



**Fight Colds, Flu
& Other Infections
with AHCC**

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Introduction:

Fight Colds, Flu and Other Infections with AHCC

More than ever, people are interested in concrete steps they can take to protect themselves from colds, flu, and other infections. Growing concerns over global pandemics, combined with a higher incidence of deadly antibiotic-resistant Staph infections, are fueling increased interest in nutritional interventions and natural methods of boosting immunity.

One exceptional compound in this respect is AHCC (Active Hexose Correlated Compound), a bionutaceutical developed in Japan that has been extensively studied for its ability to stimulate immune response and protect against viral, bacterial and fungal infections.

I was first introduced to AHCC at a scientific conference in Sapporo, Japan, where several recent studies on this unique compound were presented. Impressed to learn that there were more than 25 well-conducted studies on AHCC published in prestigious scientific journals, I delved into the data.

What I found was nothing short of amazing. Here we have a safe natural compound demonstrated to be effective against numerous specific infections in animal models and shown to substantially improve immune response in human clinical trials. Yet few people outside of Japan know that such a product even exists! So I took it upon myself to write this book.

Information is power — particularly when it comes to your health. My mission in writing this book is to let you and your loved ones know about this important compound that can support robust immunity, not only during the cold and flu season, but all year long.



Viruses, Bacteria, Fungi: What's the Difference?

Viruses, bacteria, and fungi can all be pathogenic — meaning they all have the capability to make you sick. However, their nature is different.

Bacteria are single-celled organisms. Unlike the complex cells of plants and animals, bacterial cells have no nucleus and few organelles. Instead of replicating by sexual reproduction, bacterial cells simply grow bigger and then divide. *Streptococcus pyogenes*, *Mycobacterium tuberculosis* and *E. coli* are examples of disease-causing bacteria.

Viruses contain only two elements: DNA or RNA, surrounded by a protein shell. For years, viruses have perplexed scientists because they display several characteristics of living things, but lack some of the basic machinery needed for metabolic function. Viruses can't replicate on their own; they need to take over a host's cells to multiply. The common cold, swine flu and HIV are examples of disease-causing viruses.

Fungi encompass a large group of organisms, including yeast and mold. Like plants, fungi have cell walls, but instead of being made out of cellulose, they are made out of chitin. Some fungi replicate by fission, just like bacteria. Other fungi reproduce sexually. Athlete's foot, ringworm and *Candida* are examples of disease-causing fungi.

Despite their differences, viruses, bacteria, and fungi can all cause problems when they replicate inside you. When *E. coli* replicates, you get food poisoning. When the cold virus replicates, you get a cold. And when *Candida* replicates, you get a yeast infection.



Cold and Flu: A Modern Reality

If you're like most American adults, you get at least one cold per year — and more likely two or three. Children are even more susceptible, suffering an average of six to eight colds per year!¹ Colds can be mild, with manageable symptoms like a runny nose and sneezing, or they can hit hard, manifesting in head congestion, a wracking cough, and an extremely sore throat. While the common cold is a minor illness, the disruption it causes to normal life is a major inconvenience that most people would prefer to avoid.

Many of the symptoms of influenza are similar to those of a severe cold. But with the flu, these symptoms come on faster, are more intense, and last longer. And as you're probably all-too aware, the flu also has its own unique set of symptoms, like fever, headache, muscle aches, and chills and sweats. According to the Centers for Disease Control and Prevention, 5-20 percent of U.S. residents get the flu each year.² Because it is a more severe form of illness than the common cold, influenza can cause hospitalization and even death. In fact, every year, 36,000 Americans die from flu complications.³

Other Infectious Threats

While the **H1N1 influenza virus** (swine flu) isn't getting as much press as it did a year ago, the World Health Organization announced on July 20, 2010 that it has not declared an end to the global pandemic. Meanwhile, the deadly influenza H5N1 (avian or bird flu) remains a danger, with the New York Times reporting in 2008 that there is "tremendous concern that H5N1 poses an enormous pandemic threat."⁴

Health officials are also alarmed by the rise of deadly **MRSA** (methicillin-resistant *Staphylococcus aureus*) infections. Once occurring only in hospital settings, this antibiotic-resistant staph infection is now showing up in healthy people in the wider community.

And though not generally contagious, localized yeast infections, caused by overgrowth of the fungus **Candida albicans**, can be extremely uncomfortable, while invasive candidiasis (or systemic *Candida* infection) is a serious, sometimes-fatal condition characterized by fever, chills, and organ distress.

