

GLUTATHIONE

King of The Master
Molecules of Health



William D. Greenman, PhD

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Of Health

A REFERENCE GUIDE

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William D. Greenman, PhD

In Praise of Glutathione

Immune depressed individuals have lower Glutathione (GSH) concentrations. Healthy people also drop their Glutathione levels when fighting disease. Lymphocytes, cells vital for your immune response, depend on GSH for their proper function and replication.

Immunology 1987

Glutathione is your cells own major antioxidant. Maintaining elevated glutathione levels aids the body's natural antioxidant function.

Biochemical Pharmacology 1994

It is well known that aging is accompanied by a precipitous fall in Glutathione levels. Lower Glutathione levels are implicated in many diseases associated with aging....

Journal of Clinical Epidemiology 1994

Raised glutathione levels fight the oxidation of circulating fats in the bloodstream, including cholesterol, retarding the process of plaque formation in the arteries...

Nutrition Reviews 1996

Your life depends on Glutathione. Without it, your cells would disintegrate from unrestrained oxidation, your body would have little resistance to bacteria, viruses...and your liver would shrivel up from the eventual accumulation of toxins.

Glutathione: Essential Health AID - Antioxidant. Immune Booster. Detoxifier

Dr. Jimmy Gutman, M.D., FACEP

Glutathione (GSH) deficiency contributes to oxidative stress and therefore appears to play a key role in the pathology of many diseases...

Glutathione In Health And Disease

Dr. Patricia Kongshavn, MSC, Ph.D. 2005

Antioxidants are well documented and known to possess vital roles in health maintenance and disease prevention. No other antioxidant is as important to overall health as Glutathione. Glutathione is important in DNA synthesis and repair, detoxification, enhancement of the immune system, and protection from oxidation...it is the regenerator of immune cells...

The Immune System Cure,

Lorna R. Vanderhaeghe & Patrick J.D. Bouic, Ph.D.

Without glutathione, other important antioxidants such as vitamins C and E cannot do their job adequately to protect your body against disease.

Breakthrough in Cell Defense

Allan Somersall, Ph.D., M.D., and Gustavo Bounous, M.D. FRCS(C)

Glutathione has potent anti-viral properties - if you raise the Glutathione level you can stop the replication of most any... intracellular pathogen...but Glutathione deficiency produces a pro-viral effect.

Paul Cheney, MD

Glutathione circulates constantly throughout your body neutralizing free radicals and removing dangerous waste products and toxins from your system while increasing your level of energy. When your Glutathione level is high, your overall health is high. You feel good and you look good. You fight off minor illnesses quickly, you have plenty of energy, and you feel mentally and physically alert... you're at an optimal level of good health.

Alan Pressman, DC, PhD, CCN

GSH (Glutathione) is the unsung antioxidant...the one that makes all the others work.

Robert C. Atkins, MD, Founder of The Atkins Center

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International Standard Book Number: 978-0-9721373-5-5
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Dedication

To those in the healthcare profession
who live to strengthen the lives
of others.

GLUTATHIONE

King of The Master Molecules of Health

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Introduction

Since the mid 1970's my wife, Meg, and I have been searching for the nutrients that will bring the highest possible health to our bodies, and to everyone we can share that knowledge with. We became the "go to" health nuts for all of our friends and in the process we learned a ton about what's good for you, what's bad for you, and what you can get away with. We learned how the body works and what it produces within itself to be sure it keeps working. It's those endogenous (made by the body) items that most attracted me. We personally felt and confirmed that if we could get our bodies to make the very things they needed most, because they produced them, we'd have a great chance at good health and long life. Over four decades later – it's still working very well!

There is a handful of what I call *Master Molecules* made by the body to build and sustain these multi-faceted and fascinating physical machines in which we live and their synergism is truly astounding. Personally, I believe God created our bodies and has revealed the nutrients, lifestyles, and modalities that lead to optimal health – we just have to look for them. My quest continues to be to find as many of those as I possibly can and then share them with you. My search has brought me to arguably the most important molecule of all.

In this book I will focus on what I believe is the *Master* of the Master Molecules. It is the #1 *Guardian* of our physical selves. It is a true *King* that takes part in

opening virtually every door of our health and wellness. It touches every cell, organ, gland, and system with its spectacular power. This *King* is *Glutathione* and it will amaze you with its ability to do so many wonderful things for your health and well-being. You've always had it within you, keeping you alive and well. It's guarded you, energized you, fought for you, and dreamt with you. It has been a loyal friend since the moment you were conceived, keeping watch over you 24 hours a day. In fact, it even protected both the sperm and egg that lead up to your conception.

I'm so glad to share this concise explanation of some of the things that Glutathione can do for you. The research articles, books, and blogs on this subject are myriad, and you will have quite a time wading through it all. This is not an exhaustive study, but it will give you a great foundation to build upon. You won't look at your body or this powerful molecule the same way again.

And yes, I will be sharing how you can be sure to get all of the Glutathione you need. Enjoy the book and live your life in optimal health!

Dr. William Greenman

How To Use This Book

This is a reference book and is not sequential in its layout. You can read it cover to cover, but that is not its intended design. Please refer to the following before beginning your reading.

- Familiarize yourself with the **Table of Contents** so you know exactly what chapter holds the information you might need for quick reference.
- You will find **redundancy** throughout, as I did not assume the reader would go cover to cover. I included the same information several times in different chapters for easier understanding without having to look through the entire book to discover the meaning of a word or phrase in each specific context.
- Another redundancy is the capitalization of the word Glutathione. While this is not necessary and is grammatically taboo, I wanted to make it easier for the reader to find direct references to this subject on any page as easily as possible.
- You will find very few direct references to specific diseases in this book, though some of the books listed in the Reference section are replete with them. My philosophy is that if you will focus on the things that bring you life, such as the

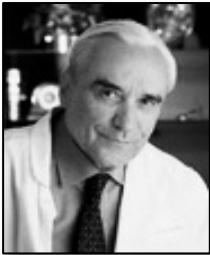
nutrients you are made of, and proper lifestyle disciplines, your health will improve and stay strong. You will find this especially true with Glutathione. However, I do acknowledge the need for understanding Glutathione's role - its abundance or lack - where disease is concerned, and I encourage the reader to study such.

- The research articles listed in the **Appendix** and **References** are included for the reader's ease of personal study, though are not intended as exhaustive listings. The majority of those listed contributed to my research for the writing of this book.

Acknowledgements

The Molecule Makers

Any book on Glutathione must include some space on the following three men. They are the preeminent pioneers in the formulating of Glutathione (GSH) supplements and each of them is responsible for helping untold thousands obtain better health through their discoveries. I will take time to discuss their formulas later in this book, but I will reference their names several other times, so I wanted to be sure you knew who they were. I list them here in the order of their discoveries and will later discuss the various products they subsequently brought to market.



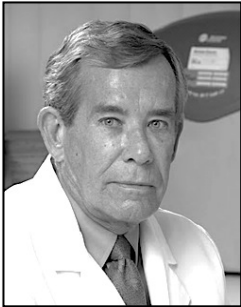
Dr. Gustavo Bounous

The late Dr. Gustavo Bounous was educated at the University of Turin and the University of Genoa, Italy. He became a highly respected authority on the problems of nutrient absorption in disease and trauma. Dr. Bounous emigrated from Italy to the U.S. in the 1950's and his distinguished career in medical research began as a Research Fellow in surgery at the Indiana Medical Center, Indianapolis. This led to his appointment as Professor of Surgery, first at the University of

Sherbrooke (1973-1985) and then at McGill University in Montreal, Canada (1985-1993).

Dr. Bounous made a breakthrough in the treatment of hemorrhagic shock. This work earned him the 1965 Medal of the Royal College of Physicians and Surgeons of Canada. It also led him to develop the science of enteral nutrition and the invention of the "elemental diet," used in the prophylaxis and treatment of intestinal lesions associated with shock, intestinal ischemia, radiation, cancer chemotherapy, and Crohn's disease, now used in hospitals throughout the world.

In 1968, Dr. Bounous was named Career Investigator of the Medical Research Council, an award that was reconfirmed until 1993, the year of his retirement from McGill University. His discoveries in the area of Glutathione research were awarded with several patents.



Dr. Robert Keller

The late Dr. Keller was triple board certified in Internal Medicine, in Immunology, and also in Hematology. He served on the scientific review panels for the National Institutes of Health and the United States Veterans Administration.

