

# **Effect of Chaga Mushroom as a Natural Immune Modulator on Upper-Respiratory Tract Infections (URTIs) and Psychological Mood State**

*Eevia Health study conducted in collaboration with Dr. Shawn M. Talbott and GLH Nutrition, November 17, 2021*

## **Background**

Heavy exercise or intense training may increase susceptibility to upper respiratory tract infections (URTI) (Nieman et al., 1990; Peters and Bateman, 1983; Spence et al., 2007). Heavy exercise is a physical stressor that results in measurable immune challenges with reductions in key immune system components such as neutrophils, natural killer cells, T cells, and B cells (Mackinnon and Hooper, 1994; Nieman et al., 1995; Ostrowski et al., 1998). Athletes are particularly susceptible in the one-to-two-week recovery period after competitive endurance events, partially due to elevations in hormones that coordinate the stress response (Peters and Bateman, 1983). The net effect of an ongoing immune challenge is a weakened immune system, which often results in URTI and a detrimental impact on psychological mood state.

Exercise stress is similar to other stressors, such as psychological stress, possibly leading to a weakened immune system and increased susceptibility to URTI and other disease states (Mackinnon, 1997). Although regular exercise is generally regarded as a buffer against many detrimental effects of stress, psychological stress can also result from prolonged training and competition – in both elite and recreational athletes – with noticeable deteriorations in mood state during intense training periods and before and after endurance events (Achten et al., 2004; Hassmen and Blomstrand, 1991). Lifestyle factors, such as coping with daily stress, may influence the immune response to exercise (Konig et al., 2000). Several researchers (Cohen et al., 1999; Glaser et al.,

1999) have observed reductions in immune cell populations, lowered antibody production, and altered cytokine response due to psychological stress.

A variety of intervention techniques can be used to ameliorate psychological and physical stress, such as administering selective dietary supplements containing immune-modulating compounds (Akerstrom and Pedersen, 2007; Nieman and Bishop, 2006; Peters et al., 1993). In ultra-marathon runners, 600mg of vitamin C, taken 21 days before and 14 days after a 90 km race, reduced URTI symptoms (Peters et al., 1993). Biological response modifiers such as beta-glucan enhance the innate immune response (Luhm et al., 2006; Niederman et al., 2002), helping the prime immune system function during and following various forms of chronic stress.

## **Study Summary**

The study was conducted in the U.S. by recruiting 40 healthy subjects to participate in a research study investigating the effects of dietary supplementation for one month with Chaga (N=20) that may be immunomodulatory for improving immune system vigilance and psychological stress versus Placebo (N=20).

Mushrooms, particularly Chaga, have a long history of use in traditional medicine for supporting general well-being. An abundance of in-vitro evidence suggests that a wide range of mushroom bioactives may modify immune vigilance, including promising preliminary research in humans.

To “stress and suppress” the immune system of volunteers, participants trained for and completed a strenuous endurance running event (half-marathon to marathon distance) to induce physical and mental stress. The aim was to create a “susceptibility window” whereby a higher risk for upper-respiratory tract infections (URTIs) is more likely to be observed in the control/placebo group. We hypothesized that the group(s) supplementing with

Chaga as a natural immune modulator would demonstrate fewer URTI symptoms and lower mental/physical stress markers.

Stress-related immune alterations can be consequential for health; they can enhance susceptibility to infectious agents and influence the severity of infectious disease, diminish the strength of immune responses to vaccines, reactivate latent viruses, and slow wound healing. Furthermore, stressful events and negative emotions promote systemic proinflammatory cytokine production while reducing the beneficial production of proinflammatory cytokines that are important for systemic immune protection.

Several laboratory and animal studies have demonstrated immune modulation of Chaga via effects on hematopoietic stem cells, lymphocytes, macrophages, T cells, dendritic cells (D.C.s), natural killer (NK) cells, and a variety of cytokines (IFN, IL-2, TNF-alpha, IL-6, and others).

Rather than being “immune-boosters” to stimulate immune system activity, Chaga may be considered a natural “immune-modulator” that can help balance overall immune system activity. Such natural substances represent an emerging approach to immunotherapy that either elevates a suppressed immune system “up” to optimal – or calms an over-activated immune system “down” to optimal – in a paradigm that we refer to as “priming” the immune system. An adequately primed immune system “pays attention” to factors that it should fight (e.g., viruses, bacteria, cancer cells, etc.) while “ignoring” factors that should be considered non-harmful (e.g., pollen, mucus membranes, joint cartilage, etc.).

