

# GLUTATHIONE

The Miracle Molecule You Can't Live Without



**Chances are you may never have heard of it. It's the key to preventing aging, cancer, heart disease, dementia and more, and a necessary component to treating everything from autism to Alzheimer's disease.**

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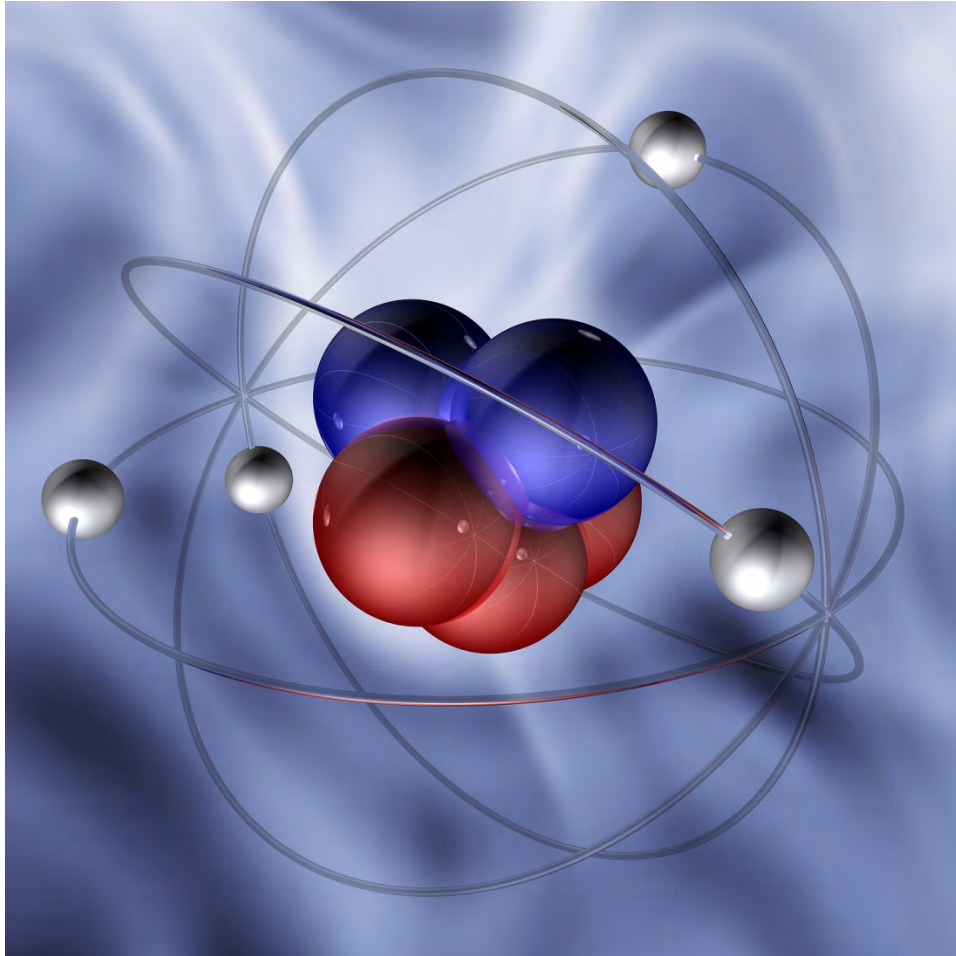
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# OVERVIEW



## OVERVIEW

This miracle molecule is required for you to stay healthy and ward off disease – yet for all its incredible power; chances are you may never have heard of it. It's the key to



preventing aging, cancer, heart disease, dementia and more, and a necessary component to treating everything from autism to Alzheimer's disease. Unbelievably, there are more than 90,000 medical articles written about it -- but your physician probably doesn't know anything about it - let alone how to use it.

What is it? Variously referred to as the master antioxidant, the primary detoxifier and leading booster of the immune system: it is the tri-peptide GLUTATHIONE (pronounced "gloo-ta-thíon")

From before birth every cell in your body produces its own glutathione. Aging, poor diet, pollution, toxins, medications, stress, trauma, infections and radiation all deplete your natural glutathione.

Without glutathione you are vulnerable to widespread cell damage from oxidative stress, free radicals, infections and cancer. Without glutathione your liver gets overtaxed with

toxins making it unable to fulfill one of its primary roles – recycling plant and garbage collector for your body.

When tested Glutathione deficiency is reported in nearly all very chronically sick



people. These include patients with chronic fatigue syndrome, heart disease, cancer, prolonged infections, autoimmune disease, diabetes, autism, Alzheimer's disease, Parkinson's disease, arthritis, asthma, kidney problems, liver disease and more.

### **What is Glutathione?**

Glutathione is a very simple 3- part molecule that is naturally produced from non-essential amino acids found in most cells in your body. It is a combination of three building blocks of protein or amino acids -- cysteine, glycine and glutamine.

The secret to glutathione's effectiveness as an anti-oxidant is the sulfur (SH) chemical group it contains. Sulfur is an attractive element which easily combines with electron or proton deficient compounds, including free radicals and toxins like mercury and other heavy metals such as chromium, selenium or strontium. Glutathione easily neutralizes free radicals & combines with toxins to diminish the damage these agents can cause.

Many genes are involved in the regulation of enzymes that build reform and recycle glutathione. These genes have several names, such as GSTM1, GSTP1 and more.

Many people now have a limited capacity to get rid of toxins because these people are missing the GSTM1 function -- one of the more important genes involved in the process of creating and recycling



glutathione in the body. Nearly all very sick people are missing this gene function.

### **The Importance of Glutathione in Protecting Against Chronic Illness**

Glutathione is critical for one very simple reason: *It is a self rejuvenating antioxidant.* Free radicals are like the old digital game Pac-Man. They eat (steal) electrons (-) or protons (+) from wherever they can – the mitochondria, cell membranes, DNA, nerve cell, or white blood cell and in so doing damage the function of the molecule they have attacked. To counter the effect free radicals get passed like a bucket brigade from vitamin C to vitamin E to lipoic acid and then finally to glutathione which shuts down the Pac-Man and recycles other antioxidants. After this happens, the body can "reduce" or regenerate another protective glutathione molecule and we start the process all over again.



When we are overwhelmed with too much oxidative stress or too many toxins problems occur with cellular metabolism and the machinery starts to malfunction.



When glutathione becomes

depleted and we can no longer protect ourselves against free radicals, infections, or cancer and we can't get rid of toxins problems occur. This leads to further sickness and soon we are in the downward spiral of chronic illness.

*Glutathione is the most important part of your entire detoxification system.* Toxins are attached to glutathione, which then carries them from the liver into the bile and the small intestine before becoming stool in the large intestine and excreted.

*Glutathione is involved in peak mental and physical function.* Research has shown that elevated glutathione levels decrease muscle damage, reduce recovery time, increase strength and endurance and shift metabolism from fat production to muscle development.

Research has shown the highest glutathione levels in healthy young people, lower levels in healthy elderly, lower levels still in sick elderly and the lowest of all levels in the



hospitalized elderly. If you are sick or old or are just not in peak shape, you likely have glutathione deficiency.

*Glutathione is critical for immune function and controlling inflammation.* It is the master detoxifier and the body's main antioxidant, while also protecting our cells and working to keep running smoothly our energy metabolism.

### **What do the Experts Say about Glutathione?**

"Glutathione is a very interesting, small molecule that's produced by the body and found in every cell," says Gustavo Bounous, MD, a retired professor of surgery at McGill University in Montreal, Canada. "It's the body's most important antioxidant because it's within every cell."

### ***What Does Glutathione Do?***

“The strong antioxidant effect of glutathione helps keep our cells running smoothly,” according to Jeremy Appleton, MD, who also says “it helps the liver to remove chemicals that are foreign to the body, such as drugs and pollutants.”



"If you look in a hospital situation at people who have cancer, AIDS, or other very serious diseases, almost invariably they are depleted in glutathione," says Appleton. "The reasons for this are not completely understood, but we do know that glutathione is extremely important for *maintaining intracellular health*."

Glutathione is not well absorbed into the body when taken by mouth. One way to get around this is to take it by vein. A more practical solution is to take the precursors -- that is, the molecules the body needs to make glutathione -- rather than glutathione itself. There is no solid proof this works. Another approach is via a patch applied to the skin which stimulates the production of glutathione in the liver. This approach has obtained proven blood level increases in glutathione.

## Who Does Glutathione Help?

Animal and laboratory studies have demonstrated that glutathione has the potential to fight almost any disease, particularly those associated with aging, since free radical damage is the cause of many of the diseases of old age.



"Theoretically, there are many very strong arguments in favor of a therapeutic use of glutathione," says Appleton. "But when people have actually tried to use Glutathione as an oral supplement, nasal spray, or intravenously, the results have been more of a preliminary nature. The amount of research on glutathione as a supplement ... is very limited."

