BETA GLUCAN

THE BEST FROM NATURE

by

Vaclav Vetvicka, Ph.D.

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What is Glucan?

From the chemical point of view, glucans are polysaccharides of glucose monomers linked by glycosidic bonds. Beta-glucans (β-glucans) comprise a group of β-D-glucose polysaccharides naturally occurring in the cell walls of cereals, yeast, bacteria, and fungi, with significantly differing physicochemical properties dependent on source. Typically, β-glucans form a linear backbone with 1-3 β-glycosidic bonds but vary with respect to molecular mass, solubility, viscosity, branching structure, and gelation properties. Some β-glucan molecules have branching glucose side-chains attached to other positions on the main D-glucose chain, which branch off the β-glucan backbone. In addition, these side-chains can be attached to other types of molecules, like proteins.

Generally, glucans are natural polysaccharides, existing in numerous molecules of glucose (so called D-glucose units) bound together in several types of linkages. Based on these linkages, we can recognize 1,3 glucans or even 1,3/1,6 glucans. In addition to those glucans, 1,2 or 1,4 glucans also exist, but their biological role is significantly less studied and known.

When people started studying biological effects of glucans, they found significant activities, but had no clue about the responsible cells or even the mechanisms. Therefore, the name "biological response modifier" or even "nonspecific immunomodulator" appeared, reflecting lack of knowledge. However, as I will explain and describe later, the important aspect is the activity and not the name.

Short History of Glucans

The first studies were focused on zymosan. Zymosan is primarily a potent stimulator of alveolar macrophages, and among others induces the release of a series of cytokines, first of all IL-8, from human neutrophils. Even though zymosan was able to stimulate nonspecific immune response, it was not clear which of its components was responsible for that activity. Actually, zymosan is not a pure polysaccharide but rather a crude insoluble product which contains about 50% of β-glucan and approximately 17% of mannan, 14% of a protein, and some ballast substances. Detailed investigation led to the conclusion that the active component, responsible for the primary effect of zymosan, is glucan. Probably the first attempt to compare physiological effects of pure β-glucan and zymosan was done by a team from Tulane University in New Orleans, headed by Nicholas DiLuzio. This polysaccharide forms a substantial part of the cell walls of yeast. From the point of view of immunological functions, it is important that β-glucan, except for some harmless yeasts, is also an obligate component of the cell wall of human pathogenic fungi. This is the main reason immune reactions trigger after contact of β-glucan with the proper receptor on certain immune cells (macrophages, monocytes, dendritic cells, neutrophils).

There are various natural sources of glucans; it can be isolated from yeast, mushrooms, seaweed, bacteria, various grains, and even protozoa. However, there are three main sources: mushrooms, yeast, and grain. Historically, the Western civilization has consumed both bread and beer for centuries; therefore, there is a significant surplus of yeast. Similarly, the Far East is known for adding mushrooms to the regular diet and various mushrooms are part of the old folk remedies. Grain glucans are the result of a surplus of various grains in Canada and Australia, and some regions in France, particularly those close to Canal La Manche, have a huge supply of seaweed.

It is important to mention another way leading to current information about specific

physiological properties of isolated glucan. Studies of the remedial characteristics of medicinal Asian fungi (shiitake – *Lentinula edodes*, maitake – *Grifola frondosa*, and hiratake – *Pleurotus ostreatus*) have shown that these fungi, besides having other physiologically active compounds, contain mainly β-glucan. Pioneering work done by Goro Chihara from the National Cancer Center in Tokyo, who isolated β-glucan from *Lentinula edodes*, termed it "lentinan", first described its biological activities.

Decades of research has revealed several types of action. The first level of action is active in the early stages of carcinogenesis and involves enhancement of several facets of immune response, including cytokine production, NK cell activity, and macrophage activation. The role in NK cell reconstruction during cancer treatment seems to be particularly important. Another level of protection involves an increase of antioxidant capacity and detoxification of mutagenic compounds. The third, possibly the most clinically relevant, affects involved cooperation with antitumor antibodies. In vitro and in vivo data have indicated that a combination of antibodies and glucan offers superior effects, making it an extremely important finding. Normally, the majority of malignant cells in solid tumors are naturally targeted with C3 fragment. Freshly excised tumors and established cancer cell lines were examined for tumor opsonization and natural antibodies and the opsonization with circulating antitumor antibodies and C3 was confirmed.

