

CHITIN:

The Breakthrough
Nutritional Secret
for Optimal Health

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CHITIN: THE BREAKTHROUGH NUTRITIONAL SECRET FOR OPTIMAL HEALTH

Imagine for a moment what life would be like if you didn't have bones or a skeleton. You wouldn't be able to move, for one. Your vital organs would all squish together into one giant, non-functional blob of flesh. As a result, nearly everything you came into contact with would easily harm you. It's certainly an unsavory thought, and one that you've probably never even considered. Most of us take our physical bodies (bones and all) for granted, not realizing the extent to which the human skeletal structure plays a critical role in keeping us alive.

The many individual parts that make up our skeleton need to function harmoniously while still remaining upright, protected, and strong. In order for this to happen our bone structures must be in good working order at all times.

This requires a steady supply of minerals and other supportive elements that comprise the unique skeletal lattice that makes up our interior. After all, the skeleton serves as a type of hidden body armor – similar to the framing and trusses inside your home that keep it stable and prevent it from collapsing.

As is evident by their many unique forms, each member of the plant and animal kingdom possesses this type of structural protection, although not always on their *insides* like us humans do. Insects and arthropods, for instance, were created with what are known as *exoskeletons* on the outsides of their bodies that keep them protected from the elements and shielded against attack.

Just like with our own internal skeletons, these exoskeletons are replete with a mysterious substance known as *chitin*. As you're about to learn, chitin is fast becoming one of the most highly reputed nutritional compounds in the world.



THE MANY USES FOR THE WORLD'S MOST PLENTIFUL POLYSACCHARIDE

Chitin was first discovered and isolated back in 1811,¹ and later given a name by Swiss chemist Dr. Albert Hofmann in 1929. Chitin might not seem like much, considering it's technically just a polysaccharide – which is just a fancy name for a complex sugar chain.

You may be familiar with *cellulose*, a plant-based compound that serves as structural support for things like trees and shrub.² Chitin is similar in form and is a glue-like carbohydrate substance that's recognized as one of the most abundant renewable “bio” polymers on the planet – with many unique functions and applications.³

Because chitin is both strong and pliable, Dr. Hofmann (who, as an aside, is credited with being the first to discover the psychedelic drug LSD⁴) observed that it makes an excellent bonding agent. In crustaceans such as crabs, shrimp, and lobsters, chitin melds with calcium carbonate to form their tough outer shells.

In insects, chitin mixes with a substance known as *sclerotin* to form their rigid, yet moveable, outer shell-like coats. Chitin is even found in mushrooms and other fungi, serving as one of the structural building blocks to support their “bloom” and upright growth.

Practically speaking, chitin is probably best described as nature's “glue,” as it helps to reinforce the structural integrity and stability of many different lifeforms. Science continues to uncover new facets of its unique biological properties as well. This explains why chitin is increasingly making its way into a wide range of human applications, including in agriculture, dentistry, cosmetics, food, and even medicine.

CHITIN'S RELATIONSHIP TO CONDROITIN AND GLUCOSAMINE



You won't find chitin anywhere in the human body, or in the body of any other vertebrate creature, for that matter. That's because chitin exists only within the biological blueprints of invertebrates, which are uniquely suited to synthesize it for structural support purposes. At the same time, science has revealed that humans can in many ways benefit from chitin supplementation or topical application.

Many people who take dietary supplements are probably familiar with a substance known as *glucosamine*, which is often marketed as providing natural support for joints, cartilage, and bones. Many folks take glucosamine, often alongside another substance known as *chondroitin*, to help support joint health and improve cartilage density.

