Beta 1-3, 1-6,Glucan:
Extraordinary Immune Support

Latest human research:

April 28th 2014 *- the most recent research confirms the safety,efficasy and immunomodulatory effect of beta-glucan 1-3, 1-6 in humans -* ***Click here for the study.***

A clinical human trial Published ***January 23rd 2013*** *in the* ***European Journal of Nutrition,*** *based on a double-blind, randomized, placebo-controlled, multicentric study in healthy subjects, suggests beta-glucan 1-3, 1-6 helps prevent colds, improves symptoms and increases the body's potential to defend against invading pathogens:*
Click for Study Details *Further References listed below.*

A new nutritional product called **beta-1-3, 1-6-glucan** is one of the most exciting things happening today in the field of nutritional supplements.

Obtained from purified yeast, beta-1-3-glucan has a long scientific history and a reference list including literally hundreds of papers. Research originated in the 1940's when Pillemer and his colleagues described a crude yeast cell wall preparation, Zymosan. They reported that this material was able to stimulate nonspecific immunity[1]. It was unknown at that time which element of this composition, containing a relatively crude mixture of proteins, lipids and polysaccharides, actually activated the immune response.

The answer came later in the 60's, when Dr. Nicholas DiLuzio at Tulane University experimented with beta-1-3-glucan[2] . In the late 1980's Dr. Joyce Czop, at Harvard University, described the mode of action of this material in stimulating the immune system: there is a specific receptor for beta-1-3-glucan on the surface of certain cells, called macrophages[3] that when activated, stimulate a cascade of events turning the body into "an arsenal of defense".

Macrophages play an essential and pivotal role in the initiation and maintenance of the immune response. From an evolutionary point of view, the macrophage is the oldest and most consistently preserved immunologically competent cell known. Not only humans and higher animals, but primitive invertebrates such as Hydra, which have no other immunological effector cells, have macrophages. In order to function immunologically, the macrophages must pass through a state of activation which involves certain morphological changes but also, most importantly, a whole sequence of metabolic changes which result in the production of series of so-called cytokines which act as internal regulators of the immune system. Activation can be initiated by a variety of different stimuli, such as endotoxin, bacteria, viruses or chemicals which can be too toxic or pathogenic to be useful. Beta-1-3, 1-6-glucan is not only orally effective, completely non-toxic and safe, but is one of the most potent stimulators of the immune response.

Considerable attention has been recently given to Aloe Vera extract, which was found to carry one of the macrophage activating polysaccharides, mannan or polymannose. While mannan has some macrophage activating potential, it is very slight compared to that of glucan[4]. There are several different glucans with different levels of activity, the most active of which is beta-1,3-glucan from the cell wall of yeast. A three dimensional model of this molecule shows it to be a helix, and the research at Harvard has shown that there exist, on the macrophage cell membrane, receptors for a small number of residues, approximately seven[5] . The fact that such a small number of glucose units can activate this receptor is very remarkable. What is more remarkable still, is that there should be a specific receptor for this sort of polysaccharide chain on the surface of the most ancient sugar cell in the immune cascade.

There is now evidence to show that glucan is, from an evolutionary point of view, the most widely and most commonly observed macrophage activator in nature[6]. The same enhancing mechanisms have been found in all branches of the animal, bird, fish and plant kingdoms[7,8].

The activated macrophages is a veritable powerhouse in terms of activity. Not only can a macrophage recognize and kill tumor cells non-specifically, as well as removing foreign debris, but it can produce a number of essential cytokines that are able to stimulate the immune system in general and boost bone marrow production. Individuals, who by reason of age and other factors, such as chronic infection or poor nutrition, have a compromised immune defense system, are liable to all of the following problems: arthritis, reduced wound healing capacity, reduced bone marrow proliferation with resulting lowered white cell counts and anemia, increased incidence of cancers, increased incidence of all kinds of viral, fungal, and bacterial infection. It is well understood that one of the main elements of the aging process is a lowering of effectiveness of the immune function[9,56,57] : all the problems mentioned above occur in old age. In addition, during ordinary living, the chances that the immune system is impaired may be surprisingly high.