Dr. Keller also served on the faculties of the Mayo Graduate School of Medicine, the University of Wisconsin, and the Medical College of Wisconsin (Marquette Univ.) He published more than 100 original

articles in various scientific and medical journals and was awarded several patents. Additionally, Dr. Keller was elected to The Board of Governors of the American Academy of HIV Medicine. He was Fellow and Senior Research Fellow in Immunology, Mayo Clinic Foundation, Mayo Graduate School of Medicine Rochester, Minnesota.

Just a small portion of the awards he received included: The Consumers' Research Council named him one of America's Top Physicians in 2003, 2004, 2005, 2006, and 2007 in all three of his certified fields. He was also named as one of the top 2000 scientists of the 21st Century and one of the top 1000 Great Americans of the 21st Century, Humanitarian of the Year National Hemophilia Foundation, Who's Who in Medicine and Science, Who's Who in Science and Technology, and the VA Career Development Award, Clinical Investigator.



Dr. Herbert Nagasawa

The late Dr. Nagasawa received his B.S. degree in chemistry from Western Reserve University in Cleveland, Ohio, and a Ph.D. degree in organic chemistry from the University of Minnesota.

Subsequently, he spent two years as a Post-doctoral Fellow in biochemistry at the University of Minnesota before joining the research staff of the Veterans Administration Medical Center (VAMC) in Minneapolis

as a Senior Chemist. He was appointed Assistant Professor of Medicinal Chemistry at the University of Minnesota in 1959. He was named Principal Scientist of the VAMC in 1961 and was promoted in 1976 to Senior Research Career Scientist, a nation-wide VA title reserved for the VA's top scientists. He was promoted to Associate Professor in 1963 and to Professor of Medicinal Chemistry in 1973.

Dr. Nagasawa also held joint professorships in the Department of Pharmacology and the university-wide Division of Toxicology and served as Visiting Professor at Washington State University in 1990. He also served for 32 years as a Senior Editor for the prestigious international *Journal of Medicinal Chemistry* from 1972 to 2004, and one year as Acting Editor-in-Chief. In addition, he served on the Editorial Board of the journal, *Bioconjugate Chemistry* for eight years, and as an ad hoc grant reviewer for the NCI and NIAAA, National Institutes of Health. He has published over 165 papers in peer-reviewed journals. In June of 2010, Dr. Nagasawa and his team attended the National Institutes of Health-Homeland Security 4th Annual Countermeasures Against Chemical Threats Network Symposium to present their work on their 3 minute cyanide poison antidote. These same institutions honored him with a banquet in Washington DC for that antidote.

While I have only personally met Dr. Nagasawa, I had the privilege of learning about Dr. Bounous and Dr. Keller not long after each of their discoveries came to market in the form of nutritional supplements – though

their products were decades apart. It is an honor for me to share some of their history with you here and their groundbreaking discoveries in Chapter 11.

Addendum

In addition to the expertise of these three eminent scientists, there is now enjoined a growing pool of elite researchers in the area of Glutathione. These men and women, on a global scale, have discovered another powerful way to help us all ingest and utilize this *King of the Master Molecules of Health*. The number one way is not actually new, but new in its application to GSH. That process is an ancient one now vastly improved by the science of our day. It is called fermentation and we will discuss that process in later chapters and a specific formula that best utilizes that process and adds an abundance of cofactors to it for optimal benefit.

Chapter 1



The King

Butler/Trainer/Bodyguard

What would you be willing to pay me if you knew I could help you strengthen your body, clear your mind, and lengthen your life? How about if I also cleaned your furniture? What if I also kept bugs, flies, spiders, mosquitoes, and even violent criminals and thieves from harming you? And what if I also could keep your home spotless 24 hours a day? And what if I did all of this in stealth mode, so you never even knew I was there doing it all? What would you be willing to pay me? Would any price be too much?

Bad news: I can't do any of that for you. Good news: I know what can (for your body) and you already possess it. In fact you've had it with you since you were conceived and it's been working like that for you ever since. In stealth mode. Every day. All day. Its name is Glutathione (pronounced glue-ta-thigh-own) and every cell in your body produces it around the clock.

It's one of the very few substances our body produces that ties together every aspect of human health. It cleans our cells and organs, destroys harmful substances, strengthens our immune system, assists every system within us, and can even lengthen our lives if we can gain enough of it. I believe it's the most significant discovery for our health and well-being yet – greater than anything we can produce from any food or chemical. In fact, without it we cannot live.

In The Spotlight

Glutathione, or GSH, was discovered more than a century ago and has become one of the most highly researched items in biochemistry, with ever-increasing numbers of studies being done around the world. Presently, as of this writing, there are more than 167,000 research articles related to Glutathione and its activities in the body that can be found on www.pubmed.gov, which is the National Institutes of Health's research library site. This is an increase of over 50,000 articles in the last 10 years and more are being added almost every day from around the world. Glutathione has garnered this interest due to its universal need by every aspect of the human body.

Those multiplied thousands of studies have proven that Glutathione functions in many diverse ways in the body, protecting us from the ravages of our increasingly toxic environment, our own poor food choices, and unexpected life events. Here are some of those functions, many of which we will discuss in more detail in later chapters:

- Glutathione's primary function is that of helping each individual cell produce maximum energy for optimal health and function of every organ, gland, and system of the body.

- Glutathione is the most powerful of all known antioxidants.
- Glutathione helps to regenerate other antioxidants that also halt oxidative stress.
- Glutathione facilitates the transfer of proteins between cells and also between the myriads of sections within each cell.
- Glutathione acts as an anti-toxin and is also effective in detoxifying such elements as heavy metals and other pollutants found in our foods, air, and water, which are detrimental to the health of our cells.
- Glutathione activates very specific immune system cells that act as the first wave of defense against all substances and living organisms that could harm our cells, then also protects those same defensive cells from being changed into enemy cells themselves.
- Glutathione is a promoter of efficient production of blood and facilitates better blood flow.
- Glutathione has a positive affect on our sleep, mental capacity, and overall quality of life.
- Glutathione strengthens our organs and greatly improves our life span.

More Evidence

A considerable number of research studies demonstrate that Glutathione is vitally important to both our quality of life and our longevity. Reviewing this list of conditions may give you a deeper appreciation for all Glutathione does to preserve and support our health.

- Increased Glutathione is always linked to an in-crease of ATP production. This is a mandatory activity for

optimal physical and/or mental activity. (We will discuss ATP at length in Chapter 3.)

- Lowering of Glutathione is always linked to a decrease of ATP. This lack of ATP production is usually found in those with sedentary, (inactive) lifestyles.
- Glutathione levels continually decrease as we grow older.
- Glutathione is always found in greater quantity in healthy people compared to those who are sick, regardless of their age.
- Glutathione is also found in greater quantities in those people who live to 100 than in any other age group, with the exception of those who are healthy and in their 20's to 30's.
- Restricting the number of calories (eating less) is correlated with increased levels of Glutathione.

Glutathione (GSH) is one of the most important and researched substances found in all cells of the human body. As mentioned, that research can be accessed by anyone through the Internet 24 hours a day and the findings of many of those research studies form the basis for much of what you will read in this book. However, my desire is not just to educate you on the glories of Glutathione or simply to change the way you think. Instead, **I want to give you a plan of action** for utilizing what you learn about this wonderful molecule and tell you how to help your body create as much of it as possible.

Many health care professionals are now coming to appreciate the undeniable link between vibrant *cell* health and therefore overall body health. The volumes of research mentioned above prove the effects of Glutathione on increasing the human lifespan and the quality of that life. For

many years Glutathione has been a consistent and widely accepted indicator of health when tested from our blood.

