Glutathione: “Your Body’s Most Powerful Protector” (GSH) Part II

In the last newsletter, we presented information on glutathione, and why raising glutathione levels in the body can be a very good thing – it is your body’s most powerful protector! The truth of the matter is that since glutathione is SUCH an excellent nutrient for so many things… a cell protector, an antioxidant, a detoxifier, an immune system enhancer, an energy booster, a healing agent, an anti-aging nutrient… we had to take two newsletters to BEGIN to tell you about some of the health benefits. For detailed information on glutathione and the biochemistry behind how it works in the body, refer to Glutathione Part I. For detailed information on how to raise glutathione in the body, refer also to Glutathione Part I. This newsletter is an extension of the research demonstrating the vast health benefits of raising glutathione, and is focused on reporting some of the conditions that are strongly supported by elevated glutathione levels.

As a review, Glutathione Part I describes how nutrients like undenatured whey, n-acetyl cysteine, Alpha lipoic acid, Vitamin C, vitamin E, selenium, glutamine, milk thistle, silymarin, rosemary, turmeric, curcumin, thiamine (vitamin B-1), riboflavin (vitamin B-2), vitamin B-6, vitamin B-12, folic acid, magnesium, zinc, rosemary, superoxide dismutase and catalase can all work to elevate glutathione levels. One of the most efficient pathways of glutathione replenishment is undenatured whey, because the precursor protein bonds are held intact and the building blocks make it to the cells quickly and efficiently. Refer to Glutathione Part I for a detailed description of this process.

In the last issue, we discussed mechanisms, and several conditions with reported benefits from glutathione supplementation, including rheumatoid arthritis, metal detox (and general detox), pregnancy, lactation, childbirth, sleep, BPH, prostate cancer, infertility, hair loss, and others. In this issue, we present even more research on numerous conditions associated with reported benefits from elevating glutathione levels, including: psoriasis, glucose control, cystic fibrosis, aging, athletic performance, heart disease, cholesterol, Alzheimer’s, and more! The list just goes on, as this nutrient is such a powerful antioxidant, immune system-builder, and detoxifier, and helps SO many systems to attain a higher level of health.
Psoriasis and Antioxidant Help:

Psoriasis vulgaris is a chronic and recurrent inflammatory skin disease characterized by redness of the skin (due to congestion of the capillaries) and scaly plaques. The pathogenesis of psoriasis still remains unclear. An increased reactive oxygen species (ROS) level, or oxidative stress due to inflammatory cells and insufficient antioxidant activity, have been determined in psoriatic lesions. Results support the hypothesis of an imbalance in the oxidant-antioxidant system in psoriasis (Yildirim M, Inaloz HS, Baysal V, Delibas N. The role of oxidants and antioxidants in psoriasis.) The ROS are believed to damage constituents in the plasma and the red blood cells. Red blood cells have a limited biosynthesis capacity and poor repair mechanisms anyway, however in psoriasis patients, the numbers are lower, and the red blood cells that are present are characteristic of enhanced damage and aging. The damaged cells are strongly connected with oxidative stress and the worsening of psoriasis (Rocha-Pereira P, et al. Erythrocyte damage in mild and severe psoriasis. Br J Dermatol. 2004 Feb;150(2):232-44.)

**Glutathione supplementation**, which alleviates oxidative stress, **may be helpful for psoriasis.** Glutathione and glutathione peroxidase are much lower in psoriasis patients (Kokcam I, Antioxidants and lipid peroxidation status in the blood of patients with psoriasis. Clin Chim Acta. 1999 Nov;289(1-2):23-31), and since “disorders in antioxidant defense mechanisms may play an important role in the pathogenesis of psoriasis” (Wozniak A, Oxidant-antioxidant balance in patients with psoriasis. Med Sci Monit. 2007 Jan;13(1):CR30-33), correcting these disorders with glutathione supplementation may be helpful in a nutritional protocol.

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Glutathione (GSH) to the Rescue!

