TAURINE

Taurine is an amino acid-like substance (technically, a sulfonic acid) containing a negative valence sulfur (sulfhydril) functional group. It is therefore anti-Anaerobic in its metabolic effect. It is also anti-Sympathetic in reversing the adverse effects of excess catecholamine. It also antagonizes the damage done by excess insulin levels in your Ketogenic patients.

A tremendous amount of research for nearly 30 years has demonstrated Taurine’s protective affect against heart attacks and strokes. Its benefits are largely the result of its effect on calcium and magnesium metabolism. Taurine helps keep calcium out of the myocardium and the smooth musculature of the arterial intima, and allows magnesium to fully exercise its biological role. But beyond protecting against excess calcium and enhancing the effects of magnesium, taurine also facilitates the elimination of excess cholesterol, and promotes vasodilation, and best of all actually decreases the size of atherosclerotic lesions. Taurine also protects against the damage associated with insulin resistance, the underlying cause of much hypertension, cardiovascular disease, abdominal obesity, and Type II diabetes.

Taurine supplementation is thus a useful adjunct in balancing several of your NUTRI-SPEC Imbalances. These include:

- Electrolyte Stress Imbalance
- Anaerobic Imbalance
- Sympathetic Imbalance
- Ketogenic Imbalance

Conditions frequently found in patients who share one or more of these imbalances include:

- fatigue
- high blood pressure
- cardiac arrhythmia
- cardiovascular disease
- high cholesterol
- seizures
- migraines

Taurine also reverses the damage done by excess insulin levels in your Ketogenic patients with cardiovascular disease. There are studies estimating that perhaps in excess of 60% of all cardiovascular disease is associated with poor carbohydrate tolerance along with the associated excess insulin levels.
Taurine parallels magnesium in its anti-Anaerobic, its anti-Ketogenic, and its anti-Sympathetic metabolic roles. Taurine also parallels magnesium in its role in reversing Electrolyte Stress. For your Electrolyte Stress patients, Taurine antagonizes the central action of excess angiotensin II. It thus lowers the blood pressure while at the same time reducing excess Sympathetic activity.

Along with decreasing blood pressure, Taurine protects the heart against excess calcium binding, but without the life-threatening effects of calcium channel blockers; it prevents cardiac arrhythmias; it reduces excess vaso constriction; it decreases the incidence of strokes; it lowers cholesterol, and it also possesses anti-thrombotic properties and prevents angina.

Taurine prevents cardiac arrhythmias.

Taurine reduces excess vaso constriction.

Taurine decreases the incidence of strokes.


Circulation, May 1996.

It is interesting to note that a form of heart disease that was the leading cause of death among cats was eliminated entirely as soon as they began supplementing all cat food with taurine.

Taurine lowers cholesterol.

Taurine possesses anti-thrombotic properties.

Taurine prevents angina.

An Australian study published in the Asia Pacific Journal of Clinical Nutrition 2001; 10(2):134-7, showed that Taurine is one of the key properties in fish that protects against cardiovascular disease.

A large-scale study in Japan, drawing from 24 populations in 16 countries, revealed a strong inverse association between Taurine levels and ischemic heart disease. This was published in Hypertension Research, 2001 JUL; 24(4):453-7.
Researchers at the University of South Alabama found that congestive heart failure responds favorably to Taurine therapy. Their study was published in *Amino Acids*, 2000; 18(4):305-18.

A study published in *Clinical and Experimental Pharmacology and Physiology*, 2001 VOL 28, ISS 10, 809-815, described mice bred for severe high cholesterol and atherosclerosis being fed Taurine for three months. Even though their (genetically predetermined) cholesterol levels were still significantly elevated after treatment, Taurine reduced the area of arterial lipid accumulation by an astounding 28%. There was also a decrease in the size of lesions in the aorta. The blood levels of the oxidative stress marker TBARS were significantly decreased by the Taurine as well. Thus, while it has been long known that Taurine lowers elevated cholesterol in humans, it is now seen that Taurine prevents the formation of atherosclerotic lesions independently of blood cholesterol levels.

Most impressive of all is the study published in the January 7, 2003 issue of *Circulation* showing that smokers initially have blood vessel diameters much smaller than non-smokers. Yet, after taking just 1.5 grams per day of Taurine for only five days, the smokers’ blood vessel diameters increased to equal that of non-smokers.

In your Ketogenic patients with Type II diabetes, Taurine will potentiate the activity of insulin, causing increased glucose clearance from the serum into the tissues.

As an anti-Aerobic sulfur donor, Taurine is effective in treatment of chemical sensitivities.

Low levels of Taurine were found in 64% of patients with chronic fatigue.

Taurine spares sulfur amino acids while providing an effective antioxidant.

Taurine has powerful membrane stabilizing properties. It has an anti-Aerobic effect on membrane permeability to various ions. It is also an effective stabilizer of over-excitable nerve tissue, and thus is very effective for seizure patients. (Seizures are virtually always an Anaerobic condition.)

