WHAT IS BETA GLUCAN?

A Concise Guide to the Benefits and Uses of the Most Powerful Natural Immune Enhancer Known to Science

by

Roger Mason

What is Beta Glucan?

by

Roger Mason

ISBN#: 1-884820-66-2
Printed in the U.S.A.
Fall 2011 Revision

The Beta Glucan book is not intended as medical advice. It is written solely for informational and educational purposes. Please consult a health professional should the need for one be indicated. Because there is always some risk involved, the author and publisher are not responsible for any adverse affects or consequences resulting from the use of any of the suggestions, preparations or methods described in this book. The publisher does not advocate the use of any particular diet or health program, but believes the information presented in this book should be available to the public.

All listed addresses, phone numbers and fees have been reviewed and updated during production. However, the data is subject to change.

Safe Goods
561 Shunpike Road
Sheffield, MA 01257
For a complete listing of books, visit our website:
www.safegoodspub.com
or call for a free catalog (888) 628-8731
order line: (888) NATURE-1

Contents

About This Book

For decades beta glucan has been studied for its most impressive biological effects on mammals. It has been common knowledge in the scientific community that beta glucan is the most powerful immune stimulant known, is a very powerful antagonist to both benign and malignant tumors, lowers cholesterol and triglycerides, helps normalize blood sugar levels, heals and rejuvenates the skin, and has many various other benefits.

Yet, in 2011 still no one has bothered to write a real book on the subject. There have been a couple of incomplete attempts to write small pamphlets that merely skim the surface. Search the Internet for anything on "beta glucan" and see what you get. Search www.amazon.com and www.barnes&noble.com and you'll get the same result. The research in this book goes back to 1980 in the main scientific reference journal of the world Chemical Abstracts, the "Scientists Bible". Every relevant abstract was copied, every important study was obtained (and translated from foreign languages when necessary). All these were collated and put together into this easy to read, plain English short book. Why not, say, a 200-page book? Because that was unnecessary, and most people just aren't going to take the time to read a long book. All you need to know is in here. Everything you need to know and more is in this short book. It won't take you long at all to read it. After reading it take beta glucan for the rest of your life. This is one of the most important supplements you can take to be healthy, have strong immunity and live a long life. This is a supplement for all ages as well as your beloved pets.

You'll notice there are no companies recommended, phone numbers or addresses, or any brand names listed. Just find a reliable brand at the best price you can. Search the Internet for "beta glucan" to find one with 200 mg at $10 or less for 60 capsules. Or a cream with 1% beta glucan for under $12.

Roger Mason, Fall 2011

Overview

This is a factual and very thoroughly documented book, replete with dozens and dozens of published scientific references. You may find it a little dry at times, but there is a reason for this - the only intent is to factually document the scientific studies that show the amazing power of this natural supplement.

The natural supplement industry is, like all other industries, basically directed towards advertising and profits. You hear endless promotions for various supplements that claim to do miraculous things for your health and cure your ills. Fortunately, some of these natural supplements are, in fact, very powerful and effective, while remaining very safe and non-toxic. For the layman it becomes impossible to separate fact from fiction, since these promotions are so skillfully and professionally written. In the case of beta glucan one company swears only yeast glucan is valid, while another swears only oat glucan is effective, while a third swears that only mushroom glucan works. You'll see here that all true 1,3 beta glucans work, regardless of their source.

This book was written objectively and factually with no profit motive. After reading these seven chapters you should agree that beta glucan is one of the most important supplements for people of all ages. You'll see that beta glucan is the most powerful immunity enhancer known to science. Beta glucan is now being used on real people with cancer to see how it can assist in other therapies. You will especially want to try taking beta glucan if you suffer from malignancies, high cholesterol, a weak immune system, or blood sugar problems. Healthy people will want to take it to become even stronger and feel better.

It has only been in the last few years that technology has brought the price down to where we can get potent 200 mg capsules very inexpensively, as well as real topical creams with an honest 1 percent glucan content. This has been known about for over 30 years, but the extraction technology didn't make this practical and inexpensive for the general public until about 1999. Take advantage of this, and make it a part of your daily supplement program.

Chapter 1: What Is Beta Glucan?

Beta glucan is a polysaccharide (i.e. a chain of glucose molecules) that is found in such foods as oats, barley, mushrooms, and yeasts. Also, to a lesser extent in rye and wheat. For decades scientists have known beta glucan as a food constituent, and they knew it was abundant in the foods as just named. It is extremely difficult to extract and purify, however. Oat bran contains about 7 percent beta glucan, and is inexpensive, but only good as a food. It is too weak to use as a supplement or in a cream. Dry rolled oats contain about 5%, as does pearled barley. Whole wheat and rye contain about 2%. It wasn't until the l980's that commercial beta glucan creams (but no capsules) started appearing. Generally they were weak and overpriced due to the high cost of extracting. Finally, about 1999, technology succeeded in producing less expensive beta glucan from both oats and brewers yeast (after the beer was brewed). Now, 200 mg oral capsules were offered in amounts that were honestly biologically effective. Powerful 1% topical creams also appeared.

Some companies, however, still refused to put realistic amounts of beta glucan in their products. One company, for example, put out two different strengths- one was called "-24" but only actually contained a mere 3 mg of beta glucan per capsule! The other was called "-100", but only actually contained a mere 10 mg. These were very, very expensive, despite being biologically useless. Fortunately, such deficient products long ago disappeared from the market place. Just read the label to see how much beta glucan is in what you buy. The amount by per cent must be clearly stated by law.

Eventually, even further breakthroughs happened. Beta glucan could be extracted from brewers yeast with 80 percent purity (80 percent purity for beta glucan is very practical). As of 2011 the oat products still haven't been able to match this price and strength of the yeast product, but have come up to over 80 percent purity at a good price. Mushroom glucan is simply too expensive.

You must remember the natural supplement industry can be as bad as any other, since advertising and profits are often more important than helping people be healthier and living longer naturally. There are some wonderful, sincere, and dedicated people in this industry, but they

are definitely in the minority. You will see endless arguments that mushroom (the most expensive source of all) glucan is superior, or that yeast glucan is superior, or that oat glucan is superior. One company swears theirs is, "free of fat and protein", which makes it superior! The consumer can get very confused as to which source is better, how much one needs to take, and what price is fair.

Chemically we only need to be concerned that what we buy is a true 1,3-D-beta glucan. This means it is a basic "1,3" position on the glucose chain. Yeast and mushroom glucans are 1,3/1,6 positions, while oat and barley glucans are 1,3/1,4 positions. *It just doesn't make any difference* folks. They are all true 1,3 glucans, and basically have the same biological benefits. This was proven quite conclusively in 1997 at the University of Hamburg in Germany (*Carbohydrate Research* v 297). Dr. Kulicke and his cohorts concluded, "All glucans investigated, regardless of molar mass and solution structure, stimulate the investigated immunological measures more than a commercially available biomedical drug used for comparison". They discovered this after studying human blood monocytes for, "tumor necrosis factor alpha release activity". This basically means they measured real human blood to see how the glucans would help strengthen immune qualities and resist infection.

What are the major benefits of taking beta glucan? This nutrient benefits anyone who wants to be healthier, live longer, deal with the stress of modern society, be less allergenic, speed up healing, and resist the dangerous microbes, bacteria and viruses that seem to be everywhere. As you saw in the contents, the major reason to take beta glucan is to *enhance your immune system*. If you have benign or malignant tumors it is a powerful adjuvant (which means to aid or help) to whatever else you are doing, whether it is taking chemotherapy or eating a macrobiotic diet. It is an effective way to lower cholesterol and triglycerides, especially when used with other natural supplements. The effects on your skin (especially on your face) are dramatic and it should be a daily part of your skin care routine. It has been found to help regulate blood sugar levels especially in cases of diabetes. There are various other benefits, such as protection from ionizing radiation. These are discussed in Chapter 7. Now that beta glucan is inexpensive, and has come out of the scientific closet after all these years, we will certainly see many more studies on real people to find new uses for this wondrous natural food extract.

How much should you take? Some studies used ridiculous amounts in test animals- like 100 mg per kilogram. This equates to about

7,000 mg (7 grams!) in humans. Interestingly enough, they found no negative side effects, even at such extreme doses. Generally people take 200 mg a day for immunity and cholesterol lowering. If you have a medical condition, and want to add beta glucan to your repertoire, you can take 400 mg a day. If you have, say, diabetes, cancer or another serious condition, you could take 400 mg a day for one year, and then drop down to a maintenance dose of the usual 200 mg. Just 50 grams of (dry) oatmeal or barley contains an amazing 2,500 mg! Just 100 grams of (uncooked) whole wheat pasta contains 2,000 mg.

Can you take this with prescription drugs and medication? Yes, you can, but "complementary medicine" just doesn't work. Why take toxic drugs you don't need, when you can cure yourself naturally? Beta glucan is simply a food extract we find abundantly in such foods as oats, barley, wheat, and rye. It has no known side effects even in very extreme doses. It has a Generally Recognized as Safe (GRAS) classification from the FDA. Actually, it has been shown repeatedly to enhance the actions of many such drugs. For example, if you are taking an antibiotic it may well help the potency of it. This is not the point of this book, however, to recommend the use of allopathic drugs.

The published world medical literature has numerous studies on beta glucan. Scientists knew about it long before it became a popular supplement. In 1998 German researchers (*Getreide Mehl Brot* v 52) published a review with 25 references on oat and barley glucans. Canadian scientists in 1997 (*Canadian Chemical News* v 49) did a nice review with 11 references on oat glucans, since oats are a major agricultural product in Canada. Peter Wood at the Center for Food and Animal Research in Ottawa did a good review in *Cereal Chemistry* (v 87, 2010), which revealed beta glucan is also found in rye. A second review was published in the *Journal of Cereal Science* (v 46, 2007). He stressed that oat and barley glucans were very effective for lowering cholesterol. They originally did a review with 23 references back in 1991 (*Trends in Food Science and Technology* v 2). The book *Technology of Functional Cereal Products* (2008, Hamacker) devoted a chapter to the, "health-promoting effects" of oat glucan. The article "Arguments in Favor of Incorporating Beta Glucans in Nutrition" was published in *Endorcinologica y Nutricion* (v 54, 2007). They suggested this be used as a normal daily part of our diet due to the many proven health benefits. A 10 page review was published in *Natural Product Reports* (v 28, 2011). They said, "Beta glucans have been shown to provide a remarkable range of health benefits, and are especially important against the two most common conventional

causes of death (CHD and cancer)". That is a strong statement. In the book *Novel Food Ingredients for Weight Control* (2007, Woodhead) said glucans not only have multiple proven health benefits, but may well be very useful in a program of weight loss.