High Glutathione levels indicate strong life and low levels point toward a body whose health is deeply im-paired. Such understanding has caused countless physicians to embrace Glutathione as a viable help for their patients. While it should *not* be seen as a silver bullet to cure all that ails us, research has shown it to be a very powerful part of the health and healing process. Unfortunately, as we shall see, Glutathione therapy has been mostly unreliable. But that has changed dramatically in the past decade, allowing health care professionals to find great help for their patients in many areas, beyond treating symptoms with toxic medications or invasive surgeries. Here are just a few of those areas you might like to study for yourself and some we will discuss in depth in other chapters:

- Blood Sugar
- Digestion
- Fatigue
- Vision
- Circulation
- Hearing
- Inflammation
- Kidney
- Liver
- Respiratory
- Neurological
- Pancreas
- Prostate
- Skin

Throughout this book we will look at the plethora of research concerning Glutathione covering the most prevalent issues we deal with on a daily basis as humans in today's world. But before we do I want to share with you the amazing ways Glutathione touches every aspect of our body's many and varied functions. There is nothing else like it in the body and that is why **I believe Glutathione is truly the King of the Master Molecules for vibrant health.**

Non-Identical Twins

Glutathione is usually abbreviated in scientific terms as GSH and GSSG. Throughout the proceeding chapters I will use these abbreviations quite often. GSH is the antioxidant form of Glutathione. When we are young, we find that about 90 percent of our Glutathione exists as GSH in our cells. When an antioxidant has all its electrons in place, such as GSH, it is said to be in a *reduced* state. When all its available electrons have been given away, it is said to be in an *oxidized* state. GSSG is the oxidized form of Glutathione. It is changed chemically by giving up electrons to neutralize free radicals and to revitalize other antioxidants.

It is the GSH or reduced-state molecule that is the main focus of our discussion in this book. These two forms work synergistically throughout the body.

If too much Glutathione is in GSSG form - the oxidized state - enzymes are produced and activated to regenerate the antioxidant GSH form. This is a common occurrence in the liver, which is the organ with the highest per-cell concentration of Glutathione. When we are healthy the ratio between GSH and GSSG is 90%/10% respectively. Our cells become compromised, and disease can set in when these ratios change. **When our GSH levels fall below 70% there are big problems on the way for those cells or organs.**

However, if our GSH is simply working on our own normal metabolism its levels can continually stay in the correct range because GSH can continually “regenerate” or regain its missing electrons. But if the Glutathione is constantly used to eliminate toxins such as chemicals, heavy metals, or to shut down oxidative agents caused by such things as stress or injuries until its capacity to regenerate is gone, it becomes GSSG, which cannot regenerate itself. That’s a problem.

Cousins

There are several other kinds of Glutathione in the body. Two of the most helpful cousins are Glutathione S-transferase and Glutathione Peroxidase. They work synergistically with GSH in several meaningful ways.

Glutathione S-transferase

Glutathione S-transferase enzymes (GSTs) spark and speed up the joining of reduced Glutathione (GSH) to a wide variety of toxic molecules, such as heavy metals. This action also detoxifies compounds such as oxidized fats, as well as facilitates the breakdown of toxins. GSTs may also function to transport proteins (including GSH if the cell has too much) and unwanted substances *out* of the cells for elimination from the body.

Glutathione Peroxidase

Glutathione Peroxidase is the name given to a family of enzymes. The main role of these enzymes is to protect our cells from oxidative damage, in particular the reduction of hydroperoxides into specific alcohols. It is also used to dismantle hydrogen peroxide into harmless water molecules. So far, eight different forms of Glutathione Peroxidase

have been identified in our bodies and their varying forms can be found in nearly every cell at differing levels. Some are found specifically in the intestines and others only in plasma.

In Summary:

A strong presence of Glutathione is essential for vibrant health. Glutathione is a mandatory part of the body's energy production within our cells. Glutathione is needed in order to keep inflammation and waste build up from causing damage. It has several forms; the two most common are GSH, which is Glutathione with electrons to give, and GSSG, which has no electrons to give. Its cousin enzymes are Glutathione S-transferase, which transfers excess GSH out of the cells and into the blood stream, and Glutathione Peroxidase, which helps neutralize hydrogen peroxide in our bodies.

The ability of Glutathione to do so many different functions in the body qualifies it as the King of Molecules for Health. Making sure we have plenty of it is the first step to enlisting the King's services. To do that we will first discover what it's made of, where it's made, and exactly how it works in every aspect of our body.

Chapter 2



Glutathione: What – Where – How

What It Is

Glutathione is a tripeptide (more on peptides in the Appendix). In other words, it is a protein-like compound of three very specific amino acids called glycine, glutamic acid (glutamate), and cysteine. Cysteine is by far the most important as it is the primary building block of the Glutathione molecule. And of the three acids cysteine is the most difficult to get into our bodies through our diets in the proper amounts for optimal Glutathione production.

Cysteine has the ability to actually put a limit on the amount of Glutathione a cell will produce. This limiting factor is not found in the other 2 acids. If our cellular levels of cysteine are too low and we cannot get it through our food intake we should be doing so with nutritional supplements. (More on that later in this book.)

These three amino acids must be presented to our cells in the exact proportions needed for the cells to make Glutathione. If any one of these three is missing or in the wrong proportion the body must then manufacture that missing component (at its own expense of energy and materials) or go without. This creates one of two problems: either we will then have a diminished supply of Glutathione because we have too little of the right materials to make it; or we will deplete other parts of our body of these nutrients as our cells take them up to make Glutathione. As we will see in later chapters, neither decreased stores nor low production of Glutathione bode well for our health.

Where Glutathione Comes From

Glutathione is made within all 70+ trillion of our cells and is also found in all living creatures, including animals, plants, and microorganisms. Its universal presence among such diverse living organisms displays its vital importance to vibrant life. Glutathione is water-soluble, so therefore it's found mainly in the water containing parts of the body. This would specifically include the cytosolic compartment of every cell. Let me explain its function in that compartment.

Glutathione is found and produced inside the cytosol of every cell of our bodies. It is in the cytosol that the majority of metabolic processes take place. These would include bringing nutrients into the cell and expelling the waste from the cell. Glutathione is found in the cytosol as a *guardian* of those metabolic processes. This important work requires the amount of Glutathione to be highly regulated, both inside and outside every cell.

If the amount of Glutathione in the cytosol declines at any time a signal is automatically released to the cells to produce enzymes that create more Glutathione. But if too much GSH

is accumulating within the cell, another specific enzyme will be made to transport excess GSH out of the cell and into the blood.

The liver and spleen have the highest concentration per cell of Glutathione. The liver provides itself with sufficient Glutathione to function as our most powerful detoxifier. It will also export excess Glutathione to perform its many different tasks of cleaning up, protecting, and detoxifying cells.

Taking Glutathione

Glutathione is an extremely large molecule. Many studies have shown that while we can ingest Glutathione in a pill or liquid form, or even inject it into our blood stream intravenously, very little, if any of it, will make it into our cells and so it will have a nominal effect. Crudely put, due to the size of the molecule it cannot slide through the multitude of microscopic holes in the cell membrane. It would be like trying to put your fist through a buttonhole – it simply cannot happen.

More accurately, there are no mechanisms inside the cell to draw Glutathione in, as there are for nutrients and water. Also, the vast majority of Glutathione molecules when taken in pill or liquid forms will never make it through the digestive system, for as with all proteins they will be quickly broken down into their several component amino acids. However, this problem has been solved by the science of very specific fermentation discovered in the mid 2010's.

This process has been a major breakthrough in the area of Glutathione supplementation. While I won't go into the specifics of any company or product name here, I do recommend specific Glutathione-building supplements. One particular product, due to its innovative formula, brings 2 types of Glutathione directly into the bloodstream

and also delivers precursors (raw materials) for every cell to draw into itself and turn into the Glutathione compound for the cells to use. We will discuss the special formula that utilizes this process with excellent results in Chapter 11.

God meant the body to have enough of this precious Glutathione protein for us to have a long and healthy life. Unfortunately, this just doesn't happen for most people today due to inadequate nutrition, our toxic environment, and the effects can be devastating. But there is hope.

How Glutathione Works

The human body is an amazing machine that operates simultaneously on three distinct levels – chemical, mechanical, and electrical. All three are intricately woven together and function as one unit, though their functions are completely different. Glutathione is one of the few substances vital to the function of the body on all three of these distinct levels. Without Glutathione we cannot exist. The less we have the less vitality we have.

There is no substitute for Glutathione and there is nothing that can match its abilities. Let's take a look at these three elements of the human physiology and how they synergistically work together – all with the help of mighty Glutathione.

Chemical

The chemical aspects of our bodies have to do with the vitamins, minerals, enzymes, hormones, our very blood itself, and other substances within us. All work together in a symphony of reactions and activity that releases energy and allows and creates growth in the building of our every cell. Our organs, such as the liver and pancreas, rely on the constant flow of chemical substances to make the proper enzymes and other digestive and detoxifying substances that

allow us to assimilate our food and cleanse our bodies from the inside out. Our blood is constantly delivering oxygen and removing carbon dioxide in the magnificent process of breathing, coupled with the beating of our hearts. Even our brains are bathed in specific hormonal chemicals that create specific moods and emotions – actually transcending the physical as it moves us into the emotional.

