

From The President's Desk

Understanding Glutathione

95 % of the oxygen we breath is used up through oxidative phosphorylation in the mitochondria to generate cellular energy (ATP molecules). Oxidative phosphorylation involves electron transfer. However, 2.5 % of electrons “escape” becoming oxygen free radicals (superoxide anions) Free Radicals create oxidative stress and damage our cells and its constituents. This makes mitochondria the most vulnerable intracellular organelle from oxidative stress damage since this is where oxidative phosphorylation takes place. Furthermore mitochondria themselves lack intracellular antioxidants (Glutathione, Superoxide Dismutase and Catalase).

Mitochondrial DNA also do not have Histones and hence lack the ability to repair damaged DNA. So, wherever oxygen is used up or generated, free radical formation is inevitable. This makes it highly likely that the first single cell living organisms from which we humans evolved could not have survived without a robust antioxidant system.

Glutathione (GSH) evolutionally is likely to be the first intracellular antioxidant that would have made life possible simply by its 3 powerful effects on cellular and systemic health. GSH as we now know is the master antioxidant that neutralises free radicals by its strong electron donating ability. It functions as a reducing agent through the sulphhydryl (- SH) group. GSH is also the master detoxifier in the P450 Phase 2 detoxification system. This helps the liver to detoxify and eliminate Xenobiotics, Carcinogens, Drugs, Heavy Metal etc. GSH also deserve its recognition as the master of our immune system. Proliferation, growth and maturation of T and B cells need GSH. Activated T cells and NK cells also need an adequate supply of GSH

Almost all of our 300 trillion cells is capable of producing GSH. However the demand has outstripped the supply. Toxins, heavy metals, electromagnetic radiation, stress, refined / deep fried / grilled foods, chronic infections like Hepatitis, HIV, etc., places a heavy demand on the body making most of us deficient in this master molecule. Aging is clearly associated with GSH deficiency as well. GSH synthesis declines from the age of 20 onwards and the levels decline by 10% for every decade of our life.

Hundreds of studies have confirmed that GSH deficiency is associated with Premature Aging, Cancers, Frequent Infections, Poor Recovery from Illness, Trauma & Shock etc. GSH deficiency is also commonly associated and contributes to many of the chronic degenerative / age related disorders like Diabetes, Atherosclerosis, Heart Disease, Parkinson's, Alzheimer's, Autoimmune Diseases just to name a few. In fact GSH deficiency is present in about 100 medical conditions. Recent studies have shown that conditions like Schizophrenia , Down's Syndrome, Autism and

Neurodegenerative conditions are also associated with GSH deficiency. Studies clearly show significant benefits in many of these conditions when GSH levels are increased through supplementation.

GSH is a tripeptide made inside our cells from its 3 precursor Amino acids, Cysteine, Glutamine and Glycine. Significant increase in GSH levels and clinical benefits are best seen when the precursor formulation is used rather than oral GSH, which is a large molecule and poorly absorbed (only about 10%). Regular intravenous GSH is not advisable as it shuts down the intracellular homeostatic mechanisms and furthermore intact GSH molecule cannot be transported into the cells, working only in the blood and is short lived. Recent studies show that the liposomal form of GSH may be trapped and retained in the fatty cell membrane. It is advisable to ensure adequate intake of selenium, which is needed for GSH activation and to recycle from the oxidised GSH (GSSG) to the reduced form (GSH).

Several enzymes are involved in the synthesis and functions of GSH.

- Gamma Glutamylcysteine L (GCL) is involved in the first step of GSH synthesis - bonding of cysteine with glutamine.
Inborn deficiency of GCL is rare but when present, is associated with life threatening medical condition.
- Glutathione synthase activates the second reaction by combining glycine to cysteine + glutamine complex.
- Glutathione Transferases (GSTP). There are 10 such enzymes that help to attach GSH to toxins in the phase 2 detoxification. Of the 10, the Mu class (GSTM) is the most significant. Single Nucleotide Polymorphism (SNPs) involving GSTP1 and GSTM1, can slow down phase 2 detoxification. Such SNPs is seen in 80% of the Asian population.
Slow phase 2 in the presence of a normal phase 1 detoxification is hazardous. Increasing GSH with precursor amino acids in such cases is critically essential for good health (which means most will benefit from increasing GSH synthesis).
- Glutathione Peroxidases cleaves the GSH molecule and help in the intracellular transport of glutamine.
- Glutathione Transpeptidases are the enzymes that help GSH to recycle other oxidised antioxidants such as Vitamin C, Vitamin E, Lipoic acid in their reduced form. GSH is the only antioxidant that not only recycles itself but also helps in the recycling of other antioxidants.
- Glutathione Reductase reduces the oxidised GSH (GSSG) to its reduced form (GSH). Both Transferases and Reductases require selenium as a co-factor.

Vitamin C and GSH combination offer a potent antioxidant protection. Animals fed on a GSH free diet and have their GSH synthesis deleted, die within a few days. Giving Vitamin C helps in their recovery but reversal of prior health is not possible. However, giving GSH and Vitamin C improves health significantly, emphasising the importance of these two synergistic antioxidants.

While the water phase GSH is the master of all antioxidants, consuming other antioxidant such as vitamin C (water phase extracellular mainly), Vitamin E (lipid phase) and lipoic acid (both water + lipid phases) offers a wider range of antioxidant protection for better health.

In essence, increasing GSH levels helps to optimise health across the ages. Those who are suffering from Chronic Degenerative Diseases, Cancers, Recurrent / Chronic Infections, Neurodegenerative Disorders, Fatigue, Insomnia, Trauma and a host of other illnesses will benefit from increasing their GSH levels. Taking the Precursor Amino Acids is far superior to taking an intact GSH molecule. Optimising Selenium levels improves the benefits of GSH. Consuming other Antioxidants especially Vit C synergistically with GSH.

TOWARDS BETTER HEALTH.

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