The Key to Good Health

While it may sound tempting, the answer to avoiding colds, flu and other infections isn't to stay at home with the doors locked. The fact is, germs are everywhere. The key to staying healthy and infection-free is to fortify your immune system so that it is better able to conquer the germs it encounters. That is the promise of AHCC.

What is AHCC?

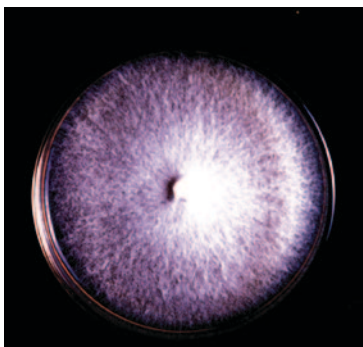
AHCC is an extract obtained from a hybridization of several subspecies of mushroom mycelia. A highly effective immuno-modulator, AHCC is used in over 1000 clinics worldwide and as a standard preventative regimen for all incoming patients to reduce the risk of hospital infections.

One of the distinguishing features of AHCC is its low molecular weight. While most medicinal mushroom extracts have a molecular weight of more than 200,000 daltons, AHCC is manufactured through a patented process that reduces its molecular size to under 5,000 daltons — increasing absorption and efficacy.

How AHCC Works

Interestingly, if you put AHCC in a test tube with a virus, a bacterium, or a fungus, it wouldn't do anything. AHCC is not directly anti-viral, anti-bacterial, or anti-fungal. So how does it work?

In the words of the Teiko University researchers, “The life prolongation of AHCC...is attributed to the enhancement of infectious resistance in the host.” Put simply, AHCC works by making your immune system work better.



Basidiomycetes Fungi

An Immune System Primer

The immune system's job is to protect you from harm. It is always scanning your body to determine if bacteria, viruses, toxins, parasites, and other pathogens have entered your system or if any of your cells have mutated and become abnormal.

You have two basic types of immunity: innate and adaptive. Your innate immunity launches an immediate, non-specific attack against a threat. Your adaptive immunity takes longer to kick in, but produces a specific response to a particular microbe.

Studies in humans and animal models have found that AHCC modifies both the innate and adaptive immune response, helping fight all kinds of infectious threats.

How AHCC Boosts Immunity

AHCC has been shown to increase:

- Cytokine production. Cytokines are chemical messengers that help immune cells communicate and coordinate an immune response. Animal and human studies have demonstrated that AHCC increases the production of cytokines, such as INF- γ and TNF- α .^{16,17}
- NK cell activity. NK cells are white blood cells (WBC) that recognize and destroy infected or abnormal cells by injecting granules into them, causing them to explode. Studies in cancer patients have found that 3 grams of AHCC per day for two weeks increased their NK cell activity by 200-300%.^{18,19}
- Macrophage populations. Macrophages are WBC that engulf and ingest bacteria and cellular debris. There is evidence that AHCC increases the populations of macrophages, in some cases doubling them.²⁰
- Dendritic cell (DC) numbers. DCs are WBC that present foreign substances to B and T cells, initiating an adaptive response. A double-blind clinical trial in healthy human subjects found that taking 3 grams of AHCC daily for 4 weeks significantly increased levels of DCs compared to placebo.²¹
- T cell numbers and activity. Part of the adaptive immune system, T cells are WBC that are able to recognize previous invaders and destroy them with a specific response. Several studies conducted at Yale School of Medicine, in both animals and humans, have shown that AHCC increases the amount and effectiveness of T cells.^{22,23}

AHCC Research

While there are plenty of nutritional supplements claiming immune-boosting properties, very few compounds have undergone rigorous scientific research, and rarely are products studied in response to actual infectious diseases. One notable exception is AHCC.

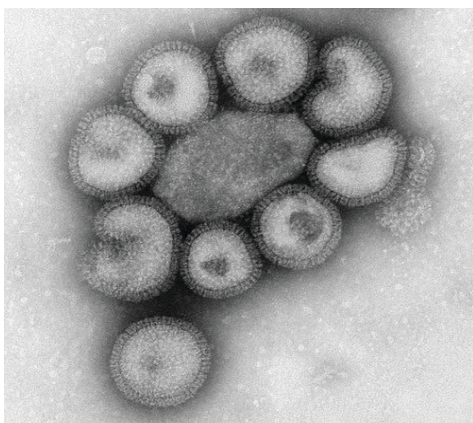
AHCC has been the subject of over 25 published studies by such prestigious institutions as Harvard Medical School, Yale University School of Medicine, and Drexel University. These studies have shown that AHCC modulates the immune response against a variety of pathogens.

