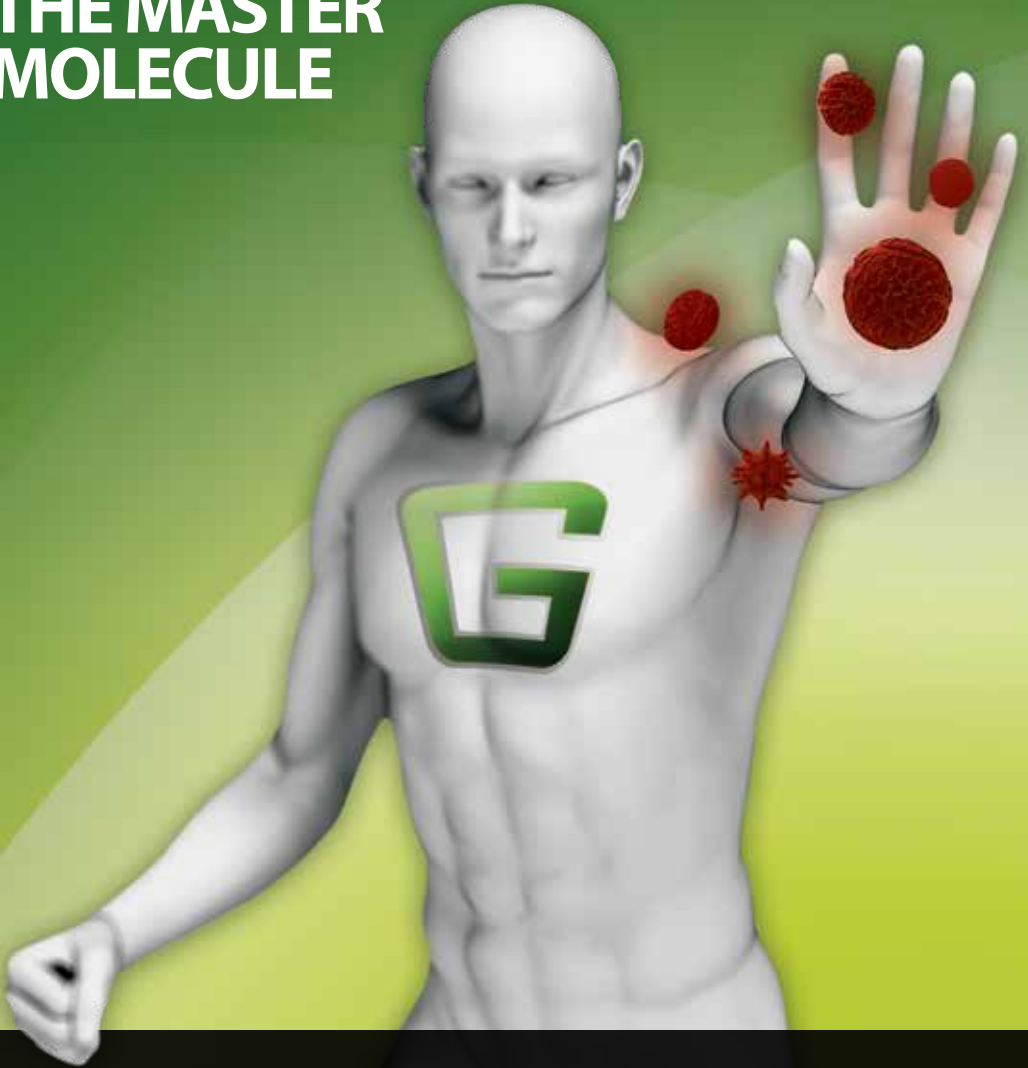


# GLUTATHIONE

THE MASTER  
MOLECULE



Are you winning the war  
against oxidative stress?



