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ASTASHINE CAPSULE: World's Most Powerful Antioxidant on Earth

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ABSTRACT

Antioxidants are our first line of defense against free radical damage, and are critical for maintaining optimum health and wellbeing. The need for antioxidants becomes even more critical with increased exposure to free radicals. Pollution, cigarette smoke, drugs, illness, stress, and even exercise can increase free radical exposure. Because so many factors can contribute to oxidative stress, individual assessment of susceptibility becomes important. As part of a healthy lifestyle and a well-balanced, wholesome diet, antioxidant supplementation is now being recognized as an important means of improving free radical protection. Based on these facts A Super Antioxidant ASTASHINE Capsules has been developed at R&D centre PUGOS Nutrition Research Centre, Hyderabad. The present paper reviews the role of ASTASHINE Capsules in maintaining optimum health and wellbeing.

Introduction

The ability to utilize oxygen has provided humans with the benefit of metabolizing fats, proteins, and carbohydrates for energy; however, it does not come without cost. Oxygen is a highly reactive atom that is capable of becoming part of potentially damaging molecules commonly called "free radicals". Free radicals are capable of attacking the healthy cells of the body, causing them to lose their structure and function. Cell damage caused by free radicals appears to be a major contributor to aging and to degenerative diseases of aging such as cancer, cardiovascular disease, cataracts, immune system decline, and brain dysfunction. Overall, free radicals have been implicated in the pathogenesis of at least 50 diseases. Fortunately, free radical formation is controlled naturally by various beneficial compounds known as antioxidants. It is when the availability of antioxidants is limited that this damage can become cumulative and debilitating. Free radicals are electrically charged molecules, i.e., they have an unpaired electron, which causes them to seek out and capture electrons from other substances in order to neutralize themselves. Although the initial attack causes the free radical to become neutralized, another free radical is formed in the process, causing a chain reaction to occur. And until subsequent free radicals are deactivated, thousands of free radical reactions can occur within seconds of the initial reaction. Antioxidants are capable of stabilizing, or deactivating, free radicals before they attack cells. Antioxidants are totally critical for keeping optimal cellular, systemic health and well-being.

Reactive Oxygen Species

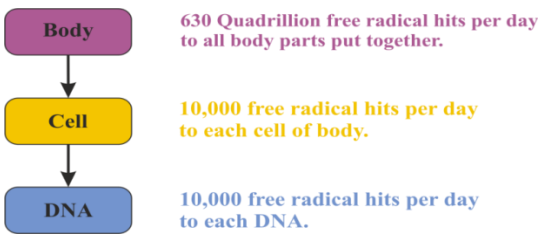


Fig.1. Reactive oxygen species

Reactive oxygen species (ROS) is a term which encompasses all highly reactive, oxygen-containing molecules, including free radicals. Types of ROS include the hydroxyl radical, the superoxide anion radical, hydrogen peroxide, singlet oxygen, nitric oxide radical, hypochlorite radical, and various lipid peroxides. All are capable of reacting with membrane lipids, nucleic acids, proteins and enzymes, and other small molecules, resulting in cellular damage. ROS are generated by a number of pathways. Most of the oxidants produced by cells occur as:

(1) A consequence of normal aerobic metabolism: approximately 90% of the oxygen utilized by the cell is consumed by the mitochondrial electron transport system.

(2) Oxidative burst from phagocytes (white blood cells) as part of the mechanism by which bacteria and viruses are killed, and by which foreign proteins (antigens) are denatured.

(3) Xenobiotic metabolism, i.e., detoxification of toxic substances. Consequently, things like vigorous exercise, which accelerates cellular metabolism; chronic inflammation, infections, and other illnesses; exposure to allergens and the presence of "leaky gut" syndrome; and exposure to drugs or toxins such as cigarette smoke, pollution, pesticides, and insecticides may all add to an increase in the body's oxidant load.

Antioxidant Protection

To protect the cells and organ systems of the body against reactive oxygen species, humans have evolved a highly sophisticated and complex antioxidant protection system. It involves a variety of components, both endogenous and exogenous in origin, that function interactively and synergistically to neutralize free radicals.