It is clear that it has taken polysaccharides a long time to reach their true potential. Even after centuries of sometimes intensive research, our knowledge of their biological effects is far from optimal. There are, however, no doubts about their importance. The process of accepting natural molecules is a long process––it has taken over 70 years to accept that vitamin C cures scurvy. It may take repetitious studies, and years or even decades, before individual polysaccharides will be credited for their role in health improvements.

Why Glucan?

There cannot be any doubts that medicine is making tremendous improvements. Some diseases have been completely eradicated (usually due to the successful vaccination programs), while others are being kept at bay. Even with cancer, which is arguably one of the scariest disease of our lifetime, current medicine is showing progress and new medicines are popping up regularly.

Despite these facts, mankind still has a long, long way to go. Serious diseases, such as AIDS and cancer, continue to be major health concerns. New flu strains are emerging fast and the traditional flu vaccines are becoming less effective. Diseases such as swine or avian flu (or most recently Zika virus infection), represent new dangers for millions of animals and, directly or indirectly, for people.

In addition, we are running into troubles with antibiotics. Their overuse has created more virulent and resistant strains of bacteria, making infections acquired in hospitals one of the leading causes of death. Approximately 18,000 Americans die every year just from infections with methicillin-resistant *Staphylococcus aureus* (MRSA). We are getting closer to the time when antibiotics will not cure even ordinary infections. Our immune system is here to protect us, but we cannot expect miracles. Many diseases, such as allergies, cancer, infections, or autoimmune diseases, are the result of dysfunctional immune systems. Sometimes the immune system is not strong enough, sometimes it is just the opposite and our immune system starts attacking our own body. In either case, we need a well-tuned, optimally-working immune system; otherwise we can expect a life full of problems. And some of them can be fatal.

The question remains, how to fine tune our immunity. Modern medicine has limited tools to achieve this goal and major pharmaceutical companies, quite understandably, focus more on direct treatment of individual diseases than on general, often nonspecific, stimulation. Some treatments are available, such as direct injection of immunoglobulins, but this is not practical for everyday use at home. Therefore, is it not surprising that we often need to try something else. One of these options can be natural products. Historically, mankind is forever searching for something common, natural, cheap, and easily available. Today, with the growing distrust in anything synthetic, the interest in natural products is reaching new heights.

It is important to note that the lack of interest by major pharmaceutical companies in natural products is understandable. It is not a question of preferring expensive synthetic chemicals, but the fact that even natural products are not completely without problems. The same problem in characterizing natural products also occurred with glucans: in nature, they represent a complex mixture of ingredients, each of which might contribute to biological activity. In addition, it is much easier to reach batch-to-batch homogeneity during chemical synthesis than during extraction from biological material. Essential oil from thyme, for example, often differs in composition, based on country of origin, as well as on individual counties, or even if the patch was more or less sunny.

Hence, the evaluation of biological properties on any natural product has to focus not only on biochemical characteristics and biological activities, but primarily on adequate isolation techniques which, in the end, give us the highly purified molecules. In the case of glucan, we have already established that the only meaningful data can come from experiments based on sufficiently purified glucans.

Meet the Immune System

In order to better understand how glucan affects our immune system, we need to understand what the term "immune system" really means. **Immune system** is a highly complex host defense system comprising many biological structures and processes within an organism that protects against disease. To function properly, an immune system must detect a wide variety of agents, generally known as pathogens, from viruses to parasites, and distinguish them from the organism's own healthy tissue.

In order to survive, organisms have developed various defensive mechanisms, from the ability to run away from danger, having large teeth to better fight, or the ability to hide (including mimicry). Additional defensive tools are external or internal mechanical barriers, which include exoskeletons of numerous invertebrates, skin of vertebrates (surprisingly solid barrier blocking the entrance for pathogens such as bacteria or viruses) or mucous membranes (e.g., inside the nose). Without these protections, no animal on Earth would ever survive. The potentially mortal danger can be anywhere, a small splinter in your finger, a skin abrasion from a fall, or toxic substances in our waters and air.

