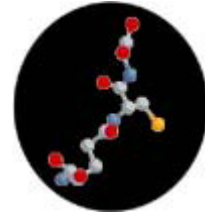


Glutathione (GSH) Optimal Health With the Master Antioxidant

What is Glutathione?

Glutathione (GSH) is your body A.I.D. (A- antioxidant, I- immune system, D- detoxifier).

Glutathione (GSH) is a tripeptide - a chain of three amino acids - cysteine, glycine, and glutamic acid - found in human cell tissue.



Glutathione exists in the reduced form (GSH), and maintains a balance with its oxidized form (GSSG) - a disulfide.

Glutathione, the Master Antioxidant

But more importantly, glutathione is your body's master antioxidant and one of the most important healing agents. The highest concentration of glutathione is found in the liver which is the principal organ involved in the detoxification and elimination of toxic materials.

Interestingly, glutathione also acts to reconstitute the antioxidant vitamins C and E after they have been oxidized, and therefore plays a determinant role in their function.

Glutathione, the "Superfood"

Glutathione is one of the 14 "Superfoods" listed in *SuperFoods Rx : Fourteen Foods That Will Change Your Life*, co-authored by Dr Steven Pratt, an authority on food and ageing.



The list is based on an exhaustive study of the scientific research behind the world's best daily diets, and includes the 14 nutrients that show up consistently in the most health-promoting, disease-preventing, anti-aging diets in the world.

Glutathione, the Life Extension Molecule

Low glutathione levels are found in immune compromised individuals, neuro-degenerative diseases such as multiple sclerosis, ALS, Alzheimers, and Parkinson's disease, atherosclerosis, male infertility, pregnancy complications, cataracts, damage from many pharmaceutical drugs, cancer and poor survival rates for patients with AIDS.

High levels of glutathione appear to protect against the dangers of cancer, heart disease, premature aging, autoimmune diseases, and chronic illnesses.

What the Experts are saying about Glutathione

- *"Glutathione is a substance, the levels of which in our cells are predictive of how long we will live. There are very few other factors which are as predictive of our life expectancy as is our level of cellular glutathione. Glutathione has been called the "master antioxidant", and regulates the actions of lesser antioxidants such as vitamin C, and vitamin E within the body. "We literally cannot survive without this antioxidant."* Earl Mindell, R.Ph., Ph.D, in What You Should Know about the Super Antioxidant Miracle
- *"Without glutathione, other important antioxidants such as vitamins C and E cannot do their job adequately to protect your body against disease."* Allan Somersall, Ph.D., M.D., and Gustavo Bounous, M.D. FRCS(C) in Breakthrough in Cell Defense
- *"No other antioxidant is as important to overall health as glutathione. It is the regulator and regenerator of immune cells and the most valuable detoxifying agent in the human body. Low levels are associated with hepatic dysfunction, immune dysfunction, cardiac disease, premature aging, and death."* Lorna R. Vanderhaeghe & Patrick J.D. Bouic, Ph.D.in The Immune System Cure,
- *"If there is one survival tool every HIV(+) person should consider it is taking dietary supplements that increase glutathione production."* - Michael Mooney, Author of Built to Survive: A Comprehensive Guide to the Medical Use of Anabolic Steroids, Nutrition and Exercise for HIV (+) men and women
- *Glutathione may be one of the most important keys to longevity. Centenarians have been found to have higher levels of glutathione than would be expected for their age. Boosting one's glutathione levels ...should be one of the first items on anyone's anti-aging agenda.* - Ivy Greenwell in The Antioxidant Network, A brief review of "The Antioxidant Miracle," by Lester Packer, PhD and Carol Colman

The Glutathione Antioxidant System

Mammalian cells have evolved numerous mechanisms to prevent or treat injurious events that can result from normal oxidative by-products of cellular metabolism (oxiradicals).

The "glutathione antioxidant system" is foremost among these internal protective systems. Glutathione participates directly in the destruction of reactive oxygen compounds (free radicals or oxiradicals) - the normal oxidative by-products of cellular metabolism.

Glutathione is also involved in the detoxification of foreign compounds such as carcinogens, etc., and supports the normal active functioning of the immune system. Glutathione reduces toxic substances before they can damage other molecules or important parts of the cell.