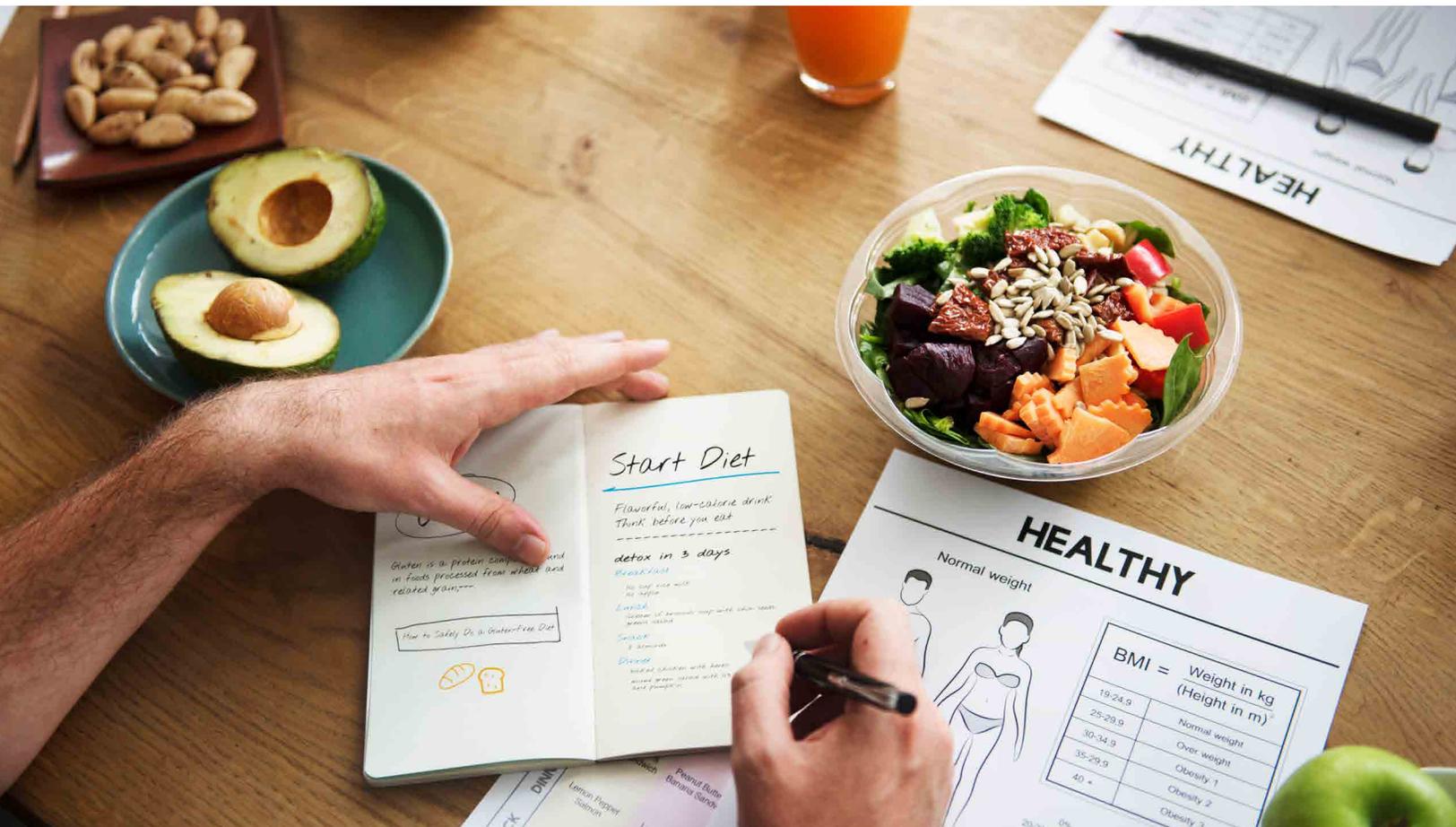
Chitin, it turns out, is actually glucosamine that's undergone polymerization. This means it reacted with other molecules to become a glucosamine bonding agent – which, again, gives it special utility in forming strong invertebrate body armor.

But there are also benefits to be had for humans. Chitin's "sticky" properties make it an excellent form of dietary fiber that research dating back to the 1980s suggests gives it health-promoting properties. General Mills (yes, the cereal company) published a study in 1983 illustrating that chitin is an *amino polysaccharide*, meaning it doesn't actually break down and absorb into the body upon ingestion.⁵

Not breaking down and absorbing doesn't mean that chitin isn't useful. To the contrary, like many other forms of dietary fiber, chitin facilitates the movement and delivery of nutrients extracted from food throughout the digestive tract. Chitin also has an electrically-charged magnetism that draw certain compounds like lipids, or fat, as well as cholesterol to itself – effectively preventing the body from digesting and absorbing them.

This can be a really good thing when a person is trying to lower bad cholesterol, for instance, or slim down and lose weight. Amino polysaccharides in general, we've come to find out, are uniquely suited to such tasks, and chitin is no exception. And because chitin isn't absorbed by the body, it's actually considered to be a calorie-negative substance – meaning you don't have to worry about it throwing off your dietary goals.

The hypocholesterolemic properties of chitin are further noteworthy, as this fibrous substance has been found to support healthy levels of cholesterol in the body. Some people have found that combining chitin with herbs like *Garcinia Cambogia* – a fruit extract reported to help balance weight and normalize cholesterol levels – provides added benefits due to their interactional synergy.



HEALTHY

Normal weight

BMI = $\frac{\text{Weight in kg}}{(\text{Height in m})^2}$

19-24.9	Normal weight
25-29.9	Over weight
30-34.9	Obesity 1
35-39.9	Obesity 2
40 +	Obesity 3

LIVER AND KIDNEY SUPPORT: THE FUNCTIONAL BENEFITS OF CHITOSAN



The promising health benefits of chitin get even better. For all that this powerful substance has been found to be good for, chitin is actually even more beneficial when one of its acetyl groups, or molecular components, is removed. We call this process acetylation, and scientists in the mid-19th century discovered that chitin could be chemically tinkered with in this way to make it more bioavailable (accessible) to the body. The end result is chitin derivatives such as *chitosan*, which is basically just chitin’s more bioavailable “cousin.”