Immunology, the studying and describing our immune system and immune reactions, is a relatively young science, being fully established only about 50 to 60 years ago.

Probably the earliest known reference to immunity was during the plague of Athens in 430 BCE. Thucydides noted that people who had recovered from a previous bout of the disease could nurse the sick without contracting the illness a second time. In the 18th century,

Pierre-Louis Moreau de Maupertuis made experiments with scorpion venom and observed that certain dogs and mice were immune to this venom. This and other observations of acquired immunity were later exploited by Louis Pasteur in his development of vaccination and his proposed germ theory of disease. Pasteur's theory was in direct opposition to contemporary theories of disease such as the miasma theory. It was not until Robert Koch's 1891 proofs, for which he was awarded a Nobel Prize in 1905, that microorganisms were confirmed as the cause of infectious disease. Pasteur's work gave base to the concept of antibodies. The cellular branch of immunity was born from the independent studies of the Russian zoologist Elie Metchnikoff, who, from his studies of sticking the rose thorn under the skin of a starfish larva, pioneered the hypothesis that cells are the most important protection our bodies have from invaders. Later, a broad array of scientists from various parts of scientific community, a number of them Nobel Prize winners, laid the foundation for modern immunology on the basis of their studies of the immunity of man and various animal species.

By the late 1950s, immunologists generally accepted the hypothesis that there are two completely different, however closely cooperating, types of immune reactions–– the cellular reactions mediated mostly by lymphocytes and macrophages and the humoral reactions mediated by antibodies and other soluble factors. Immunological investigations into the hemagglutinating antibodies led to the finding of blood groups and subsequently to blood transfusions. These studies ultimately resulted in the current boom in organ transplantations.

Major Principles of the Immune System

Three major principles of immunity are common to all living creatures. These principles are ***recognition***, ***processing*** and ***response***. Generally speaking, all creatures on Earth stay healthy by employing these individual principles. It is necessary to recognize invading danger by distinguishing between self (i.e., everything constituting an integral part of an organism) and nonself (all the rest). Invading bacteria and viruses can serve as an example of nonself, as they are not an original part of our tissues and organs. Recognition accompanies all defense mechanisms, including the most complex ones. Without recognition, our body would not know when to react and against what to react.

The first step is followed by the processing of this information (this analysis determines the precise events of the response) and by response to the threat, which is usually elimination either by the action of specific antibodies or via various cell types. Processing consists of transporting the signal received from the receptor to other molecules, and subsequent analysis of the information. The threat is either excreted directly or destroyed via digestion into small fragments by cell proteolytic enzymes. To serve better, each of these mechanisms has been endowed with a memory.

Generally speaking, scientists recognize two basic types of immune systems: the ***innate*** immune system and the ***acquired*** immune system. The innate system (sometimes called "nonspecific", because it reacts automatically against everything nonself) is considered to be the first line of defense and represents a significant part of the entire immune system. The major characteristics are the nonanticipatory nature and no memory. It includes mechanical barriers, cells such as macrophages and neutrophils and soluble factors such as the complement system and numerous antimicrobial peptides. Another characteristic is that these defense reactions are present prior to exposure to infectious microbes; therefore, even newborns have some type of defense reactions and are not completely helpless. Simplified scheme of immune reactions is shown in Figure 1.