*“Relying on the wisdom and holistic approach of Traditional Chinese Medicine, Western Natural Therapies, and a 6000 year unbroken history of Herbal Medicine, I offer a healing system that focuses on the cause of disease, not merely the suppression of symptoms.*

*My goal is to discover the individuality of your health problem, treat its cause, and stimulate your body to heal itself as soon as possible”.*

## ***Dennis Vander Kraats***

B.A., N.D., Dip.Acup., D.B.M.

FELLOW • Australian Acupuncture & Chinese Medicine Association Ltd

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MEMBER • Acupuncture Ethics and Standards Organisation (A.E.S.O.)  
• Fellow Australian Acupuncture Association (A.Acu.A.)  
• National Herbalist Association of Australia (N.H.A.A.)  
• Australian Traditional-Medicine Society (A.T.M.S.)

### ***Personal History***

Dennis Vander Kraats was born in Toronto, Canada and grew up with a passion for distance running. He represented Canada nationally and internationally on a number of occasions, including the 1979 World Cross Country Championships. His success in athletics earned him a scholarship from the prestigious University of Notre Dame (USA).

After arriving in Australia, Dennis and his wife Marion successfully operated a health food store and this stimulated Dennis's desire to further his knowledge of natural therapies.

After eight more years of study, Dennis graduated from the Melbourne College of Naturopathy and Homoeopathy, the Nanjing College of Acupuncture, and the Australian Acupuncture College (Victorian University of Technology) to become a qualified Naturopath and Acupuncturist.

Dennis is now in private practice, and the director of Vander Kraats & Associates, evidence based natural medicine in Western Australia.

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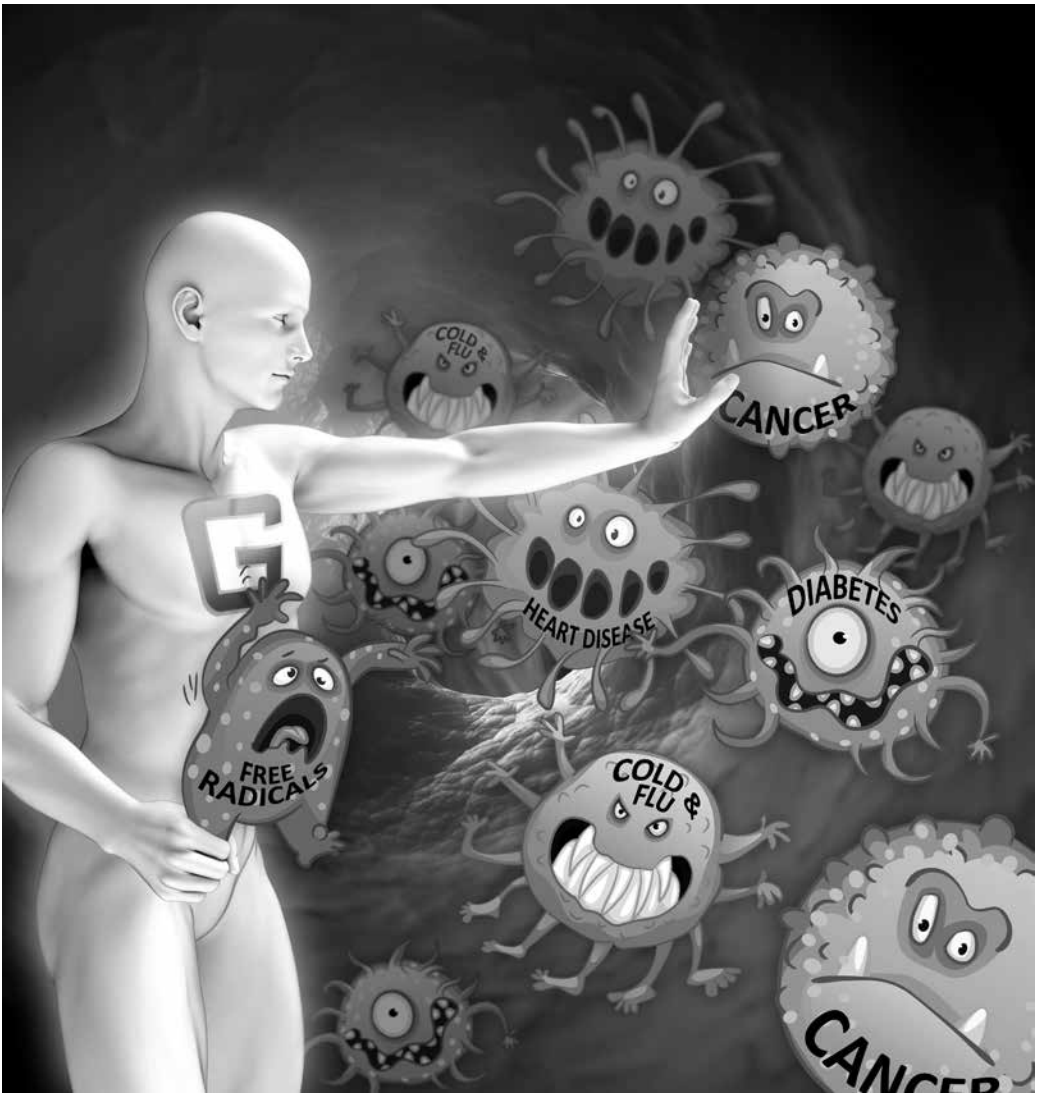
# *Glutathione: The Master Molecule*