We may not understand how the chemical factory is working, but we can certainly feel the affects. We definitely feel the stomach acid in our throats if we have acid reflux, the surge of strength and alertness from adrenalin in a fearful or dangerous situation, or joy from the release of endorphins when we exercise or hug someone we love. We may not know which ones are at work or how the chemicals come together to form tears or sweat – but we do experience them. We don't even have to think about the chemical reactions in our mouths that begin the digestive process of our food, but it happens. We are undeniably awash in a sea of chemicals every moment of our lives.

Not all chemicals are created equal in the body, however. We all know people who are seriously imbalanced in their chemical makeup, yet who live full lives. There are also those who due to such imbalances are living lives of physical, mental, and emotional suffering. The human body can withstand a tremendous lack of the proper nutrients needed to bring the proper chemicals into the cells and survive. Junk food – what I call “fake food” – has wreaked havoc on the health of millions of people in all age groups, helping to drive obesity and diabetes to epidemic proportions. And yet the amazing chemical factory within us continues to adjust, cleanse, and neutralize the unwanted substances – such as additives, preservatives, and pesticides – in a heroic, though sometimes impossible effort to keep us alive.

Mechanical

The mechanical aspect of the human body refers to our skeletal structure, our muscles, and our organs. It is these parts of our body that perform many of the vital functions within us, help us to move about, and allow us to be physically active. We are more in tune with this part of our physical being than the other two because we can see it, feel it, feel with it, and otherwise experience it throughout our daily lives. When we reach for a glass to fill with water for a drink, or sit, stand, walk, or run we feel and engage the many mechanical parts of us. We experience it when we drive our car, mow the lawn, write a letter, or throw a ball. It is not always a conscious effort on our part to experience the mechanical – it simply *is* a part of almost every one of our experiences.

The mechanical aspect of our bodies – in its simplest form of muscle and bone, ligaments, and tendons – is not completely necessary for life to continue. There are millions of people who become paralyzed to some extent or another, yet who live on. Even complete quadriplegics can survive with much help from loved ones, care givers, and often machines to assist with breathing, without any use of their mechanical systems. Amputees likewise have become award-winning athletes in the absence of body parts. Again, the body's ability to survive is astounding. Our Creator truly made us wonderfully.

Electrical

Most of us have never thought of ourselves as electrical beings, making this probably the least understood of the three parts of the human physiology. And yet it is this aspect of the body that is perhaps the most vital. Every cell in our bodies – be it a chemical cell or one of the trillions of the

mechanical cells – is alive with electricity. We call such electrical charges protons (positively charged) and electrons (negatively charged). Our nervous system, along with the meridian system, makes up the intricately woven power grid through which our electrical currents run to every cell we have. It is the presence of our internal electricity and electrical system that allows every cell, every organ, and every system to function. Take away the electrical and everything stops.

Computers are amazing machines that can do thousands of cyphers in the blink of an eye. But if you unplug a computer from the power source - be it a battery pack or a wall socket - it stops instantly. Flip the switch on the wall and the light stops lighting the room. Turn the key off in your car and the engine dies instantly. Why? No electricity – no power. Our bodies are exactly the same. We can live with bad chemicals and broken mechanicals – but we cannot live without electricity coursing through our cells.

It is electricity that causes your heart to beat for decades without you ever having to think about it. It is electricity that causes the brain to send an electric signal through the nervous system to tell the muscles in your arm to pick up the pencil you just dropped on the floor. These *electrical* impulses spark a series of *chemical* reactions within the *mechanical* tendons, muscles and bones to do what the brain has ordered. All this happens at the speed of light! The electrical ignites the chemical and the mechanical almost simultaneously. We are not aware of it. We don't feel it. We simply are electric.

Glutathione X 3

Glutathione runs effortlessly through all three aspects of the human body. It is simultaneously involved in all of the

electrical, the chemical, and therefore the mechanical parts of us.

- In the midst of the chemical ocean within us Glutathione is produced from several chemically based ingredients.
- The amount of Glutathione we produce will either directly or indirectly affect almost every chemical action and reaction in our bodies.
- Glutathione assists in cleansing muscles and organs of unwanted waste.
- Glutathione can eliminate harmful substances from, and thereby strengthen, every organ, gland, and tissue.
- Electrically, Glutathione constantly exchanges electrons with both good and bad molecules, acting as both a skilled defender and a master builder.

Simply put, Glutathione facilitates energy production for the mechanical to use for movement, chemical reactions to be initiated and completed, and of course other electrical events needed in the body. It continually and safely changes the chemical makeup of the cells around it as it releases its electrons. Glutathione stands alone as the one molecule that can take a vital part in the defending, healing, protecting, and building aspects of our physical bodies – all at the same time. It does so at the electrical, chemical, and mechanical levels with precision as a true King of vibrant health in the body.

No Lone Ranger

But Glutathione never acts alone. It has the ability to join itself with other nutrients and compounds to form much

more complex compounds that have a vast array of effects. It is Glutathione's compounding ability that makes it so vital in serving so many different functions with so many positive and needed results. Here are more ways in which Glutathione sets itself apart as a most unique and wonderful molecule:

- Helps with DNA synthesis and repair
- Helps with Protein synthesis
- Is a super nutrient for the feeding and health of our Immune System
- Assists in the function of important enzymes
- Oxygenates our blood

And even beyond these points Glutathione displays itself as vital to human function at every level.

In Summary:

Glutathione is made in every cell in our body from three amino acids - glycine, cysteine, and glutamic acid or glutamate. Its main function is to give its electrons away to other molecules in need and will continually regenerate its electrons. Glutathione's ability to fill a vital role in the chemical, mechanical, and electrical functions of our bodies makes it unique and further establishes it as vital to vibrant health. Now let's take a look at the role of Glutathione in energy production..

Chapter 3



The Energy King

The Source of Our Energy

If I asked you what your source of energy is you might say food, water, your heart, exercise, or even God. All would be partially correct, but they are not the specific origin. The source I'm speaking of is found in every one of your cells, in microscopic energy factories called Mitochondria. There can be thousands of these factories in a single cell and all are very fragile – needing the protection of Glutathione.

Nutrients from our food are taken into the mitochondria factories for conversion to energy. Changing the nutrients into energy requires the presence of oxygen. It is this oxygen that is the main culprit in releasing damaging waste molecules after the energy is used or burned. Glutathione is present to neutralize or clean up the waste. Interestingly, it is the presence of Glutathione that both causes the burning to take place and also protects our cells from their fiercest attackers – free radical oxidizers – the waste molecules created by the burning of cellular fuel. Sound confusing? Let me explain.

Energizer!

Once Glutathione has been created in the human cell, many things begin to take place. First and foremost is the production of ATP within the cell. ATP is Adenosine Triphosphate – the energy source created by the mitochondria from the nutrients we ingest, with the aid of oxygen. Simply put, the more ATP a cell generates the more energy that cell has to work with. The more energy it has the stronger it is. As individual cells increase their energy levels, every organ, gland, and system likewise increase their energy and therefore function better. Better quality of life ensues.

But therein lies the problem mentioned above. As ATP is burned for energy there is heat given off and waste left over, as with anything consumed as fuel. These two aspects of that process can cause damage to the very cells that create and use the ATP. Glutathione – created in the cell with ATP – has the unique ability to both put out the fire and remove the waste before they can damage the cell. GSH is at once water and broom!

Inflammation is kept in check by Glutathione’s “fire extinguisher” activity. Less inflammation means less pain and less disease. The Glutathione broom neutralizes and sweeps away damaging free radical molecules, which are the root of all inflammation.

The Tag Team

ATP is needed for the production of GSH and GSH takes part in the release of the energy within ATP. It is the delicate balance between these two that allows ATP to safely burn as fuel, in addition to the antioxidant and other activities of Glutathione. **If you raise your cellular levels of ATP, which can be done artificially, your Glutathione production will *not* rise with it. However, if you can raise your**

Glutathione levels within your cells, those cells instinctively know that they can then make and use more ATP for more energy, because the Glutathione will stop the free radical activity and stop any inflammation.