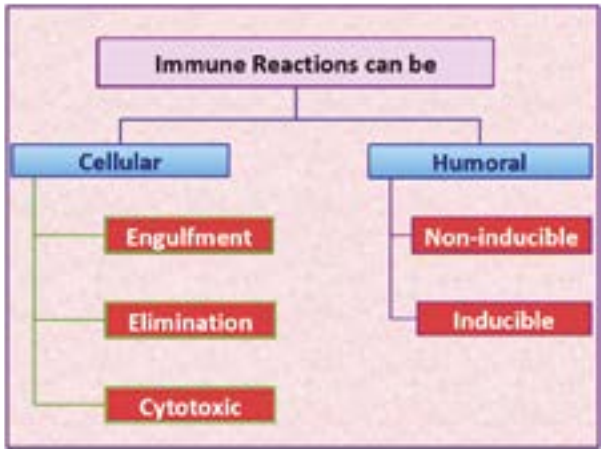

figure 1

The whole immune system has evolved over millions of years as an extremely potent and efficient defense mechanism directed toward a single goal: to keep us healthy. The vertebrate immune system has evolved to detect and respond to the vast array of microbes it encounters on an ongoing basis. The innate immune system is the first line of host defense and its underlying mechanisms can occur within minutes of encountering a potentially threatening microbe. It results in a variety of responses including some, such as the production of cytokines and chemokines, and the presentation of antigens to lymphocytes, which trigger the adaptive arm of the immune system. Our immune system consists of a vast and intricate network of various cell types that constantly monitor our health. However, despite numerous factors involved, including macrophages, several types of lymphocytes, antibodies, and other humoral factors, the ever decaying conditions we live in are relentlessly lowering our immune responses and diminishing the ability of our body to survive constant attacks. The relationship among individual types of cells involved in immune reaction is given in Figure 2.

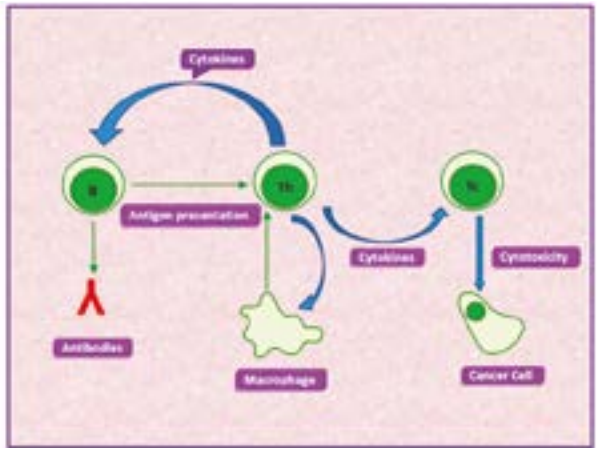

figure 2

Every infection lowers our natural immunity, but it is not only infection which endangers our defense reactions. We live, every day, in a surrounding full of potentially harmful effects, from smoking and polluted environment to stress, bad nutrition or overuse of drugs and antibiotics. Each and every one of these factors will negatively affect our immune system, resulting in problems such as slow wound healing, repeated infections, lower blood cell counts, and higher risk of oncological problems. Effects of glucan on macrophages are shown in Figure 3.

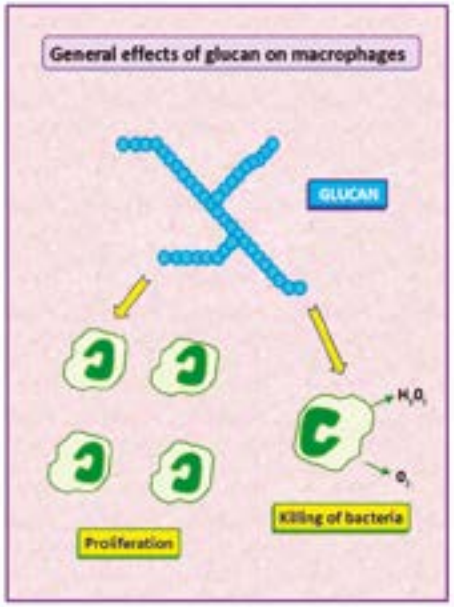

figure 3

Immune cells are usually very active, but for maximal effects, they need to switch from a steady-state to an activated state. Only then they can fulfil all the needs of our body. There is no doubt that our immune system needs every help it can get, and glucan represents an ideal molecule—it is natural, has no negative effects, and most of all, it works.

Glucan and Allergy

Allergic reactions represent several conditions caused by hyperactivity of the immune system. The spreading epidemic of allergies and asthma (one in three people now suffers from allergies) has led to increased interest in both research of the mechanisms and of the potential treatment. Allergic reactions include asthma, sinusitis, rhinoconjuctivitis, food allergy, atopic dermatitis, urticaria, and anaphylaxis.