Because it is difficult to conduct well-controlled clinical trials on infectious agents — it would be unethical to inject humans with a pathogen and then see how they respond — animal research provides the best way to study how AHCC boosts immunity in response to viruses, bacteria, and fungi. The results of such research on AHCC are detailed on the next few pages.

AHCC against Viruses

AHCC Fights the Common Flu

In 2006, the first study to investigate the effects of AHCC against viral infection was published in the prestigious *Journal of Nutrition*.²⁴ Researchers divided young mice into two groups. One group was orally administered 1 gram of AHCC per every kilogram of body weight (1 g/kg) daily for one week. The other group, which served as controls, was administered distilled water. Subsequently, all the mice were infected with influenza A (H1N1), a common flu virus, and continued to receive AHCC treatment.



Influenza Virus
image courtesy of CDC/ Dr. F. A. Murphy [via pingnews].

After ten days, AHCC had shown its anti-viral power. AHCC decreased the severity of infection, shortened recovery time, and increased survival rate. In fact, AHCC slashed the death rate from 25% to just 5%.

AHCC Fights West Nile Virus

Researchers at Colorado State University recently examined AHCC's ability to boost resistance in response to the West Nile virus, which can cause inflammation of the brain and result in permanent neurological damage. In this study, published in *The Journal of Nutrition* in 2009, one group of mice was orally administered 600 mg/kg of AHCC every other day for one week before infection, as well as at days 1 and 3 post-infection. The control group received distilled water. The mice were infected with a lethal dose of the West Nile virus.

Four weeks after being infected, the viral load of mice administered AHCC was 19% lower than that of control mice. Even more impressive, the survival rate of the AHCC-treated mice was more than twice that of the controls: 54% compared to 21%. Additionally, blood analysis showed that AHCC increased the production of antibodies specific to the West Nile virus — essential in helping the immune system protect itself from infection.

AHCC against Bacterial Infections

A major health threat today is the emergence of antibiotic-resistant bacteria or “superbugs.” According to a recently published study in the *Journal of the American Medical Association*, superbugs killed nearly 19,000 Americans in 2005 — more than HIV/AIDS. Spreading quickly throughout hospitals and nursing homes, drug-resistant strains of *Klebsiella pneumoniae* and MRSA (methicillin-resistant *Staphylococcus aureus*) are now responsible for more than twice as many infections as previously thought.

AHCC Fights K. Pneumoniae

Several studies have been undertaken to test AHCC’s ability to fight bacterial infection in an animal model. Three of these studies used *K. pneumoniae*, a potentially lethal bacteria and a frequent cause of hospital-acquired infections, as the test bacteria.^{27,28,29} In each case, mice were supplemented with either AHCC or placebo both pre- and post-infection, and they were infected with either a sub-lethal or lethal dose of the bacteria.

In every case, AHCC-treated mice were better able to clear bacteria from their systems and were more likely to survive than controls. In fact, one study found that mice pretreated with AHCC before infection with *K. pneumoniae* had completely cleared the bacteria from their systems by day 6, whereas control mice suffered from increased levels of the bacteria and became extremely sick.³⁰ The researchers concluded that “AHCC appears to induce an early activation of the immune response, leading to an effective clearance of bacteria and rapid recovery.”

AHCC Fights Pseudomonas Aeruginosa

Another study undertaken to test AHCC’s ability to fight bacteria used *P. aeruginosa* as the infectious agent.³¹ *P. aeruginosa* is an opportunistic infection that frequently occurs in patients with compromised immunity. It is a serious infection: 50% of people who contract it die. In this study, scientists at the Teikyo University School of Medicine in Japan researched the effects of varying dosages of AHCC — administered both orally and by injection — on *P. aeruginosa* infection in immune-compromised mice.

AHCC dramatically increased survival rate. While mice administered 500 mg/kg of AHCC by injection survived an average of 14 days post-infection, the poor control mice, which had received injections of distilled water, survived just 3 days. Mice given 1,000 mg/kg of AHCC orally showed similar benefits. Once again, the control mice only survived 3 days post-infection. But 6 out of 8 mice receiving oral AHCC lived for a full two weeks.

AHCC Fights MRSA

The same researchers also studied AHCC's ability to fight MRSA — a sometimes-fatal antibiotic-resistant Staph infection that can penetrate the bones, joints, heart, and lungs. Once again, varying dosages of AHCC, administered both orally and by injection, were studied in response to MRSA infection. At a dosage of 500 mg/kg by injection, AHCC significantly prolonged survival.