Defends against toxins, disease, aging and oxidative stress.

DECLINING LEVELS OF GLUTATHIONE IN THE BODY INCREASES  
VULNERABILITY TO OVER 70 MAJOR DISEASES...

Alzheimer's disease, Autism, Parkinson's disease, liver disease, cancer, heart attack, stroke, diabetes, depression, fatigue, inflammation, arthritis, thyroid disease, allergies, poor immunity, frequent infections, poor memory, impaired cognition, insomnia, weight gain, vision problems...

**Disclaimer:** IMPORTANT – The information contained in this booklet is intended for educational purposes only. It is not provided to diagnose, prescribe or treat any disease, illness or injury. The author, publisher, printer and distributors accept no responsibility for such use. Those individuals suffering any disease or persistent symptoms should consult with their physician. It is hoped that this information will empower you to make more informed decisions regarding your health and wellbeing.



***“Being able to stimulate the body’s own endogenous production of glutathione is the most significant breakthrough in natural medicine that I’ve seen in 30 years.”***

***Glutathione is the body's most important defense against free radicals, chemical toxins, radiation, heavy metals, pollution and oxidative stress.***

Oxidative stress is the damage caused to our cells as the result of normal oxidative processes occurring all the time in our bodies. If you cut an apple in half the exposed sliced parts will soon turn brown. This is an example of oxidative stress. It is the same process which causes metals to rust.

A healthy body will keep the damaging effects of oxidative stress at bay. However, cells are damaged when the effects of oxidative stress overwhelm the body's ability to protect itself.

Someone who spends too much time in the sun will have damaged skin due to the effects of free radicals and oxidative stress. In a sense, oxidative stress causes the body to "rust" and cause premature aging.

Oxidative stress, in fact, is the cause of about 70 different diseases including heart disease, cancer, arthritis, diabetes, autoimmune disease, Alzheimer's, cataracts, and thyroid disease.

Some of the reasons that oxidative stress is implicated in so many disease processes is that it damages our DNA, leading to cell membrane dysfunction, and inactivation of proteins which are critical in the healing process.



## ***Glutathione is our strongest and first line of defense against oxidative damage.***

Are you suffering from declining glutathione levels?

### ***The discovery of glutathione and the beginning of biochemistry at Cambridge***

Sir Frederick Gowland Hopkins (1861–1947) was born in East Sussex, Great Britain. He founded the Department of Biochemistry at the University of Cambridge in 1914. Hopkins focused his own research on “accessory food factors,” later termed vitamins, and his interests shaped the directions of research in this distinguished department.