Fifty years after demonstrating that IgE is capable of transferring sensitivity to allergens, we now fully understand the immunological background on these problems. Generally speaking, allergic diseases are those mediated by expansion of T helper 2 cells together with isotype switching of B lymphocytes to generate IgE antibodies.

Both mast cells and IgE antibodies are concentrated in the mucosal tissue, meaning that they are among the first defense molecules encountering invading pathogens. The most classical allergic response is mediated by the IgE-FcεRI complex expressed on the plasma membrane of mast cells and is represented by immediate hypersensitivity with symptoms such as asthma, rhinitis, or atopic dermatitis. The crosslinking of these receptors results in mast cell degranulation and chemokine release. The early stages are later changed into late phase, characterized by activation and homing of inflammatory cells and by activation of IgE-sensitized antigen–presenting cells.

Based on 50 years of research, significant progress has been made in understanding immunological pathways leading to allergies, chemical mediators, and environmental agents augmenting allergen sensitization. Despite the intensive research and significant improvements of our understanding of the immune mechanisms involved in allergic reactions, this mountain of information did not reach any significant new treatment. Studies showing the success of omalizunab in treatment of allergy offer new hope and suggest that allergy, as a fully immunity-based disease, can be cured by immunological means. Particularly promising are monoclonal antibodies directed against cells expressing markers such as IL-5R and CCR4. Glucan, with well-established multifactorial effects on almost all aspects of immune reactions, remains one of the possibilities for utilizing modulation of the immune mechanisms in treatment, or even prophylaxis, of allergic problems.

The role of glucan in allergy is rather neglected and controversial, since glucans are a common structural component in a variety of established allergens. Mouse studies have shown that glucans are responsible for the induction of IL-6 secretion from these cells and that glucans further regulate cytokine/chemokine production of lung epithelial cells. These effects are, however, more connected with lung response to challenge than with the allergic reaction.

However, recent studies suggest that glucan can also play a role in alleviation of allergic problems. The mechanisms of the role of glucan in allergies are, as yet, not fully established. Most hypotheses suggest that glucan effects are manifested via decreasing proinflammatory cytokines (mostly IL-6 and TNF-α increasing IL-10 secretion, and elevating accession of cellular antioxidants.

In the mouse experimental model, previous studies have documented anti-inflammatory effects of glucans derived from *Aureobasidium pullulans* on acute inflammation, accompanied by the typical symptoms of severe vasodilation, edematous changes of skin, and infiltration of inflammatory cells. The authors concluded that glucans from this yeast-like fungus have somewhat favourable effects in the reduction of the induced acute inflammatory response.

Another study of the therapeutic effects of glucan of *A. pullulans* on the ovalbumin-treated allergic reaction in mice found that glucan significantly inhibited the production of IgE antibodies specific to antigen, reduced formation of IL-12 and IFN-γ production by lymphoid cells in the spleen, and decreased numbers of CD8-positive and IFN-γ!! positive cells in the small intestine. This suggests that food allergic reaction against ovalbumin could be positively influenced by glucan administration support. Therapeutic effects of glucans were confirmed later with the conclusion that glucans could be a possible compound for the effective therapeutic treatment of allergic diseases.

It is predicated that in 2050, up to 4 billion people will suffer from some type of allergy disease such as asthma, allergic rhinitis, atopic dermatitis, or various forms of food, drug and insect allergies. Airborne concentrations of common ragweed pollen, a potent allergen, could increase fourfold in Europe by then, as well.

On the basis of *in vitro* and *in vivo* experimental studies documenting the suppressive effects of glucans on artificially induced allergic reactions in murine and rat models, the glucans were applied in several clinical trials in patients suffering from asthma or other allergic diseases. Numerous data show that glucans and other microbial signals may play a protective role against the development of asthma. One of the first studies on the therapeutic use of glucans for asthma was a study in which the hot water extract of *Agaricus blazei* was used to treat a bronchitic patient with asthma-like symptoms. After oral intake of the extract for two months, the attenuation of bronchitic symptoms was observed. The authors deduced that the amelioration of respiratory symptoms was accompanied by a decrease of Th2-dependent IL-10 and increase of the production of IFN-γ by Th1 cells. In other study, after four weeks of application, patients allergic to ragweed demonstrated alleviated symptoms and some patients reported increased physical health, activities and emotional well-being, and decreased sleep problems. Approximately 50% of the treated patients reported improved quality of life when compared with the study participants given the placebo. Some authors affirm that glucan administration can improve, or even prevent, symptoms of allergic rhinitis and upper respiratory tract infections as well as other allergic symptoms. In children suffering of recurrent respiratory tract infections, the active treatment with glucans can contribute to significant depression of eosinophilia and stabilization of IgE serum levels.