Glutathione is required to detoxify the nicotine and free-radicals contained in cigarette smoke - even second hand smoke. It is effective against the toxins contained in the exhaust fumes of motor vehicles and also against pesticides and other environmental toxins.

Glutathione plays a key role in the body's defense against pollutants and ultraviolet radiation. Removal of heavy metals (mercury, lead, cadmium) from the body requires glutathione.

When these toxins combine with glutathione, they form a water soluble compound that can be excreted once and for all by the kidneys.

The highest concentration of glutathione is found in the liver which is the principal organ involved in the detoxification and elimination of toxic materials.

Glutathione also acts to reconstitute the antioxidant vitamins C and E after they have been oxidized, and plays an essential role in their function. That's why it is known as the Master Antioxidant.

How Does Glutathione Boost The Immune System?

There are over a trillion immune system cells in the human body. These cells are the body's soldiers for defending itself.

The strength of your cells and their ability to replicate are directly related to their ability to manufacture glutathione.

Imagine millions of tired and worn out soldiers as your immune system cells would be if they were low on glutathione. Not a very strong defence against enemies, such as viruses and bacteria, that might attack you.

Now imagine an army of the strongest, healthiest soldiers you can get. And imagine how strong a defence your immune system can put up if these soldiers never get tired, weak or sick. This is exactly what happens when your body has optimal levels of glutathione.

White blood cells (or immune system cells) are particularly sensitive to changes in glutathione levels, and even subtle changes may have profound effects on the immune response.

As an antioxidant, glutathione is essential for allowing white blood cells (or lymphocytes) to express their full potential, without being hampered by accumulation of oxyradicals (the harmful by-products of cellular metabolism) during the development of the immune response.

As glutathione levels drop, the person gets sicker. This is because white blood cells and the liver use GSH to detoxify poisons inside the body.

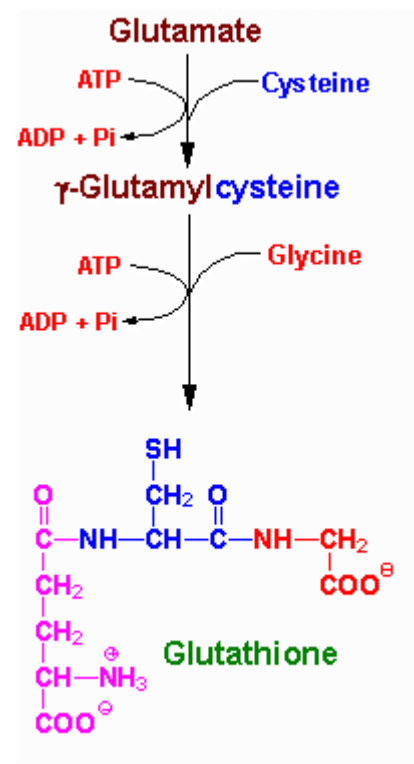
When the level decreases, less toxins are able to be eliminated leading to a build up in the body. This leads to increased white blood cell death (due to the cell poisoning itself) and liver impairment.

Glutathione has also been shown to enhance the movement (locomotion) of white blood cells called neutrophils to the site of injury or infection and decrease the number of bacterial colonies present there, resulting in improved survival.

What Is Cysteine And Why Is It Important?

Glutathione is manufactured inside your cells from the three amino acid precursors, L-glutamate, L-cysteine, and L-glycine. Your cells' ability to make glutathione is determined by the supply of raw materials (or precursors) for glutathione, in particular of the amino acid cysteine.

Glutathione synthesis is a two-step process involving the enzymes *gamma-glutamylcysteine synthetase* and *GSH synthetase*.



The first reaction is the rate-limiting step and is effectively inhibited by GSH feedback. This means the reaction is controlled by its own end-product and slows down once enough glutathione is synthesised.

When GSH is consumed or used up in the neutralisation of harmful oxyradicals, this feedback inhibition is lost. So now, the availability of L-cysteine as a precursor determines how much glutathione is synthesised by the cell.

The amount of **cysteine** available can hence become the rate-limiting factor for the manufacture of glutathione.