In order to make chitosan commercially, producers simply soak crustacean shells in sodium hydroxide, also known as lye, a highly alkaline substance that strips it of its acetyl groups. But don’t be scared by all this chemical talk, as acetylation performed in this manner is a relatively natural process that simply makes chitin that much more powerful and effective at bringing about its desired benefits.

Beyond what we’ve already covered, these benefits further include mediation of the liver’s release of bile acid, which is critical for the digestion and absorption of both fats and fat-soluble vitamins in the small intestine. Bile release is also important for moving toxic waste products through the digestive system more efficiently to ensure these poisons are removed from the body as quickly and effectively as possible.

This was demonstrated in research conducted on mammals, in which those subjects given chitosan in their food were found to excrete far more fat and bile acid than subjects not given



the fibrous chitin derivative.⁶ Follow-up research demonstrated similar benefits, with chitosan supplementation helping test animals to achieve decreases in not only liver triglyceride levels but also low-density lipoprotein (LDL) cholesterol levels.⁷

The lipid metabolism normalization properties of chitosan are interesting in light of what we discussed earlier concerning its cousin chitin's role in binding to fats and pulling them out of the body. What this complementary action suggests is that both chitin and chitosan may work in tandem. Not only to help normalize the metabolism of dietary fats, but also to process them at maximum efficiency in conjunction with normal liver function.

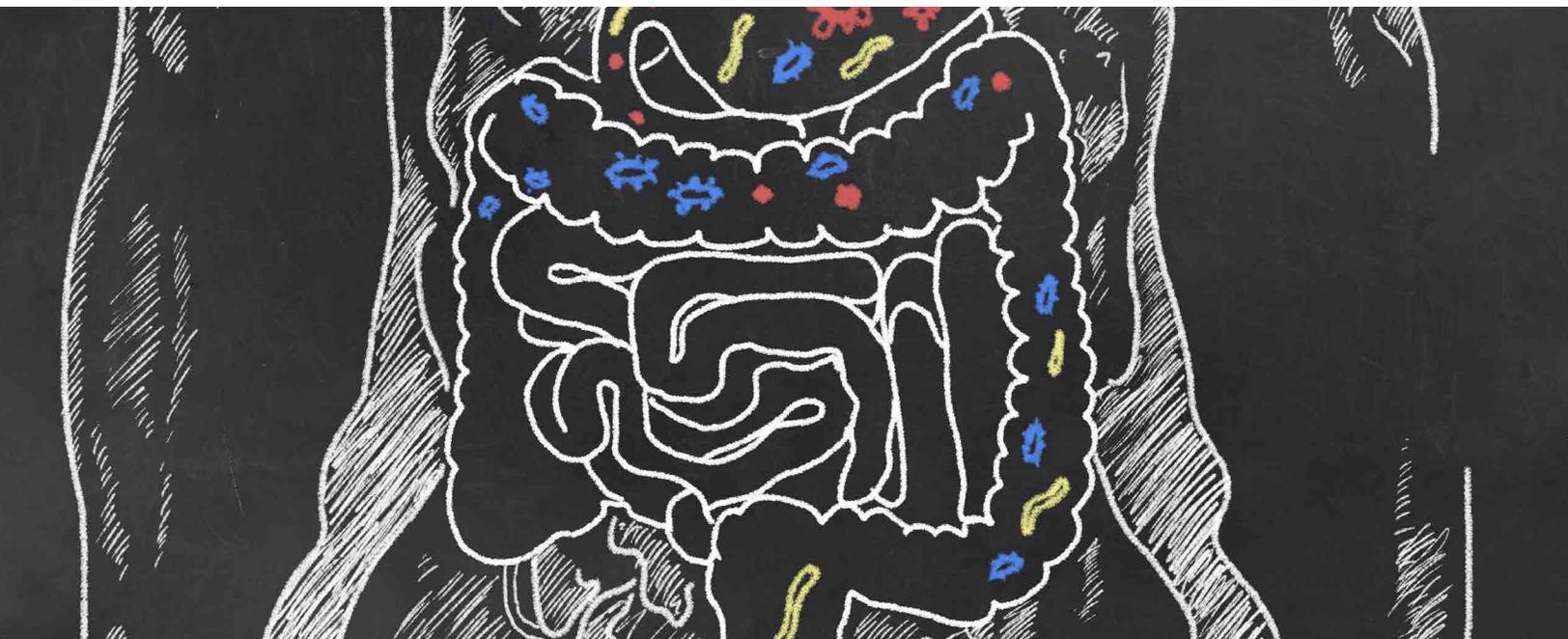
Concerning its effects on other organs, when kidney patients undergoing hemodialysis were given chitosan as part of a study on renal failure, their cholesterol levels were observed to go noticeably down at the same time that their hemoglobin levels went up. Major reductions in both urea and creatinine levels were also observed, the end result being that the kidney patients experienced more strength and improved sleep.⁸