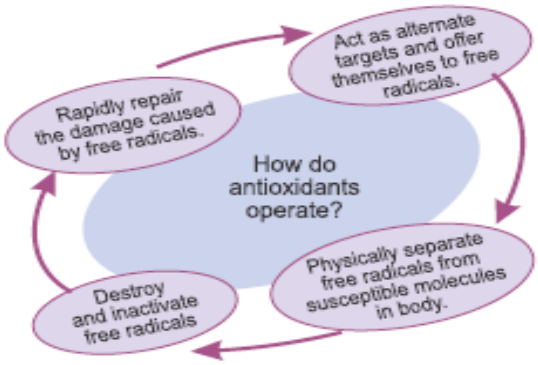


Fig.2. Antioxidant protection

Oxidative Stress

As remarkable as our antioxidant defense system is, it may not always be adequate. The term "oxidative stress" has been coined to represent a shift towards the pro-oxidants in the pro-oxidant/antioxidant balance that can occur as a result of an increase in oxidative metabolism. Increased oxidative stress at the cellular level can come about as a consequence of many factors, including exposure to alcohol, medications, trauma, cold, infections, poor diet, toxins, radiation, or strenuous physical activity. Protection against all of these processes is dependent upon the adequacy of various antioxidant substances that are derived either directly or indirectly from the diet. Consequently, an inadequate intake of antioxidant nutrients may compromise antioxidant potential, thus compounding overall oxidative stress.

Oxidative Stress and Human Disease

Oxidative damage to DNA, proteins, and other macromolecules has been implicated in the pathogenesis of a wide variety of diseases, most notably heart disease and cancer.

A growing body of animal and epidemiological studies as well as clinical intervention trials suggests that antioxidants may play a pivotal role in preventing or slowing the progression of both heart disease and some forms of cancer.

Conditions associated with oxidative damage

- Atherosclerosis
- Cancer
- Pulmonary dysfunction
- Cataracts
- Arthritis and inflammatory diseases
- Diabetes
- Shock, trauma, and ischemia
- Renal disease and hemodialysis
- Multiple sclerosis
- Pancreatitis
- Inflammatory bowel disease and colitis
- Parkinson's disease
- Neonatal lipoprotein oxidation
- Drug reactions
- Skin lesion & Aging

As aerobic organisms, we depend completely on molecular oxygen for our existence; the typical result of just a few minutes without oxygen is irreparable damage or death. However, although oxygen is utterly critical for human life, this molecule has also a dark side to its actions.

Oxygen is also found in a large number of harmful by-products that are relentlessly being produced in living tissues. These molecules are chemically unbalanced and very active; hence they tend to react with any other adjacent molecule. These *reactive-oxygen species* (ROS) contain reduced oxygen molecules as free radicals and reactive compounds.

In nature, electrons in covalent bonds always come in pairs. Whenever a covalent bond is broken down, each atom is left with one unpaired very active electron, and is therefore termed a *free radical*. Free radicals

include superoxide, hydroxyl radicals, and peroxyl radicals; all have one unpaired electron, and thus will seek any other atom with which to react.

ROS also include reactive compounds, which are non-radicals, such as ozone, lipid peroxides, hydrogen peroxide, and singlet oxygen. Additionally, a number of nitrogen compounds containing oxygen, such as nitrogen oxides and peroxynitrite, are also extremely harmful.

The strong tendency of ROS to react with neighboring molecules puts these molecules at risk. Free radicals and highly reactive forms of oxygen are produced in the human body during normal metabolic reactions and processes. Consequently, ROS are found in our bodies at any given time, and react with the tissue molecular constituents, such as proteins, DNA, RNA, carbohydrates, and lipids. The results of such "oxidative attack" may include protein and lipid peroxidation and structural changes in DNA and RNA, which in turn may lead to damage, mutations, and even loss of function. The oxidation of poly-unsaturated fatty acids in the membranes could induce a chain reaction of free radicals, which in turn could result in the loss of adequate function of the lipid components of the cellular membranes.