If ATP and Glutathione fall out of this balance due to trauma, toxins, aging, or other oxidative stress-causing issues, then disease states can be established. Unfortunately, as we age the ability of our cells to produce Glutathione decreases, which lowers ATP utilization. This is why older people tend to get sleepy and tired in the afternoons. It's also one of the reasons why aging usually brings on more disease states – there is less energy and less Glutathione to keep down oxidative stress.

This is why it's not a good idea to take an ATP supplement by itself. If you ingest ATP as a supplement, you will tip the scales *against* Glutathione and it will not be able to adequately handle the waste and free radical activity. Yes, your energy will increase, but it will come at a high price if you keep up such supplementation for very long.

However, if we can raise our Glutathione levels by supplying our cells with the correct formula of nutrients, or bioavailable Glutathione itself, then our cells will produce enough ATP to meet the new Glutathione levels. So, the best thing you can do for increased energy is not to supply more ATP, but to supply more Glutathione because you will release the energy in a safe manner.

Energy

If you raise the energy of every cell, the energy available to every organ and every aspect of every system will automatically be raised. If your organs and systems have more energy, then your overall health must increase. Now add to that the fact that Glutathione is the *Master Anti-*

oxidant – ridding the body of free radicals and the oxidative stress they create, plus the fact that it is also the *Master Detoxifier* removing poisons and heavy metals from our tissues – and you have a three stranded cord for vibrant health that cannot easily be broken. I'll go into more detail on each of these in later chapters.

There are multiple steps in the cellular production of Glutathione, which of course has a direct effect on ATP production. Each step requires a specific enzyme that is used to transfer energy from ATP to the newly forming Glutathione molecule. The new Glutathione molecule then takes that energy and distributes it as needed through its various functions, such as neutralizing free radicals and bonding to toxins.

Clarity

All athletes know that there are two mind games going on in a sports competition. It is for these mind games that raising your GSH levels comes into play once again. The first game is what goes on inside *your* head. Are you clear and confident? Are all your synapses firing at optimal levels so you can think with the speed of light and make the right decision and make the right moves to win?

The second game is about what you cause to go on inside *your opponent's* head. Interestingly the second game is greatly dependent on the success of your first game. You will project your confidence or lack of it into the thought processes of your opponent by your eyes, your focus, your demeanor, your words – all stemming from your clear or cloudy mind. You can see in an athlete's eyes if they are focused and clear. Watch any sport on TV and you will see this clarity and focus in the eyes of all champions.

When your energy levels are at their best your brain has what it needs to fire the synapses and bring you everything you mentally need to succeed. Free radicals, inflammation and oxidative stress are taken out of the equation. Toxins are removed. Thoughts flow freely. This is a very common occurrence for those elevating their Glutathione levels. For the athlete and for us all, that is imperative.

When body and mind are coordinated, breaking world records doesn't seem so hard. For the rest of us who are not world-class athletes this mind/body equation is just as sweet a benefit when we boost our own GSH levels. Thinking clearly on the job is just as important as doing so in the gym. Moms, dads, grandparents and kids all need this congruency of body and mind for optimal performance.

Recovery

Athletic Performance

As we've seen, the mitochondria are the energy factories of the body and Glutathione is a major controlling factor over how much energy should and can be made. For an athlete this is extremely important. Why? Because energy is the foundation for all that an athlete will accomplish. The more stored and producible energy a body can muster the more it can do and the longer it can do it. Let's take a look at how this process works in the area of athletic performance.

As a natural function of the human cell Glutathione levels dictate the amount of ATP that can be burned because it is responsible for stopping the free radical (waste) activity. The harder an organ or muscle or system of the body works the more energy it will burn. The more energy burned means there are more free radicals (waste molecules) released by the burning process. The greater number of free radicals released into our cells the greater amount of

Glutathione is needed to quench them to halt the onset of oxidative stress and inflammation.

Now, when an athlete pushes his or her body to the limits of endurance the mental stress as well as the physical will always result in high free radical activity. It is extremely difficult for the body to overcome this overwhelming infusion of free radicals into the systems. This creates several common consequences for the athlete.

First, the burning of fuel releases free radicals into the cells that have been stressed by the exercise. This waste product sits in the cells and causes pressure and inflammation if not removed immediately. This pressure and inflammation is the pain felt by every athlete or anyone for that matter who has ever done anything strenuous. How often have we said – “I didn’t even know I had muscles there!” – as we struggle to get out of a chair the day after such activity. It’s not the muscles – it’s the inflammation *in* the muscles.

Glutathione will act as an antioxidant and quench the inflammation caused by free radicals released by the burned fuel. But as a major detoxifying agent it will also work to remove any toxic elements, such as lactic acid, from the cells. If there is enough Glutathione to handle the job the pain will dissipate or never be felt at all. This is what I hear constantly from those athletes and weekend warriors who use the GSH supplement I recommend.

Let me give you a great example from a world champion weightlifter.

More Strength

This is a true story. Bill (not the author) has been lifting weights since he was teenager. When in his late 40’s he was introduced to one of the most powerful Glutathione

producing supplement of that day. He was skeptical as he was not a fan of supplements for the most part – so his mindset was not a positive one about the supplement actually working for him. However, as he began using the supplement his workouts became less strenuous and he was recovering much more quickly. He was able to lift more and more weight for longer periods and do so again much sooner than what was normal for him. A month or so after starting on the product he entered a weightlifting event.

Amazingly, during this contest he set 5 consecutive world records for the bench press! His first lift broke the old record. His second, third, fourth and fifth lifts broke each of the records he had just set. And he broke them all in the *same* day – an unheard-of occurrence due to tremendous drain on the body's energy stores by each lift!

Bill stated that he actually was feeling stronger with each lift. There was obviously no placebo effect taking place that day because Bill was not a fan of supplements. Then a few months later Bill broke his previous record for an unprecedented sixth world record bench press!

What gave Bill this ability to go so far beyond his normal routines and shatter those records? How did the increased production of Glutathione help him? Here's a simple equation I believe will help you understand it, and it's one you can apply to any athlete or person who engages in strenuous activities:

***More GSH = More E.A.D. = Less pain, faster recovery,
more activity!***

In other words, increasing your **Glutathione (GSH)** levels will increase your **Energy (E)**, and your **Antioxidant (A)** and **Detoxification (D)** ability to handle any amount of

free radicals released in the process. This translates into less pain in the muscles and joints, which means faster recovery from workouts, which means you can work out and compete again sooner, which means you will build more strength and stamina at a faster yet safe rate. That's what happened to Bill and thousands of athletes at all levels of competition and age groups who have supplemented their nutritional intake with Glutathione producing products. It can happen for you.

In Summary

Energy is the life force within our cells that makes everything work properly and efficiently. More energy means higher function and higher function means more vibrant health. Even in athletic performance we see this amazing molecule act as the true key to more strength and faster recovery.

Glutathione is unique in that it is involved in almost every aspect of the energy cycle. Its presence allows the cells to produce and then burn more ATP inside the mitochondria. GSH will then clean up any waste and reduce any damaging heat from the ATP burning process that gives the cells their energy.

Ironically, the entire energy cycle would create massive inflammation were it not for the powerful antioxidant activity of Glutathione. Our entire next chapter will go into great detail about that one function of this mighty molecule.

Chapter 11



The King Formula

The Building Blocks

Creating optimal Glutathione levels in our bodies requires that its formation and protection be supported not only by the lifestyle choices mentioned in the previous chapter, but also by ingesting some very specific nutrients. Remember directly absorbing Glutathione is the key, as is taking in the correct elements with which your body can build Glutathione in its cells. Fulfilling those two factors will perform one or more of the following tasks:

- Keep the stores of Glutathione from being depleted.
- Supply one or more of the three amino acids used in making Glutathione.
- Help support the enzyme activity needed for making Glutathione.

Noting the function of the many antioxidants and other elements that go into the production of Glutathione in the body, it is not difficult to compile a list for creating an excellent supplement that will optimally help the cells of our bodies create Glutathione. Fortunately we don't have to try to figure out the exact formula on our own – that's been done for us already by Dr. Bounous, Dr. Keller, Dr. Nagasawa, and the scientists who recently modified the age-old fermentation processes to make GSH. These scientists are all noted in the Acknowledgements section at the beginning of this book.