Among the many contributions Hopkins made is the discovery and characterization of glutathione that is described in this *Journal of Biological Chemistry* (JBC) Classic Paper. The discovery of glutathione certainly ranks among the most important discoveries in biochemistry.

## ***Over 98,000 published medical studies on glutathione and counting!***

Since Sir Hopkins' discovery, the scientific community has considered glutathione (and related molecules) to be so important that there are over 98,000 published medical studies on it. Glutathione has been dubbed “the master molecule” and the “mother of all antioxidants” and is considered by many to be the most important molecule in your body to stay healthy and prevent disease.

Over 98,000 scientific studies and articles on glutathione are recorded in PubMed, the official U.S. Government library of medical research. Those articles reveal the remarkable role glutathione plays in the protection and function of every cell in the human body and the support of optimal health and function. They also show the terrible consequences of low glutathione levels, and how those lower levels accelerate the aging process and increase vulnerability to the issues of aging.

The best way to search the medical studies on the internet is to type in “glutathione + pubmed”. To refine your search, add another keyword, such as the name of a disease or topic that you are interested in.

PubMed is a free search engine accessing primarily the MEDLINE database of references and abstracts on life sciences and biomedical topics. The United States National Library of Medicine (NLM) at the National Institutes of Health maintains the database as part of the Entrez system of information retrieval.

### ***People with higher Glutathione levels often:***

- Have More Energy
- Recover Faster From Exercise
- Sleep Better
- Have Greater Mental Clarity and Focus
- Less Inflammation
- Improved Joint Function
- Have Better Immune Systems
- Live Longer
- Live Better
- Improve the Health and Function of Every Cell, Tissue and Organ in the Body.



## ***Glutathione protects against chronic illness***

In every moment of our life, there is a constant battle between the damaging effects of OXIDATIVE STRESS vs. the PROTECTIVE and HEALING effects of antioxidants.

OXIDATIVE STRESS is caused by:

1. The body's normal production of energy
2. Bacteria, viruses, fungi, parasites and infections
3. Exposure to toxins and chemicals in our food, water, and air
4. Emotional and psychological stress.
5. Physical exercise

Glutathione is critical because it recycles other antioxidants.

Glutathione is produced inside every cell of your body and protects one's DNA and the energy producing engines inside our cells called mitochondria.

## ***Glutathione is the master antioxidant***

It is considered the master antioxidant due to its unique multifunctional characteristics as well as its unprecedented ability to neutralize many types of free radicals that assault the cell. It is the only antioxidant that recycles itself again and again to continue fighting free radicals.

## ***Glutathione is the primary detoxer of the body***

Today we are confronted by over 80,000 chemicals in the air we breathe, the food and water we ingest, and the materials we touch and handle. Many of these toxic chemicals enter our cells and must be eliminated to protect the cell and maintain optimum function. Glutathione is the cell's first line of defense against chemicals and toxins and the primary detoxifier that can eliminate many of these toxins when it is present in optimal amounts.

## ***Glutathione is a powerful chelator of heavy metals***

Heavy metals enter our cells in the same manner as chemical toxins. Fortunately, they can be removed from the cell by a process of chelation, and glutathione is one of the cell's most powerful chelating agents.



## ***Glutathione is the protector of our immune cells***

Our immune cells are designed to protect us, but what protects the immune cell? Glutathione is the protector of the immune cell and allows newly formed immune cells to proliferate to attack germs and viruses.

## ***Glutathione is the protector of our mitochondrial DNA***

The breakdown of the mitochondrial DNA accelerates aging and increases cell death. Glutathione is the protector of the mitochondrial DNA, and the lower the glutathione level, the more vulnerable this DNA becomes to breakage.

## ***Glutathione is the protector of the cell nucleus***

The nucleus of the cell regulates all cell activity and protecting it is critical to the health of the cell and its optimal function. When present in abundance, glutathione gives the nucleus the protection it needs.