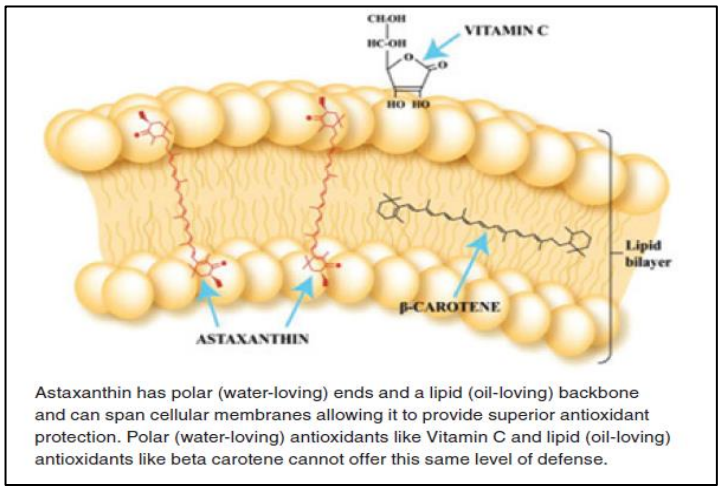


Fig.3. Astaxanthin offers better protection

to cell membrane

Physiological stress, air pollution, tobacco smoke, exposure to toxic chemicals, or exposure to ultraviolet (UV) light can enhance the production of ROS. Indeed, oxidative damage has been linked to aging, atherosclerosis, ischemia-reperfusion injury, macular degeneration of the eye, carcinogenesis, neurodegenerative diseases, bacterial and viral meningitis, and many other known health phenomena and diseases, all of which pathogenic conditions involve an underlying oxidative insult, either in their development or in their progression. On the other hand, this constant attack on the body is continuously countered by mechanisms designed to neutralize oxidative damage and prevent associated damage and diseases. An important defense mechanism in the body is the cascade of enzymes that neutralize the ROS prior to the induced damage (superoxide dismutase, catalase, glutathione peroxidase). This preventive pathway is extremely important, since it helps to support a healthy existence. Certain repair enzymes can reverse the damage produced by the ROS, as in the case of DNA breaks being enzymatically restored.

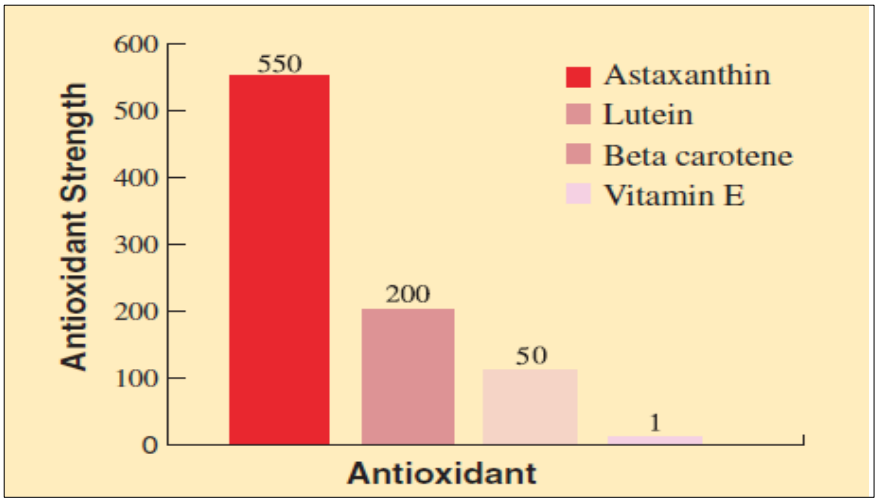


Fig.4. Singlet oxygen quenching rates

An additional defense mechanism against free radicals and reactive compounds in the body requires the action of special molecules, ones we call *antioxidants*. Antioxidants are a variety of substances from diverse chemical groups that share one common property: their ability to scavenge for the harmful free radicals and react with these active molecules. Some of the antioxidants in our defense system are synthesized in the body; some are solely consumed with the diet. Progression of, and in some cases even prevent, a wide array of health phenomena and diseases.