You may be wondering how beta glucan works so powerfully. It would be very presumptuous to think we understand that very well, but certain things are known. We have large white blood cells called "macrophages" (i.e. "great eaters"), such as phagocytes, neutrophils, and other such cells found in all the tissues of our bodies. These literally devour bacteria, foreign cells, dead and dying cells, mutated cells, and other negative invaders in our bloodstream. *They are the most important cells in our immune system*. For example, natural killer (NK) cells eat the cancer and infected cells along with these. These important cells in our immune systems are activated and strengthened by beta glucan, by means we don't yet truly understand. When you take a beta glucan supplement these immune cells are more active, more powerful and effective in attacking and consuming what doesn't belong in our systems.

What is the best kind to take? Barley derived beta glucan has never been offered because oats are a more economical source. Oat beta glucan is less popular than yeast, because yeast derived is less expensive. Mushroom beta glucan is the most expensive of all, and the worst choice for your money. Some manufacturers claim they use bakers yeast, but this seems rather unbelievable, since brewers yeast is a much less expensive source. Millions of pounds of brewers yeast are discarded by the beer breweries every year, and this is why brewers yeast beta glucan is the most economical choice. What about allergies to yeast? Regular yeast, whether bakers or brewers, is one of the top ten allergenic foods known. Beta glucan, however, is so well extracted and only from the cell walls of the yeast that -even at only 80% purity- any allergenic proteins are almost completely removed or present in such small doses as to not affect you physically. Therefore it is not allergenic.

Find a product that contains sixty capsules containing at least 200 mg each of actual beta glucan. If it is 80 percent pure there must be 250 mg per capsule to have 200 mg of actual glucan content. You can find reliable products under $10. A face cream must have at least 1% as stated on the label. You can find good brands under $12. Make beta glucan part your supplement program. Yes, people of all ages and your pets should take it.

Chapter 2: Nature's Strongest Immunity Enhancer

Ninety per cent of our immunity comes from our digestive system. *Strong, healthy digestion equals good immunity*. A whole grain based macrobiotic diet is the key to healthy digestion. Eating two meals a day and fasting 24 hours every week helps greatly. Taking supplements like good (refrigerated) multi-strain acidophilus, FOS, and glutamine are also very supportive.

You have heard about exotic, bioengineered supposed wonders of medical science like "interferon alpha" for enhancing immunity. These are priced out of the reach of any but the rich. The truth is that interferon has been a toxic, over-touted failure from the beginning. The strongest immunity enhancer on earth has been known about for over thirty years now. *Nothing rivals beta glucan for immune enhancement.* No substance on earth- manmade or natural- has international, published studies to back it up like beta glucan does. In the following pages you will see the last thirty years of published research to prove this. We certainly need more human studies for various illnesses and conditions. It is easy and inexpensive to give real people beta glucan and then test their various immunity parameters.

The best review of all was published in the *Journal of the American Nutraceutical Association* (v 3, 2001). This was done at the University of Louisville with a full 49 references. "Beta Glucans as Immunomodulators". "The immunomodulating effects of beta glucans are well established during the development of immune reactions." All the human references will be covered in this chapter.

At Tulane University (*Annals of Surgery* v 211, 1990) trauma patients were about to undergo surgery for their injuries. Half were given beta glucan, and half were given placebos. The ones who got the glucan had a zero total mortality rate, compared to a full 29% mortality rate for the ones who got the placebo!!! A zero mortality rate! The doctors said macrophages are key to immunity, and glucans are proven macrophage stimulants. This was over 20 years ago, but beta glucan is still not given to patients prior to or after surgery. This should be routine.

Again, in the above journal (v 220, 1994) at Harvard University patients undergoing serious thoracic and abdominal surgery were given either beta glucan or a placebo. Over one fourth of people undergoing major surgery get infectious complications. The average cost per patient is over $12,000. "Patients who received beta glucan had significantly fewer infectious complications, decreased intravenous antibiotic requirement, and shorter intensive care stay. Beta glucan is safe, and appears to be effective in the further reduction in the morbidity and and cost of major surgery." Very well put.

A second study at Harvard Medical School (*Archives of Surgery* 129, 1994) was very similar to the above. More high-risk surgical patients were given beta glucan, while others were given placebos. The ones getting the beta glucan were given varying doses, both before and after their thoracic and abdominal surgeries. Only one of the patients got an infection who was taking high dose glucan. Four of the placebo patients got serious infections. They concluded, "Beta glucan was generally safe and well tolerated, may decrease postoperative infection rates, and warrants further investigation."

At Tokyo University (*Surgery Today* v 23, 1993) people with gastric cancer were given glucan from lentinan mushrooms. Some were given intravenous glucans, and some simply water both before and after surgery. Very sophisticated diagnostic tests were done, especially for lymphocytes. The results are too sophisticated (i.e. measuring exotic parameters like Leu11, CD4 and LeuM3 cells) to discuss by name, but their immunity was dramatically increased. The surgeries were far more successful, with less infection and complications, in the glucan patients.

At Minoo City Hospital in Japan (*Japanese Journal of Cancer and Chemotherapy* v 30, 1981) lentinan glucan was given to more gastric cancer patients. This was a full 30 years ago! People with gastric cancer have low immunity and poor quality of life when undergoing chemotherapy. Surgery is risky and complications are common. Even with the harmful medical treatments that continued their immunity was improved with a better quality of life giving them mushroom glucan.

At Yamaguchi University in Japan more lentinan glucan was given to people after dangerous cardiopulmonary bypass surgery (CPB). This may be the most dangerous of all surgeries. This was published in the *International Journal of Immunopharmacology* (v 21, 1999). Half the patients were given lentinan glucan and half were not. "The preoperative

administration of lentinan for patients undergoing CPB ameliorated the impairment of natural killer cell activity, and promoted the rapid recovery of the CD4 positive cells. "

In Warsaw (*Przemysl Spozysczy* v 56, 2002) a well referenced review was published. Human studies have shown, "Dietary beta glucan enhances immunity by activation of macrophage cells, doubling their counts in 24 hours. Dietary beta glucan also acts as an antioxidant protecting the body against free radical damage and lowers blood cholesterol levels. Dietary beta glucan can be helpful in treatment of many immunity-related diseases." Very well stated.

At the famous Maastrict University ileostomy patients were given oat beta glucan enriched diet, and others a control diet. This means these people had an external orifice for their small intestine, and had to defecate in an attached plastic pouch. (*Molecular Nutrition & Food Research* v 51, 2000). The doctors said all true glucans have immune-modulating effects thought to be mainly due to affecting leukocytes. After giving these patients glucan they confirmed this line of thought. They performed very sophisticated immunity tests, and got some very strong results. Their immunity strengthened despite their digestive disorder. This confirmed the power of oat glucans as well as from yeast and fungi.

More ileostomic patients were given beta glucan at the same university (*Scandinavian Journal of Gastroenterology* (v 46, 2011). They found, "The consumption of oat beta glucan seems to decrease the levels of antimicrobial peptides in fecal water from human ileostomy patients."

The University of Strathclyde in Glascow did a fine review on animal and human studies with beta glucan (*International Journal of Medicinal Mushrooms* v 5, 2003). In addition to the proven immune enhancement benefits they said, "Recent research has also shown that some of these mushroom-derived polymers may possess direct cytotoxic effects on cancer cells." Soon we will be routinely using beta glucan for treating various forms of cancer naturally.

At the State University of Tennessee in 1996 (*Proceedings-Beltwide Cotton Conference,* v 1) researchers were aware that, "Glucans, isolated from natural sources, are known to stimulate humoral and cell-mediated immunity in humans and animals. It is now established that 1,3 beta glucans are recognized by macrophages and perhaps, neutrophils and NK cells via a 1,3 beta glucan specific receptor. Following receptor

binding, glucan modulates macrophage cytokine expression." This simply means they understand the way glucans work is by binding to macrophages, neutrophils and NK cells and making them more potent in their defense of the body. This fine review had 47 references.

At Kobe University (*Myoscience* 41, 2000) HIV patients were given beta glucan. This is not a natural virus, but rather a manmade bioengineered one from the warfare labs of the world. There is no cure. There are no effective medical treatments. Maitake glucan was given to these HIV patients. Their immunity rose dramatically. "85% of the respondents reported an increased sense of well-being with regard to various symptoms and secondary diseases caused by HIV." To effectively treat an "untreatable" illness like this is nothing less than amazing.

There are almost countless animal studies published around the world proving the immune enhancing effects of all beta glucans. We will mention a few of these. At Tulane University in New Orleans in 1987 (*International Journal of Immunopharmacology* v 9), researchers showed that beta glucan enhanced the production of both interleukin-1 (IL-1) and interleukin-2 (IL-2) in rats. Their plasma levels of IL-1 and IL-2 were measured after this was given. They concluded, "Thus beta 1,3 glucan will enhance IL-1 and IL-2 production and elevations in lymphokine production can be maintained up to 12 days." (Higher lymphokine levels stimulate the immune system.)

At Tokyo College Pharmacy in Japan much work was done over the years on glucans. In 1989 (*International Journal of Immunopharmacology* v 11) they gave oral glucan from mushrooms (Sclerotinia) to mice and found this, "enhanced the activities of both natural killer (NK) cells in the spleen and the lysosomal enzyme of peritoneal macrophages."

A very impressive study using malaria was done at Rangaraya Medical College in India in 1990 (in the *Indian Journal of Experimental Biology* v 28). Malaria (Plasmodium berghi) was injected into mice and death was prevented in most of the ones receiving the glucan while the untreated ones died. They said, "The results suggest that glucan potentiated both limbs of immunity and both were involved in the host defense against malaria." Malaria is very prevalent in the poorer tropical countries.

At the MacArthur Center for Tropical Diseases in Israel in 1991 (*Parasite Immunology* v 13) deadly Leishmania major germs were in-

jected into mice. Some mice were given yeast beta glucan, which mitigated most of the effects of this devastating bacteria. They concluded, "The anti-Leishmania antibody titer of glucan treated mice was lower and their sera recognized fewer antigens than that of control Leishmania bearing mice."

At the University of California at Davis in 1992 (*International Journal of Immunopharmacology* v14) mice were studied for their immune responses. It was found that beta glucan was an excellent "adjuvant" which is an immune enhancer that augments immune response. They found, "glucan and lipovant present effective adjuvant alternative, to Freund's complete adjuvant and may be of value in immunization against visceral leishmaniasis" (Leishmania infantum was the bacteria they used in this experiment).