Appleton points out that "The best studies have been conducted in cancer. One study involved women with ovarian cancer who were being treated with chemotherapy. Some of the women were also treated with intravenous glutathione. Those given the glutathione not only had fewer side effects from the chemotherapy but also had better overall survival rates."

## **What Are the Risks?**

Overall, taking glutathione via injection, patch or its precursors in reasonable amounts appears to be quite safe, although oral supplements should be avoided in people with milk protein allergies and in those who have received an organ transplant.

Appleton says "there's no evidence that supplementing with glutathione, even intravenously, is in any way going to make any cancer worse. In fact, the evidence we have suggests the opposite. It suggests that glutathione and other antioxidants, far from interfering with the activity of chemotherapy, appear to reduce side effects without decreasing efficacy and may, in fact, improve the efficacy of the chemotherapy in fighting cancer."

# HEALTH BENEFITS



## What are the Health Benefits of Glutathione?

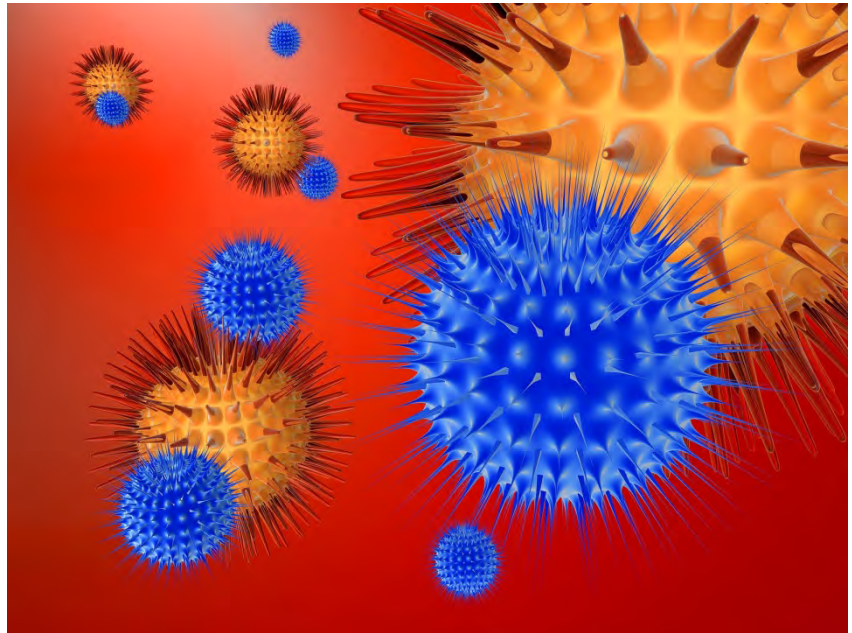
Before discussing the benefits of glutathione, we should know what glutathione (GSH) is. It is a natural,



abundant anti-oxidant. Glutathione exists in practically every cell in our body. It is synthesized in the body using amino acids called Cysteine, Glutamic acid and Glycine. Glutathione is found mainly in the lungs and intestinal tract. Glutathione detoxifies harmful compounds and removes them from the body.

There are many benefits associated with glutathione. Researchers have come to realize that glutathione plays a vital role in boosting the immune system by neutralizing free radicals in our body. Evidences show that GSH can also help to repair the body damaged by pollution, stress, infections, aging, drugs, unhealthy diet, or sunburn. An interesting thing to know about the benefits of glutathione is that it plays a vital role in various major systems in our body such as the immune system and numerous metabolic systems. It plays a role in biochemical reactions like DNA synthesis, protein synthesis, enzyme activation, and amino acid transport and assists in the metabolism of carcinogens. All major organ systems of the body are linked to glutathione.

Another important benefit of glutathione is that this molecule has the potential to fight almost all diseases, especially those associated with aging. This is because free radical damage is the main reason for the disease of old age.



The best researchers have been experimenting with glutathione to cure cancer, high blood pressure, Parkinson's disease, Alzheimer's and male infertility. Glutathione has also been used to treat ovarian cancer in women.

Glutathione deficiency can have an effect on the nervous system and cause various mental disorders. Other chronic disorders such as Asthma, Rheumatoid Arthritis, or too much exposure to pollution can cause glutathione deficiency. Glutathione acts to support white blood cells which are important in developing the immune systems response and ridding toxins from the body.

Glutathione is manufactured primarily in the liver and found in food like fruits, vegetables, eggs, meat, wheat germ and whole grains. Green fruits and vegetables are



particularly helpful. Other foods can stimulate the production of glutathione in our body. Vegetables such as broccoli, cabbage, brussels sprouts, cauliflower, kale and parsley can stimulate the body to produce glutathione.

Glutathione deficiency states include, but are not limited to, HIV/AIDS, chemical and infectious hepatitis, myalgic encephalomyelitis, chronic fatigue syndrome, prostate and



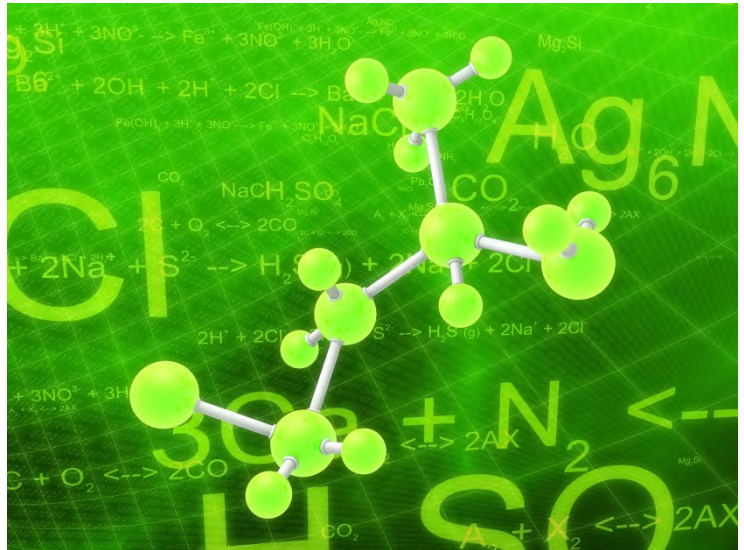
other cancers, cataracts, Alzheimer's disease, Parkinson's disease, chronic obstructive pulmonary disease, asthma, radiation poisoning, malnutritive states, arduous physical stress, and aging. Many clinical pathologies are associated with oxidative stress and are written about in numerous medical references. Low glutathione has also been strongly implicated in wasting and negative nitrogen balance, cancer, AIDS, sepsis, trauma, burns and athletic overtraining. Schizophrenia and bipolar disorder are also associated with lowered glutathione. Accruing data suggest that oxidative stress may be a factor underlying the pathophysiology of bipolar disorder (BD), major depressive disorder (MDD), and schizophrenia (SCZ). Glutathione (GSH) is the major free radical scavenger in the brain.

# HEALTH EFFECTS





For example, glutathione controls inflammatory mediators like leukotrienes which are involved in inflammatory disorders such as allergies and arthritis. Researchers have shown that decreased glutathione levels can lead to age related diseases such as cancer, Alzheimer's, and Parkinson's disease.



In normal healthy humans, 90% of the glutathione pool is found in the reduced form while 10% is found in the disulfide form. In its reduced form it is capable of oxidizing and in its oxidized form capable of reducing. This two way action is critical to its effectiveness as an anti-oxidant. Because it exists in two forms it is able to both oxidize & reduce free radical molecules. Glutathione is a major antioxidant participating in neutralizing free radicals and maintaining essential antioxidant vitamins like vitamin C and vitamin E. Glutathione also plays a vital role in regulating the nitric oxide cycle which has been implicated in chronic fatigue syndrome, fibromyalgia, and other diseases.

Glutathione plays a major role in rejuvenating the immune system and numerous other metabolic systems. It controls biochemical reactions like DNA synthesis, protein synthesis, enzyme activation, and amino acid transport. Thus all major systems of the

body such as the immune, nervous, and gastrointestinal systems are linked with the glutathione system.

Glutathione is an antioxidant and prevents damage of important cellular components which are caused by reactive oxygen species such as free radicals and peroxides.

Glutathione exists in certain food such as asparagus, acorn squash, avocado, cantaloupe, grapefruit, okra, orange, peach, potato, spinach, strawberries, tomato, watermelon, and zucchini. A few vegetables like broccoli, cabbage, brussels sprouts, cauliflower, kale, and parsley not only supply glutathione but also stimulate the production of glutathione in the body.