BALANCING YOUR MICROBIAL ECOSYSTEM WITH CHITIN

Another area of human health that's gotten a lot of attention in recent years is the gut microbiome, which is where upwards of 80 percent of your immune system lives. There's lots of talk these days about probiotic foods and supplements that help to maintain a healthy ecosystem of these beneficial microbes, or bacteria, all throughout the digestive tract which is critically important for staying healthy and fit. But what doesn't get talked about as much is how to keep these countless billions of microbes properly nourished.

This is where chitin comes back into play. A powerful *prebiotic* substance, chitin functions as a type of food source for *probiotic* bacteria, helping them to thrive and flourish. If the gut microbiome was its own planet, chitin would be the rain that saturates its surface, providing life-giving sustenance for the many tiny critters whose job it is to make sure you stay nourished and protected against disease-causing invaders.

Studies on insect-based diets, which are popular in some parts of the world, have revealed that the prebiotic activity of chitin consumption has a direct effect on the probiotic activity of the gut microbiome. Edible insect species, researchers have determined, are rich sources of not only protein and complex carbohydrates, but also a variety of chitinous compounds that help gut microbiota to flourish.⁹



THE ROLE OF CHITIN IN IMMUNE SUPPORT

It's probably more accurate when discussing the potential healing properties of chitin to point out that, along with chitosan, there are actually many different chitin-like substances and proteins that fall into the general category of chitin. Research is ongoing as to the various roles that this chitin family might play in human health. But we do know that chitin does a lot, especially in the area of immune support.

A growing cohort of studies suggests that chitin and chitin-like proteins (CLPs) are highly useful in providing support for the human immune system, as well as mediating the degradation of the chitinous external protective structures that surround pathogenic bacteria. That's right: even harmful microbes have protective "covers" that surround them in the same way that shellfish and people have. And interestingly, chitin supplementation can actually be useful in breaking them down and destroying what's inside.

In many ways, chitin acts as a type of natural "vaccine." Animal trials have shown that its administration in various ways provokes an innate immune response. (Innate being the non-specific immune response that the body immediately engages whenever presented with a pathogenic threat.) There are many layers to your innate immune system, of course, including everything from tiny immune system cells that are invisible to the naked eye, to the skin that covers your body. Chitin can serve as yet another layer of defense.



An *injectable* vaccine provokes an immune response both at the site of the injection and inside the body. In a similar way chitin has been shown to trigger the activation of innate immune factors like *macrophages*. These govern the signaling pathways through which other immune factors like *eosinophils* (a specific type of white blood cell) engage an invading pathogen and begin the process of fighting it off and destroying it. But unlike many actual vaccines, chitin contains no toxic heavy metals or chemical adjuvants that pose the risk of serious side effects or adverse events.



Chitin further differs from vaccines in that it targets the body's innate immune system, or its non-specific defense apparatus that provides general protection against disease. Vaccines, on the other hand, bypass the innate immune system entirely and directly target the *adaptive* elements of the immune system, which are programmed to learn how to fight disease upon natural exposure rather than artificial intervention. This, in many ways, makes chitin a preferable immune-supportive alternative, not to mention a powerful, natural immunostimulatory agent that works in tandem with the immune system to help naturally support its ability to ward off disease.

CHITIN USED TO SUPPORT HEALTHY INFLAMMATION LEVELS IN THE BODY

Chitin's benefits extend even further to supporting the body against the damaging effects of the big "I": inflammation. While the human body doesn't produce chitin, it does produce its own chitin-like substances, which are implicated in inflammatory conditions like asthma and fibrosis. What's interesting is that studies show these same conditions can benefit from exposure to exogenous (external) administration and use of chitin derived from insect and arthropod sources.



In an asthma model, for instance, chitin was found to help work alongside an innate human chitinase known as CHIA to provide remediation against alveolar inflammation. This chitin-CHIA combination was further shown to help protect respiratory epithelial cells from dying, along with several groupings of cell-signaling enzymes associated with this process.