At the Tokyo College of Pharmacy in Hachioji in 1993 (*Biology Pharmacy Bulletin* v 16) mushroom beta glucan called OL-2 was studied on mice for their specific immune responses including white blood cells, tumor necrosis factor, bone marrow cells, colony stimulating factors and other parameters. They said, "These facts suggested that OL-2 could enhance nonspecific host defense mechanisms by enhancing hematopoietic responses…" In other words beta glucan gives nonspecific immune enhancement by various means.

At the Ustav Biofaktory in the Czech Republic in 1993 (*Biopharm* v 3) dairy cows were given yeast beta glucan in a double blind experiment. Various biological responses were measured and they found optimal doses to be given the cows to strengthen their immunity. In raising farm animals like cows, pigs, and sheep it is important to keep their immunity high so they will be resistant to disease. Beta glucan is an inexpensive way to insure the health of such animals.

At the Nippon Roche Research Center in Japan in 1994 (*FEBS Letters* v 348) researchers used a killer toxin called HM-1 for this experiment. They found that beta glucan interfered with the toxin action of HM-1. They reported, "Addition of HM-1 killer toxin with several kinds of oligosaccharides revealed that either beta 1,3 or beta 1,6 glucan block the cytocidal (toxic) action of HM-1 killer toxin…" Again, this shows that it does not matter whether the beta glucan is 1,3 which we are concerned with, or even the 1,6 configuration (which is also found in common foods) to be effective.

At Purdue University in Indiana in 1995 (*Carbohydrate Polymers* v 28) 1,3 beta glucan was studied for configuration and structure in relation to immunostimulant activity. They reported their findings that, "Immunopotentiation effected by binding of 1,3 beta glucan molecules or particles probably includes activation of cytotoxic macrophages, helper T cells, and NK cell, promotion of T-Cell differentiation and activation of the alternative complement pathway." In simpler terms they feel that beta glucan works by assisting macrophages, T-cells and NK cells work more effectively.

A study from the University of Saskatchewan took place in 1997 (*Microbiological Immunology* v 41) with oat glucans they called OBG. OBG was tested for its ability to enhance non-specific resistance to a bacterial challenge in mice. Survival in mice challenged with deadly Staphylococcus aureus was enhanced by a single dose of OBG three days prior to the bacteria being administered. "These studies demonstrated that OBG possesses immunomodulatory activities capable of stimulating immune functions both in vitro and in vivo." Staphylococcus is one of the most deadly of bacteria to mammals and for beta glucan to effectively resist this deadly microbe is very impressive medically. The National Veterinary Institute in Sweden (*Journal of Veterinary Medicine B* v 50, 2003, pp. 121-7) verified this with cows.

Another study at the University of Saskatchewan in Canada in 1997 (*International Journal of Parasitology* v 27) oat beta glucan was studied in mice. The deadly Eimeria vermiformis bacteria was given to mice and their immune systems were suppressed with the toxic drug dexamethasone. The immunosuppressed mice who received no beta glucan showed severe symptoms of disease and a 50 percent mortality, while minimal symptoms and no mortality occurred in the beta glucan treated groups. There were no deaths from Eimeria in the beta glucan protected mice! They summarized the results that beta glucan treatment strongly increased the resistance to Eimeria infection even when the immune system was chemically suppressed.

In 1998 the people at the University of Saskatchewan (*Microbiological Immunity* v 42) again studied OBG and this time on the deadly Eimeria vermiformis bacteria. Oat beta glucan given to mice raised their levels of serum Igs (immunoglobulins) and antigen-specific Igs (specialized immunoglobulins). One group was not given any glucan and the other group was before both groups were infected with the Eimeria. They said, "OBG appeared to up-regulate immune mechanisms and provide

enhanced resistance against Eimerian coccidiosis in mice." Again glucans saved mammals from death by a most deadly bacteria.

At the National Hospital in Oslo in 1998 (*Scandinavian Journal of Immunology* (v 47) more scientists studied mice. This time they were given beta glucan before being infected with the deadly Mycobacterium bovis bacteria. Mice treated with the beta glucan showed significantly lower numbers of bacteria in their bodies and especially in their spleens and livers. They said, "The results suggest that beta glucan has a protective effect against Mycobacterium bovis infection in susceptible mice."

Oat beta glucan was studied in mice at the University of Saskatchewan (*FEMS Immunology* v 35, 2003). "In conclusion, the oral or parenteral oat beta glucan treatment enhanced the resistance to Staphalococcus aureus or Eimeria vermiformis infection in the mice. These studies suggest that immune functions may be up-regulated by both oral and parenteral administration of oat beta glucan and these enhanced responses may play an important role in providing resistance to bacterial and parasitic infection. Current pharmacological treatments for the pathogenic infections may be enhanced when combined with oat beta glucan administration."

Yet again at the University of Saskatchewan in 1999 (*Canadian Journal of Veterinary Research* v 63) scientists studied beta glucan but this time on beef steers. They used the stand "OBG" extract from oats. They got varied results with different groups but the most interesting result was when the steers had their immune systems suppressed with dexamethasone. The glucan overcame this very effectively. Very sophisticated parameters were measured including serum antibody responses, serum IgG (immunoglobin G) levels, blastogenic responses of blood lymphocytes, differential blood leukocytes as well as iron and zinc levels in the blood. They said, "When cells or animals were treated with dexamethasone, OBG significantly restored some of the specific and nonspecific immune parameters studied."

At the National Institute of Public Health in Oslo in 2000 (*FEMS Immunology Medical Microbiology* v 27) doctors studied fungal beta glucan against deadly Streptococcus pneumoniae, a potent pneumonia strain. They called their beta glucan extract "SSG". They said, "The data demonstrate that SSG administered systemically protects against pneumococcal infection in mice." Of course you can't ethically give one group of humans beta glucan and not to another group and then infect

them both with deadly pneumonia, but there is no reason to doubt that this would also protect humans just as well. They later verified these results (*Current Medicinal Chemistry* v 2, 2003) and said, "Thus, in the future, biologically active polysaccharides that stimulate the innate immune system, may prove to be useful alternative compounds in the fight against respiratory tract and other infections."

Anthrax is not the most effective biowarfare agent for the simple reason it is not communicable, as are such infectious agents as smallpox and Dengue Fever. Nevertheless it is still widely used in warfare. Two studies show the effectiveness of beta glucan in protecting us against anthrax. An article in *Medscape General Medicine* (v 5, 2003) was on mice given oral beta glucan in their drinking water before being injected with Bacillus anthracis spores. The ones given the glucan fared far better than the ones who weren't. "These results demonstrate the potential for beta 1,3 glucan immune modulators to provide a significant degree of protection against anthrax, a potential biological warfare agent."

The numerous clinical studies done at well known research facilities over the world and published in top scientific journals should convince you this is the most potent immune potentiating substance known to science. It is safe, natural, effective and inexpensive with no known side effects. You will see more studies done on humans to verify what we know from animal research.

Chapter 3: Tumors – Benign and Malignant

Cancer is the second leading killer in the world after coronary heart disease. Of all the many studies on the various powers of beta glucan, it was surprising how many concerned tumors and cancer. The published literature on this is simply overwhelming. It is not just macrophages here that attack tumors, but also natural killer cells (NK), killer T cells, lymphokines and interleukin-1 and –2 cells. All these scientific terms just refer to the various processes we have to attack tumor cells and destroy them. There are so many animal studies on the anti-tumor properties of beta glucan just in the last thirty years, that we can only list a fraction of them. There are even a few human studies finally. Most of the work was done in Japan with various types of mushrooms, but the same effectiveness would be obtained from yeast, oat and barley glucans. Science has known about the anti-cancer and anti-tumor power of beta glucan for over three decades now, and it is time to start using these on real people to both help prevent and treat the many different types of cancer. "Solid sarcoma 180" tumors are the standard means of study using special strains of mice.

Finally human cancer patients were given Grifola beta glucan at Kobe University (*Biological & Pharmaceutical Bulletin* v 25, 2002). Their macrophage and NK cell activity rose among other positive cancer fighting factors. The patients did much better than the ones who did not take the beta glucan. Clearly we need to use this with real people as a standard course of treatment.

Women with breast cancer at Istanbul University (*International Immunopharmacology* v 7, 2007) were given beta glucan. Their average age was 52, and their cancer was in the advanced stage. It was concluded, "Beta glucan administration seems to stimulate proliferation and activation of peripheral blood monocytes in patients with advanced breast cancer." The control group just got worse of course.

At Roger Williams Hospital in Rhode Island, (*Journal of* Experimental & Clinical Cancer Research v 27, 2008) people with advanced malignancies were being treated with radiation. They were given beta glucan to help mitigate the damage from this procedure. "Beta glucan is well tolerated in cancer patients receiving chemotherapy, may have a

beneficial effect on hematoposesis in these patients, and should be studied further, especially in patients with chronic lymphocyle leukemia and lymphoma."

Kinki University in Japan (*Biotherapy* 17, 2003) found yeast beta glucan to stop tumor growth in mice. So, they gave it to 260 humans with advanced or terminal cancer for three months. Even though such subjects do not respond well to conventional therapy they got very clear benefits from oral glucan. NK cells and other exotic measurements were done to substantiate this improvement.

The *Journal of the Nutraceutical Association* (v 5, 2002) published two fine articles. At the University of Louisville it was found mice were protected from tumors. "Orally administered beta glucan treatments also showed tumor protective effects on tumor size and vascularization." At the University of Mississippi a well referenced review of the literature was done. Based on all the animal studies it was suggested real people start using beta glucan to both help prevent and to treat various cancers.

At the University of Louisville (*Journal of Immunology* v 173, 2004) the very mechanisms by which beta glucan attacks tumors was clearly defined. Beta glucan was bound to radioactive dye and the course of action was following after oral administration to mice. The macrophages took up the glucans, and then transported them to the spleen, lymph glands, and bone marrow.

Kobe Women's College has done a lot of work in this area. In *Chemistry Pharmaceutical Bulletin* (v 35, 1987) Grifola (maitake) beta glucan showed clear anti-tumor effects against solid sarcomas in mice (these simply refer to the type of cancer strains). A study in *Food Science & Technology* (v 7, 2001) mice with tumors got very positive results with mushroom beta glucan. Another study (Annals of the N.Y. Academy of Sciences v 768, 1995) showed strong anti-tumor activity in mice giving them oral maitake glucans. Here they got an amazing 90% inhibition of both carcinogenesis and metastasis. A fourth study in Cancer Letters (v 192, 2003) found the same results as the others.

Tokyo College of Pharmacy did five studies. In *Journal of Pharmacobio-Dynamics* (v 11, 1988) mice were injected with glucans. "Beta glucan administered i.p. had effective antitumor activities." In the same journal (v 10, 1987) they found, "a potent anti-tumor activity over 95% was observed against solid sarcoma." Another study in the same volume

found dramatic effects from injecting mice with mushroom glucans. "Apparently, beta glucan is a useful antitumor agent." A fourth study in Biological Pharmacy Bulletin (v 17, 1994) said, "Winn assay confirmed the activation of the systemic antitumor immunity." In Chemistry Pharmaceutical Bulletin (v 39, 1991) the researchers said, "These results suggest that glucans given both by oral or injected routes are effective in the inhibition of pulmonary metasasis of tumors."