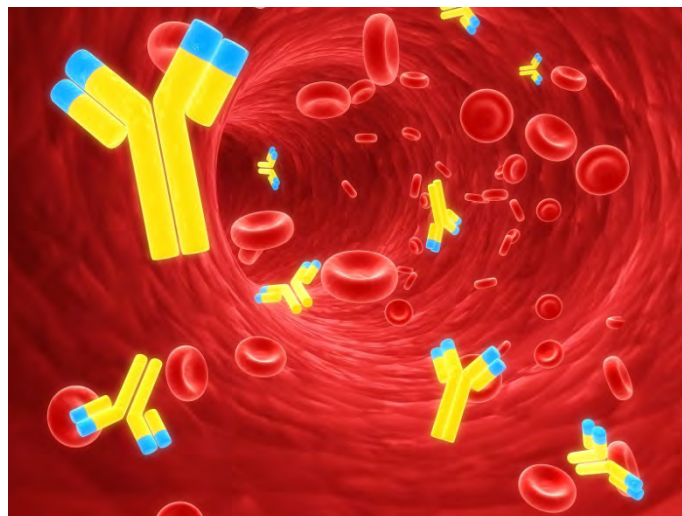
# ANTI-AGING & FREE RADICALS



## How Glutathione Does Prevents Early

### Aging?

Aging is a natural process that can appear at any age. Aging is reflected not only in the modifications of our external body, but also by the signs of internal organ function



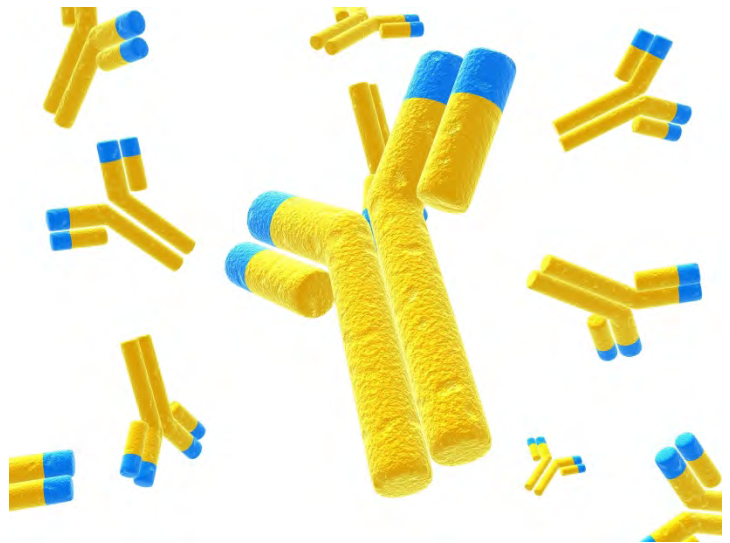
deteriorating. Aging inhibits the native ability of our body to maintain metabolism, optimal physiology, fight against chronic diseases and maintain a solid immune system defending against age-related diseases.

The appearance of our external body is an indication of the amount of deterioration in our internal body. Pain sensation, wrinkles, and sagging skin are some symptoms of aging in our external body. Aging occurs when the synchronization of the body slows down or fails to take place as planned. Age degeneration happens slowly and gradually as time goes on while sudden degeneration can happen as a result of glutathione deficits in our body cells.

GSH or glutathione is a vital molecule in all human cells because it helps prevent assaults on the immune system and human cells. It normally creates conjoined molecules to protect the cells from harmful foreign agents like free radical oxidants.



Glutathione is an antioxidant which generally helps to enhance our cell health and to stave off the assailants. It is the most important and dynamic substance in human cells and it manages a variety of critical functions.



Nutrition experts assume that the cause of premature aging is acidosis; or the result of too much acid due to our modern life-style. Aging slows down the regeneration of human cells and impairs metabolic functioning. Glutathione levels start to decline, which plays a role in accelerating diseases associated with aging. Human cells need nutritious food to form the molecules of GSH and maintain a normal metabolic rate to prevent premature aging.

Generally, glutathione levels begin falling at the rate of 15% per year from the age of 25 onward. After ages 50, GSH is produced more slowly. As a result, aging occurs. Experts say that aging has sped up because of modern life-styles and food habits. Aging decreases the formation of GSH and slows down the function of human cells sooner. Stressful environments, emotional life, and an acidic diet also speed up the process of aging.



decreases as we get older.

While glutathione decreases,

free radicals increase,

speeding up the oxidation of

our body. An important role

played by glutathione is

detoxifying dangerous

materials from the body. It has the ability to provide protection from the kind of damage that can be caused during the aging process.

Since GSH is a major antioxidant produced by the human cells, it succeeds in protecting the body from the aging process. Free radicals are a result of oxidation which leads to the separation of electrons from atoms. Free radicals are very dangerous since they have the ability to destroy human cell mechanisms. GSH manages these radicals and gives counterbalance which protects the skin, brain, eyes, liver, heart, lungs and kidneys. A crucial role that glutathione plays is in the detoxification of foreign substances. In this modern age, our body is continually affected by detrimental toxicants and other injurious substances like pesticides, drug metabolites, solvents and poisonous pollutants. We have to avoid ingesting these through drink, air and water. GSH helps by enabling the immune systems to work faster and fight against these toxins and others we meet daily.





## Free Radicals plus Anti-Oxidants Equals

### Anti Aging

Aging is caused by free radicals in our body.

Oxygen stripped of an electron is somewhat of a poison inside the body.

Every time the body uses oxygen in metabolism, free radicals are formed.

These free radicals are by products of metabolism and are highly reactive. A free radical lacks one electron, making it reactive to other substances in our body such as protein, carbohydrates and fats. When these free radicals react with other substances, it affects how the cell functions and at times can ultimately lead to the death of the cell.

Antioxidants and aging are connected to each other. One of the body's main mechanisms to fight free radicals are called anti-oxidants. These anti-oxidants can safely react with free radicals in the body to neutralize their toxicity by offering an electron or proton.

Some examples of free radical fighters can be found in fruits and vegetables such as vitamins C and E, lycopene, and carotenoids, more popularly known as beta-carotene.

Another anti-oxidant is carnosine, also naturally present inside the body but decreasing with time as people age.



## How are antioxidants and anti-aging connected?

Oxidation is a natural chemical reaction occurring in our bodies, particularly in rapidly dividing cells, which is part of the metabolic processes that generate energy for our bodies to use. During oxidation, free radicals are produced, which are chemicals that can damage our cells and lead to premature aging. Antioxidants such as glutathione, vitamins C and E, and certain enzymes naturally present in our body, combat the effects of free radicals. Hence, increasing the levels of glutathione and vitamins C and E can dramatically reduce the occurrence of cell damage, which in turn slows down the aging process.

Glutathione is composed of three amino acids: cysteine, glutamic acid and glycine. All three chemicals are produced and stored mainly in the liver, and are found everywhere in the human body.

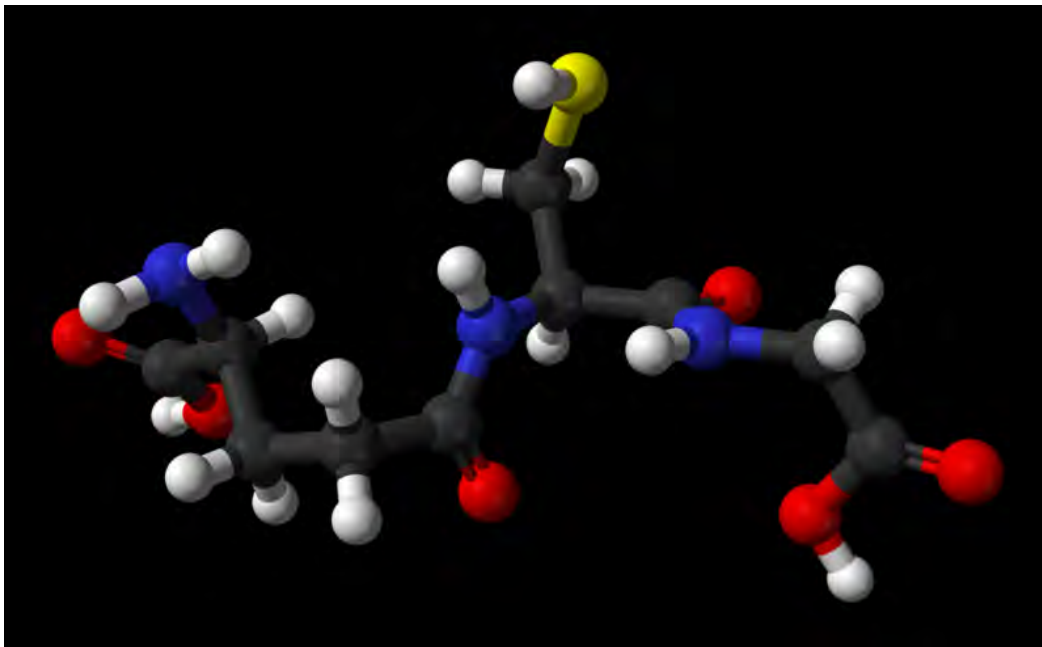
Glutathione's main job is to help the liver detoxify harmful compounds through the bile. It is also released by the liver to the bloodstream to keep our red and white blood cells healthy, thus *maximizing the effectiveness of our immune system*. Glutathione levels decrease with age, which is why older people's cells are more susceptible to free radical damage.