Not only environmental influences like UV radiation, electro-magnetic fields, food preservatives and antibiotics can cause temporary immunosuppression but also stress and heavy physical exercises have these negative effects. It is well-documented that after heavy exercise, generally healthy athletes frequently suffer from influenza or pneumonia because of the depressive effect on their immune system[10]. The same immunosuppression is observed in people under physical or emotional stress and in patients with stress-related diseases, such as coronary disease. Under these influences the number of macrophages available are reduced and unable to participate in the immune cascade which causes even deeper immunosuppression. Beta-1-3 1-6-glucan has been proven to both stimulate and activate macrophage cells[11] which will counter these negative effects.

In the 1970's after extensive studies in animals, human experiments with glucan began. Dr. Peter Mansell reported that after injection of glucan into subcutaneous nodules of malignant melanoma they resolved within a few days. When the biopsy of the injection sites were done no evidence of melanoma was found, just a collection of obviously activated macrophages[12].

A follow up of that study was to treat a number of women with recurrent malignant ulcers of the chest wall following mastectomy and radiation for breast cancer. After an application of glucan in a vehicle these normally very indolent ulcers healed completely. Subsequently, the same material had been used in the therapy of large pressure ulcers at the New Orleans Charity Hospital with complete resolution of the ulcers, some of which went down to the sacrum. An unexpected benefit was the complete lack of infection and the rapidity of the reappearance of normal skin[13].

The first human study on this specific glucan's systemic effect was done in the mid1980's on advanced HIV infection. Even in these deeply immunologically deficient individuals, an increase in serum cytokines IL-1, IL-2 and Interferon was measured[14]. Results of another clinical trial showed significant mortality decrease from infectious complications in severe trauma patients[15].

At that time a crude preparation containing beta-glucan was already registered in Eastern Europe for injection in patients for treatment of the effects of bone marrow suppression from radiation or chemotherapy. In contrast to the crude mixture called Zymosan, beta-1,3-glucan, a substance that is highly purified and active when taken by mouth, is effective in very small dosages[11].

One of the most remarkable oral studies with beta-1,3-glucan was done at the US Armed Forces Radiobiology Institute. **In a well controlled study, 70% of rats given a lethal dose of radiation were completely protected from radiation effects when given a dose of yeast beta glucan by mouth AFTER the radiation[16].** Dr. Myra Patchen discovered that beta-glucan is also a free radical scavenger. It is able to protect blood macrophages from free radical attack during and after the radiation allowing these cells to continue to carry their important functions in the irradiated body and release factors important to the restoration of normal bone marrow production[17].

In the light of what we know about free radicals today and their potential to accelerate aging, cause cancer and other diseases, this particular effect of beta-1,3-glucan is especially important. Free-radical scavenging assays were repeated in different models and which confirmed the antioxidant effect[18].
Recent experiments completed at Baylor College of Medicine in the laboratory of Professor Phil Wyde also prove the oral effectiveness of beta-1,3-glucan to stimulate nonspecific immunity[11]. Peritoneal macrophages doubled their phagocytic activity in mice fed with beta-1,3-glucan. This systemic effect of oral application of beta-1,3-glucan is comparable to that achieved using injections, which makes this material a unique and very valuable oral immunostimulant.

When beta-1,3-glucan was added to antibiotic regime in animals challenged with different bacterial (Staphylococcus aureus, Klebsiella pneumoniae, Escherichia coli and others) and viral (Herpes virus) pathogens, a reduced amount of antibiotics or antivirals was needed to cope with the infection[11]. It also has an antifungal effect, shown in experiments with Candida albicans[11]. Such a broad anti-infective spectrum of beta-glucan can be explained only by the fact that the immunostimulation produced by this unique material is non-specific.