AHCC against Fungal Infections

AHCC Fights *Candida Albicans*

In addition to studying AHCC's ability to fight bacterial infection, the researchers at Teikyo University School of Medicine also tested AHCC against *Candida albicans*. Normally, this fungus happily inhabits the mouth and digestive tract. It only becomes a problem when it overgrows. Overgrowth of *Candida* in the mouth causes thrush; overgrowth in the vagina causes yeast infections. If *Candida* enters the bloodstream — which may occur in surgical patients, hospitalized patients, or people whose immunity is compromised — it can cause a systemic infection that may lead to organ failure and death.

In the present study, immune-compromised mice were treated with AHCC for 4 days, either orally or by injection, prior to being infected with *Candida*. Once again, AHCC proved its anti-microbial ability. Whereas all the control mice died within 7 days of being infected, 8 out of 10 that received 500 mg/kg of AHCC by injection survived for 28 days. Amazingly, when the number of yeast cells in the mice's kidneys was counted 3 days post-infection, the AHCC mice had just 1/100th the amount of yeast as the control mice. Oral administration of 1,000 mg/kg of AHCC also significantly extended survival time.

AHCC and Vaccination

AHCC Boosts Immune Response to Flu Vaccine

Vaccines are given in order to improve a person's immune response to a particular disease. Therefore, anything that can contribute to a heightened immune response is highly valuable. A recent randomized, double-blind, placebo-controlled human clinical trial investigated whether AHCC could improve the immune response in healthy individuals receiving a seasonal flu vaccine.

All 29 participants in the study received the flu vaccination; however, for two weeks afterwards, half of them took an AHCC supplement (providing 3,000 mg AHCC daily), while half of them were given a placebo. (Neither group knew which treatment they were receiving.)

The researchers took a sample of all the subjects' blood on the day of vaccination and again two weeks after taking their respective pills. The blood samples showed that, compared to those in the placebo group, the people in the AHCC group had a heightened immune response. They had significantly higher increases in percentages of T cells, specifically CD8+ T (cytotoxic) cells, and a subset of NK cells that produce cytokines in response to the flu vaccine. The effect was particularly dramatic in adults over 60 years old, the population most vulnerable to influenza.

The researchers concluded, "This suggests that short-term AHCC supplementation may be a good therapeutic intervention to sustain, or increase, the immune response to influenza vaccination in healthy subjects."



Researched Benefits of AHCC Against Infection

The animal research conducted to date has clearly shown that AHCC modulates the immune response against a variety of infectious agents, including viruses, bacteria, and fungi. Specifically, AHCC has demonstrated the following benefits:

- Early activation of the immune response
- Decreased susceptibility to infection
- Decreased severity of infection
- Shortened recovery time
- Reduced bacterial and viral load
- Increased ability to clear viruses and bacteria from the system
- Increased survival rate after infection

Safety

AHCC is extremely safe. It is derived from a hybridization of several subspecies of mushroom mycelia, which have been used as food since ancient times. Animal studies show very low toxic potential in both acute dose and long-term studies. And most importantly, in observations of thousands of patients in hospitals and clinical trials, no significant adverse events have been noted with the use of AHCC.

In 2007, a Phase 1 study on the safety of AHCC was conducted in healthy human volunteers. The subjects took 9 grams of AHCC per day — 3 times the recommended therapeutic dosage — for 14 days. There were no significant adverse events reported and no clinically significant changes in any parameter of laboratory data (blood pressure, pulse, white blood cell count, etc.).

Dosage Recommendations

Studies testing AHCC against infectious agents in animals have shown a benefit at dosages of above 500mg/day when translated into human dosage based on weight. Many human studies have shown profound immune activation at dosages of 3 grams per day.

In general, the recommended daily dosage of AHCC is 1 gram per day for immune system maintenance and 3 grams per day when fighting infection. AHCC should be taken twice daily on an empty stomach (30 minutes before a meal or 2 hours after a meal) for the best absorption. However, AHCC is well absorbed even when taken with a meal.

Conclusion

We live in a world full of germs. Every day, we are exposed to a variety of infectious agents — in our homes...at work...in the grocery store...at the playground...anywhere life is, germs are.

Increasingly, there has been a trend to try to kill the germs in our external and internal environments, hence the increase in anti-bacterial soaps and the over-prescription of antibiotics. Unfortunately, trying to eradicate all germs is a losing battle and only results in the development of “superbugs.” The real answer to staying well in a world of germs is not to kill them but to develop stronger resistance to them.