Recent scientific studies have shown that increased levels of glutathione in the body *result in healthier organs*. A study among 13 patients suffering from artery plaques, seven of whom have low levels of glutathione, and six with higher levels found that five out of the seven patients with low levels of glutathione had stenosis, or an abnormal narrowing in their contralateral carotid arteries. None of the six patients with higher levels of glutathione had the condition.

With these new findings, glutathione has become synonymous with 'antioxidant' and 'anti-aging,' with an added side effect: it whitens the skin. Hence, many intravenous and oral glutathione supplements have come out in the market. These supplements tend to be quite expensive and the body's ability to absorb them orally is greatly diminished due to gastric acid destruction of the glutathione molecule. Intravenous glutathione is effective but the molecule half-life is short and the effects are not long lasting.



# BIOCHEMISTRY



## What Is the Biochemistry of

### Glutathione

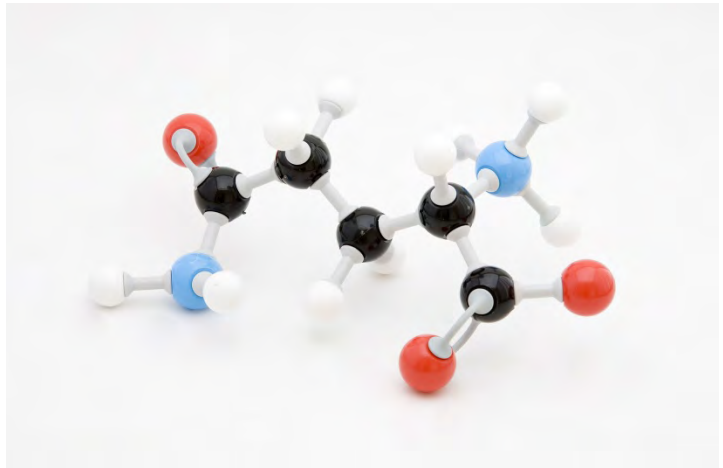
Glutathione (GSH) is a tripeptide that contains an unusual peptide linkage between the amine group of cysteine (which is attached by a normal



peptide linkage to glycine) and the carboxyl group of the glutamate side chain. It is an antioxidant, preventing damage to important cellular components caused by reactive oxygen species such as electron & proton deficient free radicals and peroxides. The sulfhydryl (thiol) group (SH) of cysteine serves as a proton donor and is responsible for the biological activity of glutathione.

Glutathione reduces disulfide bonds formed within cytoplasmic proteins to cysteines by serving as an electron donor. In the process, glutathione is converted to its oxidized form glutathione disulfide (GSSG), also called L- glutathione. Glutathione is found almost exclusively in its reduced form. The ratio of reduced glutathione to oxidized glutathione within cells is often used as a measure of cellular toxicity is capable of being oxidized – one of the most frequent chemical reactions in the body.

Glutathione exists in reduced (GSH) and oxidized (GSSG) states. In donating an electron, glutathione itself becomes reactive, and readily reacts with another reactive glutathione to form glutathione disulfide (GSSG). Such a reaction is



possible due to the relatively high concentration of glutathione in cells (up to 5 mM in the liver). GSH can be regenerated from GSSG by the enzyme glutathione reductase.

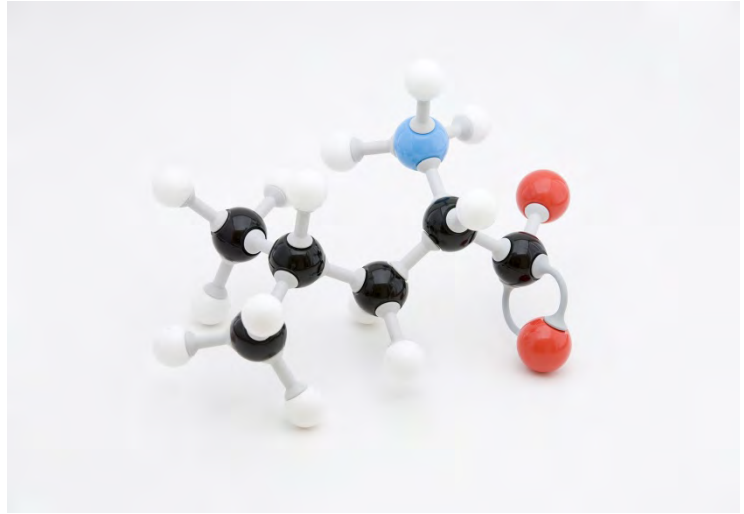
In healthy cells and tissue, more than 90% of the total glutathione pool is in the reduced form (GSH) and less than 10% exists in the disulfide form (GSSG). An increased GSSG-to-GSH ratio is considered indicative of oxidative stress.

Glutathione is not an essential nutrient (meaning it does not have to be obtained via food), since it can be synthesized in the body from the amino acids L-cysteine, L-glutamic acid, and glycine.

The supply of cysteine is the rate-limiting factor in glutathione synthesis by the cells, since cysteine is relatively rare in foodstuffs. Furthermore, if released as a free amino acid, cysteine is toxic and spontaneously broken down in the gastrointestinal tract and blood plasma.

Glutathione is synthesized in two adenosine triphosphate-dependent steps:

- First, via the enzyme gamma-glutamylcysteine synthetase (a.k.a. glutamate cysteine ligase,



GCL). This reaction is the rate-limiting step in glutathione synthesis.

- Second, via the enzyme glutathione synthetase.

While all cells in the human body are capable of synthesizing glutathione, liver Glutathione synthesis has been shown to be essential.

### **Glutathione has multiple functions:**

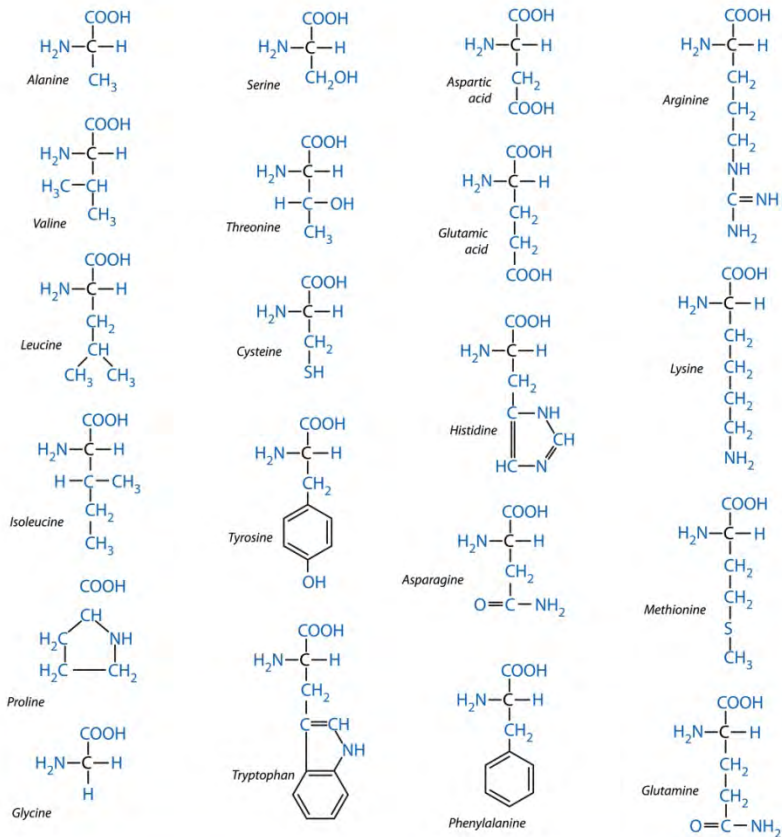
\* It is the major endogenous antioxidant produced by the cells, participating directly in the neutralization of free radicals and reactive oxygen compounds, as well as maintaining exogenous antioxidants such as vitamins C and E in their reduced (active) forms.

\* Regulation of the nitric oxide cycle, which is critical for life but can be problematic if unregulated. Nitric oxide is also capable of being an oxidizing and reducing agent.