At New York Medical College (*International Journal of Medicinal Mushrooms* v 4, 2002) Grifola beta glucan was given to real people to help cure their diabetes. The results showed this, "may have therapeutic implications in the effect treatment of prostate cancer." In the same volume of this journal from Tokyo University mice were injected with Sparassis mushroom beta glucan. Dramatic anti-tumor activity was found here. In 2003 (v 5) Toei Pharmaceuticals used mice with sarcoma cancers. Again, they found dramatic anti-tumor activity.

The University of Regensburg in Germany did four studies. Mushroom glucan was effective against Sarcoma 180 solid tumors in mice (*Food Hydrocolloids* v 1, 1987). In another study, mice with solid 180 sarcomas were successfully treated with various mushroom glucans (*Farmaceutisch Tijdschrift voor Belgie* v 64, 1987). All the glucans were very potent regardless of the source. Tumor weights were reduced 72-99 percent in only thirty days with no other treatments! A third study was done (*NATO ASI Series H* v 53, 1991) with sarcoma 180 mice. Various sources of glucan resulted in up to 100% decrease in tumors. They stressed that all true beta glucans are effective, whether from grains, yeast, or fungi. A fourth study (*Journal of Cancer Research* v 118, 1992) mushroom glucan shrank sarcoma 180 mouse tumors by 100%. The source of the glucan does not matter.

At Osaka City University in Japan four studies were done. Reishi mushroom glucan (*Osaka-shiritsu Daigaku* v 38, 1988) was proven to inhibit and shrink the solid sarcoma tumors in mice. A stunning review was done complete with a full fifty-four references in the book *Carbohydrate Drug Design* (1997, Dekker) on the many studies done on antitumor activity. This excellent review even covered the structures, mechanisms of action, and clinical applications of all glucans for tumor and malignancy prevention and treatment. Another review with 14 pages and 18 references was published in *Frontiers of Biomedicine and Biotechnology* (1993). This covered many of the antitumor and anticancer properties of glucans and their structure. In *Bioscience, Biotechnology,*

Biochemistry (v 60, 1996) the usual sarcoma 180 mice were given mushroom glucans with substantial reduction in size.

At the University of Shizuoka in Japan five studies were published. In *Nippon Nogei* (v 58, 1984) reishi glucan stopped sarcoma 180 tumor growth in mice. In the same journal (v 59, 1985) resishi glucan again topped the growth of sarcoma 180 tumors in mice. In *Shizuoka Daigaku Nogakubu* (v 38, 1988) various mushroom glucans were found to be effective in inhibited mouse tumor 180 scarcome growth. In the same journal (v 41, 1991) the same mice with the same tumors were given mushroom glucan to successfully stop tumor growth. Lastly, in *Agricultural Biological Chemistry* (v 50, 1986) maitake glucan stopped sarcoma 180 growth in mice.

At the Tokyo Public Health two studies were done and published in *Chemical Pharmaceutical Bulletin*. More solid sarcoma 180 mice (volume 38, 1990) were used. Beta glucan was extracted from Omphalia fungi, which they called "OL" extracts. They compared the various structures of the extracts, and found all of them to be effective in shrinking the tumors. A second study at this laboratory (v 40, 1992) used the same OL extracts and found more proof of antitumor activity using the same strain of mice, regardless of structure.

At Joseph Fourier University in France (*Carbohydrate Polymers* v 16, 1991) mushroom beta glucan prevented Sarcoma 180 solid tumors in mice from growing, "with an inhibition ratio of almost 100 percent." To have this kind of success is incredible. At the Institute of Nutrition Research in Bratislava (*Ceska Slovak Gastroenterology* v 53, 1999) rats were fed mushroom glucans. This had dramatic effects on their SOD and glutathione enzymes and stopped precancerous intestinal lesions from growing. A well referenced review from Georg August University in Germany (*Pharmacy Unserer Zeit* v 21, 1992) was done. This just verified the proven antitumor activity of mushroom glucans. At Christian Albrechts University in Germany (*Carbohydrate Research* v 231, 1992) mushroom glucan was again found very effective against solid sarcoma tumors in mice.

At the National Research Institute in Cairo (*Egyptian Journal of Biochemistry* v 20, 2002) mushroom glucan was found to have strong anti-tumor acitivity in mice. Lifespan was extended, and tumors were in-

hibited by full 88%. At Tulane University (*Hepatology* v 5, 1985) the doctors gave glucans to mice with liver cancer. They said, "Glucan will significantly inhibit hepatic metastases, inhibit growth of tumors, and enhance long term survival." At the Study Center for Nuclear Energy in Belgium (*Immunological Letters* v 15, 1987) mushroom glucans were given to mice with lymphoma with very positive results. At the University of South Carolina (*Journal of Applied Physiology* v 97, 2004) the same results as the previous study were obtained with oat glucans.

At the University of Milan (*Mutation Research* v 658, 2008) a well referenced review was done regarding all beta glucans as treatments for cancer and mutations. They recommended their use in humans with malignancies as standard treatment. At the famous Mayo Clinic (*International Journal of Cancer* v 65, 1996) mice with pulmonary metastases were given beta glucan. In only fourteen days the lung cancer growth was measurably inhibited. The overall survival rate was greatly increased as well. At the University of Medical Science in China (*Agricultural Biological Chemistry* v 55, 1991) mice with solid sarcomas got very positive results

The famous Sloan-Kettering Cancer Institute published a study on mice (*Cancer Immunology Immunotherapy* v. 51, 2002) demonstrating the anti-tumor effects of oral glucans. "Given the favorable efficacy and toxicity profile of oral beta glucan treatment, the role of natural products that contain beta glucan in cancer treatment as an enhancer of the effect of monoclonal antibody therapy deserves further study."

Folks, we could go on with animal studies for a long time. Wuhan University in China shrank tumors in mice with mushroom glucans. Ehime University in Japan stopped colon cancer from growing in mice with yeast glucans. The Russian Academy of Medical Sciences published a well referenced review of the power of yeast glucans for antimutagenic, antiinfective, and antitumor activity. They recommend this for human patients in the prevention and treatment of cancer. At Makato Research in Japan found mushroom glucan stopped the growth of solid sarcoma tumors in mice. At Northeastern Normal University in China mice reduced tumors a full 50% by simply eating mushroom glucan in their feed. Doctors at Gifu University in Japan found Amanita mushroom glucans were effective against mouse sarcoma.

In these many studies you can see that beta glucan has proven to have powerful antitumor and anticancer activity. After almost two decades of overwhelming proof with animal studies it is time to use beta glucan on men and women in clinical studies. Any individual can choose to use beta glucan with traditional medical treatments or with other natural healing methods especially diet, supplements, hormone balancing, exercise and fasting. We still need more human studies published in the medical journals to prove objectively that this is something that should be routinely used by anyone with benign or malignant tumors and cancerous growths.

Chapter 4: Your Cholesterol and Heart

It has been well known to scientists for over two decades now that beta glucan has very strong cholesterol and triglyceride lowering properties. Many of these studies were done on test animals for a long time before humans were used. This is the usual progression of events in clinical studies to make sure a supplement actually works and is safe. Additionally, animal studies are much less expensive to perform.

Two hundred and sixty-eight men and women with high cholesterol were given oat beta glucan in a study at the Chicago Center for Clinical Research (*Journal of Nutrition* v 133, 2003). "Results of this randomized, double-blind trial demonstrate that subjects with mild to moderate hypercholestemia can reduce their LDL and total cholesterol levels by consuming a group of phytosterol and beta glucan containing foods as part of a diet low in saturated fat and cholesterol." This is real life evidence we don't need expensive, toxic, dangerous statin drugs to lower blood fats. Maastrict Univeristy has done wonderful research here. In this same journal (v 137, 2007) men and women with high cholesterol were given muesli with oat glucans in a randomized, cotrolled, crossover study for only 4 weeks. "Intake of food products rich in beta glucan lowered serum cholesterol." They further said, "Beta glucan muesli decreased serum LDL cholesterol and increased bile acid synthesis and decreased cholesterol absorption."

Maastrict University has done a lot of work in this area. In *Nederland Tijdschrift voor Chemie* (v 30, 2005) they published another study. "Beta glucan can lower cholesterol and/or bile acid absorption in the small intestine. LDL levels can decrease approximately 6% with a daily intake of 5 g of beta glucan." At National Agricultural Research (in the book *Zywnonosc Technologica Jakosc* 1996) they reviewed the fat replacer Oatrim. "Oat soluble fiber beta glucan is known to lower blood cholesterol in animals and humans." Unfortunately, this wonderful oat food ingredient was never commercially successful. Oatrim contains large amounts of beta glucan, and helps lower fat content of foods while giving the mouthfeel and taste of eating these fats.

The human studies leave no doubt that the animal studies apply equally to real people. At Syracuse University in New York (*Journal of*

the American Dietary Association v 90, 1990) seventy-one men and women with hypercholesteremia were given various combinations of low fat diets with and without oat beta glucan supplements. The people on glucan not only lowered their cholesterol up to 17 percent but most all of them raised their levels of beneficial high-density cholesterol. The 17 percent figure is very dramatic. This shows the power of using better food choices along with your supplements.

At the University of Ottawa (*European Journal of Clinical Nutrition* v 48, 1994) hypercholesterolemic men and women were given oat beta glucan, which reduced their total and LDL cholesterol with no change in diet or exercise. This was a double blind study where the placebo group received no benefits. In 1997 this same journal (v 51) published a study at the University of Kuopio in Finland. Men and women were simply given oat bran which is naturally rich in beta glucans. "In the oat bran group serum total cholesterol declined." Later, in the same journal (v 67, 2011) at Pavia University in Italy men and women were given beta glucan enriched foods. "The results of the present crossover clinical trial showed the beta glucan enriched foods are effective in lowering serum LDL levels."

At the University of Wisconsin (*Hepatology* v 20, 1993) men with NORMAL cholesterol levels were given oat bran containing glucan and still lowered their cholesterol significantly with no change in diet! This is nothing less than amazing.