## ***Glutathione reduces oxidative stress***

Oxidative Stress is the most aggressive destructive force that assaults the cell. Cells manufacture a number of antioxidants to counter oxidative stress. Glutathione plays a primary role in neutralizing many different types of free radicals.

## ***Glutathione reduces intercellular inflammation***

Inflammation is the mortal enemy to the tissues, organs and various systems of the body. All inflammation begins at a cellular level, and low glutathione levels are associated with inflammation.

## ***Glutathione is the re-utilising agent of ingested antioxidants.***

Antioxidants that are ingested (not manufactured by the body such as vitamin C and E) once spent, cannot be re-utilized by the cell unless they are first converted into a usable state. Glutathione is the agent that converts those antioxidants into a state that can be utilized by the cell.

## ***Glutathione is the reducing agent for hemoglobin, allowing it to transport oxygen to every cell***

The purpose of hemoglobin is to carry oxygen to all living cells. However, when it is oxidized, it cannot carry an oxygen molecule and must first be reduced to an acceptable state. Glutathione protects hemoglobin from oxidizing agents and can also make this possible.

## ***What are the causes of low Glutathione levels?***

Glutathione levels naturally decline in most people after the age of 30 even without disease present.

There are many genes that are involved in producing enzymes that allow the body to produce and recycle glutathione. People can have damaged or mutated genes and many people can actually have a missing gene essential for healthy glutathione levels.

Other causes of low glutathione levels can be chronic stress, toxins, smoking, alcohol, exposure to radiation, and poor diet.

Athletes, especially high intensity or endurance athletes, have greater requirements for glutathione since exercise produces oxidative stress.

Basically, if you are unwell and/or suffer from a chronic disease, there is a very good chance that your body is low in glutathione.

Low glutathione levels speed up the aging process.



## ***Glutathione Studies***

### ***Elevation of Glutathione as a Therapeutic Strategy in Alzheimer's Disease***

Oxidative stress has been associated with the onset and progression of mild cognitive impairment (MCI) and Alzheimer's disease (AD). AD and MCI brain and plasma display extensive oxidative stress as indexed by protein oxidation, lipid peroxidation, free radical formation, DNA oxidation, and decreased antioxidants. The most abundant endogenous antioxidant, glutathione, plays a significant role in combating oxidative stress. The ratio of oxidized to reduced glutathione is utilized as a measure of intensity of oxidative stress. Antioxidants have long been considered as an approach to slow down AD progression. In this review, we focus on the elevation on glutathione through N-acetyl-cysteine (NAC) and -glutamylcysteine ethyl ester (GCEE) as a potential therapeutic approach for Alzheimer's disease.

### **Conclusions**

Oxidative stress is a known characteristic of MCI and AD. Up regulation of endogenous antioxidants is vital in combating oxidative stress and thus helping to slow the advancement of MCI and Alzheimer's disease. Glutathione is the most abundant and versatile endogenous antioxidant with many enzyme systems to enhance its function. NAC (FDA approved) and GCEE are known to increase glutathione in the brain and periphery and protect against ROS-producing substances in vivo. More research needs to be invested in GCEE, since it has no known harmful effects and by-passes the feedback inhibition cycle of glutathione. Increasing glutathione remains a promising therapeutic strategy to slow or prevent MCI and Alzheimer's disease.