\* It is used in metabolic and biochemical reactions such as DNA synthesis and repair, protein synthesis, prostaglandin synthesis, amino acid transport, and enzyme activation. Nitric Oxide (NO) in low concentrations protects the heart, stimulates the brain, kills bacteria, helps prevent blood clots, enhances oxygen delivery to tissue and helps regulate blood pressure. Elevated levels of NO have been associated with various carcinomas, inflammatory diseases, juvenile diabetes, multiple sclerosis and ulcerative colitis. Thus, every system in the body can be affected by the state of the glutathione system, especially the immune system, the nervous system, the gastrointestinal system and the lungs.

# BIOCHEMICAL FUNCTION

## 20 amino acids A life basis



## What is the Biochemical Function of Glutathione?

Reduced L- glutathione, most commonly called glutathione or GSH, is the most powerful naturally occurring antioxidant in all human cells.



It is a tripeptide composed of the amino acids glutamic acid, cysteine and glycine.

Glutathione is found in all cells in the body, including the bile, the epithelial lining, the lungs, and—at much smaller concentrations—in the blood.

The highest concentration of glutathione is found in the liver, making it critically important in the detoxification and elimination of free radicals. Accumulation of these dangerous compounds can result in oxidative stress, which occurs when the generation of free radicals in the body exceeds the body's ability to neutralize and eliminate them. Free radicals are highly reactive compounds created in the body during normal metabolic functions; they can also enter the body through the environment.

Metabolically, glutathione has many functions. For example, glutathione plays a substantial role in the functioning of the body's immune system.



Its antioxidant property makes it vital to white blood cells (lymphocytes)—as it allows them to reach their full potential during the oxygen-requiring activity of the body's immune response.



### **Biochemistry and Metabolism:**

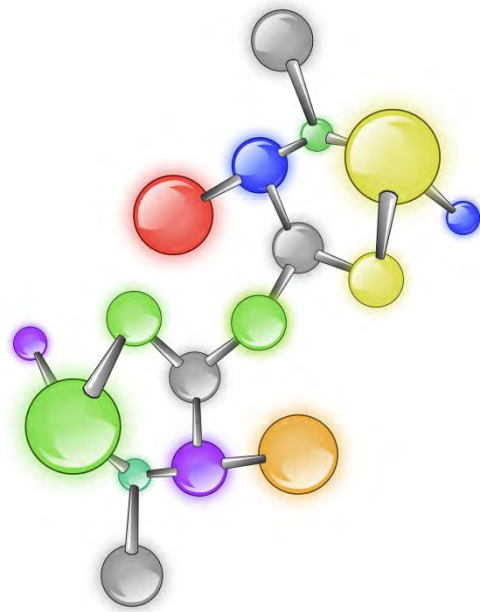
Reduced Glutathione (GSH) is a linear tripeptide of L-glutamine, L-cysteine, and glycine. Technically N-L-gamma-glutamyl-cysteinyl glycine or L- glutathione, the molecule has a sulfhydryl (SH) group on the cysteinyl portion, which accounts for its strong electron-donating character.

As electrons are lost, the molecule becomes oxidized, and two such molecules become linked (dimerized) by a disulfide bridge to form glutathione disulfide or oxidized glutathione (GSSG). This linkage is reversible upon re-reduction.

Glutathione is under tight homeostatic control both intracellularly and extracellularly. A dynamic balance is maintained between GSH synthesis, its recycling from GSSG/oxidized glutathione, and its utilization.

Glutathione synthesis involves two closely linked, enzymatically-controlled reactions that utilize ATP. First, cysteine and glutamate are combined by gamma-glutamyl cysteinyl

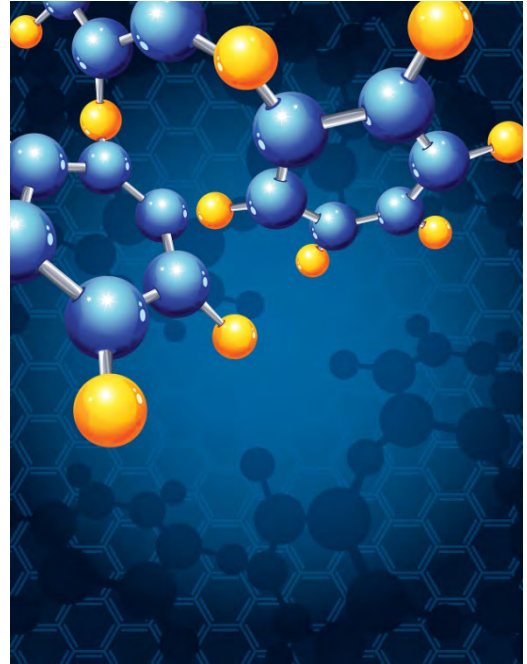
synthetase. Second, GSH synthetase combines gamma-glutamylcysteine with glycine to generate Glutathione. As glutathione levels rise, they self-limit further GSH synthesis; otherwise, cysteine availability is usually rate-limiting. Fasting, protein-energy malnutrition, or other dietary amino acid deficiencies limit glutathione synthesis.



Glutathione recycling is catalyzed by glutathione disulfide reductase, which uses reducing equivalents from NADPH to reconvert GSSG to 2GSH. The reducing power of ascorbate helps conserve systemic glutathione.

Glutathione is used as a cofactor by (1) multiple peroxidase enzymes, to detoxify peroxides generated from oxygen radical attack on biological molecules; (2) transhydrogenases, to reduce oxidized centers on DNA, proteins, and other biomolecules; and (3) Glutathione S-transferases (GST) to conjugate glutathione with endogenous substances (e.g., estrogens), exogenous electrophiles (e.g., arene oxides, unsaturated carbonyls, organic halides), and diverse xenobiotics. Low GST activity may increase risk for disease—but paradoxically, some glutathione conjugates can also be toxic.

Direct attack by free radicals and other oxidative agents can also deplete glutathione. The homeostatic glutathione redox cycle attempts to keep glutathione replenished as it is being consumed. Amounts available from foods are limited (less than 150 mg/day), and oxidative depletion can outpace synthesis.



*The liver is the largest reservoir of glutathione.* The parenchymal cells synthesize GSH for P450 conjugation and numerous other metabolic requirements—then export GSH as a systemic source of SH-reducing power. Glutathione is carried in the bile to the intestinal luminal compartment. Epithelial tissues of the kidney tubules, intestinal lining and lung have substantial P450 activity—and modest capacity to export glutathione.

### **Mechanism of Action:**

*Glutathione is an extremely important cell protectant.* It directly quenches reactive hydroxyl free radicals, other oxygen-centered free radicals, and radical centers on DNA and other biomolecules.

*Glutathione is a primary protectant of skin, lens, cornea, and retina against radiation damage* and is the biochemical foundation of P450 detoxification in the liver, kidneys, lungs, intestinal, epithelia and other organs.

Glutathione is the essential cofactor for many enzymes that require thiol-reducing equivalents, and helps keep redox-sensitive active sites on enzyme in the necessary reduced state. Higher-order thiol cell systems, the metallothioneins, thioredoxins and other redox regulator proteins are ultimately regulated by glutathione levels—and the GSH/GSSG redox ratio. GSH/GSSG balance is crucial to homeostasis—stabilizing the cellular biomolecular spectrum, and facilitating cellular performance and survival.

Glutathione and its metabolites also interface with energetics and neurotransmitter syntheses through several prominent metabolic pathways. Glutathione availability down-regulates the pro-inflammatory potential of leukotrienes and other eicosanoids. Recently discovered S-nitroso metabolites, generated in vivo from glutathione and NO (nitric oxide), further diversify glutathione impact on metabolism.

# IMMUNE BOOSTING



## How Does Glutathione Enhance Immunity?

Even the healthiest people get sick because of infection diet, weather, or stress. There are 5 natural ways to boost the immune system and protect it from stressors and toxic chemicals.

- **The first step to boost your immune system is diet**

- Antioxidants play a significant role in protecting the immune system. Fruits and green vegetables are rich in antioxidants. Consuming fruits, green vegetables, eggs, meat and grains regularly can boost up your immune system. These foods stimulate antioxidant production in your body.
- Healthy fats like omega-3 fatty acids are rich in fish and over saturated fats are rich in dairy products and meat. These foods boost up your immune system by regulating the synthesis of compounds which are responsible for immunity. Adding ginger and garlic to your meal regularly also improves the immune system.





- Drinking plenty of water also helps you to be strong and healthy. The simple act of hydration keeps cellular metabolism working efficiently.



- Glutathione can help boost your immune system and ward off the natural effects of aging.