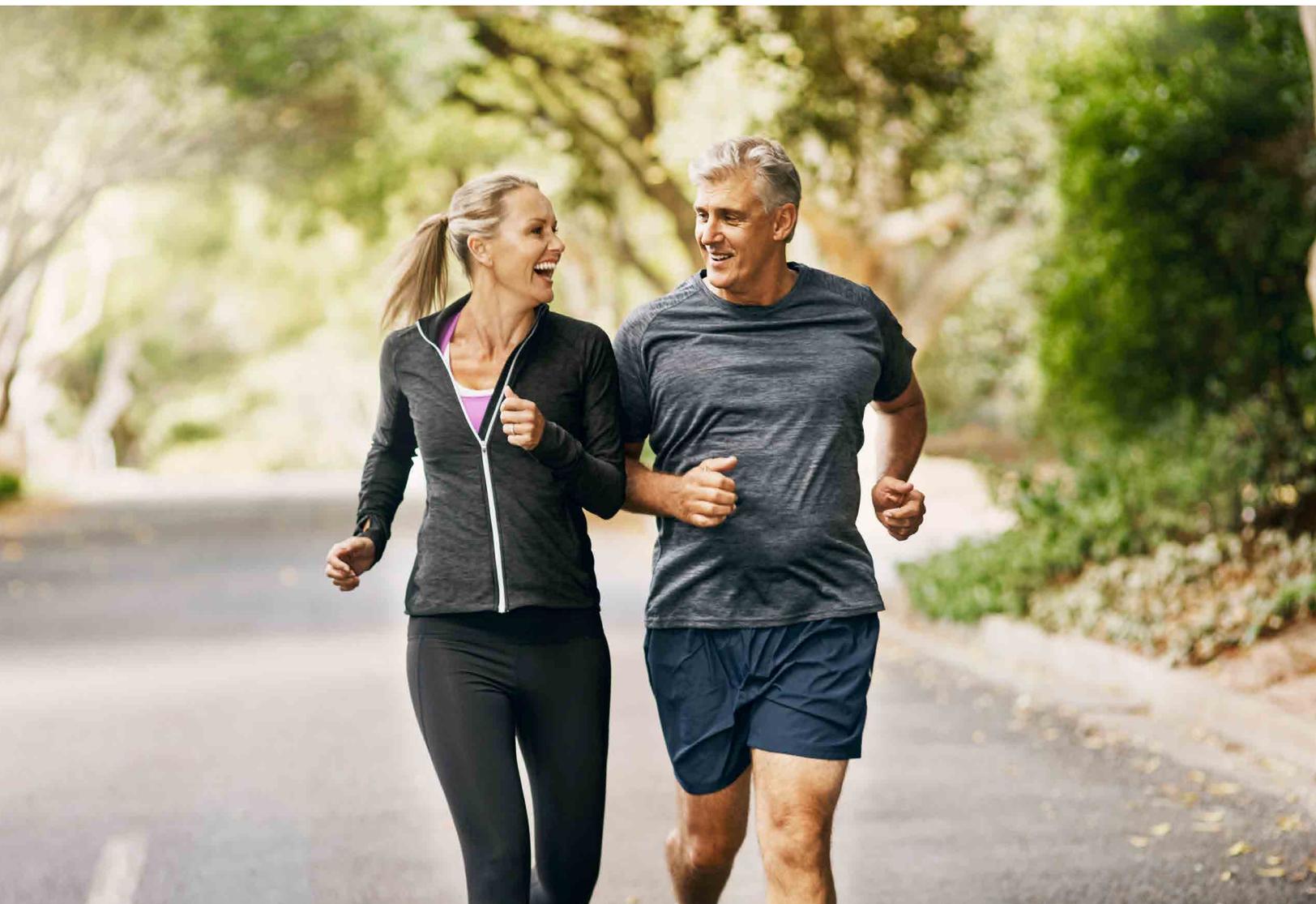
The same was found to be true for CHIT1, another innate human chitinase that's associated with airway hyper-responsiveness and asthma. Along with various other proteins responsible for keeping inflammation levels in check, CHIT1 combined with chitin was found to help improve the transfer of oxygen into the bloodstream via the respiratory system, in essence reversing the inflammatory action that had resulted in oxygen deficiency.¹⁰