In this study, we report the effect of supplementing with Chaga for four weeks on long-distance runners’ physical and psychological well-being. The current study employed a series of subjective self-assessment questionnaires that addressed overall health status and URTI symptoms. In addition to evaluating

subjects for physical health, a psychological assessment known as the Profile of Mood States (POMS) was conducted to assess mood state. We also collected objective markers of microbiome balance (*Streptococcus thermophilus*) and stress hormones (salivary cortisol). These two markers are associated with immune system vigilance and psychological mood state, representing a possible mechanism by which immune function and psychological mood state are related.

## **Results**

Following four weeks of supplementation with Chaga Mushroom (three weeks before and one week following an intense endurance run), we observed the following differences between the Supplement and Placebo groups:

### *Subjective Measures*

- Self-Reported URTI Symptoms (total number of symptoms reported such as cough, sore throat, sniffles, stuffiness, etc.) were 51% lower.
- Global Mood State (e.g., “overall well-being”) was 10% higher.

### *Objective Measures*

- *Streptococcus thermophilus* was 61% higher (suggesting improved immune system regulation).
- Cortisol was 30% lower (a primary stress hormone related to both mood and immune function).

These results demonstrate a meaningful benefit of Chaga Mushroom for the immune system as both a “shield” (protection from viruses) and as a “communication organ” (signaling wellness between body and mind and resulting in higher psychological mood states). This linkage between body and mind across the Gut-Brain-Axis involves many aspects of a coordinated and

interconnected communication system linking the gut microbiome (*S. thermophilus*) to the brain (psychological mood state) across the axis (immune and stress response pathways). When the entire system is balanced, as evidenced in the Chaga group, there is a noticeable benefit for physical health and mental wellness.

## **Discussion**

During the 4-week treatment period (three weeks before and one week after an intense endurance run), subjects in the Supplement group reported fewer URTI symptoms, better overall health, and a more positive mood state than Placebo. In addition, supplemented runners also showed higher *Streptococcus thermophilus* (*S. thermophilus*) levels and lowered stress hormone exposure (cortisol), both associated with immune vigilance and psychological mood state.

Runners and other athletes, whose athletic activities cause significant physical stress, are more susceptible to URTI, and many studies have reported that nutritional supplementation can modulate their health status (Nieman et al., 1990; Nieman and Bishop, 2006; Peters and Bateman, 1983; Peters et al., 1993; Spence et al., 2007).

In this study, Chaga, a commercially available dietary supplement, reduced the incidence of URTI symptoms and positively impacted mood state as measured by the POMS assessment. Chaga participants reported both fewer URTI symptoms and better overall health status. The URTI symptoms reported by subjects are typical of cold and flu symptoms and analogous to symptoms reported in other studies (Cohen et al., 1999; Konig et al., 2000).

Physical and psychological factors of subjects undergoing stressful situations may increase URTI (Cohen et al., 1999; Konig et al., 2000). In all cases, the subjects supplemented with Chaga experienced better physical health and a

significantly improved psychological status (Global Mood State) than those in the placebo group.

Previous research reported that athletes training for a marathon experience a deterioration in global mood state (Achten et al., 2004; Hassmen and Blomstrand, 1991). The POMS assessment for psychological health strongly supported and mirrored the physical health assessment. Illness and stress impact the immune system physically and psychologically (Konig et al., 2000; Strasner et al., 2001). The POMS methodology has been used in more than 2,900 studies (McNair et al., 1971); thus, it has well-established validity. The survey instrument employs 65 adjective-based scales scored by subjects without knowing how the scale scoring will be analyzed. The POMS survey instrument assesses subjects' overall global mood state – analogous to a measurement of general well-being and mental resilience.

These results add to the growing scientific literature and natural armamentarium for immune-modulation to reduce URTI symptoms and improve psychological mood state in “stressed” individuals (endurance athletes in this study). Previous work has shown benefits of beta-glucan for improving overall immune function (Hetland et al., 1998; Hong et al., 2004; Kernodle et al., 1998; Vetvicka et al., 2002; 2008); antibacterial effects (Kernodle et al., 1998) and anti-tumor properties (Hong et al., 2004; Vetvicka et al., 2008). Other dietary supplements may reduce URTI symptoms (Cox et al., 2008; Kekkonen et al., 2007; Peters et al., 1993). Zinc treatment reduced the duration and severity of cold symptoms (Prasad et al., 2000); probiotics (*Lactobacillus fermentum*) reduced the severity and duration of URTI in athletes (Cox et al., 2008). Vitamin C supplementation in ultramarathoners reduced the duration and severity of URTI when taken 21 days before an ultramarathon (90 km) (Peters et al., 1993).

## **Conclusion**

In this study, Chaga significantly decreased URTI incidence and improved psychological mood state compared to Placebo.

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