○ **The next step to boost your immune system is exercise**

- Regular exercise and walking can mobilize your T-cells (white blood cells) which help keep your immune system strong. There are healing exercises which fight stress and raise your energy level.
- Research has proved that moderate amounts of exercise can boost up your immune system but oxygen deficiency decreases your immune system. Moderate exercise can increase oxygen intake and help increase your metabolism. You can also regulate its circulation by therapeutic exercises like Yoga, which helps because of its relaxation, gradual movement, and focused breathing. Deep breathing stimulates the lymph system and has a beneficial effect on the immune system.

- Aerobics, running, swimming, and tennis are all vigorous activities that can increase the supplement of oxygen to the body. It also helps to



build your muscles, strengthen your heart, burn calories, and reduce weight.

- **The third important point to boost up your immune system is to avoid stress:**

- Most of us grow up with stress, and chronic stress is a negative impact on your health. It is essential to overcome stress by routinely incorporating relaxation techniques such as meditation, yoga, and deep breathing.

Practicing these techniques will go a long way to promoting your health.

- **The other fact to boost your immune system is sleep and hygiene**

- Lack of sleep is a major contributor to sickness. At least 7 to 8 hours of sleep is necessary, which helps to maintain a strong immune system.
- Wash your hands frequently with warm and soapy water before eating, after coughing or sneezing, and after using the bathroom. This will keep you free from infections.

○ **Herbs and other supplements can also boost your immune system**

- Researchers have proved that herbs like ocimum, tenuiflorum, astragals, Echinacea and elderberry can protect you and help to reduce the duration of an illness if taken as soon as infection starts.

# SKIN WHITENING



## How Is Glutathione Involved In Skin Whitening?

Since time immemorial, men and women have been looking for the elixir of youth and beauty. While the hands of clock tick, it signals

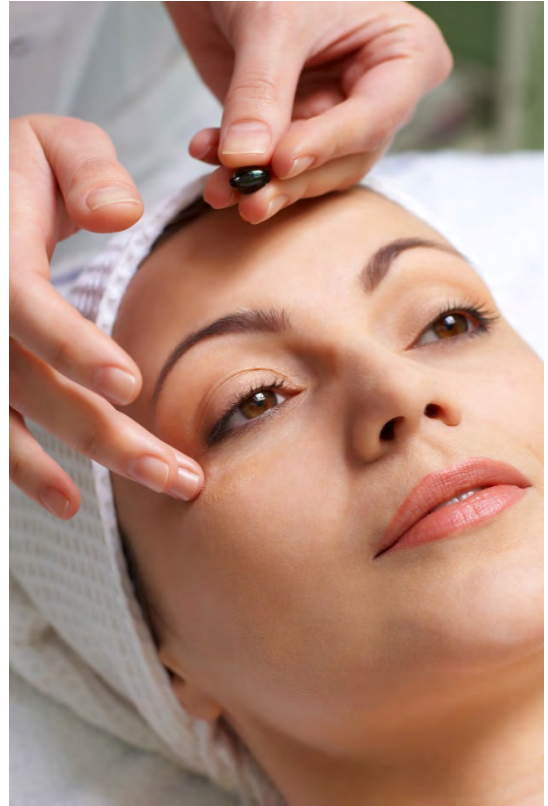


that time is passing and you add another day to your age, then another week, then another month, and then another year. Nothing can stop time from ticking away. Nothing can stop you from aging.

But do you know that a magical elixir is really available these days? It is not the magic potion that people envisioned they could drink to transform themselves into a vibrant, youthful, desirable creature. It is glutathione, a natural component of the body that detoxifies and strengthens the immune system, and can bring out that radiant glow to the skin. Because the level of glutathione decreases as a person ages, results will show on the face first. There are many glutathione products on the market these days that promise to bring out the inner youthful glow in you. But you know how it is these days. Most of these products are not so effective. The truth is you'll have to wait years to see the desired effect.

## The Beauty From Within

Every day, people are faced with environmental pollutants which cause free radicals to build up in the body. As a reaction to these pollutants, free radicals collect in the body and begin to immediately destroy the cell wall and the overall genetic structure of the cells making it difficult for the cells to reproduce and renew itself. *This applies to skin cells or the dermal layer especially.*



Did you know that antioxidants have the ability to heal the cells and prevent free radicals from forming? For this reason it is important that we take good care of ourselves and make sure that we get ample amounts of antioxidants and anti aging vitamins and minerals.

One good example of an antioxidant is glutathione. Glutathione is known to be the *master antioxidant* and plays an important role in our overall health. It detoxifies the body and strengthens the immune system aside from the fact that it also has anti aging



properties. It is also known to improve athletic performance thus helping us to keep going longer.

Apart from this, glutathione also protects our bodies from toxins we accumulate every day. It is said to be



found naturally in our bodies and as we age, the level of glutathione in our body starts to decline.

### **Say Goodbye to Unevenly-Whitened Skin with Glutathione Patches**

Glutathione, or L- glutathione (GSH), is L-Carnosine's big sister. It is an amino acid with an effective antioxidant, detoxifier and enzyme cofactor. It is a strong antitoxin which boosts the body's immunity. It is naturally present in the body, and with proper nutrition it can boost immunity, protecting the system against illnesses and premature aging. Like carnosine, glutathione also destroys free radicals, the harmful chemicals that hinder cell multiplication in the body, and ushers them out of the body as toxins.

Upon the elimination of free radicals, benefits such as unclogged veins and arteries, decreased blood sugar, increased energy, improved memory recall, and increased visual

acuity follows. Perhaps the most sought after therapeutic effect of glutathione is the wrinkle-free, smooth, radiant skin that is eventually revealed after prolonged use.

Glutathione is a very popular product in all kinds of supplements that came out in the market. However, you should understand that glutathione is not absorbed well when taken orally. Digestive juices break down glutathione even before it is absorbed by the system. Topical application such as soaps and creams are valuable, but it doesn't last very long as it can be worn off easily with sweat. Its effect will be greater when taken intravenously, however a mediating substance such as Vitamin C or E will be required for it to be processed by the body faster. Intravenous injections are a hassle as well, considering the expense and the pain of inserting needles into a vein.

The new revolutionary method of increasing your glutathione level in the body is so effective it can dramatically change the way you feel and look in less than 24 hours. It is clinically proven the most effective antioxidant and anti-aging technology is a glutathione patch, so there is no need for you to take those risky injections.



# SUPPLEMENTATION



## Supplementation

Raising GSH levels through direct supplementation of glutathione is difficult. Research suggests that

Glutathione taken orally is not well absorbed across the gastrointestinal tract. In a study of acute oral

administration of a very large dose (3 grams) of oral

glutathione, Witschi and coworkers found “it is not

possible to increase circulating Glutathione to a

clinically beneficial extent by the oral administration of a single dose of 3 g of

glutathione.” Given this very high dose (way more than normal) it is reasonable to

predict that the small amounts of glutathione found in foods will not have much of an

impact on glutathione deficiency.

Glutathione is a tightly regulated intracellular constituent, and is limited in its production

by negative feedback inhibition of its own synthesis through the enzyme gamma-

glutamylcysteine synthetase, thus greatly minimizing any possibility of overdose.

Glutathione augmentation using precursors of glutathione synthesis or intravenous

glutathione is a strategy developed to address states of glutathione deficiency, high

oxidative stress, immune deficiency, and xenobiotic overload in which glutathione plays a

part in the detoxification of the xenobiotic in question (especially through the hepatic



route). Glutathione patches as produced by the LifeWave Company have been shown to improve glutathione blood levels by 300% in 24 hours.

Glutathione deficiency states include, but are not limited to, HIV/AIDS, chemical and infectious hepatitis, myalgic encephalomyelitis chronic fatigue

syndrome ME / CFS, prostate and other cancers, cataracts, Alzheimer's disease, Parkinson's disease, chronic obstructive pulmonary disease, asthma, radiation poisoning, malnutritive states, arduous physical stress, and aging, and has been associated with suboptimal immune response. Many clinical pathologies are associated with oxidative stress and are elaborated upon in numerous medical references.

Low glutathione is also strongly implicated in wasting and negative nitrogen balance, cancer, AIDS, sepsis, trauma, burns and even athletic overtraining.

Schizophrenia and bipolar disorder are associated with lowered glutathione. Accumulating data suggest that oxidative stress may be a factor underlying the pathophysiology of bipolar disorder (BD), major depressive disorder (MDD), and schizophrenia (SCZ).

Glutathione (GSH) is the major free radical scavenger in the brain.





## 9 Tips to Optimize your Glutathione Levels

### Eat Foods that Support Glutathione Production

1. **Consume sulfur-rich foods.** The main ones in the diet are garlic, onions and the cruciferous vegetables (broccoli, kale, collards, cabbage, cauliflower, watercress, etc).
2. Try **bioactive whey** protein. This is a great source



of cysteine and the amino acid building blocks for glutathione synthesis. As you know, I am not a big fan of dairy. But this is an exception – with a few warnings.