Glucans and Cancer

Cancer is the general name for a group of over 100 individual diseases in which some cells begin to grow out of control. It involves malfunction of genes controlling cell growth and proliferation. Cancer is a leading cause of death worldwide. Approximately 20% of all deaths in developed countries are caused by cancer. Cancer can be caused by numerous factors, both external and internal. Among external factors are radiation, smoking, various chemicals, and infection. Among internal factors are mutations, hormones, and conditions of the immune system. These factors can act individually or in conjunction. It is important to remember that 10 or more years pass between exposure to these factors and clinical manifestation of cancer.

Based on the multiple biological effects of glucan, it is not surprising that it is also involved in the fight against cancer. Despite the fact that most tumors are recognized by the immune system, the antibody response is usually only weak. Even a completely healthy immune system cannot adequately deal with fast-growing cancer cells. Glucan is extremely important, as it is able to cooperate with antibodies. After the tumor cells have been recognized as foreign, specific antibodies are secreted and subsequently bind to the cancer cells. Following this binding of antibodies, the C3 fragment of complement coats the surface of cancer cells. The glucan-primed cells, such as macrophages, NK cells, and neutrophils, then recognize these antibody-C3 coated cells and kill them. Without glucan, the destruction would not take place and the situation would be compounded very quickly. In addition, monoclonal antibodies are currently being evaluated in cancer treatment. Although many patients respond to the antibody treatment, remissions are often transient. Without the glucan-caused activation of immunocytes, the cancer cells remain coated with antibodies but no killing occurs. Compared to the traditional treatments of cancer, this type of treatment has one big advantage: it acts without any negative side effect. The experiments mentioned above provided the basis for clinical trials in which patients are treated with antitumor antibodies and oral glucan. How glucan act in synergy with antibodies is summarized in Figure 4.

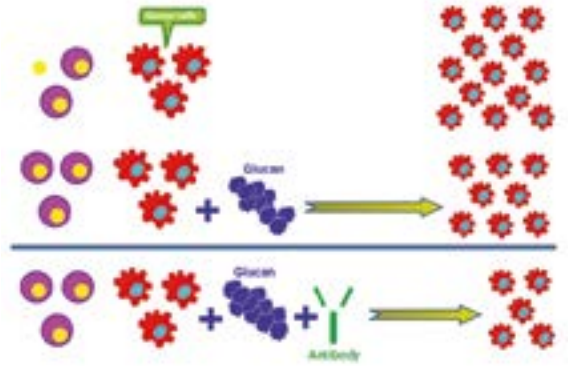

figure 4

There are multiple positive effects of glucan in tumor therapy. One is the direct stimulation of immune cells. Macrophages form the first line of defense and protect our body against cancer cells. Natural killer cells represent a special subtype of "bloodthirsty" lymphocytes and have an extremely important function—to kill tumor cells. Together, these cells form a defensive line that guards the integrity of our body. Their job is not easy and considering they perform this function literally 24/7, it is easy to see how they can become exhausted. Therefore, they can use all the help they can get. And glucan serves as a molecule guiding these cells towards cancer cells. Once they arrive, they are further stimulated by glucan and start to kill cancer cells.

Glucan, however, has another trick up its sleeve. The major side-effects of both traditional chemotherapy and irradiation are strong decrease in the number of immunocytes and significant suppression of the immune system. Both leukopenia and immunosuppression limit the dosage and frequency of treatment. The effects of injected glucan on enhanced recovery after experimental leukopenia have been documented. In the cyclophosphamide-induced leukopenia model, there frequently was a peak at about day three followed by a slow recovery. Similar data were found after irradiation. Figure 5 shows that glucan supplementation protects bone marrow.

