

GlucoSANO™: A New Mushroom Nutritional Super Food for Cellular Metabolism and Sugar Stabilization

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August 2009*

- Is inflammation associated with the development of diabetes?
- Are there natural whole foods that can assist in regulating cell function and aid in stabilizing blood sugar levels?
- Do anti-inflammatories have any effect on blood sugar levels?
- Can ancient mushrooms provide anti-inflammatory/anti-oxidant substances to help control obesity and blood sugar levels?

These questions and many more are the focus of this "white paper" and the answers might surprise many. Recent medical research has provided a tremendous amount of information and data on medicinal mushrooms, on their potent nutrients and antioxidants and on the healing relationship mushrooms provide to humans. I encourage readers to use their own knowledge and life experiences when evaluating and making decisions regarding the potential applications of mushrooms in addressing various illnesses and disease states. This "white paper" is not intended to diagnose, treat, cure or prevent any human disease but rather to provide you, the reader, with the information you need to make decisions regarding your nutrition and health.

The World Health Organization estimates that 171 million people worldwide have diabetes and that 340 million will be diabetic by 2030. Ninety percent of current diabetes patients have Type 2 diabetes. The cause(s) of Type 2 diabetes have been unclear until researchers at the University of San Diego (UCSD) School of Medicine

(Patsouris, D. et al) discovered the role of inflammation as a causative factor. White blood cells in the bone marrow, such as macrophages, play a key role in the body's immune response. When these cells get into fat or liver tissue they release 'cytokines' or signaling proteins. Chemical messengers called cytokines form an integral part of the immune system. As messengers, cytokines tell other immune cells to activate, grow or even die. Cytokines have the ability to regulate the body's immune system responses and can drive the inflammatory process. There are hundreds of cytokines and their activities can vary, thereby producing different physiologic responses. In the case of the macrophage response, the particular cytokines released cause cells to become insulin resistant, which in turn can lead to Type 2 diabetes. Release of cytokines is part of the inflammatory pathway. The research team at UCSD, led by Dr. Solinas and Dr. Olefsky, further showed that by disabling the macrophage inflammatory pathway, insulin resistance and the resultant Type 2 diabetes can be prevented.

Inflammation is defined as a response of body tissues to injury or irritation; characterized by pain and swelling and redness and heat. Immune cells in the body, such as macrophages, produce inflammatory molecules, such as cytokines, that can cause inflammation in organs, such as the heart, and islets of the pancreas, while also increasing insulin resistance in muscle and liver. The logical next question is 'do anti-inflammatory substances have an effect in diabetes?'

Turmeric, is an Asian spice found in many curries, and has a long history of use in reducing inflammation, healing wounds and relieving pain. Drew Tortoriello, M.D., an endocrinologist and research scientist at the Naomi Berrie Diabetes Center at Columbia University Medical Center, and his colleagues were curious what effect the herb might have on diabetic mice. They found that turmeric-treated mice were less susceptible to developing Type 2 diabetes, based on their blood glucose levels, and glucose and insulin tolerance tests. The conclusion that Dr. Tortoriello and his colleagues have reached is that turmeric – and its active anti-oxidant ingredient, curcumin – reverses many of the inflammatory and metabolic problems associated with obesity and improves blood-sugar control in mouse models of Type 2 diabetes. Dr. Tortoriello said. "Although the daily intake of curcumin one might have to consume as a primary diabetes treatment is likely impractical, it is entirely possible that lower dosages of curcumin could nicely complement our traditional therapies as a natural and safe treatment."

Mushrooms and their contained potent enzymes are a complete biological system that has survived for more than 100 million years. Mushrooms process the environment (i.e. soil) and act as an

interface between plant roots and nutrients within the soil. Because they are hidden within the ground, mushrooms for long did not attract as much scientific investigation as plants and animals. Ancient cultures, hunter-gatherer humans, and later Asian cultures have used mushrooms for food and medicines for thousands of years. It is only recently that Western civilization has turned its attention to this poorly understood food substance and come to recognize the important role of this early evolutionary biologic organism in human evolution and health. Mushrooms are the "food that feeds the food;" the great recycler that provides the essential nutrients that are needed by plants and animals. Mushrooms also contain unique potent anti-inflammatory/anti-oxidant compounds such as L-Ergothioneine (ERGO), polyphenols, Beta-glucans, and organic selenomethionine.