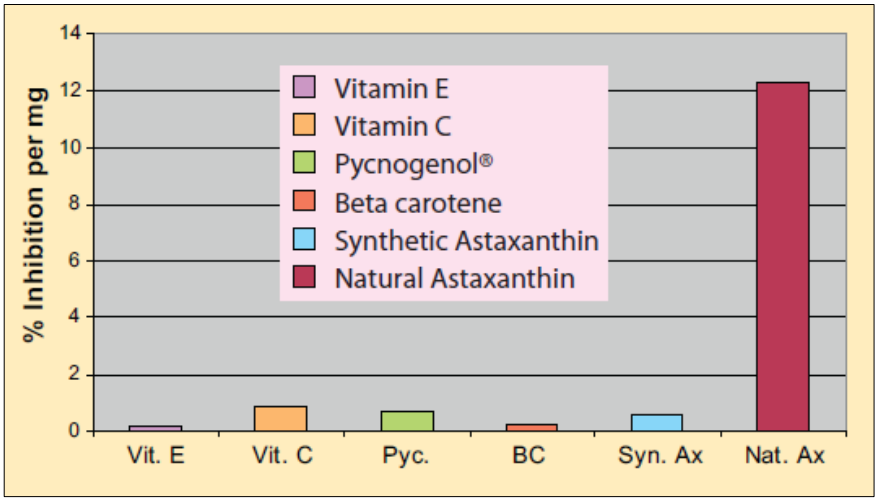


Fig.5. Oxygen free radical scavenging

Astashine capsules as a powerful antioxidant

Astaxanthin is a carotenoid that belongs to the xanthophyll sub-group, a family of oxygen-containing carotenoids. Unlike the most common carotenoid in the human diet, the Vitamin A precursor _-carotene, Astaxanthin possesses additional potent hydroxyl and ketone groups at both termini, which are responsible for its official chemical name, 3,3'-dihydroxy-_-_-carotene-4,4'- dione. Astaxanthin has two asymmetric carbons (carbons 3 and 3') in its side rings, and thus contains two chiral centers. Therefore, it may present three stereoisomers: 3S, 3'S form, 3R, 3'R form, and the meso form 3R, 3'S. Synthetic Astaxanthin consists of the racemic mixture of the three enantiomers, but only one form is abundant naturally: the 3S, 3'S isomer.

Astaxanthin consists of geometric isomers as well, all-trans isomer (all- E), and the cis isomers (mainly as 9Z and 13Z). In nature, Astaxanthin can appear as free Astaxanthin, monoester, or diester; while the most abundant geometric isomer in nature is the all-E isomer. In the microalgae *Haematococcus pluvialis*, Astaxanthin is accumulated mainly as monoester, partly as diester, and only in minor quantities as free Astaxanthin.

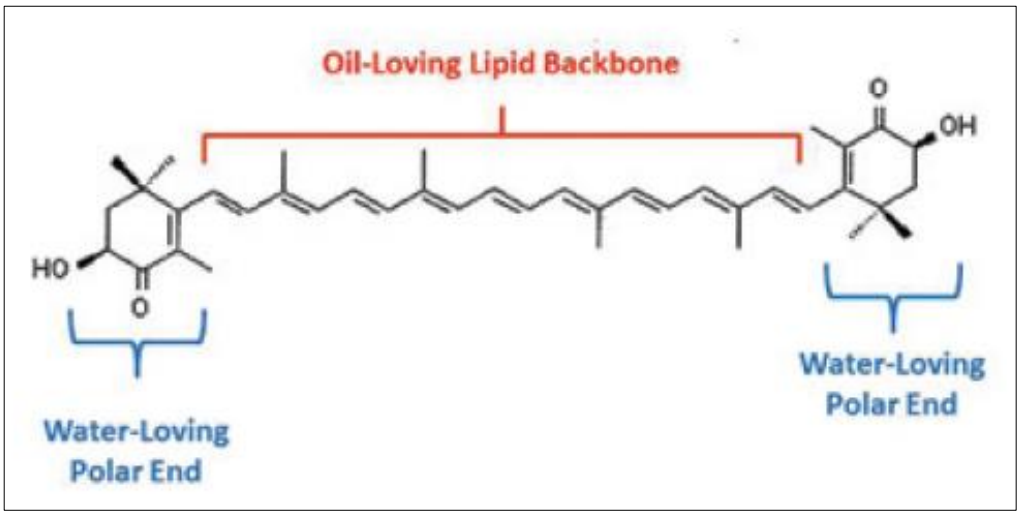


Fig.6. Molecular structure of Astaxanthin

Composition of Astashine capsules

Astaxanthin - 2mg.