The whey protein **MUST** be bioactive and made from non-denatured proteins (“denaturing” refers to the breakdown of the normal protein structure).

Choose non-pasteurized and non industrially produced milk that contains no pesticides, hormones, or antibiotics. Immunocal is a prescription bioactive non-denatured whey protein that is even listed in the Physician’s Desk Reference.

3. **Exercise boosts your Glutathione levels** and thereby helps boost your immune system, improve detoxification and enhance your body’s own antioxidant defenses. Start slow and build up to 30 minutes a day of vigorous aerobic exercise like walking or jogging, or play various sports. Strength training for 20 minutes 3 times a week is also helpful.

**4. N-acetyl-cysteine.** This has been used for years to help treat asthma and lung disease and to treat people with life-threatening liver failure from Tylenol overdose. In fact, in pharmacy school I learned it can be given to prevent



kidney damage from dyes used during x-ray studies.

**5. Alpha lipoic acid.** This is a close second to glutathione in importance in our cells and is involved in energy production, blood sugar control, brain health and detoxification. The body usually makes it, but given all the stresses we are under, we often become depleted.

**6. Methylation nutrients (folate and vitamins B6 and B12).** These are perhaps the most critical to keep the body producing glutathione. Methylation and the production and recycling of glutathione are the two most important biochemical functions in your body. Take folate (especially in the active form of 5-methyltetrahydrofolate), B6 (in active form of P5P) and B12 (in the active form of cyanocobalamin).

**7. Selenium.** This important mineral helps the body recycle and produce more glutathione.



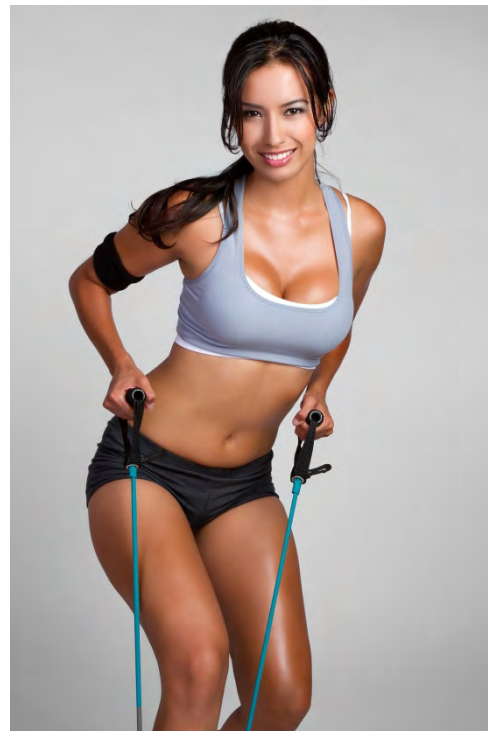
8. **A family of antioxidants including vitamins C and E** (in the form of mixed tocopherols), work together to recycle glutathione.
9. **Milk thistle** (silymarin) which has long been used in liver disease and helps boost glutathione levels.

# SUZANNE SOMERS



## **Suzanne Somers Appointed LifeWave Ambassador!**

Well-known actress and health advocate Suzanne Somers has entered into a significant long-term relationship with the healthcare corporation LifeWave as new LifeWave Ambassador, Suzanne will be an advocate of LifeWave products and an integral part of their marketing efforts.



### **What this Means for LifeWave**

This is a significant and important development for LifeWave. Suzanne is a visible, trusted, outspoken advocate of a holistic approach to health. In addition to her work as a well-known actress, singer, comedienne and businesswoman, she is a #1 New York Times bestselling author, with numerous books on health and wellness. Suzanne's endorsement will garner more visibility for LifeWave, helping propel the company to new levels of growth.

This appointment solidifies, expands and strengthens Suzanne's long-standing relationship with the company.

In this new role, Suzanne will be:

- \* Participate in more LifeWave events

- \* Speak on behalf of the company on

LifeWave conference calls

- \* Be featured in LifeWave promotional

videos



“Suzanne and her team understand who we are as a company and what we do,” says LifeWave Founder & CEO David Schmidt. “Our visions are very synergistic, and we are tremendously enthusiastic about this relationship.”

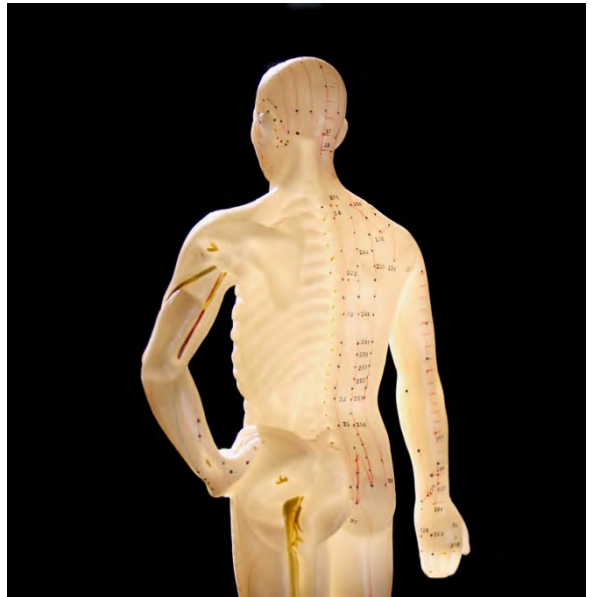
Suzanne was first introduced to LifeWave in 2006. After trying the glutathione patches and seeing their effects first hand, she became an avid supporter. In her latest bestseller “Knockout”, Suzanne says, “I love these patches. They are non-drug and do the job perfectly. I couldn’t be without them, and David Schmidt is a genius for creating them.”

# FACTS ABOUT LIFEWAVE GLUTATHIONE PATCHES



## Facts about LifeWave Glutathione Patches

If you are looking for an all natural non-toxic, non-chemical approach to better health care – look no further. You’ve found all the benefits of acupuncture without the use of needles. In the comfort and privacy of your own home.



## Features & Benefits

- Small / Compact Size – Can be worn under clothing, invisible
- Waterproof – Can be worn swimming or during shower
- Non-Transdermal – No drugs or chemicals enter the body
- Self-Adhesive – Easy to use
- New Technology - No side effects from drugs or chemicals
- Safe – No side effects from drugs or chemicals
- Effective – works in a matter of minutes
- Long Lasting – Works up to 12 hours using one patch
- Reliable – FDA approved product
- Quality Assured – Manufactured in FDA approved plants

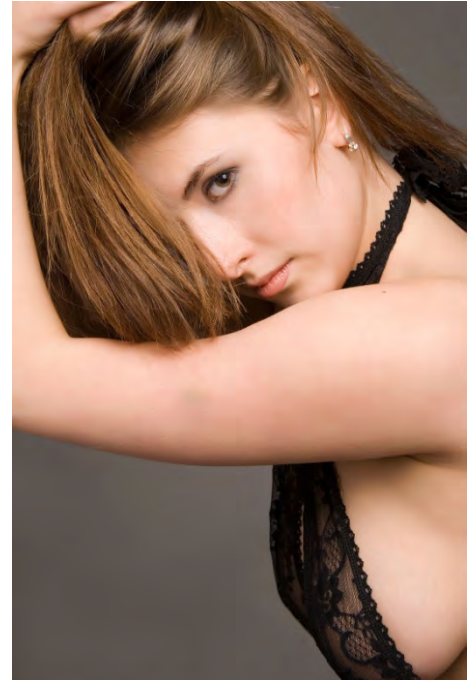
**FACTS about Glutathione and its benefits in an anti-aging program:**



- Glutathione is a material that is found naturally in the human body.
- As we age our body's levels of glutathione start to decline, necessitating the need for supplementation.
- Glutathione is the master antioxidant and plays an important role in our overall health.
- As we age our body may accumulate toxins; glutathione protects the body from many toxins we come into contact with every day.
- As we age we are subjected to numerous heavy metals, in the food we eat and the air we breathe; glutathione is known to rid the body of heavy metals such as Mercury.
- When we exercise our body uses up its stores of antioxidants; glutathione is known to improve athletic performance and to help us keep going longer.
- As we age our immune system becomes weaker; glutathione can keep the immune system functioning at its peak.



- There are other glutathione supplements on the market, but clinical research show that common glutathione pills, powders and drinks can only elevate blood glutathione levels by little more than 10% in 30 days.
- Because of LifeWave technology is capable of triggering metabolic changes within the cells, our Glutathione Booster has been clinically shown to elevate your blood glutathione levels by over a whopping 300% in just 24 hours!



**Using the LifeWave Glutathione Patch is an easy way for you to look younger, feel better, and stay healthy... without drugs, chemicals or supplements!**

In as short a time as 24 hours after wearing your first glutathione patch, you can experience significantly elevated levels of glutathione, the body's master antioxidant.