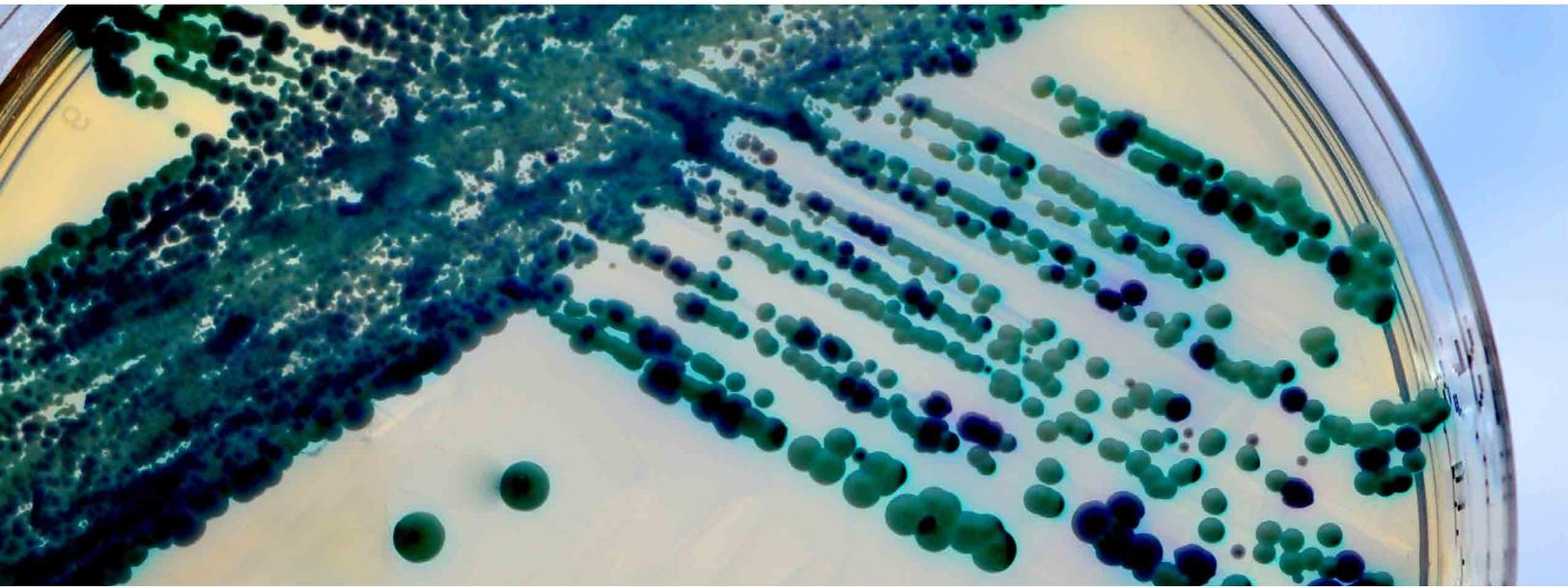
Multiple other studies have shown similar positive benefits with regards to damaging inflammation of the gut. One example of this is a study that was published in the journal *Inflammatory Bowel Disease*, which found that chitin microparticles, or CMPs, can function as an effective means to quell inflammatory intestinal diseases like colitis.¹¹

The authors of this study declared that CMPs "significantly suppress" gut inflammation in general, and they do this by normalizing the balance of immune cells like cytokines, as well

as beneficial microbes, all throughout the small intestine. In other words, chitin works much like a probiotic in this particular application (even though it's actually a prebiotic as we discussed earlier), helping to bring about homeostasis in the digestive environment.

There's no shortage of unique ways in which invertebrate-derived chitin helps to support these and many other innate vertebrate chitinase processes. When the two join forces, the result appears to be support for the balancing effect of the body's inflammatory response – whenever and wherever it happens to goes awry. Put simply, chitin essentially helps to maintain a balanced inflammatory response inside the body, as opposed to an overreactive one that can lead to disease or even death.





RESEARCHERS INVESTIGATING CHITIN FOR CANDIDA AND CANCER

Recognizing that inflammation and cancer go hand in hand, are there benefits to be had from chitin in this regard? Science sure seems to think so. One example is a mouse study published in the *International Journal of Cancer* in 2012, in which treatment with chitin helped to decrease tumor metastasis in a breast cancer model. Disseminated metastasis, that same study pointed out, accounts for more than 90 percent of all breast cancer deaths. Chitin was reported to help improve survival rates and even impede the growth and spread of more breast cancer cells in the rodent test subjects.¹²

More recent research has uncovered unique molecular interactions between chitin and CLPs in relation to both bacterial infections and cancer signaling as well – or what might be described as pathogen-induced cancer. By disrupting the way that harmful bacteria and cancer cells would otherwise normally run their course inside the body to create disease, chitin has been found to offer the type of support needed to give the body that little extra boost in guarding against even the worst immune system threats.¹³

Research from several decades back has also highlighted some important anti-fungal benefits associated with chitin. Intraperitoneal, or into the body cavity, injections of chitin have been shown to help reduce mortality rates as associated with candidiasis infection – or what many people more commonly know as candida. Such findings could lead to even greater breakthroughs in understanding how chitin might best be used to help keep harmful fungi at bay.¹⁴

CHITIN, CHITOSAN & CHITOLIGOSACCHARIDES: MORE VARIETY FOR BETTER RESULTS



The most promising discoveries on this front seem to be coming from research involving the use of chitin in its many varietal types. Besides chitosan, there are many other chitooligosaccharides (COSs) in the chitin family that show promise in supporting healthy immune balance.

Utilizing a diversity of chitin types, in other words, would seem to result in improved and more comprehensive outcomes. It's how polysaccharides in general seem to operate, activating and deactivating immune receptors and signaling pathways throughout the body like little switch operators.