At Harvard Medical School in Massachusetts (*Critical Reviews in Food Science and Nutrition* v 39, 1999) doctors found that both oat and yeast derived beta glucans lowered serum cholesterol levels without any change in diet or exercise. There was no use of drugs, which you would expect at a school of medicine. In their words, "In addition to decreasing the intake of total fat, saturated fat and dietary cholesterol, blood serum cholesterol can be further decreased by dietary fiber, especially from sources rich in beta glucan such as oats and yeast." To their credit they do very much suggest low fat diets with little animal fat or cholesterol instead of toxic, expensive prescription drugs. Doctors like this deserve a lot of praise for studying natural ways and natural supplements to cure disease.

The *American Journal of Clinical Nutrition* has published numerous studies on the benefits of beta glucan. At the VA Hospital in KY (v 52, 1990) oat bran cereal lowered both total and LDL (low density lipo-

protein) cholesterol. “Ready to eat oat bran cereal provides a practical means to incorporate soluble fiber into the diet to lower serum cholesterol.” At CSIRO in Australia (v 53, l991) men were given barley foods high in beta glucan for four weeks. “It is concluded that barley dietary flour is effective in lowering blood cholesterol in hypercholesterimic men. Consumption of barley was associated with a significant fall in both total cholesterol and LDL cholesterol.” In the same journal (v 70, 1999), at the University of Massachusetts, researchers studied obese men with high cholesterol levels. They gave them yeast based beta glucan but made no changes in their diet or exercise. In only eight weeks cholesterol had fallen 8 percent and their harmful low density cholesterol levels had also fallen 8 percent. They summarized their findings, “Thus, the yeast derived beta glucan fiber lowered the total cholesterol concentrations and was well tolerated”. In the same journal in 2003 (v. 78) a study from Maastricht University in the Netherlands was published. This time both men and women with high cholesterol were given the glucans. This generally improved their blood lipid profile in several ways including lowering their LDL cholesterol. Another study in the journal in 2002 (v. 75) at St. Michaels Hospital in Toronto was published. Adults with high cholesterol were fed a low fat diet or a low fat diet with beta glucan. The glucan group not only lowered their cholesterol and blood pressure, but improved their cardiovascular risk as equated by the Framingham Risk Equation (the largest ongoing CHD study in history.) In the same journal (v 80, 2004) in Beltsville men and women were given barley in their daily diets. “The addition of barley to a healthy diet may be effective in lowering total and LDL cholesterol in both men and women. Total cholesterol was significantly lower when the diet contained beta glucan from barley.” In the same journal (v 83, 2006) at the University of Maastrict doctors said, “Beta glucan can reduce serum concentrations of total and LDL cholesterol.”

At the United States Human Nutrition Research Center in Maryland (*Journal of Nutrition and Biochemistry* v 8, 1997) people were given oat extracts high in beta glucan content and lowered their blood fats with no change in diet or exercise. They studied these people further and found some rather remarkable beneficial changes in their metabolism after just a few weeks on beta glucan supplements. For one thing they found their dietary fat was not oxidized as much as usual which is desirable. New benefits of this are constantly being discovered.

Again at the Human Nutrition Center (*Journal of the American College of Nutrition* v 16, 1997) men and women with high blood lipid

levels were given oat extracts high in beta glucan. After only five weeks the groups were switched and those previously getting the oat extract received only the typical American high fat diet everyone was maintained on. At the end of the study it was shown that when each group got the beta glucan both their total cholesterol levels and low-density cholesterol levels decreased significantly. In their words, "A significant dose response due to beta glucan concentration in the oat extract was observed in the total cholesterol levels." When you have such thorough double blind studies at prestigious research centers where people are given a high fat diet with no exercise, there is no doubt about the powerful effects of beta glucan on humans. Earlier in 1992 in the same journal (v 11) the University of Kuopio in Finland studied patients with high blood lipids. They were given oat bran with glucans for eight weeks with good results. To have such human studies shows there are doctors who are sincerely interested in natural medicine.

At Industrial Research Limited in New Zealand (*Carbohydrate Polymers* v 29, 1996) researchers used barley derived glucan to try and discover the actual metabolic mechanisms by which it lowered blood fats. They wanted to understand just how beta glucan affects the various organs of the body to eliminate blood fats rather than let them build up. They first discovered that it increased the secretion of bile acids from the gall bladder. These bile acids are important in keeping cholesterol and triglycerides at healthy levels. They used highly sophisticated NMR (nuclear magnetic resonance) techniques and found the bile acid process was only part of the story. The mechanisms at work are much more complicated than mere enhanced gall bladder activity. This shows the more we learn the less we know, and the important thing is that beta glucan is a powerful normalizer of blood fats. We may never clearly understand the actual means by which it works.

At the University of Lund in Sweden (*Annals of Nutrition and Metabolism* v 42, 1998) men and women were given oat, soy, and cow milks. "The oat milk regimen resulted in decreased plasma cholesterol and LDL cholesterol levels." Again at the University of Lund in the same journal (v 43, 1999) mildly hypercholesterolemic men and women were given oat milk, which was high in beta glucan content in their diets for five weeks. This was a classic double blind study, and half of the men got rice milk, which contains no beta glucan. The men drinking the oat milk lowered their total cholesterol as well as their low density cholesterol levels, while the men drinking the rice milk did not. They said, "It is concluded that oat milk has cholesterol reducing properties."

Radiant research did a study in *Nutrition Research* (v 23, 2003). Children aged 6-14 with high cholesterol were studied. For the first time in history we have hypercholesterolemic children. They were given glucan enriched breakfast cereal for one month. "Thus, consumption of beta glucan containing cereal modestly lowers blood cholesterol levels in children and adolescents."

At the University of Minnesota (*Nutrition Journal* v 6, 2007) hypercholesterolemic men and women were given beta glucan in their food. "Oat beta glucan produced significant reduction from baseline in total cholesterol, and LDL cholesterol." In the journal *Diabetes and Metabolism* (v 35, 2009) people were given beta glucan enriched bread for three weeks. "The consumption of bread containing beta glucan led to significant reductions of LDL cholesterol, and in total cholesterol." Insulin levels also fell, and this was cited in the Blood Sugar Problems chapter.

The *Journal of the American Medical Association* published two studies on cholesterol. At Rush Medical Center in Chicago (v 265, 1991) people with serious cholesterol issues were simply given oatmeal for breakfast with added oat bran. They saw, "a dose dependent reduction of LDL cholesterol levels with oat cereals, which supports the independent hypercholesterolemic effects of beta glucan." At the University of Minnesota again (v 268, 1992) a meta-analysis was done of 20 different trials. A large overview such as this is very powerful. Their MEDLINE study found, "this analysis supports the hypothesis that incorporating oat products into the diet causes a modest reduction in blood cholesterol level."

At the University of Yamanashi in Japan (*Nutrition* v 19, 2003) healthy women were simply given barley in their diets. "The barley intake significantly lowered plasma total and LDL cholesterol concentrations and reduced plasma triacylglycerol (triglyceride) concentration." They recommended barley as a dietary staple.

High blood pressure or hypertension is epidemic now in all western societies. Hypertension is one of the leading causes of death in both men and women. Eating a whole grain oat cereal containing beta glucan was shown to help lower blood pressure at the University of Minnesota (*Journal of Family Practice* v 51, 2002). "Whole oats, when supplemented daily, significantly reduced antihypertensive medication need and improved blood pressure control over the twelve week intervention. Whole oats improved blood lipid and fasting glucose levels and reduced

the incidence of overall study-related side effects. Significantly increasing whole oat consumption may greatly reduce risk for cardiovascular disease in hypertensive patients."

Worldwide studies like this on real people in research clinics and hospitals leave no doubt that beta glucan is a safe, effective, proven, powerful and inexpensive way to lower cholesterol and improve blood lipid profiles. There is every reason to use natural methods like this rather than dangerous, expensive drugs with serious side effects. Some of these statin drugs have been removed from the market after too many people died from taking them. Is there any reason to believe the others are any safer? Unfortunately, most people have never even heard of beta glucan much less take it every day. Most drug stores, health food stores and vitamin companies don't even sell it, and most of the brands offered are either weak and/or overpriced.

Please read my book *Lower Cholesterol without Drugs*. Diet and lifestyle lower your cholesterol and triglycerides. Eat oats, barley, and whole wheat regularly to get large amounts of beta glucan. In addition to 200 mg of beta glucan, you can take 1-2 grams of flax oil (instead of fish oil), 300-600 mg of beta sitosterol (mixed sterols), and 40 mg of soy isoflavones (genestein and daidzein). You can also take guggul gum, an Ayurvedic herb extracted from the Commiphora tree, for six months. Take 250 mg of a reliable guggul extract with 10% sterones to give you 25 mg of actual sterones per day. With better food choices and simply walking every day your improvements can be much more dramatic. Remember that natural health means a natural lifestyle and especially a natural diet.

Chapter 5: Rejuvenate Your Skin

Beta glucan has very powerful topical effects on your skin, especially on your face to prevent wrinkling, stronger immunity and anti-aging generally. It also has powerful healing properties for trauma, sun damage, and burns. This has been known about for over thirty years now. Only in the last 10 years or so has it been possible to make an inexpensive, effective 1% cream due to the high cost and low per cent of beta glucan. It is extremely difficult to extract glucan from oats and yeast (barley and mushroom are more expensive). Even today the best beta glucan from oats or yeast is only 80% pure with 20% fiber. No one was able to put out a cream with realistic amounts of beta glucan until about 1999. It is still not easy to find a REAL beta glucan cream with one percent oat or yeast glucans. Most creams refuse to state the per cent because it is so low. If you will search the Internet you will find a few. Make sure they clearly state their creams contain at least one per cent (600 mg per 2 ounce jar). If they refuse to state how much, or contain less than that, don't buy it. Read the label! You can find a real one percent (1.0%) cream inexpensively for under $15, due to the wonders of the Internet and the advancement in extraction technology.

Beta glucan cream has been used mostly for cosmetic, anti-aging, and anti-wrinkle benefits. We need more research on trauma and healing properties such as burns and wounds. We need more research on skin diseases such as psoriasis, dermatitis, and eczema, and skin cancer. (Acne is caused by digestive and hormone factors and does not respond to topical treatment well at all). These various skin diseases are epidemic in western societies now. The real cure for all skin conditions is internal by using diet and lifestyle to treat them. Effective topical treatments are still very important as supportive help.

We have already spoken of macrophages. Macrophages are in your skin, and are activated by topical beta glucan just as the internal macrophages are. Our skin is not just a covering for our body- it is the largest organ of the body (the liver is second) and the most important organ for our immune system. The outer layer or epidermis contains about five per cent macrophages. These cells stop the growth of dangerous microbes and produce something called "epidermal growth factor" which stimulates renewal of skin cells.

It is also important to mention Langerhans cells. These are also dendritic (immunity) epidermal cells, and very similar to macrophages. They ingest toxins and other foreign substances and render them harmless as much as possible. Beta glucan also stimulates these vital skin cells. Langerhans cells play a key role in defense, immunity, and repair. Natural killer (NK) cells are stimulated by beta glucan. These are crucial to immunity.