(Naturally derived from Haematococcus pulvialis algae extract, which is microencapsulated).

Clinical Study Reports of Astaxanthin in Astashine Capsules

Clinical studies have shown that Astashine capsules have the strongest quenching effect against singlet oxygen, and a strong scavenging effect against free radicals. Astaxanthin was found to be at least 10 times stronger antioxidant than zeaxanthin, lutein, tunaxanthin, canthaxanthin, and beta-carotene, and 100 times stronger than Vitamin E.

Supplement	How many times Weaker than Astaxanthin	How many mg to equal 4mg of Astaxanthin
Astaxanthin		
Alpha Lipoic Acid	75 times weaker	300 mg
Green Tea Catechins	550 times weaker	2200 mg
CoQ10	800 times weaker	3200 mg
Vitamin C	6000 times weaker	24,000 mg

Fig.7. Clinical Study Reports of Astaxanthin

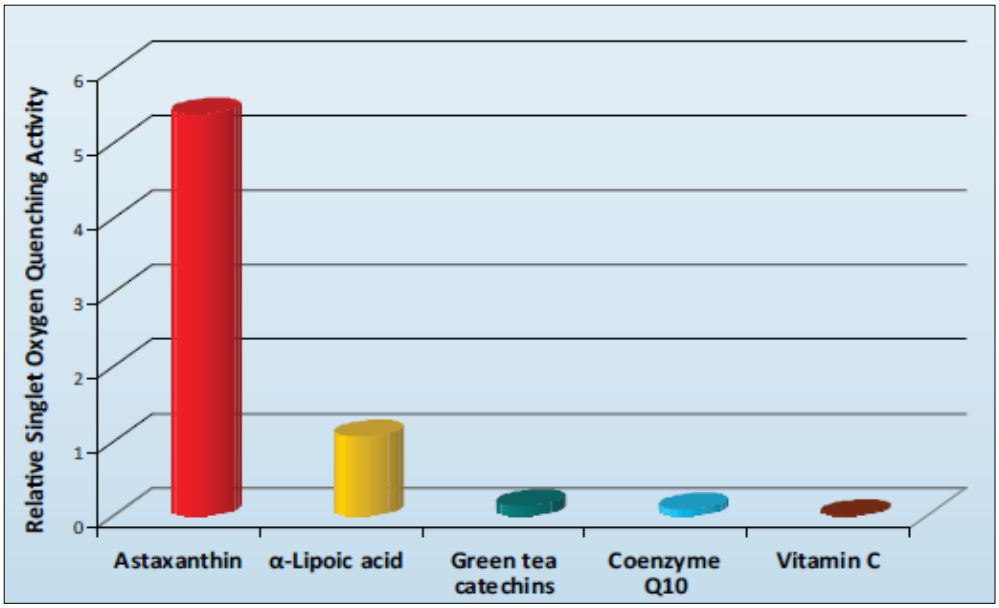


Fig.8. Oxygen quenching activity

Astaxanthin is a potent antioxidant nutrient with a wide variety of health benefits. Three recent studies demonstrate excellent anti-aging potential, especially to help preserve the efficiency of energy production during aging. Mitochondria are cell's Power house.

They need to function well in order to maintain efficient energy production, especially to offset the common decline in mitochondrial function that occurs during aging. Astaxanthin improves the mitochondrial function. Astaxanthin improves antioxidant status and decreases the levels of nitric oxide that is linked to inflammatory states in the circulation. Under the influence of astaxanthin, not only did mitochondria Organelle function better, they grew in physical size and demonstrated superior enzyme activity.