Continuing research with oral application of beta-1-3-1-6 glucan revealed that it increases the effectiveness of other oral cholesterol-reducing agents, such as Niacin and Lopid[19]. Interestingly, recent research has also demonstrated the anti-diabetic effect of IL-1 cytokine, which increases insulin production resulting in lowering of blood glucose level[20]. Macrophages are the main source of IL-1 in the body and it's production can be boosted by beta-1,3-glucan supplementation. Mindful of the

extremely high rate of atherosclerotic complications and the extraordinary requirement for antioxidants in diabetic patients, beta-1,3-glucan is an obvious adjuvant for an improved lifestyle in these conditions.

As is repeatedly shown in the multitude of studies concerning the activity of beta glucan as an immune stimulator, or perhaps more descriptive, a "biological defense modifier", there are enormous benefits to be obtained by the use of beta-1,3-glucan as a nutritional supplement. The aging process has been defined as "the sum total of life's physical embarrassment due to adverse conditions"; in this regard, beta-1-3-glucan may well be the first and only true anti-aging supplement. **It is defensive to negative events such as infection, tumors and radiation damage and adjunctive to the positive effects of antioxidants, lipid balance enhancers, antibiotics and other therapeutics.** The result is improved general health which means more enjoyment of life, less infirmities, less time and money required for medical needs and potentially dramatic savings in Medicare and other health related expenditures over time.

Beta-1-3,1-6-glucan is effective in all mammals as it is in fish and birds. It successfully prevents vibriosis, yersiniosis and furunculosis in Crustacea when it is added to the feed[7,21,22]. The new devastation of the shrimp farm, the Taura Syndrome, which has been recently identified as viral disease, causes high mortality with survival of less than 20% of the shrimp farm population. Feeding shrimp with beta-1,3-glucan increases their survival rate up to 90%[23].

Beta-1-3, 1-6-glucan basically is a highly purified form of a food product. Technically it is a polysaccharide molecule completely made with glucose. Glucose is a simple saccharide that the body transforms to energy as ATP and stores in muscles, liver and other tissues in a form of glycogen. Beta-glucan is different from energy-storing glucose-containing polysaccharides because the connection between the glucose units is different, more specifically, it is the beta-1,3-linkage, which makes this compound so unique. It is Generally Recognized As Safe (category GRAS according to FDA) and has no toxicity or side effects[24].
To summarize, beta-1-3, 1-6-glucan is a safe and very potent nutritional supplement with a systemic effect that can be described as non-specific immune stimulation combined with it's free-radical scavenging activity. Some of the biological events illustrating this stimulation are:

- Activation of macrophages, expressing increased nonspecific phagocytic ability allowing macrophages to destroy pathogens more efficiently, frequently preventing disease.
- Release of important cytokines, such as IL-1, IL-2 among others, initiating immune cascade and triggering other cell lines, such as T-cells. Release of colony-stimulating factors, boosting bone marrow production.
- Cholesterol-reduction through cell activation and anti-oxidant activity.

Groups of people that are considered to benefit from beta-1-3, 1-6-glucan supplementation:

1. People with impaired immunity from any cause including but not restricted to HIV infection; people with high occurrence of infectious diseases, tumors and undergoing chemotherapy and radiotherapy; age 40+ when the natural aging process starts to slow down immune reactivity, geriatric patients, and others with a compromised immune response.
2. People that are possibly can be affected by extra free-radical production caused by external sources: ones frequently exposed to low-dose radiation, including sun light, other types of exposures such electromagnetic fields; lack of raw fruits and vegetables in diet and eating preserved food. Extra free-radicals can also be a result of a chronic disease such diabetes or chronic inflammation.
3. People who exercise excessively, professional and amateur athletes as well as people who workout intensively and also those under physical or emotional stress who have a temporary immune deficiency which can result in infection. Beta-1,3-glucan will provide them with nonspecific immunostimulation that can increase their resistance to illness.
4. People with high risk of atherosclerosis should definitely add beta-1,3-glucan to their diet whether they are taking cholesterol-reducing drugs or not. Macrophage activation will not only help to draw extra cholesterol from the blood but it also can prevent further plaque formation on the arterial walls and phagocytize existing plaque which is recognized as a foreign body.

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