What makes mushrooms most valuable as a nutritional food is the fact that mushrooms can manufacture the potent stable antioxidant ERGO; on the other hand no human or mammal can produce ERGO. Despite the inability of humans to manufacture ERGO, human red and white blood cells contain a specific transport system whose only role is to deliver ERGO to these cells. This discovery was recently made by Dr. Dirk Gründemann of the University of Cologne, Cologne, Germany. ERGO is also found in high concentrations in a number of mammalian organ systems including the eye, liver and kidney. The biological significance of ERGO is only now beginning to be understood, but it is known that this important nutrient seems to play a dual role in both energy regulation and in protecting cells from oxidative damage. Inflammation and

oxidative damage occur together and are associated with the release of cytokines that has been implicated in the cause of Type 2 diabetes.

Can the bioactive agents and antioxidants in mushrooms play a role in Type 2 diabetes?
Clinical studies indicate the answer may be yes.

The mushroom *Agaricus Blazei Murill* in combination with metformin and glicazide improves insulin resistance in Type 2 diabetes: a randomized, double-blinded and placebo-controlled clinical trial.

The researchers in this study addressed the issue of complementary and alternative medicine use in adults with Type 2 diabetes. Although most of the herbs and supplements appear to be safe, there is still insufficient evidence that demonstrates their definitive beneficial effects. This study was done to determine whether the mushroom supplement of *Agaricus blazei Murill* extract improves insulin resistance in Type 2 diabetes. The conclusion of the study was that the supplement of *Agaricus Blazei Murill* extract improves insulin resistance among subjects with Type 2 diabetes.

Insulin resistance (IR) is a condition in which the cells of the body become resistant to the effects of insulin, that is, the normal response to a given amount of insulin is reduced. As a result, higher levels of insulin are needed in order for insulin to have its effects. Type 2 diabetes occurs later in life and insulin

resistance usually precedes the development of Type 2 diabetes, sometimes by years. In individuals who will ultimately develop Type 2 diabetes, it is believed that blood glucose and insulin levels are normal for many years and then at some point in time insulin resistance develops. This development of insulin resistance is associated with high insulin levels, central obesity, cholesterol abnormalities, and/or high blood pressure (hypertension). This constellation of disease processes is also known as the 'metabolic syndrome.'

Are there mushroom products that can nutritionally assist the body in controlling the inflammatory processes that are associated with insulin resistance? Yes, we believe so. GlucoSANO™ is a mushroom nutritional supplement that can best be described as a newly discovered Super Food that is the result of years of research in university laboratories worldwide.

Most people are limited in the amount of mushrooms that they can consume on a daily basis and for this reason GlucoSANO™ was created. Collaborative research with food scientists at Pennsylvania State University enabled us to evaluate and include specific mushrooms with high levels of potent bioactive anti-inflammatory substances, such as L-Ergothioneine, polyphenols, Beta-glucans, glycoproteins and organic selenomethionine compounds.

Why should one use GlucoSANO™ as a daily nutritional supplement in people who have problems controlling blood sugar levels?

Nutrition appears to play an important role in the preventive fight against inflammatory diseases, such as bacterial and viral infection, bowel disease, stroke, Alzheimer's disease, fibromyalgia, diabetes and even premature aging. But in no way should the data be construed as suggesting a specific course of diagnosis, treatment or cure. The important message is "prevention rather than intervention." Nutrition, by itself, cannot treat a disease once it has occurred, but most people have forgotten about the role that nutrition plays in the daily fight against external and internal stressors and inflammatory processes. An illustrative example is the treatment of two people with bacterial pneumonia – the one who has a more nutritious diet of food and supplements will respond best to the antibiotic that is treating the pneumonia.