Glutathione is so important to our well-being and so powerful that it is able to naturally detoxify your body, strengthen your immune system and turn back the effects of time with dramatic anti-aging properties.

The speed with which our glutathione patch works to elevate your glutathione blood levels has previously not been available.

Our glutathione boosting patch is considerably more powerful and faster acting than other methods of elevating glutathione levels.

**FACTS about LifeWave Glutathione Patches and their benefits in an anti-aging program:**



\* Glutathione is a material that is found naturally in the human body.

\* Glutathione is a tripeptide composed of 3 amino acids: cysteine, glutamic acid and glycine.

\* Glutathione is synthesized primarily in the liver.

\* As we age our body's level of glutathione starts to decline, necessitating the need for supplementation.

\* Glutathione is the master antioxidant and plays an important role in our overall health.

\* Glutathione helps protect cells from reactive oxygen species such as free radicals and peroxides.

\* Glutathione enhances lymphocyte production.

\* Glutathione enhances the killing activity of cytotoxic T cells and NK cells.

\* As we age our body accumulates toxins; glutathione protects the body from the many toxins we come into contact with every day.

\* As we age we are subjected to numerous heavy metals, in the food we eat and the air we breathe; glutathione is known to rid the body of heavy metals such as Mercury.

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One of the challenges associated to increasing glutathione levels is the body's digestive system. Nearly all ingested glutathione, whether in the form of tablets or glutathione liquids, is almost completely destroyed by our digestive acids.



### **Glutathione Injections**

Since the most impressive glutathione health benefits only occur when you have higher than average Glutathione levels, this problem with digestive destruction can be a little troubling. One way a physician can overcome the issue is with a glutathione injection. This is the most effective method of increasing glutathione levels but it is also the most expensive, painful, and inconvenient method, too.

### **Glutathione Patches**

With the low effects of most oral supplements and the cost, inconvenience, and pain of injections you may want to take a look at glutathione patches as a method of supplementation. The patches stimulate the body to provide glutathione and evidence suggests the results are impressive and quite rapid. Keep in mind that scientific data on the effect of glutathione patches is limited.



# ENDORSEMENTS





## Endorsements

See What Other People are Saying...

### What Experts say about Glutathione

“Glutathione is a substance, the levels of which in our cells are predicative of how long we will live. There are very few other factors which are as predicative 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.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© in Breakthrough 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

**“Raising Glutathione levels is a good thing, no matter how you do it.** There are several theories about how to do this and all are slightly different. Some believe that NAC will do it, it certainly has the right chemical structure. Others think that only bioavailable Glutathione is the way to go ... However you evaluate your Glutathione levels; it is a good thing to do!” – Douglas T. Dieterich, M.D. in a response to patient query at a forum on TheBody.com, and AIDS and HIV Information Resource.

One reason why it is so important to maintain high levels of **Glutathione is that it is crucial for the detoxification of carcinogens.** Packer states that most people do not





inherit “cancer genes”; rather, they have a genetic weakness in their detoxification system. Glutathione is an extremely important part of the detoxification system, and thus of our defenses against cancer. Interestingly, **wey protein has also been found to raise Glutathione levels.**

Glutathione may also 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.



“As Dr. Lombard points out in his book, “The Brain Wellness Plan” ... the brain’s high fat content renders it especially vulnerable to free radicals, so that the body has defined specific ways to protect brain cell fatty acids through special antioxidants ...**Glutathione is one of the most powerful antioxidants in the body. Depressed Glutathione levels are associated with the increased generation of free radicals found in Parkinson’s patients, for example, and contributes to further brain cell death.**” – Excerpts from the Willner window Radio Show aired in May 98

**A deficiency of Glutathione can cause hemolysis (destruction of red blood cells, leading to anemia) and oxidative stress.** Glutathione is essential in intermediary metabolism as a donor of sulfhydryl groups which are essential for the detoxification of acetaminophen. [PDR Medical Dictionary. Spraycar.1999] Selenium is a structural component of, and a co-factor for the antioxidant enzyme glutathione peroxidase.

**“(Glutathione peroxidases) break down hydrogen peroxide and any peroxides which form on fats and oils within the body.** The selenium contained in the enzymes acts as the reactive centre, carrying reactive electrons from the peroxide to the Glutathione. It is the Glutathione that is the antioxidant in the reaction, not the selenium as many health food companies would lead us to believe. Selenium by itself is a potent oxidant which can be very toxic if too much is taken.” – Dr. Steven Gieseg in Reducing Free Radicals – A Dietary Revolution, New Zealand Science Monthly, (1999) July 6-8.

“I have found the skin all over my body especially my arms and legs are getting softer and looking so much nicer.” – La Rae K.

“The lady at the make-up counter made a comment that when I get into my 50s you’ll have to start looking at the little fine lines and I laughed because I’m 69!” – Karina L. “As an athlete playing in the NFL for 7 years, I know what my baseline strengths are



when I’m working out at the gym. So I tried the Glutathione patch with the energy patches in combination with my workout and I noticed a tremendous increase in my strength and stamina right away. I got phenomenal results.” – Joe P. “This product has been absolutely amazing, 95% of all my sun damage is almost gone!” – Jim L. “I noticed my vision for close reading has improved where I don’t need to use my reading glasses as much, plus the fine lines on my face started to diminish.” – Gail B. “I’m 60 years old and my friends have been asking me if I’ve had a facelift.” – Chuck M. “I’m 61 years young and after a few weeks of using the Glutathione patch I noticed better color and density on my skin and not as much dryness. After 3-4 weeks the lines on my face and body started to soften.” – Mary C. “I had a pretty bad motorcycle accident and had 7 surgeries on my right bicep and shoulder.

I started to use the Glutathione patch and noticed the skin was releasing from under the scar and it's creating a smoother surface and my scar is starting to disappear, this is absolutely amazing!" – Phil A.



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# TIMELINE



**1888**            **Glutathione was discovered in 1888, but it wasn't until the 1920s and 1930s that researchers began to unfold its mysteries. Initially most of the research concentrated on the eye and especially on its lens. The research was very valuable, as glutathione** deficiency is directly related to eye problems – specifically macular degeneration.

1921            The compound was first isolated, analyzed, and named by Professor F. Gowland Hopkins of Cambridge University in 1921. Bernard F. McKenzie and Dr. Harold L. Mason were collaborators of Dr. Kendall in isolating **glutathione** in crystalline form and in identifying it as a tri-peptide of glutamic acid, cysteine, and glycine. This was accomplished independently of the isolation of crystals of **glutathione** and determination of structure by Professor Hopkins.

1973            In **1973**, Dr. JT Rotruck of the University of Wisconsin and his colleagues discovered that selenium is a component of **glutathione peroxidase** an antioxidant enzyme produced in the human body. This resulted in selenium's essential-nutrient status. Selenium is not an antioxidant in the classical sense, but is an essential component of endogenous antioxidant enzymes, such as **glutathione peroxidases**. **Glutathione peroxidases** are the most studied selenium – containing antioxidant.

- 1989 Jul 1, 1989 – PREPARING **GLUTATHIONE** MONOESTERS: Patented by Owen W. Griffith and Ernest B. Campbell on **July 1, 1989**. Abstract: In the esterification of **glutathione** with alcohol in the presence of acid catalyst, neutral **glutathione** monoester is isolated in high yields without the intermediate isolation of ester acid salt by treating the reaction mixture with base anion exchange resin (basic form) to neutralize the acid and bind the resulting acid anion.
- 1991 Apr 9, 1991 – Compounds having **glutathione** peroxidases activity and use thereof: Patented by Abraham Spector, Stephen R. Wilson and Paul A. Zucker on **April 9, 1991**. Abstract: The present invention provides compounds having **glutathione** peroxidase activity and, therefore, are effective **glutathione** peroxidase replacements. These compounds are useful as drugs for the prevention of cataracts and as anti-oxidants for H<sub>2</sub>O<sub>2</sub> and other peroxides.
- 1997 Nov 5, 1997 – Phospholipid hydroperoxide **glutathione** peroxidase (PHGPx): more than an antioxidant enzyme Biomed Environ Sci **Nov 05, 1997** The family of **glutathione** peroxidases encompasses, as far, three tetrameric **glutathione** peroxidases (GPx) and the monomeric PHGP.

2004            2004 – **Glutathione** typically works by binding to heavy metals, which the body then knows to eliminate.

In **2004**, researcher Jill James, Ph.D., of the Arkansas School of Medicine, led a pioneering study that showed autistic kids had significantly less **glutathione** than typical kids – which put their bodies in a state of “constant oxidative stress”. In other words, autistic kids were genetically predisposed to have low **glutathione** levels.