- Quinolinic acid-induced seizures are prevented by: dopamine, noradrenaline, adrenaline, GABA, glycine, taurine, proline, melatonin.

Consider that Taurine is one of the most powerful protectors against excitotoxic brain cell destruction in the hippocampus. Taurine protects against neuronal injury by preventing glutamate-induced elevation of intracellular free calcium. Taurine also protects the CNS from ammonia toxicity. Taurine also inhibits NMDA receptor-mediated nitric oxide synthesis, which protects against free
radicals and extracellular accumulation of cyclic GMP arising from nitric oxide synthesis. Taurine also protects the CNS against nitric oxide-induced hydroxyl free radicals. Taurine is a glycine receptor agonist, thus having a neuroprotective role in osmoregulation. The pituitary neuronal lobe is rich in taurine, which is essential for body fluid homeostasis.

- To protect the brain from excess ammonia, we use carnitine, taurine, citrulline, and betaine.

**Taurine** has a cytoprotective role in exercise-induced muscle injury ----- taurine is present in high concentration in skeletal muscle and may play a role in cellular defenses against the oxidative stress and tissue damage resulting from intense exercise. **Taurine supplementation significantly increased plasma glutamate levels in exercised rats. Exercise reduced plasma methionine, and taurine prevented its decline. Taurine supplementation increased the muscle taurine content significantly in all muscles except the soleus.**

Beta alanine decreased muscle taurine content about 50% in all muscles examined. **Lipid peroxidation (TBARS)** was significantly increased by exercise in the extensor digitorum longus and gastrocnemius muscles, and both taurine and beta alanine completely blocked the increase in TBARS in the extensor digitorum longus, but had no effect on the gastrocnemius. Muscle content of the cytosolic enzyme LDH was significantly decreased by exercise in the gastrocnemius muscle and this affect was attenuated by both taurine and beta alanine. Muscle myeloperoxidase (MPO) was significantly elevated in the gastroc muscle, and MPO activity was significantly increased by exercise in the liver, but both taurine and beta alanine blocked this affect. Running performance as assessed by a subject rating scale was improved by taurine supplementation, and there was significant loss in body weight in the beta alanine treated rats 24 hours after exercise.

**Taurine supplementation decreases oxidative stress in skeletal muscle after eccentric exercise ----- taurine supplementation in eccentrically exercised rats was found to decrease superoxide radical production, decrease creatine kinase, decrease lipoperoxidation, decrease carbonylation, and increase total thiol content in skeletal muscle, but it did not affect antioxidant enzyme activity.** The study suggests that taurine affects skeletal muscle contraction by decreasing oxidative stress in association with decreased superoxide radical production.

**Taurine and serine** supplementation modulates the metabolic response to tumor necrosis factor-alpha (TNF-α) in rats fed a low protein diet ----- Plasma taurine and serine decrease following trauma and in severe inflammatory disease. These changes may signify an increase in requirements for sulfur amino acids. Cysteine supplementation can restore the impaired ability of rats
fed a low protein diet to increase hepatic zinc, glutathione, and protein concentrations in response to TNF-α. Since serine provides the carbon skeleton of cysteine and taurine, the depression in lung glutathione due to TNF-α injection was lessened. The absolute increase in ceruloplasmin in response to TNF-α was enhanced in rats fed an alanine-supplemented diet. Serine normalized this response. It is observed that the effects of taurine and serine on lung glutathione and a significant negative correlation between ceruloplasmin and liver and lung glutathione concentration in rats fed TNF-α suggest that supplemental serine and taurine may improve antioxidant defenses when dietary supplies of cysteine are low, but do not influence cysteine availability for normal response to TNF-α.

No direct data exists on the influence of supranormal intakes of sulfur amino acids on immune function. However, 3 major products of sulfur amino acids --- glutathione (GSH), homocysteine, and taurine, influence inflammatory aspects of the immune response in vitro and in vivo. Methionine intakes above approximately 1 gram/day transiently raise plasma taurine, homocysteine, and GSH. Taurine and GSH ameliorate inflammation. Homocysteine has the opposite effect. A biphasic relation between cellular GSH and CD4+ and CD8+ numbers occurs in healthy men. How changes in sulfur amino acid intake influence this phenomenon is unknown. In animals, high taurine intakes are anti-inflammatory.

A positive relation between plasma neopterin (a marker of Th1-type immune response) and homocysteine indicate that homocysteine may play a part in inflammatory aspects of Parkinson’s Disease and aging. In vitro, homocysteine in concentrations seen following consumption of approximately 6 grams of L-methionine/day in adults, increases the interactions among T lymphocytes, monocytes, and endothelium. Whether a similar phenomenon occurs in vivo is unknown. A cautionary note about supplementation of diets with L-methionine to raise intake above approximately 1 gram/day is considered.