Most of the studies done on topical uses have been done by private cosmetic and pharmaceutical companies and not published. They realize the profit potential here, and want to patent and protect any discoveries they make. Therefore, most of this chapter depends on patents they have registered. In addition, we have international clinical studies with people who have used beta glucan creams with excellent results. You'll see in the following studies that some of the largest cosmetic companies in the world are involved in this. These companies do not want to share their research, as they want to patent their products. You realistically just cannot patent beta glucan though! We need more published human studies on topical uses, especially for wound healing and reducing aging and wrinkles in the skin. Until we get those studies just use a good beta glucan cream on your face for a year and you'll see the results you want. Also use it for burns, sunburn, and other injuries. This can also help some people with skin diseases like psoriasis and eczema. Beta glucan also makes an excellent addition to a multi-ingredient cream containing other proven topical ingredients such as vitamin A, vitamin D, vitamin E, CoQ10, glutathione, SOD, melatonin, DHEA, and pregnenolone.

The best human study is from the University of SC (*Journal of Pediatric Surgery* v 36, 2001). Children with burn injuries were treated with beta glucan bandage coverings. "Observed advantages (with beta glucan) coverage include reduction of pain, improved healing, and better scar appearance. Even more important in children is the elimination of painful daily dressing changes, as well as decreased fluid loss." They treated 225 children over a two year period. They went on to say, "Burns in children can be effectively treated with beta glucan coverage with good results, even in infants and toddlers. This markedly simplifies wound care for the patient and family, and significantly decreases post-injury pain." Every year a quarter million American children suffer serious burns, and 30,000 have to be hospitalized. We have a mere 5% of the world population, so that could well be 5 million children a year worldwide. Burn injuries are very common with adults in all countries.

Doctors and emergency rooms should be treating these people routinely with topical beta glucan.

Many international pharmaceutical and cosmetic companies were granted patents for various beta glucan creams. There is a class of patents granted in the European Union called PCT International patents. The famous and huge conglomerate Ciba-Geigy A.G. Corporation was granted WO 95 22,310 patent in 1994 for a beta glucan cream containing "0.05-3.0 percent" glucans from the Schizophyllium mushroom species. You can use 0.5% in a mixed active ingredient cream, but you should use a full 1% in a beta glucan-only cream. More than 1% simply has no more effectiveness. The fact such a large corporation has researched and patented a beta glucan is prima facie proof of its value. Another PCT patent was granted in France in 1996 WO 96 28,008 for controlling skin ageing and/or increasing skin elasticity.

Japanese scientists have probably done more research here than anyone else. In 1987 Bio Bi Daimaru Company developed a beta glucan cream from the Auerobacidium fungus. They were granted JP 62, 205,008. In 1991 Kanebo Limited develop their cream based on glucans from Macrophomopsis fungus. They were granted JP 03,167,109. In 1992 Ichimaru Pharcos K.K. Company made a facial cream from Euglena extract. They were granted JP 04,59,715. In 1995 Noevir K.K. Company patented a generic glucan face cream with a special delivery base. They were granted JP 08, 291,021.

The famous ROC Corporation has been successfully promoting retinol (vitamin A or retinyl palmitate) creams worldwide. They were granted WO 98 17,246 in 1996 for a beta glucan cream. They only call for a 0.5 percent (half of one percent) beta glucan from unspecified sources, instead of a stronger 1.0 percent cream. The very successful Shaklee international multilevel marketing corporation was granted WO 99 33,439 in 1999. They were later granted a U.S. Patent as well for the same cream. They claim that their product increases the cellular viability of epidermal cells, and that it decreases the production of inflammatory mediators, as well as protects the skin from the adverse effects of UV radiation. This is a successful company that knows what it is doing. They would not spend the time and money on topical beta glucan if they didn't have very good reasons to see it as a major success. The even larger firm of S.C. Johnson and Company was granted WO 99 27,904 in 1999. An international mega-corporation this large would not invest their time and

money into patenting something unless they had very good research to show its value.

Another very big international player is the Novogen Research Limited in Australia. They were granted WO 99 36,050 in 1999 for their glucan cream. They claim their product protects the skin from UV induced erythema, photoaging, and premalignant and malignant skin cancers. These are obviously strong claims to be granted in a PCT patent. The very successful Henkel Kommanditgesellschaft Corporation in Germany was granted WO98 40,082 in 1998 for their therapeutic glucan cream. They claimed, "These substances strengthen the immune system of the skin, counteract wrinkling and can be used to prevent scaling and psoriasis." Rather impressive claims obviously. They wisely saw the potential value for skin diseases as well as anti-aging and cosmetic use.

The Pacific Corporation in Germany was granted German patent DE 19,901,270. They claimed their beta glucan cream delays skin changes and heals and brightens the skin. Brennen Medical Incorporated was granted WO99 21,531 in 1999 for "healing treatment of burns and wounds and scarring there from". This shows the healing power for people who have been seriously hurt and want to heal faster and avoid scars.

At Alpha-Beta Technology, Incorporated in the U.S. a patent was granted in 1996 US 5,488,040 for a beta glucan cream. This was a very sophisticated and complete patent. It claimed "Topical application of a solution of this glucan promoted wound healing in mice and eliminated experimental wound infection with Stapholococcus aureus." Staph infections are hard to treat due to their deadly nature. This patent continued in great detail and medical language to explain the mechanisms of healing.

The German government granted patent DE 19,901,270 in 1999 to the Pacific Group of South Korea for their therapeutic glucan cream. They claimed this is used, "as an active component in a compound for external application that can delay skin changes and can heal and brighten skin." The famous Swiss Ciba Specialty Chemicals division of Ciba-Geigy Corporation was granted European patent EP 875,244 in 1997 for their glucan cream, but did not make specific claims for its use surprisingly.

In 1995 a study was published in the trade journal *Cosmetics and*

Toiletries (v. 16). They actually used human subjects to apply their beta glucan cream from yeast. They found clear anti-aging properties, maintenance of cell integrity, improved skin metabolic function and protection against photoaging (sun damage). This is one of the only good study we have using real people. We need more studies like this on real human subjects. A second study was published from the Canadian company Canamino, who was leading the world in beta glucan technology and application at the time (*Cosmetics and Toiletries* v 113, 1998). They use oat-derived glucans for the repair of skin from environmental damage from UV radiation, pollution, smoke, bacteria and free radicals.

In the Slovakian journal *Farmacie Obzor* (v. 66 1997) researchers used beta glucan from Pleurotus mushrooms. They applied a solution of this topically to mice, and found "significant stimulation of defense mechanisms….increased phagocyte activity….higher microbiological activity of peritoneal macrophages and other very powerful effects." Animal studies for skin studies are excellent and transfer very well to humans. This was a very well done and very impressive study proving the specific mechanisms on the skin of live mice. A Slovakian patent SK 277,698 was granted in 1994. Improved immunity of skin was their primary claim. Again, our skin is our largest organ and most important part of our immune system.

The Chinese are also studying beta glucan for topical use. In the journal *Xiangliao Xiangjing* (v 6, 2007) a well done referenced review was published. This covered the uses for anti-aging effects, wrinkles, scars, and inflammation. They suggested this has great potential in both the medical and cosmetics markets.

In 1997 the trade digest *SOFW Journal* (v 123) in Germany two articles were published. The first one was from Mibelle A.B. Biochemistry in Switzerland. They used topical glucan to protect skin from UV radiation and to promote the growth of keratinocytes (growth cells) in humans and enhanced the immune system of the skin generally. The second one was from *Verlag fur Chemische Industrie* in Germany. They extracted 1,3 beta glucans from a variety of sources including yeast and various mushroom and fungi. They found these to be effective regardless of the source in topical preparations for human skin to protect and regenerate the cells.

In the trade publication *International Journal of Cosmetic Sci-*

ence (v 20, 1998) Mibelle AG Cosmetics in Switzerland studied glucan creams on people to report the effects. They said these "are involved in the activation of the body's natural defense systems and in the acceleration of the skin's wound healing processes." In placebo controlled studies on real people they proved various benefits including protecting the skin from UV sun damage.

It is surprising that beta glucan creams and ointments are not more widely known and more available. There is little profit potential in non-patented and non-prescription products. Now that both oat and yeast glucans are available inexpensively should lead to beta glucan creams becoming more popular and well known.

Chapter 6: Blood Sugar Problems

Western societies have terrible issues with blood sugar, insulin, insulin resistance, and outright diabetes. *One in three American children will grow up diabetic!* Americans eat twice the calories they need, twice the protein they need, eight times (42%) the fat they need, and a whopping 160 pounds of various sugars they don't need at all. Americans eat a mere 1% whole grains instead of a far more sensible 30 to 50% whole grains. Please read my book *The Natural Diabetes Cure* to see how to cure all blood sugar and insulin issues with diet and lifestyle. A whole grain based diet is central to preventing and curing high blood sugar, high insulin, insulin resistance, and outright diabetes. Beta glucan is a wonderful supplement to help cure these problems, but it is only one part of a total program of diet and lifestyle. People over 40 should be taking about 20 proven supplements every day.

We have a wealth of animal studies showing beta glucan is very effective in both preventing and curing this epidemic of blood sugar related issues. Fortunately, we now have a good number of published human clinical studies to verify them. You can see theses studies go back over 20 years. Yet, people still don't know how effective beta glucan is for lowering blood sugar and insulin levels. *The very best and least expensive way to do this is by adding oats and barley to your daily diet as much as possible.* These grains can contain 5% dry weight of high quality glucans. A two ounce (dry weight) serving can therefore have a full 3,000 mg. Compare this to a mere 200 mg serving of normal beta glucan capsules. Don't limit this to the usual oatmeal for breakfast and barley soup. Steamed barley can be eaten instead of brown rice. Oat flour can be added to bread. Various hot and cold breakfast cereals contain barley and oats.

At the University of Toronto (*European Journal of Clinical Nutrition* v 56, 2002) men and women diabetics were given beta glucan supplements. This was a very thorough randomized, cross-over study, complete with 56 references. They concluded, "Addition of beta glucan predictably reduces the glycemic index (GI) while maintaining palatability in a 50 g carbohydrate portion (enriched cereal). Each gram of beta glucan reduces the GI by 4 units, making it a useful functional food component for reducing postprandial glycemia."

Barley Beta Glucan Reduces Plasma Glucose and Insulin Responses was the title of a study at the world famous Beltsville U.S. Department of Agriculture Human Nutrition Research Center ((*Nutrition Research* v 26, 2006). Barley beta glucan was given to normal weight and overweight men. Their insulin and glucose responses were lowered dramatically. "Consumption of barley beta glucan in muffins was effective in reducing glucose and insulin responses in men who were mildly insulin resistant."