Mushrooms are uniquely designed, complex biologic organisms, that not only contain ERGO, but also contain other nutrients and bioactive substances that assist in maintaining more normal cellular and immune function. One mushroom can contain approximately 3,000 enzymes, proteins and nutrients that, when ingested, help our bodies adapt to everyday stresses. Because mushrooms contain some of the most powerful anti-oxidative properties known in any food product, they provide multiple health benefits. Research on the impacts of nutrition has shown that a composite of naturally occurring food components such as mushrooms can aid in reducing chronic inflammatory diseases. Recent research indicates a strong link between inflammation and disease, examples being diabetes, heart disease, arthritis, fibromyalgia,

Alzheimer's disease, cancer and even early aging. Hence, a reduction in inflammation through nutrition could play a key role in addressing illness and disease linked to inflammation, whether in humans or animals. Papers: 1. Gordon L. Jensen MD, PhD; Journal of Parenteral and Enteral Nutrition, February, 2006. 2. David R. Jacobs, Jr., PhD et al; Nutrition Reviews; 2007, October; 65,10: 439-450.

Inflammatory gum disease is a prime example. The significance of oral inflammatory disease goes way beyond the mouth; the gums are a "barometer or window" of what is going on elsewhere in the body. At this point in time most periodontal disease data has come from human studies, however, the mechanism of action crosses most species lines. The impact of chronic inflammatory disease on mammalian health is especially emphasized by the following human data:

- 50 percent – 70 percent of women will develop gingivitis (inflammation of the gums) sometime during their pregnancy. (WebMD)
- Association between periodontitis at 12-24 weeks of pregnancy and preterm labor. (Jeffcoat; Siristatidis)
- Research published in the June 2008 issue of the *Journal Lancet Oncology* found that those who had gum disease had a 14 percent higher risk of cancer compared to those with no history of gum disease (Michaud).

- The risk varied from cancer to cancer. Gum disease appeared to increase the risk for lung cancer by 36 percent, kidney cancer by 49 percent, pancreatic cancer by 54 percent and for white blood leukemia by 30 percent.

Causation of Inflammation and/or Chronic Inflammatory Gum Disease

There is no question but that mammalian diseases are intimately linked to a chronic inflammatory disease process. Equine gum disease is a classic example and represents the injury response of the animal's body to the "tenuous balance of pro- and anti-inflammatory cytokines" (Gordon L. Jensen MD, PhD; "Presidential Address"). Dr. Jensen goes on to say:"On the occasion of my presidential address, I sought to present a provocative examination of future opportunities in clinical nutrition by exploring the key role of inflammation at the interface of medicine and nutrition. There is growing appreciation for the central role of inflammation in a host of injury and disease states. It is imperative that nutrition professionals seize the initiative to participate in the pending multifaceted medical treatment of inflammatory disorders."

As can be seen from a review of the world's literature on medicinal mushrooms most laboratory and

clinical studies were performed in China and Japan. The research studies that I am referencing were performed in the United States and Europe and in most cases follow accepted western protocols for scientific testing and evaluation.

A study linking inflammatory changes and disease was performed by J.M. Mullington and colleagues in the Department of Neurology at Harvard Medical School, Boston, Massachusetts. This study revealed that mediators of inflammation, such as the cytokines, mentioned above by Dr. Jensen, are potentially altered in chronic fatigue syndrome and related diseases such as fibromyalgia. <http://www.ncbi.nlm.nih.gov/pubmed/12000021>. *Ann. N.Y. Academy of Sciences*, 2001, March; 933:201-10. These findings suggest another possible application for a product that contains whole foods with anti-inflammatory components, such as GlucoSANO™.

This study by Dr. Mullington may also apply to the development of Type 2 diabetes and the role of cytokines in the development of insulin resistance. Nutritional products that may control the pro-inflammatory cytokines could potentially modify the development of Type 2 diabetes.

Ingredients

GlucoSANO™ is a proprietary nutritional blend of five medicinal mushrooms, each of which has different concentrations of bioactive enzymes and nutrients.

GlucoSANO™ is a holistic and natural approach to health care that nutritionally assists people in maintaining more normal cellular metabolism and stabilizing blood sugar levels.

Total Nutraceutical Solutions, Inc. is an emerging nutraceutical company with a focus on discovering, formulating and marketing products composed primarily of organic natural mushroom compounds that contain bioactive nutrients for potential health benefits. TNS also develops production and analytic technologies for food and nutritional supplements. In addition

to preventative healthcare formulations and nutritional approaches to a wide variety of human conditions and illnesses, TNS also develops and acquires breakthrough nutritional tools and products in the fields of animal husbandry and livestock feeds. For more information visit www.totalnutraceutical.com.

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