Glutathione as an important antioxidant: Glutathione, like many of the antioxidants, can recycle other antioxidants when they become oxidized, such as vitamin C and vitamin E. There is a lot of synergy and interplay amongst the antioxidants, and it is important to be replete in all of them. Supplementation of certain antioxidants can ensure that levels of the important antioxidants stay in a normal range.

Glutathione as an important detoxifier: Through the action of the glutathione transferase system, glutathione inactivates drugs and toxic compounds. The thiol, or –SH group on glutathione is responsible for detoxing many xenobiotics. Glutathione binds to many compounds in phase II liver detox and gets them ready for elimination from the body. The ability of glutathione to detoxify compounds underlies the usefulness of N-acetylcysteine, which is a precursor to glutathione, in acetaminophen overdose. The acetaminophen forms a toxic compound in phase I (even more toxic than the original acetaminophen substance!), however N-acetylcysteine raises glutathione in the cells, which then binds to the toxic compound and preparing it for removal (Glutathione Deficiency in Human Disease, White, Alexander C., et al, Journal of Nutritional Biochemistry, May 1994;5:218-226).

Glutathione - Other functions: Besides building immunity, detoxifying, and protecting cells from oxidation damage, glutathione also reduces disulfide linkages in proteins, allowing biochemical activity, and also serves to enhance the synthesis of DNA precursors.

Glutathione and Glucose Control: In a study of 24 hypertensive subjects, glucose disposal was significantly related to reduced glutathione/oxidized glutathione ratios. It was determined that there is a role for glutathione in mediating the effects of vitamin E on insulin metabolism (Effects of Vitamin E and Glutathione on Glucose Metabolism. Role of Magnesium," Barbagallo M, et al, Hypertension, October, 1999;34(part 2):1002-1006.)

Glutathione and Cystic Fibrosis: The lung concentrates glutathione in its epithelial lining fluid. It is known that the levels of glutathione in epithelial lining fluid are diminished in a number of lung disorders and environmental exposures including adult respiratory distress syndrome, idiopathic lung fibrosis, lung transplantation, HIV infection, alcohol abuse, asbestos and cystic fibrosis. It has even been suggested that, “Glutathione inhalation may be a viable therapy for cystic fibrosis, since glutathione levels in the epithelial lining of patients with cystic fibrosis are low, and cystic fibrosis lung disease is associated with increased oxidative damage” Glutathione: A Radical Treatment for Cystic Fibrosis Lung Disease? Day BJ, Chest, January 2005;127(1):12-14.
Do you get enough glutathione from your food?

The good news is that fruits and vegetables have moderate to high amounts of glutathione, but the bad news is that dietary surveys tell us most people aren’t getting enough servings of either. The key to “freshly prepared meats” being high in glutathione is the “freshly prepared” part, and hopefully those meats are organic to avoid other toxicity issues. Packaged foods were very low on the glutathione totem pole!

“Glutathione is an antioxidant and anticarcinogen and is present in plant and animal tissues that form the bulk of the human diet. The glutathione content of foods was evaluated in the National Cancer Institute's Health Habits and History questionnaire. Dairy products, cereals and breads are low in glutathione. Fruit and vegetables have moderate to high amounts of glutathione, while freshly prepared meats are relatively high in glutathione. Frozen versus fresh foods had similar amounts of glutathione. Processing and preservation generally resulted in considerable loss of glutathione” (Glutathione in Foods Listed in The National Cancer Institute's Health Habits and History Food Questionnaire, Jones, Dean P., et al, Nutrition and Cancer, 1992;17:57-75.)