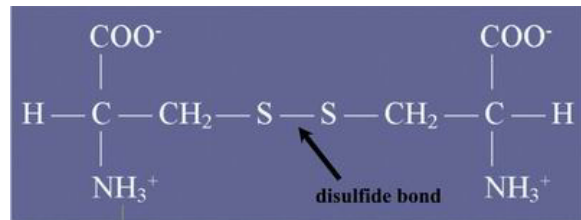
If cysteine levels drop, the body will convert methionine, another amino acid, to cysteine, but then other systems run out of methionine, which is needed for making protein.

Where Does Our Body Get Its Glutathione From?

Your cell's ability to make glutathione is determined by the supply of raw materials (or glutathione precursors), in particular of the amino acid cysteine.

Cysteine - as a free amino acid - is potentially toxic and is spontaneously catabolized or destroyed in the gastrointestinal tract and blood plasma. Hence it does not represent an ideal delivery system to the cell.

However, when it is present as a **cysteine=cysteine dipeptide** - called **cystine** - (two cysteine molecules linked by a disulfide bond) it is more stable than the free amino acid cysteine.



Cystine travels safely through the digestive tract and blood and is promptly broken up or reduced to the two **cysteine** molecules when it enters the cell.

Glutamate and Glycine are derived from your daily diet, however Cystine comes mostly from eggs, milk and cheese.

The best way to increase and maintain one's GSH levels is to include animal foods in one's diet as these contain the amino acids needed by the body to synthesize GSH. Foods rich in the sulfur amino acids (e.g., eggs) are especially good sources.

But in the cooking of eggs and processing of milk/cheese, the composition of Cystine is changed to Cysteine, while still a valuable protein it no longer functions as a food for glutathione. An excellent food supplement is un-denatured (non-heated) whey protein.

Un-denatured Whey Protein - The Best Way to Raise Glutathione Levels

As Dr. David L. Phillips, writes in *Glutathione, A Protein Vital to Life, Part 2*, "supplementing with oral glutathione won't work. The glutathione in your cells needs to be made by your cells. Taking GSH orally, like a vitamin, is a waste of money. Your digestive system will break it down and little good will come of that effort.

GSH precursors, such as cysteine, methionine and glutamine will raise the GSH levels to a minor degree; however, all have side effects and are not well tolerated by most people.

Milk thistle, melatonin and lipoic acid can be helpful as well but the bio-response and degrees of bioavailability can vary widely.

Whey proteins seem to be the best method of obtaining the building blocks of glutathione... breast-fed infants have high GSH levels and for the most part enjoy better health until about the age of 15 until their GSH level off to that of non-breast-fed infants. The whey content of raw milk contains several albuminous proteins that supply potent GSH precursors."

Whey protein has been called "the most immune-enhancing protein", as well as "the life-extension protein" by doctors and scientists alike. Whey also has important value for those suffering from cachexia, or wasting syndrome, as its proteins are easily assimilated by the body.

Whey is loaded with nutrients and essential amino acids. Whey is comprised of four major protein fractions and six minor protein fractions. The major protein fractions in whey are beta-lactoglobulin, alpha-lactalbumin, bovine serum albumin and immunoglobulins.

Each of these components have important disease-fighting effects. In addition, whey protein is easily digestible and lactose-free.

[Click here](#) to find out more about a whey protein known as a "cysteine-delivery system" and proven to optimize glutathione levels.

Our Special Reports on Glutathione in Health and Disease

For more information on the health benefits of glutathione in specific conditions, read our special reports at the links below.

- [Glutathione and whey protein in Cancer Prevention and Treatment](#)
- [Glutathione and whey protein in HIV-AIDS](#)
- [Glutathione in the etiology and treatment of Parkinson's Disease](#)
- [Glutathione \(GSH\) in Pregnancy](#)
- [Glutathione and Male Infertility - Improving Sperm Morphology, Motility](#)
- [Glutathione and whey protein in Sports Nutrition](#)
- [Glutathione \(GSH\) and Aging](#)

[More scientific publications and research abstracts on glutathione](#)

[Clinical trials with glutathione and whey protein](#)