Again, at the Department of Agriculture a study was done (*Journal of Nutrition* v 128, 1998). Here the scientists measured breath hydrogen expiration in men and women who took oat extract supplements. This is a sophisticated and rather expensive way to measure after meal blood sugar response. This was combined with the gold standard glucose tolerance test (GTT). They found breath hydrogen levels to be higher after the consumption of a beta glucan enriched pudding. This is a good thing to have higher hydrogen levels after a meal.

A study titled *Oat bran Concentrate Bread Products Improve Long-term Control of Diabetes* was done at the University of Alberta (*Journal of the American Dietetic Association* 96, 1996). A six month crossover study was done where men were given oat bran concentrate. "The well accepted oat bran concentrate bread products improved glycemic, insulinemic, and lipemic responses." This means their blood sugar, insulin, and cholesterol levels all fell just from taking the oat bran.

The University of Ottawa published *High Beta Glucan Oat Bran Reduces Postprandial Blood Glucose in Subjects with and without Diabetes* (*Diabetic Medicine* 11, 1994). They concluded, "A diet rich in beta glucan may therefore be of benefit in the regulation of postprandial (after meals) plasma glucose levels in subjects with type 2 diabetes."

Another study at the same university (*American Journal of Clinical Nutrition* v 53, 1991) was done with healthy subjects; *Oat Gum Lowers Glucose and Insulin After an Oral Glucose Load*. They used a GTT test along with a special 80% beta glucan oat extract. "These results establish that the more palatable oat gum lowers postprandial glucose and insulin concentrations in humans, and may be of greater benefit than guar gum."

The University of Milan did a very similar study with barley beta glucan (*Journal of the American College of Nutrition* v 25, 2006). Men were given crackers or cookies enriched with barley flour. They found, "Products prepared from barley flour enriched with beta glucan exhibit favorable responses on glucose metabolism, and particularly on insulinemic responses."

Another similar study was done at the University of Lausanne giving men beta glucan supplements (*European Journal of Clinical Nutrition* v 55, 2001). The doctors were interested in *how* the beta glucan lowered glucose and insulin after meals. They found, "This suggests that the lowered postprandial glucose concentrations which are observed after ingestion of a single meal containing beta glucan are essentially due to a delayed, and somewhat reduced, carbohydrate absorption from the gut, and do not result from the effects of fermentation products in the colon." They also noted, "Administration of soluble fibers such as beta glucan together with a mixed meal is known to decrease postprandial glucose and insulin concentrations. They have also been observed to improve glucose metabolism and to decrease HbA1c concentrations when administered as part of the diet over several days or weeks in type 2 diabetic patients." Hemoglobin A1c is a six month average of your blood sugar basically and an excellent diagnostic test. Their most powerful statement was, "Plasma insulin concentrations were 26% lower with beta glucan during the last 2 hours of the 9 hour meal ingestion."

A second study at the same university (*Diabetes Care* v 19, 1996) used beta glucan enriched breakfast cereals to blunt the rise in blood sugar after eating. "The 50% decrease in glycemic response that was observed after the ingestion of 35 g of enriched cereal is estimated to occur with 5 g of beta glucan. This dose of beta glucan can easily be attained without the loss of taste by incorporating oat bran concentrate in products." They did not need this much, but it shows just how much beta glucan can be taken in daily by just eating oatmeal, barley, and oat bran. This is a very easy, inexpensive, and practical way to achieve this.

New York Medical College did a study with Grifola mushroom beta glucan (*International Journal of Medicinal Mushrooms* v 4, 2002). "In clinical studies on hypoglycemic effect of Grifola extract patients with type 2 diabetes, under oral medication, demonstrated improved glycemic levels. One patient showed complete glycemic control and is currenty free of medications. Others showed over 30% decline in their serum glucose levels in 2 to 4 weeks. Therefore Grifola polysaccharides

may have therapeutic implications in the effective treatment of type 2 diabetes (hypo-glycemic action)." The only problem with mushroom glucans is they are expensive compared to yeast and oat. It is very difficult to extract the glucans from barley, so oat glucan is cheaper.

A study, *Bread Enriched with Beta Glucan Improves Insulin Resistance* was published in the journal *Diabetes & Metabolism* (v 35, 2009). Men and women were given beta glucan enriched bread in a strict randomized double blind study. They noted, "Previous studies have shown that the water soluble dietary fiber beta glucan, a natural component of oats, reduces cholesterol and postprandial hyperglycemia." This enriched bread lowered their plasma insulin and insulin response (lessened insulin resistance). High insulin levels are a basic cause of obesity. Our epidemic (one in three adults) obesity levels are due in large part to hyperinsulemia.

At Radiant Research in Chicago, hypertensive men and women were given foods fortified with oat beta glucan (*European Journal of Clinical Nutrition* v 61, 2007). Their blood glucose and insulin fell, along with their blood pressure, with no other change in diet or exercise. They actually lowered their blood pressure without any change in diet or lifestyle! The overweight subjects benefitted more than the others. "The amount of extractable beta glucan had a high correlation between the glycemic and insulinemic response." Hypertension is the most common medical condition in the entire world. Please read my book *Lower Blood Pressure Without Drugs* for more information on how to do this with diet and lifestyle.

Another study in the same above journal (v 48, 2009) was titled *Glucose and Insulin Response to Whole Grain Breakfasts*. Giving obese women whole wheat and barley breakfast cereals, high in beta glucan, dramatically reduced their after-meal glucose and insulin responses. "Peak insulin responses were significantly affected by the beta glucan amount in an inverse linear relationship. These data suggest that acute consumption of beta glucan is able to induce physiological beneficial effects on postprandial insulin responses."

A heavily referenced and very fine eight page review, *Beta Glucans in the Treatment of Diabetes*, was published in *Vascular Health and Risk Management* (v 4, 2008). This review covered many of the studies in this chapter. The conclusion was very clear, "Dietary intake of beta glucans has been shown to reduce all these risk factors (for diabetes) to

benefit the treatment of diabetes and associated complications. In addition, beta glucans also promote wound healing and alleviate ischemic heart injury."

Another fine review with a full 39 references was done at the Centre for Food Animal Research (*Carbohydrate Polymers* v 25, 1994); *Characterization of Oat Beta Glucan and its effects on Glycemic Response*. Here they showed the power of oat beta glucan to moderate the postprandial blood glucose and insulin response in humans. This was almost two decades ago, so it is not recent news. Beta glucan should be a pillar of any program to prevent and cure our current epidemic of high blood sugar and insulin conditions.

Chapter 7: Other Benefits of Beta Glucan

There are many other health benefits from taking beta glucan daily as a supplement in addition to what we have already covered. There will be many more discovered as time goes on. Right now we have studies on such areas as diabetes and blood sugar, ulcers, the qualities of our blood, digestion of our food, protection from radiation and other positive effects on our bodies.

Overweight women were give oat beta glucan (*Annals of Nutrition and Metabolism* v 49, 2005) at the Lipid Research Center in Quebec. It is very difficult to raise HDL levels. Giving them oat brain muffins raised their HDL by over 11% in just 2 weeks. "These results suggest that oat bran-rich foods have beneficial effect on the metabolic profile of overweight women".

Men were given oat bran rich in beta glucan (*European Journal of Clinical Nutrition* v 61, 2007). Liver problems are prominent in Western countries along with related gall bladder issues. The gall bladder secretes bile, which is vital for proper digestion. "Oat bran increased median excretion of bile acids by 144%." This occurred in just 72 hours after ingestion of the breakfast cereal. "Oat bran with native beta glucans increases bile acid excretion within 24 hours of consumption."

Chemotherapy is hideously harmful with extreme side effects. This treatment is actually more destructive than the cancers it purports to "treat". Patients under chemotherapy were given beta glucan (*International Review of Allergology and Clinical Oncology* v 10, 2004) at Istanbul University to ameliorate some of the side effects. Basically, this is an impossible task to undo the effect of manmade radiation injuries. Nevertheless the patients got dramatic results.

HIV is almost impossible to treat since it is a manmade disease from the biowarfare labs. At Kobe University in Japan (*Myoscience* v 41, 2000) mushroom beta glucan was given long term to men and women who were HIV positive. Their CD4+ cell counts went up strongly which shows improved immune response. 85% of them reported an increased sense of well being with regard to their symptoms. This is the way to

treat such people rather than with toxic drugs with side effects worse than any dubious benefits.

A fine heavily referenced review was published in the *International Journal of Medicinal Mushrooms* (v 7, 2005). They said, "Beta glucans demonstrate a diverse range of biological activities, and this diversity is so great that a 'common activity' has not been identified to this day". The authors found many varied uses and so many animal and human studies over the last two decades.

Another fine review was published in *Mycological Research* (v 111, 2007) from the University of Queensland. The literature suggests "beta glucans are effective in treating diseases like cancer, a range of microbial infections, hypercholesterolemia, and diabetes." This is a very powerful statement.

There are no supplements that reduce appetite or help one lose weight. Only diet and lifestyle result in weight loss and permanent weight control. A review published in *Agro Food Industry Hi-Tech* (v 19, 2008) showed that dietary beta glucan can be effective here. "Studies have demonstrated that incorporating barley beta glucans in food formulations induces satiety (feeling of fullness after eating) and traps some nutrients in a viscous matrix". They went on to say, "Barley beta glucans are an effective way of enhancing satiety and reducing energy." Another study found the same results with real overweight people (*Molecular Nutrition and Food Research* v 53, 2009). The men and women were simply given oat glucan enriched breakfast cereals every day. "Subjective satiety was increased with beta glucan doses". Very sophisticated blood parameters were measured including blood sugar, insulin, ghrellin and cholecystokinin. These are involved in metabolism and weight gain or loss. They were all improved. This shows beta glucan supplementation should be a part of any weight loss program. If these people had been given a whole grain based, low-fat diet and regular exercise these results would have been extremely dramatic. Yet, a third study (v 53, 2009) from the above journal showed the same weight loss results. People were given polenta meals with beta glucan added. Glucose, insulin, fatty acid, C-peptide, and triglycerides were all measured. They found, "The addition of beta glucan slowed the appearance of glucose in plasma, resulting in longer-lasting insulin secretion which exerted a prolonged inhibition of EGP (endogenous glucose production) and lipolysis". The measured parameters improved as well. Beta glucan helps with weight loss and maintaining the loss.