If you think of the immune system like a complex network of train tracks on which immune factor “trains” are sent from point A to point B, chitin

and COSs are basically the engineers whose responsibility it is to flip the switches and make sure the “trains” reach their appropriate destinations.

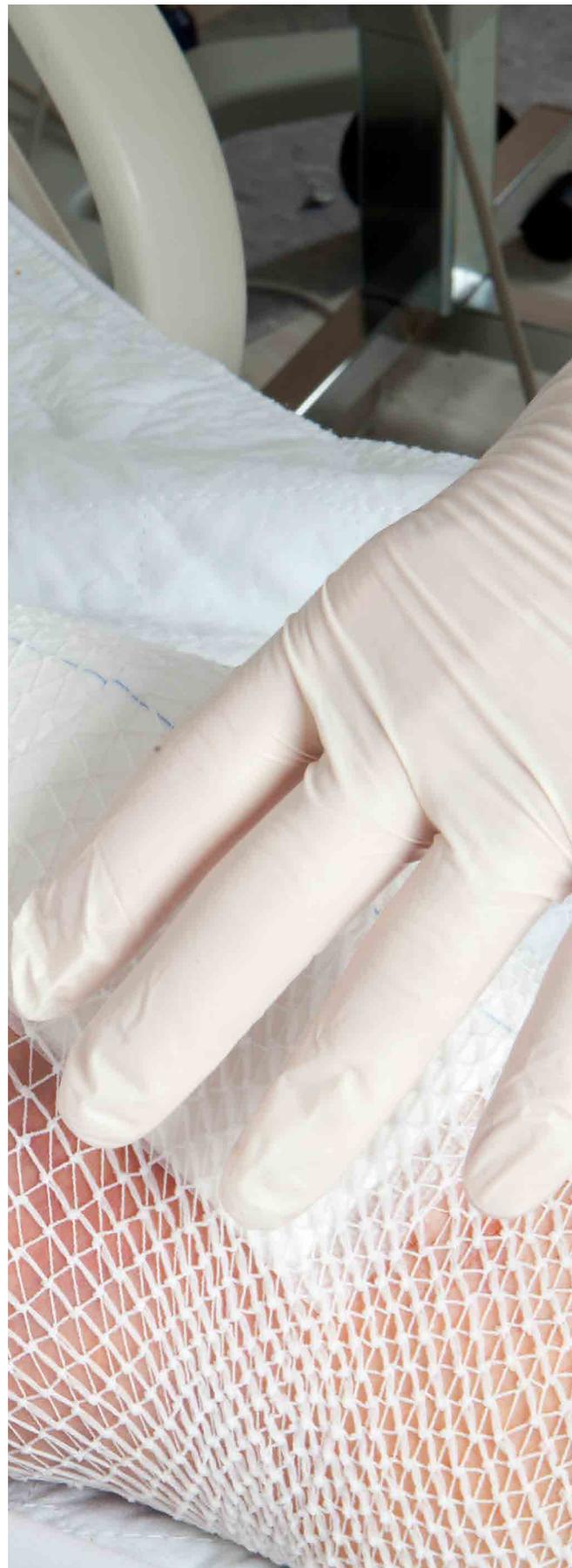
Investigatory research into the effects of chitin and COSs on the healthy growth and development of vertebrate mammals – which, remember, includes people! – serves as another great example of this.

As reported in a 2007 *in vitro* study using human umbilical vein endothelial cells, evidence of chitin-induced angiogenesis suggests that the application of chitin and COSs in formative therapeutics can not only help support the healthy formation of blood vessel systems throughout the body, but also inhibit the development of unhealthy ones.¹⁵

THE USE OF TOPICAL CHITIN IN PROGRESSIVE BIOMEDICINE

We're even seeing the topical use of chitin, chitosan, and its various other derivatives in the realm of wound healing. Research out of Japan recently found that applying chitin to bandages can help to greatly accelerate the natural wound-healing process, as well as fight off any threatening pathogens of bacterial, viral, and fungal origin in the process. The results were such a success that the study's authors made the suggestion that chitin and COSs be added to all sorts of medical products as a safe and natural way to support improved patient recovery.¹⁶

Chitin compounds are also powerful moisturizing agents for skin, as evidenced in a paper published in the *International Journal of Cosmetics Science*. Researchers tested the effects of a unique chitin-glucan solution on the forearms of healthy men, to which they discovered that it not only eliminated persistent dryness, but also minimized the signs of aging by improving skin firmness and reducing the appearance of wrinkles.¹⁷