4 Generations of Formulas

Generation 1 Formula

Generation 1 was developed by the late Dr. Gustavo Bounous. He was the first to pioneer a formula for helping the body create its own Glutathione. He realized that cysteine was the major factor in that production and at that time N-acetyl-cysteine (NAC) was the best source for getting it into the body. Together with his research staff he created a denatured whey protein that was high in NAC and effective at raising Glutathione levels by about 35%. However, the protein powder could not be standardized so that everyone could take the same amount and have quite similar increases in Glutathione. Also, some people could not digest the protein well. Regardless, Dr. Bounous' product was the most successful Glutathione enhancer of its time and a great help to thousands in many health-inducing ways.

Generation 2 Formula

Generation 2 came from the research of the late Dr. Robert Keller whom I have quoted throughout this book. He was looking for a way to help his HIV and cancer patients with their quality of life. He discovered the power of Glutathione and set out to create a complex formula that would help any and all who would take it. After years of research and many attempts he was successful, and the results were literally amazing. His formula, also built around N-acetyl-cysteine, proved to increase GSH levels by an average of 300% with 60 days of regular use.

Unlike the protein powder made by Dr. Bounous, Keller's was a small set of 3 capsules taken twice a day, so it was much easier to use and much more powerful in its results. Dr. Keller put his formula through years of testing and clinical trials to be sure it was viable for the average person and not just those who were extremely ill, like his patients. Those tests and studies were accepted and applauded by over 100,000 of his peers at international research conventions. His product received multiple patents and was taken to market in 2007, seeing similar results around the world with all ages.

Generation 3 Formula

Generation 3 was formulated by Dr. Herbert Nagasawa in the mid 1980's featuring his new molecule called **RiboCeine™**. He had been commissioned by the United States Veterans Administration to come up with a way to help military service personnel who suffered from alcoholism. He knew the liver needed to be protected and repaired from the ravages of that destructive toxin. He discovered Glutathione was the answer.

RiboCeine™ is comprised of ribose and cysteine. Ribose is a carbohydrate (sugar) used for ATP production. Think of

the ribose as the hard shell of a walnut that protects the meat of the nut (the cysteine) from harm (the digestive system) until it is ready to be used to produce Glutathione in the cells. This protective covering allows the cysteine to effectively pass through the digestive tract where it would normally be dismantled into simpler elements. Surviving digestion allowed it to be delivered to our cells, enabling efficient, natural production of Glutathione with tremendous results.

Generation 4 Formula – *The King*

As we saw earlier, the GSH molecule is mostly dismantled in the gut, but as with RiboCeine™ this next generation formula overcomes that issue powerfully. Due to the use of a highly modernized fermentation process, GSH can now pass directly into the blood for use anywhere in the body. Combining this bioavailable GSH with N-acetyl-cysteine, and other needed nutrients we will discuss shortly, this new formula effectively triples the amount of GSH in the body of previous formulas. These ingredients allow the cells to produce their own GSH in several ways, and at the same time the supplement is delivering actual GSH into the bloodstream. When the formulators added over 21 more clinically proven and synergistic ingredients to this formula they created a truly unique and highly effective product.

From here on I will call this product *GSH-4*. This is the product I am personally taking after 10 years of using the aforementioned products by Keller & Nagasawa. My reason? It is simply more effective and about half the price. (If you wish more information on this product please email: Admin@FlyingElefantz.com)

Needed Components

GSH-4 provides direct cellular absorption of two kinds of Glutathione, while also increasing the production of Glutathione. There are several other vital ingredients that will maximize the production, use, and protection of intracellular Glutathione activity. Although the mechanisms of action in producing and/or protecting Glutathione have not as yet been completely identified biochemically, the list of ingredients in this product is quite impressive.

This 22-ingredient synergistic formula in GSH promotes the production, assimilation, and protection of Glutathione. Of course, many of these nutritional ingredients have other important functions as well, but they are all linked to Glutathione. In fact, a thorough review of all the antioxidants found in PubMed.gov failed to produce any which *didn't* in some way protect or promote Glutathione. Let's take a more in-depth look at some of these nutrients.

Cofactors

As I have echoed throughout this book, Glutathione's many amazing functions cannot and will not happen alone. It must have adequate amounts of certain cofactors to maximize the efficiency of the multitude of biochemical processes required for Glutathione and ATP production. Think of it like a professional football team. Football is a sport that you simply cannot play alone and serves as a great analogy for the team effort made daily by Glutathione and its helpers.

Think of Glutathione as the quarterback of the team. The QB makes split second decisions, hands the ball to other players, and calls the signals for the next play. He is the *mastermind* of the team on the field. But he also knows that without his linemen, running backs, and receivers he will

not last a second against his opponents. He also knows that every touchdown and field goal is only possible because the team worked together to get that ball across the goal line or through the uprights. There may be a few superstars on the roster, but the team wins the game together.

So it is with Glutathione and its team of cofactors. Glutathione is the leader, but it cannot win the game of vibrant health alone. Fortunately, Glutathione's team is filled with multiple superstar players. Let's meet the rest of the team found in the GSH-4 product that powerfully enhance GSH production and effectiveness.

Superoxide Dismutase (SOD)

Enzymes are vital to the production, protection, and use of Glutathione by our cells, organs and systems. Every cell within us has the capacity to produce poisonous chemicals as the by-product of other chemical reactions needed for life. Our cells are protected from these poisons by the activity of enzymes that break them down into harmless substances that are then eliminated from the body as waste. Enzymes are catalysts that spark and speed up the rate of biochemical reactions but are not themselves altered by the reaction.

Superoxide is one of the main sources of cell-damaging oxygen that ravages our bodies. The enzyme Superoxide Dismutase (SOD) is a highly important antioxidant defense against it and other harmful forms of oxygen. SOD sparks the necessary change of superoxide into oxygen and hydrogen peroxide. The physiological importance of SOD is illustrated by the severe cellular stress and subsequent degenerative states a lack of these enzymes can cause.

SOD has proved to be highly effective in treatment of inflammation. Through its powerful antioxidant and anti-inflammatory activity SOD is a perfect teammate for GSH as

they work synergistically in the battle against free radicals and toxins.

Aloe Vera Mannose Acemannan

The gel within the leaf of the Aloe Vera plant contains over 200 compounds and an arsenal of phytonutrients with proven antioxidant properties. Aloe has been used for centuries for assisting the body with relief from a variety of physical issues including cuts and burns. Its primary effect is that of causing an immediate and profound cellular defense response when applied or ingested by humans.

GSH-4 uses a proprietary derivative of aloe gel which contains polymannose called Acemannan, a unique polysaccharide. Acemannan was discovered in the 1980s in the USA and brought to market in the mid 1990s. It's many health-related benefits include its ability to strengthen and excite the immune system. It also makes up the major portion of the substance needed for immune cells to properly connect with other cells in the body to communicate the needs of those cells, such as the need for nutrients or to be cleansed of free radicals, and more.

A study from Texas A&M University showed that Glutathione production and utilization was enhanced by the presence of Acemannan. Acemannan, in combination with other nutrients in clinical studies also displayed mental function support. These important biological facts make the inclusion of Acemannan in the GSH formula a supercharger for several of the ingredients and especially for the two

bioavailable Glutathiones. It is also a proven pathway for increasing the Glutathione production of our cells.

N-Acetyl-Cysteine

This is a synthetic source of cysteine that is easily converted into GSH by our cells. As we discovered in earlier chapters this was the go-to substance for decades to increase GSH production. NAC can help with several areas of our health.

NAC is a powerful detoxifier, assisting the kidneys and liver in their cleansing functions. NAC can also contribute to mental health by helping to regulate glutamate in the brain, as well as lessen withdrawal symptoms from nicotine and drugs. In the lungs and respiratory system, it can help loosen mucus while helping increase GSH to diminish inflammation of those tissues. Also, by decreasing inflammation in fat cells it helps stabilize blood sugar which improves insulin resistance. And NAC has been shown to increase nitric oxide production thereby relaxing and opening up veins to improve blood flow.

Once again, the inclusion of this excellent nutrient in the GSH-4 formula serves to increase the effectiveness of the product at many levels.

Additional Ingredients

Zinc Citrate

Zinc can act as an effective anti-inflammatory and anti-oxidant agent and is found in cells throughout the body. It is needed for the body's defensive (immune) system to function optimally. It plays a role

in cell division, cell growth, wound healing, and also in the breakdown of many carbohydrates.

Selenium

Selenium is a powerful mineral that is essential for the proper overall functioning of your body. It plays a critical role in metabolism and thyroid function and helps protect your body from damage caused by oxidative stress.