Glutathione Sources in Supplements:

Nutrients such as N-acetyl cysteine; alpha lipoic acid; L-glutamine; vitamin C; selenium; milk thistle; silybin; rosemary, curcumin and turmeric have all been shown to increase glutathione levels. Undenatured whey powder can also raise glutathione levels; it does so very efficiently because it carries precursors to glutathione, and contains transport nutrients to get them to the cell where they can make cellular glutathione (see Glutathione Part I for more detail). Undenatured whey powder can easily be made into a tasty protein shake. Just take organic milk (or fruit juice), add half a banana and one Tbs, powder, and blend into a yummy shake. Those who have allergies/sensitivities to whey can take the vegetarian glutathione precursors mentioned above. Even though whey is a milk protein, it does not contain all of the amino acids in milk that are common allergens.
Glutathione and DNA Damage/Anti-aging

Glutathione has been found to be important in maintaining integrity of the mitochondrial DNA. Oxidative damage to mitochondrial DNA interferes with electron transport complexes (where we make our energy in the mitochondria). Mitochondrial DNA is protected by several mitochondrial antioxidant systems, but to investigate the specific importance of glutathione, researchers studied oxidative damage in human blood lymphocytes. The damage to lymphocyte mitochondrial DNA was significantly decreased by glutathione supplementation, AND moreover, inhibition of glutathione synthesis led to lymphocyte free radical generation and mitochondrial DNA damage with increased susceptibility to cell-death.

Mitochondrial DNA is important in the aging process, and damage is suspected in premature aging. “The popular use of antioxidative vitamins illustrates the growing awareness of oxidative stress as an important hazard to our health and as an important factor in the ageing process” report researchers, and deficits in glutathione and its precursor cysteine are believed to contribute to various aging-related degenerative processes (Droge W, et al. The deficit in low molecular weight thiols as a target for antiaging therapy. Curr Drug Targets. 2006 Nov;7(11):1505-12.)

N-Acetyl Cysteine boosts Glutathione levels and is also considered to be anti-aging support:


Age-related increase of reactive oxygen species (ROS) is particularly detrimental in tissues such as the mitochondria, where we produce our energy, and where the oxidative damage is associated with premature aging. “N-acetyl cysteine (NAC) provides thiol groups to glutathione and to mitochondrial respiratory chain proteins; thus, it may counteract both ROS generation and effects.” The observed age-related changes were prevented by the dietary treatment of N-acetyl cysteine. “The present study provides further evidence for the critical role of mitochondria in the aging process.”
Whey & Glutathione for Optimal Athletic Performance:

**Whey powder** is well-known for its ability to stimulate **muscle protein synthesis** and provide **amino acid building blocks** for performance activities. Therapeutic applications have been described for whey protein and exercise performance/exercise enhancement (Marshall K. Therapeutic applications of whey protein. Altern Med Rev. 2004 Jun;9(2):136-56.)

Additionally, WHEY also contains glycomacropeptide: Glycomacropeptide (GMP) has anti-inflammatory, immunomodulatory and bacterial-toxin binding effects. The anti-inflammatory activity of glycomacropeptide was assessed, and researchers determined that, “The magnitude of the anti-inflammatory effect was generally comparable to that of sulfasalazine, an established drug used in the treatment of inflammatory bowel disease” (Daddaoua A et al. Bovine glycomacropeptide is anti-inflammatory in rats with hapten-induced colitis. J Nutr. 2005 May;135(5):1164-70.) So, whey builds muscles, the immune system, and performance in addition to being anti-inflammatory and antibacterial. When you take into consideration that **UNDENATURED WHEY** also has **ADDED benefits**, it’s a win-win for athletes!

**Undenatured whey protein has benefits for athletes above the benefits offered by whey protein alone!** It is not exposed to heat, and it raises levels of **glutathione** in the body. **Glutathione** is the most important antioxidant produced in the body, and it is drained after exercise. Raising glutathione levels can have a very positive influence on athletes.

