRC Press, Editors: Debasis Bagchi, Francis C. Lau, Dilip K. Ghosh. Part I pp.51-59.
- Roman et al., 2013. Short-term supplementation with active hexose correlated compound improves the antibody response to influenza B vaccine. *Nutr Res.*, vol. 33, pp. 12-17.
- Smith et al., 2014. Evaluation of active hexose correlated compound (AHCC) for the eradication of HPV infections in women with HPV positive pap smears. Presentation at the 11th Annual Meeting of the Society of Integrative Oncology, October 2014, Houston, Texas.
- Takanari et al., 2015. Effects of active hexose correlated compound on the seasonal variations of immune competence in healthy subjects. *J Evid Based Complementary Altern Med.*, vol. 20(1), pp. 28-34.
- Terakawa et al., 2008. Immunological effect of active hexose correlated compound (AHCC) in healthy volunteers: a double blind, placebo-controlled trial. *Nutr Cancer*, vol. 60, pp. 643-51.
- Yin et al., 2010. Effects of active hexose correlated compound on frequency of CD4+ and CD8+ T cells producing interferon-γ and/or tumor necrosis factor-α in healthy adults. *Hum Immunol.*, vol. 71, pp. 1187-90.