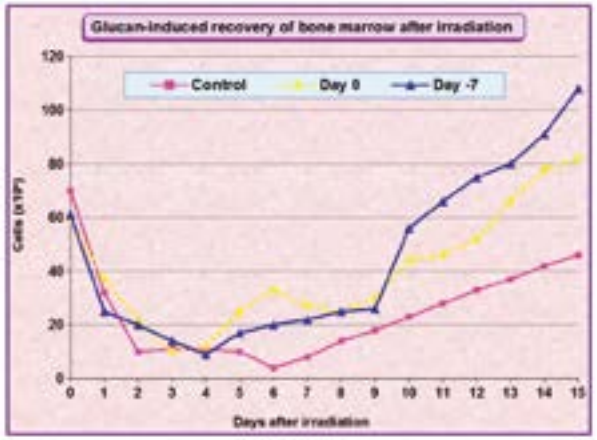

figure 5

Numerous studies showed that glucan exhibits a preferred type of recovery without the short-term overstimulation of myelopoiesis. With glucan we can prepare ourselves for possible negative effects of radiation. To summarize, when people take glucans at the same time as chemotherapy, they have fewer side-effects, do not feel quite as ill, and the effects of chemotherapy are greatly improved. In other words, the treatment has better chance to work.

Glucan and Animals

It is not surprising that most of the glucan research was (and still is) done on animals. With over 10,000 scientific papers published based on these studies, we can safely conclude that glucan works in every animal species tested, from bees, shrimps, fish, chicken, mice, rats, rabbits, dogs, pigs, horses, cattle, and humans. As there is no animal which would be resistant to glucan effects, we can clearly consider glucan to be evolutionary very old immunostimulant. We can supplement basically any animal we need, being careful to calculate the dose.

This also means that we can use glucan as a supplement of animal food. Most glucans have almost no taste and it is easy to mix glucan with food. Fish, chicken, and pigs are most important for commercial farmers, but dogs are particularly important for all dog lovers interested in keeping their family dog's health in perfect shape. Numerous studies have shown that dogs supplemented with glucans had shorter recovery from surgeries, better levels of some immunologically important factors, and lower tendency to suffer from diabetes. The beneficial effects of glucan are well known to commercial fish farmers in Norway and Scotland, who routinely use glucan as a health supplement. With the current trend of prohibiting antibiotics in farmed animals, glucan can offer an optimal, and most of all safe, alternative.

Other Effects

We discussed that glucan can suppress infection and improve our chances to beat cancer, but glucan can also improve additional biological processes including lowering blood cholesterol levels and improve wound healing. Whereas the reason how it works on cholesterol is not fully understood, we know that glucans heal wounds more quickly by stimulating of collagen formation in fibroblasts. The effects of glucan on blood sugar are less studied. Older studies suggested that glucans might reduce blood glucose concentrations after eating, possibly by delaying bowel movements so dietary glucose is absorbed more gradually. Some studies have shown the hypoglycemic activity of natural glucans. Additional studies have even shown solid effects of synthetic polysaccharides. However, the mechanisms remain unknown.

Additional areas of glucan effects include regulation of stress, probably via regulation of stress hormone corticosterone. Researchers have shown that fatiguing exercise has been associated with a decrease in certain functions of neutrophils, which can be offset by the consumption of glucan. Subsequent study later tested mortality trends over 30 days in mice run to volitional fatigue on a treadmill for 3 consecutive days and they then inoculated with herpes simplex virus following 10 days of drinking water with glucan. The results showed a surprisingly high survival rate of the glucan-treated animals. Similar data were later confirmed in human models, both athletes and workers with high physical and mental stress (such as firefighters or ambulance drivers) benefitted from glucan supplementation.

Clinical Trials

Despite most glucan effects being found in animals, the time when glucan will be used as an approved drug is near. The quality of animal data is so impressive that there are, at the time of this publication, at least 85 ongoing clinical trials worldwide, from the United States to Philippines and even Czech Republic. The most promising trials are testing the effects of glucan given simultaneously with monoclonal antibodies. More than 50 cancer centers around the world are participating in these trials.