**Glutathione can……..**
* Reduce the free radicals that lead to muscle inflammation/damage  
* Reduce muscle fatigue/delayed onset muscle soreness  
* Decrease recovery time from workouts  
* Increase strength and endurance  
* Improve ability to endure exhaustive exercise  
* Increase peak power and work capacity  
* Shift metabolism from fat production to muscular development  
* Maintain white blood cell counts that normally fall during intense workouts  
* Prevent overtraining symptoms  
* Improve performance  
* Increase resistance to illness  
* Detoxify foreign substances
Glutathione (GSH) Support:

Heart Disease:

*A study that lends credibility to the theory of cholesterol being oxidized before causing lesions:*

In an animal study, researchers found that the addition of glutathione to the diet – even when the diet was atherogenic – reduced and even inhibited the development of plaque formation! In the groups of mice receiving the atherogenic diet (with and without the addition of glutathione), there was a significant increase in levels of total cholesterol and LDL cholesterol compared to levels of these lipids in mice on the normal diet. **However,** a significant decrease in levels of triglycerides was observed in the group receiving atherogenic diet along with glutathione, AND the atherosclerotic plaques that were seen in heart and/or aorta of mice receiving an atherogenic diet were either totally absent or if seen in an animal, were extremely small and diffuse in the group receiving glutathione along with an atherogenic diet. Cholesterol granuloma developed in livers of mice on an atherogenic diet alone, however, in mice receiving the atherogenic diet plus glutathione, no cholesterol granuloma developed. Researchers concluded that the addition of glutathione to the diet, even when it was an atherogenic diet, was able to reduce or inhibit the development of plaque formation (Iqbal MP et al. Plaque formation reduction with glutathione monoester in mice fed on atherogenic diet. J Coll Physicians Surg Pak. 2006 Sep;16(9):571-5.)

Glutathione is the ultimate antioxidant. A study by Chang et al. showed that supplementation with antioxidants reduces oxidative stress and attenuates atherosclerosis in hyperlipidemic rabbits. (Chang WC, et al. Reduction of oxidative stress and atherosclerosis in hyperlipidemic rabbits by Dioscorea rhizome. Can J Physiol Pharmacol. 2005 May;83(5):423-30.)

Selenium and Cholesterol:

Selenium (Se), which was previously mentioned as a precursor to glutathione, has been shown to be involved in lipid metabolism (Dhingra S, Bansal MP. Hypercholesterolemia and apolipoprotein B expression: regulation by selenium status. Lipids Health Dis. 2005 Nov 5;4:28.) Various studies have demonstrated a significant association between selenium (Se), hypercholesterolemia and the risk of cardiovascular disorders. A scientific study revealed that Se supplementation was responsible for down regulation of HMG-CoA reductase expression (the cholesterol-making enzyme) during hypercholesterolemia. **“These findings highlight the therapeutic potential of selenium supplementation in lipid metabolism”** (Dhingra S, Bansal MP. Modulation of hypercholesterolemia-induced alterations in apolipoprotein B and HMG-CoA reductase expression by selenium supplementation. Chem Biol Interact. 2006 May 15;161(1):49-56. Epub 2006 Apr 3.) Selenium is needed for the glutathione peroxidase enzyme, and in fact the glutathione peroxidase enzyme is the only metabolically active form of selenium in the body.
Complete Glutathione
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Including:

- N-acetyl cysteine
- Alpha Lipoic acid
- L-Glutamine
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Alzheimer’s:

The antioxidant status is associated with improved cognitive status in Alzheimer's, and glutathione strengthens antioxidant status. Alzheimer's disease is associated with systemic oxidative stress, which can be followed by determining biomarkers such as the oxidation degree of glutathione in red blood cells. It has been observed that Alzheimer's patients show an increased level of red blood cell glutathione, which indicates oxidative stress in peripheral cells. **The glutathione oxidation was found to correlate statistically with the cognitive status of the patients.** Treatment with antioxidants improved cognitive performance, when performance was previously impaired by an oxidative state (as measured by indices such as red blood cell glutathione). “An important conclusion from the reported results is that epidemiological or clinical studies that aim to test the effect of antioxidant supplementation on given functions should include the determination of the antioxidant status of the patients by the measurement of blood markers of oxidative stress” (Vina J, et al. Molecular bases of the treatment of Alzheimer's disease with antioxidants: prevention of oxidative stress. Mol Aspects Med. 2004 Feb-Apr;25(1-2):117-23.)