What is so appealing about AHCC is that, as a natural biological response modifier, it increases the body’s immune response so it is better able to resist infection. And, unlike most nutritional supplements that claim to boost immunity, AHCC has been the subject of rigorous scientific research in response to actual infectious agents.

Whether you are tired of getting sick every winter, or you want to boost your resistance against more serious health threats, there is no other immune supplement with the scientific backing and efficacy of AHCC.



References

1. American Lung Association. Cold and flu guidelines: The common cold. http://www.lungusa.org/site/c.dvLUK9O0E/b.35873/k.A28F/Cold_and_Flu_Guidelines_The_Common_Cold.htm
2. Centers for Disease Control and Prevention. Key facts about seasonal influenza (flu). Sept. 8, 2009. <http://www.cdc.gov/flu/keyfacts.htm>
3. CDC, 2009.
4. A.D.A.M Avian influenza. The New York Times. Nov. 9, 2008. <http://health.nytimes.com/health/guides/disease/avian-influenza/overview.html>
5. Aviles H, 2008.
6. Yin Z, et al. Determining the frequency of CD4+ and CD8+ T cells producing INF- γ and TNF- α in healthy elderly people using flow cytometry before and after active hexose correlated compound (AHCC) intake. Unpublished study.
7. Ghoneum M. NK-Immunomodulation by active hemicelluloses compound: (AHCC) in 17 cancer patients. Adjuvant Nutrition in Cancer Treatment Symposium, Tulsa OK. Nov. 6-7, 1992.
8. Ghoneum M, et al. Immunomodulatory and anticancer effects of active hemicelluloses compound (AHCC). *Int J Immunother* X1. 1995;1:23-28.
9. Kenner, Dan. AHCC: Active Hexose Correlated Compound. Pleasant Grove, Utah: Woodland Publishing, 2001.
10. Terakawa N, et al. Immunological effect of active hexose correlated compound (AHCC) in healthy volunteers: A double-blind, placebo-controlled trial. HYPERLINK "javascript:AL_get(this,%20'jour',%20'Nutr%20Cancer.');" *Nutr Cancer*. 2008;60(5):643-51.
11. Gao Y, et al. Active hexose correlated compound enhances tumor surveillance through regulating both innate and adaptive immune responses. *Cancer Immunol Immunother*. 2006 Oct;55(10):1258-66.
12. Yin Z. Unpublished study.
13. Ritz BW. Supplementation with active hexose correlated compound increases the innate immune response of young mice to primary influenza infection. HYPERLINK "javascript:AL_get(this,%20'jour',%20'J%20Nutr.');" *J Nutr*. 2006 Nov;136(11):2868-73.
14. Wang S, et al. Oral administration of active hexose correlated compound enhances host resistance to West Nile encephalitis in mice. HYPERLINK "javascript:AL_get(this,%20'jour',%20'J%20Nutr.');" *J Nutr*. 2009 Mar;139(3):598-602. Epub 2009 Jan 13.
15. Sack, Kevin. Bacterial infection killed almost 19,000 in 2005. The New York Times. Oct. 17, 2007. <http://www.nytimes.com/2007/10/17/health/17iht-17infect.7922389.html>
16. Aviles H, et al. Active hexose correlated compound activates immune function to decrease bacterial load in a murine model of intramuscular infection. *Am J Surg*. 2008 Apr;195(4):537-45.
17. Aviles H, et al. Active hexose correlated compound (AHCC) enhances resistance to infection in a mouse model of surgical wound infection. HYPERLINK "javascript:AL_get(this,%20'jour',%20'Surg%20Infect%20(Larchmt).');" *Surg Infect (Larchmt)*. 2006 Dec;7(6):527-35.
18. Aviles H, et al. Active hexose correlated compound enhances resistance to *Klebsiella pneumoniae* infection in mice in the hindlimb-unloading model of spaceflight conditions. HYPERLINK "javascript:AL_get(this,%20'jour',%20'J%20Appl%20Physiol.');" *J Appl Physiol*. 2003 Aug;95(2):491-6.
19. Aviles H, 2008.
20. Ishibashi H, et al. Prophylactic efficacy of a basidiomycetes preparation AHCC against lethal opportunistic infections in mice. *Yakugaku Zasshi*. 2000 Aug;120(8):715-9.
21. Ishibashi H, 2000.
22. Ishibashi H, 2000.
23. Spierlings EL, 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*. 2007;53:536-539.

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