THE FUTURE OF CHITOSAN

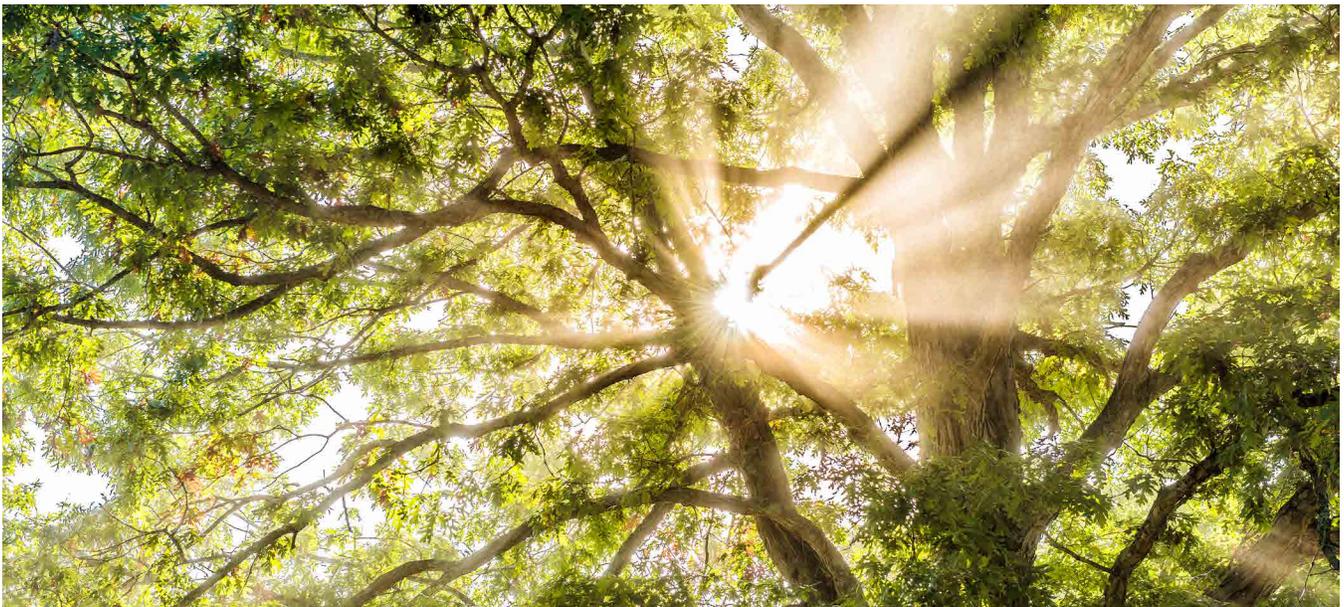
In more advanced therapeutic applications, chitosan specifically has shown promise in the area of tissue replacement therapy. When formed into artificial extracellular matrices, chitosan shows incredible promise in support of stem cell regeneration, or what you might define more specifically as the assisted growth of new cellular systems to help remediate a serious ailment or other growth or developmental impediment.

As reported in the *Biotechnology Journal* in 2013, examples of this include the application of chitosan-containing patterned materials to the body to counter infections resulting from antibiotic resistant bacteria such as MRSA (methicillin-resistant staphylococcus aureus).

Chitosan was further found to help establish proper alignment and contractile force of re-grown cardiac cells for use in repairing tissue damaged by cardiac infarction; increase neurite outgrowth for central nervous system wound repair; and host differentiated stem cells while preventing them from reverting back to a pluripotent state.¹⁸

Based on the work that's already been done in this field, many researchers are convinced that chitosan has an important role to play in the development of various medical applications to correct major tissue damage and other bodily abnormalities.

Chances are, however, that even in spite of this overwhelming cascade of scientific discovery, we've only just bumped the tip of the iceberg in terms of all that chitin can do. But this really only adds to its allure, especially since what we already know that it can do is more than enough to kickstart one's journey towards better health and improved wellbeing.





OUR VISION AND UNIQUE DEDICATION TO YOU

There is some very important and exciting news you need to know: a deep and fast-growing body of research is now showing that regardless of your genetic makeup, you have the ability - a tremendous ability - to positively shift your “gene expression” through proper nutrition and other health choices you make.

In other words, even at the genetic level, you CAN take control of your own health.

This is what the science of “epigenetics” is all about.

And here at Organixx, empowering you to take that control and make a profoundly positive impact on your health is the driving force behind everything we do.

Toward that end, it is our mission to provide you with a complete line-up of the world’s purest and most effective nutritional supplements that can truly make a powerful difference in your health and well-being.

Furthermore, we’re dedicated to providing these supplements to you at the fairest possible price. Yes, to ensure maximum effectiveness and safety we use only the world’s purest and best natural ingredients, and we employ very careful and exacting production processes, so our base costs are higher than “industry averages.” However, our price to you reflects markups that are far lower than industry averages, because we genuinely want as many people as possible to benefit from these best-in-class supplements!

The choices you make really do play THE key role in helping you live a long, healthy, and high-quality life. At Organixx, we’re committed to providing you with the world’s best supplements, and the most beneficial health insights, so you can continue to make the best health decisions for yourself.

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