In the Czech Republic, the attention of doctors was focused on the effects of glucan in children with chronic respiratory problems. A series of published clinical trials has clearly demonstrated that even a short time daily supplementation with glucan significantly improved not only secretory immunity, was also an overall health status and even physical state of these children. In addition, glucan showed positive effects on children living in heavily polluted environments or in families of heavy smokers. Data summarized in Figure 6 show that a 30 day supplementation with glucan has strong effects on antibody level in children.

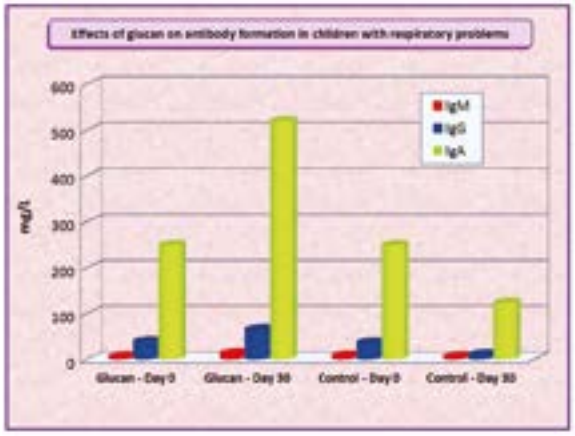

figure 6

When to be Careful

Without doubts, glucan is a safe supplement with numerous beneficial effects and is safe even in massive doses. Possible negative effects are extremely rare. There are some studies suggesting that inhaling glucan from an environment rich in molds or yeast might add risk of pulmonary problems, but the studies never fully explained if the observed results are really caused by glucan or by other components of the yeast wall. Still, glucan is not for everybody. One group which should never consume glucan (or any other immunostimulating agent) is formed by transplant patients. After transplantation, the body is trying to reject the new tissue, which is blocked by immunosuppressive medication. Clearly, we do not want to on one hand improve the immune system by glucan and on the other hand to inhibit the immune system by some drugs. The second group is represented by pregnant women. Despite the fact that there is no reason to expect any problems to either the mother or the child, it is better to be extremely careful and wait until the end of lactation.

The question of whether people suffering from autoimmune diseases is still open. Current medicine recognizes over 80 different autoimmune diseases, often influenced by different factors and different causes. With very limited knowledge, we really do not know if these patients should take glucan or not.

Which Glucan to Choose?

This is not an easy question to answer. Using the internet, we can find hundreds of companies selling glucans, so which one to choose? It is true that glucan exists in numerous versions, based on different sources, methods of isolation, size, etc. On the other hand, not all glucans can be considered equal—some are highly active, some have medium activity, and some have only little, if any, activity. So how should we choose?

It is always good to do your homework. First, the company needs to show the purity, source, and manufacturer, if possible with full certification. Next, look at the references on scientific proof that this particular glucan in question really works. You need to see publications (or at least the citations) using this glucan, not just any glucan (e.g., if you are looking at yeast-derived glucan, forego the company fortifying their claims by studies of mushroom glucan). And at last, avoid companies with clearly too bombastic claims. Glucan is good, really good, but it is not one cure for all. If you do all of this, you can be sure that the glucan you are buying will be a high-quality supplement. Not only might your health depend on the right choice, you will also be sure you are not wasting money.

You can find more informations about Betaglucan (including usage, experience and overview of studies) on: www.betaglukan.eu

Commercial enquiries on Betaglucan pls contact: info@vizian.cz

Natural products useful in preventing various disease have been highly sought after throughout history. Beta glucans have a long history as immunomodulators. Since the scientific studies, countless subsequent studies have shown remarkable anti-tumor activity against a wide range of different tumors including breast, lung, and gastrointestinal cancer. In Japan, beta glucan is already licensed as an immunostimulant effective in cancer treatment. In addition, over 40 clinical trials are currently under way, both in the United States and around the world, evaluating glucan's effects from children fitness to cancer. Beta glucan supplementation is useful in case of chronic diseases, irradiation, infection diseases, high cholesterol, stress and protection against various environmental studies.

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