When mitochondria grow in size, a process called mitochondrial biogenesis is taking place, a key anti-aging event that is helping body energy production become more youthful [1]. Another study looked at the ability of bovine embryos to maintain normal growth and development under varying levels of heat stress. After disruptive stress was induced upon the embryos, astaxanthin was provided to the embryos, which recovered their normal function and growth pattern. Astaxanthin specifically localized with the mitochondria, rejuvenating normal energy production capability. [2]

In Another study, Japanese researchers from the Department of Aging Control, Juntendo University, provided doses of either 6 mg or 12 mg per day of astaxanthin in a randomized, double-blind, placebo-controlled study to test cognitive function in middle aged and elderly patients. Over a 12-week period both groups improved on learning tests, and the 12 mg per day group improved on cognitive testing.

The researchers concluded that astaxanthin "improves cognitive function in the healthy aged individuals." Of course, the brain requires efficient mitochondrial energy production in order to perform and is also helped by a reduction in free radical damage – two of the key mechanisms of astaxanthin benefit. Astaxanthin makes sense as part of an anti-aging nutritional program wherein a variety of nutrients help reduce free radical damage and excess inflammation while helping to improve the efficiency of energetic function [3].

Safety of Astashine Capsules

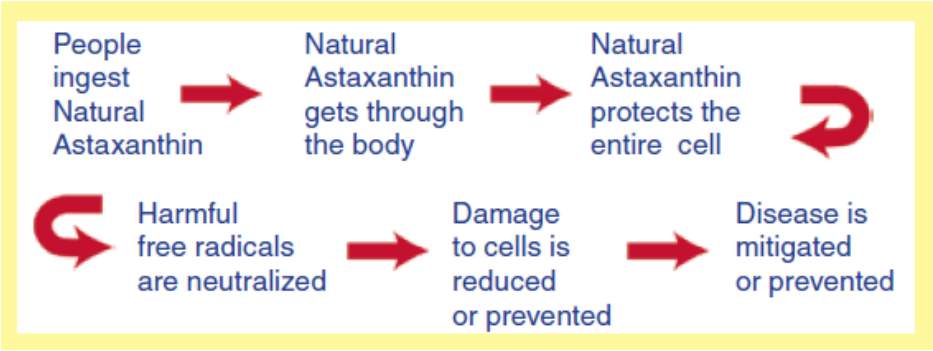
Astaxanthin has demonstrated safety in numerous human clinical trials. In one open-label clinical study on subjects with metabolic syndrome (n=17) . Astaxanthin (16 mg/day, for three months) significantly raised blood bilirubin ($p \leq 0.05$), potassium ($p \leq 0.05$), and creatine kinase ($p \leq 0.01$), although all three values remained within normal range. Also, astaxanthin significantly lowered the liver enzyme gamma-glutamyl transpeptidase (GGTP; $p \leq 0.05$). Since the researchers noted this enzyme was abnormally elevated in 11 of the 17 subjects at baseline, this astaxanthin effect may have been beneficial. Animal experiments have investigated astaxanthin at levels well over 120 mg/day in human equivalents, without causing apparent harm. Hoffman-La Roche confirmed its safety with extensive tests, including acute toxicity, mutagenicity, teratogenicity, embryotoxicity, and reproductive toxicity.

Suggested Dosage

The doses of astaxanthin used in clinical trials have ranged from 1 mg/day to 40 mg/day (with the majority in the 6-12 mg range); single-dose pharmacokinetic studies used up to 100 mg per dose. As a dietary supplement, astaxanthin should be taken along with fats, with or immediately prior to meals, to ensure its optimal absorption.

Summary and Conclusion

Astaxanthin's antioxidant activity has been demonstrated in several studies. In some cases, astaxanthin has up to several-fold stronger free radical antioxidant activity than vitamin E and b-carotene. The antioxidant properties of astaxanthin are believed to have a key role in several other properties such as protection against infection, aging and age-related diseases, or the promotion of the immune response, liver function and heart, eye, joint and prostate health.



Declarations

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Competing Interests Statement

The authors declare no competing financial, professional and personal interests.

Ethical Approval

Ethical approval for this research was given based on institutional/organizational guidelines.

Consent to participate

The consent to participate in this research was sought for and approved by the subjects to be used.

Consent for publication

Authors declare that they consented for the publication of this research work.

Availability of data and material

Authors are willing to share data and material according to the relevant needs.

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