L-Glutamine

L-Glutamine is one of the most important nutrients for a healthy digestive tract because of its ability to maintain the integrity of the intestinal wall. This is the most abundant amino acid in the body. One of its main functions is to bring healing to all tissues, especially those irritated tissues in the digestive tract.

L-Glycine

Your body needs glycine to produce important compounds, such as Glutathione, creatine, and collagen. This amino acid may also protect your liver from alcohol-induced damage and improve sleep quality and heart health.

Quercetin

Quercetin can help stabilize the cells that release histamine in the body and thereby have an anti-inflammatory and antihistamine effect. Quercetin also has antioxidant capabilities.

Alpha Lipoic Acid

This ingredient has the ability to fight against the ravages of most all free radicals. It also assists in the regeneration of other antioxidants like vitamins C & E

and Glutathione. And it has been shown to specifically help protect nerve tissues.

Cordyceps

This relatively unknown nutrient has been used for hundreds of years as a powerful support for cardiovascular, immune, and respiratory health. Certain elements in cordyceps have both antioxidant and immunological actions.

Milk Thistle

A specific compound in milk thistle known as Silymarin, has proven to protect the liver, along with immune support and free radical counteracting properties. By assisting in the support of cell membrane functions it may keep toxins from entering the cells.

Vitamins

Next are the major vitamins needed by Glutathione for optimal function. While all vitamins and minerals will help in establishing better health and therefore assist indirectly in the Glutathione pathway, research seems to indicate that the ones I will focus on here are the most important. They are paramount to keeping Glutathione in its reduced GSH form, and GSH returns the favor to them continually.

Vitamin B-9

B-9, also called folate, is important in red blood cell formation and for healthy cell growth and function. This nutrient is crucial during early pregnancy to reduce the risk of birth defects of the brain and spine. Most B-9 is sold in the form of folic acid, which is not

easily assimilated, if at all, by a huge portion of the human race. To remedy that problem the GSH-4 formula uses only methylated folate, which is easily assimilated by everyone. This is a major reason for the success of this special and unique formula and sets it apart from many on the market today.

Vitamin B-6

B-6 plays an important role in the body. It is needed to maintain the health of nerves, skin, and red blood cells. It also serves as a coenzyme catalyzing more than 150 enzymes regulating metabolism and synthesis of proteins, carbohydrates, lipids, and many other important bioactive metabolites.

Vitamin B-7

B-7 is needed by our bodies to facilitate the metabolism of carbohydrates, fats, and amino acids. Biotin, as it is also known, is also used by the body to regulate immunological and inflammatory functions.

Vitamin B-12

B-12 is a nutrient that is required for proper red blood cell formation, neurological function, and DNA synthesis.

Vitamin C

Vitamin C helps turn GSSG into GSH by giving up its own electrons. This then allows the newly replenished Glutathione molecule to give up its electrons to quench more free radical activity. *Inside* our cells, as we have seen throughout this book, GSH has no equal stopping free radical oxidative stress, neutralizing toxins,

augmenting the immune system, and slowing the aging process. Vitamin C has been shown to take on these exact duties on the *outside* of the cells. This creates a powerful synergism as vitamin C and GSH recharge and strengthen each other on a continual basis. Without a doubt one of vitamin C's main duties is to keep GSH at normal adequate levels throughout the cells and organs of our bodies.

Vitamin E

Vitamin E is a fat-soluble vitamin. It is a powerful anti-oxidant, regulates metabolism, and is a part of the process that causes energy to be released from our food. It also is vital to blood production, circulation and clotting, strengthens tissues and can prevent scarring. It has also been shown to help bring Glutathione levels back to normal in research studies. Glutathione will also lend its electrons to vitamin E to replenish its activities within the body. Like vitamin C there is a synergistic relationship between E and Glutathione, and therefore the need to keep both at the highest possible levels is undeniable.

Super Bowl Ready

Every professional football team has the goal of winning the ultimate game – the Super Bowl. They practice hard and hone their bodies and minds into the highest condition possible to do battle week after week with other like-focused teams to attain that goal. However, there are only a select few that make it to the

playoffs and only two reach the big game. In the end only one can win. That winning team displays the synergism of its players working together, increasing the strength of their individual skills by joining them to those of their teammates.

Every year there are mediocre teams, losing teams and also-rans. Every year only one is remembered as the champion. If our goal is to simply stay alive as a mediocre also-ran – then the quality of the above listed cofactors and their sources are no more critical than the players on such teams. **But if we want to *win* the super bowl of a long and healthy life, we must secure the sources that have the best nutrients to secure the best cofactors.**

Football is just a game, but men pay heavy physical prices for a ring that says they were a champion, even if just once. We must likewise be willing to pay the valuable price of discipline needed to assure we gain the life of vibrant health that we seek. It's up to us.

In Summary

Glutathione is the most powerful of all antioxidants and detoxifiers of the body. It therefore needs our utmost attention to increase its production and enhance its bioavailability every day. We must give our bodies the proper nutrients through our food and through nutritional supplements to augment this production and enhancement.

GSH-4 is a simple, efficient, and powerful way to build a strong foundation for optimal Glutathione

production in all of our cells. Other components help optimize Glutathione's work within the body by shutting off inflammation triggers and assisting GSH in lending its electrons to other antioxidants. And even with such a profound and proven Glutathione producing formula at our disposal we still will need the other myriad of nutrients found in wholesome food and nutritional supplements to supply all we need for maintaining and increasing Glutathione levels. And then there are the team members that our own body produces to assist in the production and utilization of GSH.

The human body is a truly awesome machine with processes and systems so amazing they boggle the mind in their complexity. We now have the profound privilege of accessing a vast treasury of information about how our machines work. That information has the potential to lead us to health and well-being that can be truly vibrant, if we will apply what we learn.

Glutathione stands alone as the King of the Master Molecules of Health. And with knowledge of that king now in your hand, it's my great hope that your journey from here will take you far in unlocking the many blessings of body and mind that increased Glutathione can bring you.

Appendix

Concerning Peptides

The following is taken from an article on WebMD.com

Written by [Lori M. King, PhD](#), [Shishira Sreenivas](#)

Medically Reviewed by [Nayana Ambardekar, MD](#) on

February 01, 2026

Peptides are strings of molecules called amino acids, which are the "building blocks" of proteins. Peptides are basically short proteins that are about 2-100 amino acids long linked by peptide bonds. (a protein is considered a chain of 100+ amino acids.)

A polypeptide is a longer and continuous, unbranched peptide chain. Polypeptides that have a molecular mass of 10,000 Da or more are called proteins. Chains of fewer than twenty amino acids are called oligopeptides, and include dipeptides, tripeptides (such as the glutathione molecule), and tetrapeptides. (Wikipedia)

Your body makes several types of peptides that serve important functions in some of your body's most necessary processes. For instance, insulin is a 51-amino-acid-long peptide hormone that helps your cells take in sugars from your food to use for metabolism and store them in your liver.

Researchers have been working to develop peptides as treatments for some medical conditions since 1921. In fact, insulin was the first peptide ever made in a lab by scientists (called a synthetic peptide), and it's been used to treat people with type 1 diabetes since 1923.

Peptides may have possible advantages over other medications because they may:

- *Be easier to send where they need to go in your body.*

- *Have fewer side effects.*
- *Be safer because when your body breaks them down, their byproducts are amino acids that your body can then recycle.*

Studies show that some peptides may also have benefits for your skin, hair growth, muscles, bones, testosterone, and possibly your weight. So, for decades, companies have been putting them into skin care products and dietary supplements you can buy over the counter.

However, most peptides aren't very stable, so they just break down when they're put in a supplement or cream. Also, peptides in oral supplements are digested just like your food, so they don't enter your bloodstream intact. Peptide injections are common because it's easier for your body to use the peptides when they are injected directly into your blood.

Your body makes lots of different peptides, each of which has a different role. Scientists can also make synthetic peptides in the lab. " (WebMD.com)

Using Pub Med

The website www.PubMed.gov is the official site for all research archived in the US National Library of Medicine of The National Institutes of Health, which is part of the Department of Health and Human Services. When you go to this site, simply type in the search window on the home page whatever you wish to know about concerning medical research on any subject.

For example, type in Glutathione and you will have over 200,000 studies available to you. If you type in anything next to Glutathione, such as *digestion*, in the search window it will show you the specific entries concerning GSH and that subject. This makes it a powerful tool for discovering true research on this unique set of molecules.