## ***Glutathione Studies***

### ***Glutathione metabolism and its implications for health.***

Glutathione (gamma-glutamyl-cysteinyl-glycine; GSH) is the most abundant low-molecular-weight thiol, and GSH/glutathione disulfide is the major redox couple in animal cells. The synthesis of GSH from glutamate, cysteine, and glycine is catalyzed sequentially by two cytosolic enzymes, gamma-glutamylcysteine synthetase and GSH synthetase. Compelling evidence shows that GSH synthesis is regulated primarily by gamma-glutamylcysteine synthetase activity, cysteine availability, and GSH feedback inhibition. Animal and human studies demonstrate that adequate protein nutrition is crucial for the maintenance of GSH homeostasis. In addition, enteral or parenteral cystine, methionine, N-acetyl-cysteine, and L-2-oxothiazolidine-4-carboxylate are effective precursors of cysteine for tissue GSH synthesis. Glutathione plays important roles in antioxidant defense, nutrient metabolism, and regulation of cellular events (including gene expression, DNA and protein synthesis, cell proliferation and apoptosis, signal transduction, cytokine production and immune response, and protein glutathionylation). Glutathione deficiency contributes to oxidative stress, which plays a key role in aging and the pathogenesis of many diseases (including kwashiorkor, seizure, Alzheimer's disease, Parkinson's disease, liver disease, cystic fibrosis, sickle cell anemia, HIV, AIDS, cancer, heart attack, stroke, and diabetes). New knowledge of the nutritional regulation of GSH metabolism is critical for the development of effective strategies to improve health and to treat these diseases.

#### **Source**

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## ***Glutathione Studies***

### ***Metabolism and functions of glutathione in the brain.***

The tripeptide glutathione is the thiol compound present in the highest concentration in cells of all organs. Glutathione has many physiological functions including its involvement in the defense against reactive oxygen species. The cells of the human brain consume about 20% of the oxygen utilized by the body but constitute only 2% of the body weight. Consequently, reactive oxygen species which are continuously generated during oxidative metabolism will be generated in high rates within the brain. Therefore, the detoxification of reactive oxygen species is an essential task within the brain and the involvement of the antioxidant glutathione in such processes is very important. The main focus of this review article will be recent results on glutathione metabolism of different brain cell types in culture. The glutathione content of brain cells depends strongly on the availability of precursors for glutathione. Different types of brain cells prefer different extracellular glutathione precursors. Glutathione is involved in the disposal of peroxides by brain cells and in the protection against reactive oxygen species. In coculture astroglial cells protect other neural cell types against the toxicity of various compounds. One mechanism for this interaction is the supply by astroglial cells of glutathione precursors to neighboring cells. Recent results confirm the prominent role of astrocytes in glutathione metabolism and the defense against reactive oxygen species in brain. These results also suggest an involvement of a compromised astroglial glutathione system in the oxidative stress reported for neurological disorders.

#### **Source**

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## ***Glutathione Studies***

### ***Protection against acetaminophen hepatotoxicity by ribose-cysteine (RibCys).***

2(RS)-D-ribo-(1',2',3',4'-Tetrahydroxybutyl)thiazolidine-4(R)-carb oxylic acid (Ribose-Cysteine, RibCys), a latent form of L-cysteine, releases the sulfhydryl amino acid in vivo by non-enzymatic ring opening and solvolysis. The liberated L-cysteine then stimulates hepatic glutathione biosynthesis. In the present studies, the efficacy of hepatoprotection by RibCys was evaluated to explore its potential utility as an acetaminophen (APAP) antidote. Protection was evaluated in the Swiss-Webster mouse model both by survival data as well as by quantitative histological criteria of hepatic damage. A dose-response study showed increased protection with increased intraperitoneal doses of RibCys ranging from 0.5 to 8.0 mmol/kg. RibCys administration 30 min. Prior to and up to four hours after the APAP dose showed varying degrees of protection; however, the best protection was seen when RibCys was given shortly after APAP administration. A single RibCys dose given by the intraperitoneal or intravenous route gave better protection than when administered orally; however, RibCys given in three doses, one hour apart, regardless of the mode of administration, offered the best protection after an LD90 dose of APAP. Overall, RibCys continues to exhibit promising protective capabilities against APAP hepatotoxicity, which may be capitalized upon in clinical overdose situations.

#### **Source**

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## ***Are you interested in discussing how Glutathione can benefit you?***

Contact Vander Kraats & Associates today for more information, or to book an appointment.

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