Colonic disease such as IBS, colitis, and outright cancer are all too prevalent in Western society. Our diet causes various acids to form during digestion. Various carboxylic acids help protect against disease. A study in the *European Journal of Clinical Nutrition* (v 62, 2008) actually studied the fecal acids in people. The ones given oat bran high in beta glucan for eight weeks increased their production of all the carboxylic acids, especially known protective ones such as butyric, propionic, acetic, isobutyric, and isovaleric acids.

Further studies on digestion were published in *Food Research International* (v 43, 2010). Beta glucan has a proven "prebiotic" effect. This means it promotes the growth of friendly bacteria like Bifidus in our digestive tract. Patients were given barley beta glucan with their meals every day for only two weeks. Fecal samples were then analyzed for bacterial content. "Barley beta glucan induced a strong bifidogenic effect and an increase of bifidobacteria." This occurred with no other dietary changes. This can be used along with a good refrigerated acidophilus product (with at least 3 billion units per capsule), FOS, and glutamine for better digestion.

Gastric ulcers are rather much of an epidemic in Western society. Beta glucan has shown potential to heal these ulcers since it has such a strong effect on the digestive system in general. In 1993 at Koshien University in Japan (*Koshien Daigaku Kiyo* v 19) studies were done with barley beta glucan on rats. They induced ulcers by water immersion stress over time and found that by simply feeding them barley flour high in beta glucan they were very effectively protected from getting stress ulcers. Again, at Koshien University in the same journal later in 1996 (v. 23) more rats were induced to get ulcers by water immersion and more barley derived glucan was given to them in their diets. Again, a strong protective effect was found. A third study at this university in the same journal (v. 26) only this time with oat derived glucan found the same benefits. When beta glucan is used on real people the same gastric healing will be found.

Stomach ulcers are all too common in developed countries and are due to a combination of stress and poor diet more than anything else. At Shandong University in China (*Shandong Daxue Xuebao* v 36, 2001) ulcers were caused in mice and rats by giving them irritating substances. "Beta glucan showed significant antiulcer activities in dose-response manner on experimental gastric ulcer models induced by the water-restrictive stress, ethanol, aspirin, pylorus ligature and acetic acid in mice

or rats. Oral administration was more effective than i.p. injection. Anti-ulcer effect may act through touching directly to the gastric mucosa and stimulating the immunocytes." This kind of research is tremendously promising for such a hard to treat condition.

We have seen in some of the studies just mentioned that blood parameters were improved along with other beneficial effects. The fact that beta glucan can improve the very quality of our blood is of great importance obviously. At the University of Tromso in Norway more work was done in this area (*International Immunopharmacology* v 2, 2002). Beta glucan was added to human whole blood cultures. "Soluble beta glucan has been demonstrated to protect against infection and shock in rats and mice, and clinical studies suggest that administration of soluble glucans to trauma/surgical human patients decreases septic complications and improves survival." Various blood parameters were much improved with beta glucan in real human blood cultures here. We need more work done with people instead of just test animals and human blood cultures.

At the Tokyo College of Pharmacy in 1990 (*Pharmacobio-Dynamics* v. 3) researchers studied the effects of mushroom (Grifola) beta glucan on human plasma. Proper blood clotting is one of the basic qualities of our circulatory system. If blood clots too much you end up with clumping that causes strokes and other problems. If there is insufficient clotting you can't stop internal or external bleeding. It was found that beta glucan normalized clotting, so this should not affect people on blood thinners like coumarin. The researchers found that beta glucan enhanced the ability of blood to clot normally, to bind with fibrinogen (which is a desirable trait) and to "increase the local concentration of the clotting system by steric exclusion." This was an excellent eight-page study complete with twenty-six published references at one of Japan's top universities.

At Brigham Women's Hospital in Boston in 1994 (*Immunology* v 81) yeast glucans were again studied for their effect on human blood. The doctors said, "glucocorticoids enhance monocyte functions mediated by beta glucan receptors, and this stimulation is dependent on proteins that are newly synthesized during culture." This means that the glucan enhanced the functions of the monocytes and improved the blood metabolism in general.

Tuberculosis is still a widespread and deadly disease around the world especially in agrarian cultures. Yeast beta glucan was found to be

effective against TB at the National Institute of Public Health is Oslo (*FEMS Immunology*, v 33, 2002). Mice were given beta glucan and then infected with TB bacteria. The results indicate that beta glucans inhibit growth of Mycobacterium tuberculosis in host cells in vitro, probably due to cellular stimulation and/or competitive inhibition of uptake of bacteria. Beta glucan is actually effective against such a powerful, common, and deadly illness as TB. We would find strong improvements in humans with TB if doctors would do such studies.

United States patent 5,488,040 was granted in 1996 to Alpha-Beta Technology for the improvement of blood metabolism. They claimed that yeast beta glucan stimulates platelet production in human blood. PCT patent WO98 26,787 was granted in 1998 to the very large firm Gist-Brocades in Australia for the improvement of intestinal health with beta glucan. They discovered very strong prebiotic improvement in digestion of test animals by adding this to their daily feed. The Japanese government granted patent JP 08,157,377 in 1996 for using beta glucan to control diarrhea. They used mushroom (Aureobasidium) glucan to effectively control diarrhea especially for raising commercial animals like cows and pigs. Another PCT patent was issued in 1992 WO94 04,136 for irritable bowel syndrome, including diarrhea and constipation in humans. This shows that many companies around the world realize the value of beta glucan in many health conditions and are busy trying to patent their particular product. Every year you will see more and more such patents.

We saw in the discussion of diabetes that digestion is improved in test animals by giving them beta glucan. More specific studies were done to verify this. In 1995 in the *Journal of Nutrition* (v. 125) barley glucan was given to chickens. Poultry farming is a very important industry in the United States and raising healthy chickens profitably is literally a multi billion-dollar business. At the Department of Animal Nutrition in Spain it was found that feeding the chickens barley glucan improved their digestive enzymes. They also ate less and gained less weight. Now this is not good news for the poultry industry and they want the broilers to gain as much weight as possible as quickly as possible for more profit. However, this is very good news for both healthy chickens and humans in that you would eat less and gain less weight on less food, be healthier and live longer.

It is almost impossible to protect people from the effects of radioactive contamination. When a nuclear reactor spews uranium or plu-

tonium mist into the air, water and soil it contaminates people, animals and plants. Since there is no concentrated nuclear radiation in nature, this is not a natural condition. The usual natural means of cure are therefore rarely effective. Beta glucan has been shown to help in resisting the effects of such nuclear damage. In Belgium at the Center for Nuclear Energy in 1988 (*Pharmacology Therapy* v. 39) researchers found that yeast beta glucan protected mice against the effects of x-radiation. When mice were irradiated and given beta glucan supplements their bone marrow stem cells resisted the effects and they had a much higher survival rate than the mice not given the supplements. At the same facility in Belgium in the same journal (pp. 189-93) they also studied mice given whole body irradiation with and without beta glucan supplementation. They studied their general health including gastrointestinal function and blood parameters and found that the supplemented mice successfully resisted the radiation much more than the unsupplemented mice. At the Armed Forces Radiobiological Research Institute in Maryland in 1988 (*Comments on Toxicology* v. 2) mice were irradiated and given a variety of supplements to see which protected them the most. The beta glucan supplements were most effective and the mice were analyzed for other metabolic functions. They concluded, "The results indicate the potential use of immunomodulators for protection against acute radiation injury…" At the Czech Academy of Science in 1991 radioprotective benefits of glucans were again studied on mice. They found increased recovery and increased survival in the mice given the supplements (*Folia Biologica* v. 37).

At the University of Bratislava in Slovakia in 1986 (*Methods and Findings of Experimental and Clinical Pharmacology* v. 8) it was shown that yeast beta glucan increased the macrophage activity of guinea pigs. It was also shown that superoxide activity was increased. Superoxide dismutase (SOD) is one of the basic antioxidant enzymes we have that fight free radicals. SOD falls as we age and free radicals become much more effective and harmful. They said, "Macrophages from guinea pigs treated with glucans exerted an increased ability to reduce INT and to produce superoxide." Impressive.

At the Laboratory for Biological and Cellular Molecules in France in 1989 (*Reproduction and Nutritional Development* v. 29) yeast beta glucan was given to sheep as well as barley beta glucan. They found that these stimulated hormone secretion especially valuable growth hormone. They found that this actually increased milk production in the ewes making them more valuable and healthier at the same time. It is

very difficult and expensive to increase the production of growth hormone and this is basic to how long we live and how healthy we are.

At the famous Mayo Clinic in Minnesota in 1993 (*Immunological Letters* v. 37) doctors found that tumor necrosis factor activity was enhanced in test animals by yeast beta glucan. Tumor necrosis factor is a potent cytokine or protein that is necessary to resist and kill and both benign and malignant tumor cells. This prevented the death of animals challenged with deadly bacteria. They said, "The authors therefore hypothesized that beta glucan might regulate TNF (tumor necrosis factor) secretion from macrophages in response to liposaccharide (LPS)". They went on to say that, "these data suggest an immuno-modulatory role of beta glucan which may explain both the TNF stimulating and inhibited effects of fungal beta glucans during infection." At the Tokyo College Pharmacy that has been doing so much research on glucans they also studied TNF in 1995 (*Biology and Pharmacy Bulletin* v. 18). Mushroom (Grifola) glucan was given to mice and elevated the LPS, which stimulated TNF production. This occurred within two hours and lasted a full three weeks. More verification of the means by which glucans fight tumors.

This short list of benefits is only the beginning. More and more we'll discover new benefits for taking this wondrous substance that is found in our everyday food. This should be one of the most important supplements you take for a long and healthy life.

OTHER BOOKS BY ROGER MASON

Published by Square One Publishing:

The Natural Prostate Cure	$ 6.95
Natural Health for Women	$ 7.95
Lower Cholesterol Without Drugs	$ 6.95
Zen Macrobiotics for Americans	$ 7.95
Testosterone Is Your Friend	$ 7.95
Lower Blood Pressure Without Drugs	$ 7.95
The Natural Diabetes Cure	$ 7.95

Published by Safe Goods Publishing:

The Minerals You Need	$ 4.95
The Supplements You Need	$ 4.95

Author:
Roger Mason

(photo)

Roger Mason is an internationally known research chemist who studies natural health and longevity, and writes unique and cutting edge books on these findings. He invented Beta Prostate® the most popular prostate supplement in the world. In 2011 he sold Beta Prostate® and walked away from radio and TV to form the Young Again Foundation. You can read his ten books and 300 articles for free at www.youngagain.org. He lives with his wife and dog in Wilmington, NC, where they run Young Again Products.

(back cover)

Beta glucan is the most powerful immune system enhancer known to science

- **enhance your immunity**
- **lower your cholesterol**
- **fight tumors**
- **normalize your blood sugar**
- **rejuvenate your skin**

BAR CODE $4.95 US