Internet Search

A simple Amazon or Google search will give you an ocean of articles, books, and booklets on glutathione to choose from. I've listed the books below because they cover the information about Glutathione and give the most research references and illustrations for easy use and education.

Suggested Reading

- **Glutathione (GSH) Your Body's Most Powerful Healing Agent**
Dr. Jimmy Gutman, 2000 G&S Health Books
- **The GSH Phenomenon**
Alan H. Pressman, 1997 St Martin's Press
- **GSH Master Defender**
Dr. Thomas Levy, 2008 LivOn Books
- **Toxic Relief**
Dr. Don Colbert, 2001 Siloam, Strang Publications

Glossary

- **Alpha lipoic acid** – an antioxidant that assists Glutathione (GSH) by its ability to lend electrons to GSH and by its own antioxidant activity.
- **Antioxidant** - a molecule that stops the oxidation of other molecules by supplying electrons to any oxidizing agent that tries to steal electrons from healthy cell molecules.
- **Adenosine Triphosphate (ATP)** – our cells produce and consume ATP as the main energy transfer molecule; it is produced in the Mitochondria.
- **Chelation** – the process of chelating or bonding: molecules are bonded to metals so that they may be carried into the bloodstream and eliminated from the body.
- **Cysteine** - the main amino acid building block of Glutathione; it has the ability to limit the amount of Glutathione produced in a cell; made by the living cells of our bodies from simpler compounds or can be obtained in the diet.
- **Electron(s)** - a subatomic particle with a negative electric charge.
- **Enzymes** - are highly selective catalysts that accelerate both the rate and specificity of metabolic reactions. Almost all chemical reactions in a biological cell need enzymes in order to occur at rates sufficient for life.
- **Free Radicals** - produced by oxidation reactions; are intermediate stages in many chemical reactions. Their need to balance their own electron bonds causes them to steal electrons from other molecules thereby making those molecules into new free radicals themselves.
- **Glutathione (GSH)** - is made by every cell in the body from the amino acid cysteine, glutamic acid, and glycine.

It serves as the most powerful of all antioxidants, the master cellular detoxifier, removes heavy metals, quenches the heat of ATP production and use, reduces aging, and more.

- **Glutathione Disulfide (GSSG)** – is formed when reduced Glutathione (GSH) has given away all of its electrons and is therefore in need of an electron.
- **Glutathione Peroxidase (GPX)** - an enzyme family whose main role is to protect cells from oxidative damage. The biochemical function is to reduce lipid hydroperoxides to alcohols and to reduce free hydrogen peroxide to water.
- **Glutathione Reductase (GR)** – an enzyme that reduces Glutathione disulfide to the sulfhydryl form GSH by acting as a catalyst in adding the needed electrons.
- **Glutathione S-transferase (GST)** – GSTs are a family of enzymes. They may also bind toxins and can transport proteins such as Glutathione out of our cells.
- **Glutamic acid** – one of the 3 main natural amino acids used as building blocks of Glutathione. It is widely distributed in plant and animal proteins; acts as a neurotransmitter throughout the central nervous system.
- **Glycine** – The simplest amino acid, it is one of the 3 main natural amino acid building blocks of Glutathione; is a neurotransmitter.
- **Heavy Metal** – includes iron, cobalt, copper, manganese, and zinc – all of which are required by humans, though excessive levels can be damaging. Other heavy metals such as mercury, aluminum, and lead are toxic and their accumulation over time in our bodies can cause serious illness.

- **Hormone** - a chemical messenger released by a gland in one part of the body (often transported in the blood) with a signal that affects cells in other parts of the organism.
- **Hydrochloric acid** - one of the main secretions of the stomach; acidifies the stomach content to a pH of 1 to 2; is highly corrosive; acts as a barrier against microorganisms to prevent infections and is important for the digestion of food.
- **Hydrogen Peroxide** - the oxidizing capacity of hydrogen peroxide is so strong that it is considered a oxidative agent. Consequently, nearly all living things possess enzymes which decompose low concentrations of hydrogen peroxide to water and oxygen.
- **Immune System** - a system of biological structures and processes within bodies that protects against disease by detecting and eliminating a wide variety of pathogens and parasites and distinguishing them from our own healthy tissue.
- **Inflammation** - the complex biological response of tissues to harmful stimuli, such as pathogens, damaged cells, or irritants. This pathway can also be oxidation, which leads to free radical activity, which leads to oxidative stress, which leads to inflammation.
- **Lymphatic system** - part of the circulatory system, comprised of a network of conduits called lymphatic vessels that carry a clear fluid called lymph towards the heart for return to the blood after it has been cleansed in the lymph nodes by lymphocytes (white blood cells) of bacteria and other possible pathogens.
- **Lymph** - a clear fluid comprised of plasma and the fluid between cells that carries both nutrients and waste through the lymph system.

- **Lymphocytes** – a form of white blood cells found in the lymph nodes that destroy bacteria, viruses and other harmful microscopic life forms.
- **Mitochondria** – the power plants of our cells that generate most of the cell's supply of adenosine triphosphate (ATP), which is used as a source of energy by our bodies. The number of mitochondria in a cell varies widely.
- **N-acetyl cysteine (NAC)** - is a derivative of cysteine with antioxidant and liver protecting effects; has been the primary source of getting cysteine into the body to create its own Glutathione; is often used in poison control - of acetaminophen overdose specifically.
- **Oxidation** - the *loss* of electrons or an *increase* in oxidation state by a molecule, atom, or ion.
- **Oxidative Stress** - is associated with increased production of oxidizing agents or a significant decrease in the effectiveness of antioxidant defenses, such as Glutathione. The effects of oxidative stress depend upon the size of these changes. More severe oxidative stress can cause cell death.
- **pH Balance** – pH is a measure of the hydrogen ion concentration, measured on a scale of 0-9 with 7 being optimal by conventional standards. This can be measured by your saliva or urine. Low pH (below 7) is said to be acidic and high pH (above 7) is said to be alkaline.
- **PubMed** – the National Library of Medicine for the National Institutes of Health of the USA, housing global research pertaining to the human body.
- **Reduced state** - the *gain* of electrons or a *decrease* in oxidation state by molecule, atom, or ion.
- **Super Oxide Dismutase (SOD)** – enzymes that catalyze the dismantling of superoxide into oxygen and hydrogen

peroxide. They are an important antioxidant defense in nearly all cells exposed to oxygen. 0

- **Toxin** - anything that is poisonous and damaging to the cells of our body.
- **White Blood Cells** - part of the immune system involved in defending the body against infectious disease and foreign materials. Five types of leukocytes exist, but they are all produced and derived from stem cells in the bone marrow. They are found throughout the body, including the blood and lymphatic system.

About The Author

Since the mid-1970s, William “Bill” Greenman has been helping people find and fulfill their life purposes in many different ways. He’s been a living example of what he teaches as a counselor, pastor, teacher, conference speaker, author, illusionist, trapeze artist, circus owner, corporate executive, and entrepreneur. His vision for helping others has taken him, personally, to 4 continents and 20 nations. His books and training materials have circled the globe.

Bill has been involved in sports and personal fitness since his first day at a YMCA with his father when he was 5 years old. For over 60 years he has never wavered from his commitment to the fun and disciplines of both. It was this love of sports and fitness that took him not only to the circus and a 17-year career as an aerialist and acrobat, but also into the world of martial arts, surfing, and just about anything else that would challenge him physically.

Dr. Greenman’s athletic career and personal interest directed him into the study of nutrition, health and fitness as lifestyle disciplines. This quest for knowledge of the human body and its miraculous and intricate functions blossomed into another career of nutritional training and sales, which, in turn, spawned international business ventures.

But it’s Bill’s love of teaching others how to better themselves that has formed his life’s work. Helping people discover who they are and then how to grow into all they

can be—including their physical, mental and spiritual health—is his daily motivation.

Bill earned his Ph.D. in Practical Theology from Life Christian University in 2001 and was also awarded an Honorary Doctorate from that same institution for his life's body of work in 2000. He also has degrees in Speech Communications, Biblical Studies, and Pastoral Ministry. He has studied nutrition under the University of Miami Florida Medical School Division of Complimentary Medicine and Humanitas International Foundation.

Bill has been married to his lovely wife, Meg (who he met in the circus!), since 1975. They have 3 grown children and 5 grandchildren.

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