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ANTIOXIDANTS



Antioxidants come up frequently in discussions about good health and preventing diseases. These powerful substances, which mostly come from the fresh fruits, and vegetables we eat, prohibit (and in some cases even prevent), the oxidation of other molecules in the body. The benefits of antioxidants are very important to good health, because if free radicals are left unchallenged, they can cause a wide range of illnesses and chronic diseases.

The human body naturally produces free radicals and the antioxidants to counteract their damaging effects. However, in most cases, free radicals far outnumber the naturally occurring antioxidants. In order to maintain the balance, a continual supply of external sources of antioxidants is necessary in order to obtain the maximum benefits of antioxidants. Antioxidants benefit the body by neutralizing and removing the free radicals from the bloodstream.

Antioxidants are compounds that were used to reduce damages in cell tissues by inhibiting oxidation. When chemicals in cell tissues undergo oxidation with drug compounds, produces free radicals, which in turn leads to the damage of the cells. They are available in the form of natural sources like Vitamins A, C, E and minerals like copper, zinc and selenium etc. Antioxidants are mostly available in fruits, vegetables, pulses, whole grains, meat, poultry, seafoods, herbs and spices.

Different Antioxidants Benefit Different Parts of the Body

There are a wide range of antioxidants found in nature, and because they are so varied, different antioxidants provide benefits to different parts of the body. For example, beta-carotene (and other carotenoids) is very beneficial to eye health; lycopene is beneficial for helping maintain prostate health; flavonoids are especially beneficial for heart health; and proanthocyanidins are beneficial for urinary tract health.

Mechanism of Action of Antioxidants

Antioxidants are a type of chemical that protects the body against free radicals toxicity. They work on different levels, such as preventing chain reactions from starting by eliminating free

radicals (preventing antioxidants), generating reactions that break the chain sequence that causes cell damage (antioxidants free radical scavengers), and so on. They also eliminate peroxides, preventing the formation of reactive oxygen species in the future (ROS).

Preventive Antioxidants

Lipid oxidation is inhibited by preventive antioxidants. It is a collection of free radical processes involving fatty acids and oxygen that results in lipid oxidation, which causes changes in color, odor, and texture in fatty acid compositions. Lipid oxidation shows high effect in storage conditions. Preventive antioxidants inhibit lipid oxidation by inactivating lipoxygenase enzyme. Vitamin A, C, E, Carotenoids, lycopene, zeaxanthin and selenium are having preventive antioxidant activities.

Free Radicals Scavengers

Free radicals are an atom with one or more unpaired electrons which are highly reactive. Free radicals □ scavengers are endogenous substances when combined with free radicals interrupts the formation of free radical chains and reduces the damage of cell diseases. **They are also called as chain breakers. Vitamin E, C, bilirubin, uric acid is having the property of free radical scavenger activity.**

Reactive Oxygen Species (ROS)

For typical physiological activities, ROS serve as cell signaling molecules. However,

the production of reactive oxygen species (ROS) can cause damage to a variety of cellular organelles and activities, disrupting normal physiology. ROS are primarily beneficial to cells, supporting basic cellular activities and viability, and oxidative stress arises only when a normal cell death pathway is deliberately activated. The ability of cells to maintain a constant quantity of reactive oxygen species (ROS) is critical for their survival. Different cellular organelles such as mitochondria, peroxisomes., and endoplasmic reticulum, where oxygen consumption is substantial are endogenous producers of ROS.

Antioxidants as Nutraceuticals

Nutraceuticals is a term used to describe foods, dietary supplements, and food constituents that have medical advantages. Natural source pharmaceuticals and foods play a vital role in public health and illness prevention.

Antioxidants, as nutraceuticals, have a high biological activity and have helped to progress medical science. Antioxidants, as nutraceuticals play a significant impact in neurogenic illnesses in recent investigations. Nutraceuticals ingredients contain Phyto chemicals like alkaloids, polyphenols, anthocyanins, flavones, flavanols, isoflavones, phenolic acids, stilbenes, ellagic acids and many more are significant source of antioxidants. They are naturally having bio-active chemical compounds which had high therapeutic effects in prevention of diseases and also having less adverse effects.

Benefits of Nutraceuticals Antioxidants in Disease Treatment¹

Nutraceutical antioxidants are widely used in treatments of cancer, heart diseases, skin diseases, neuro degenerative disorders and Type 2 diabetics and others.

Heart Diseases

Oxidative stress plays a key role in heart diseases, without adequate amount of oxygen free radicals damages the cell tissues. Antioxidants reduce the low-density lipoprotein (cholesterol) which in turn decreases the risk of heart attack. Dietary antioxidants such as beta β -carotene, alpha-carotene and ascorbic acids also reduce the chances of cardiac risk.

Cancer Diseases

Excessive administration of anti β -neoplastic agents result in oxidative stress by production of Reactive Oxygen Species (ROS). Antioxidants detoxify ROS and enhances the anticancer effects of chemotherapy. Several studies suggests that dietary supplementation of antioxidants during cancer treatment influences the chemotherapy. Supplements like Vitamin A, Vitamin B, Vitamin C, Vitamin D3, Beta β -Carotene, Selenium and Glutathione are used in single or in combinations with drugs in chemotherapy.

Skin Diseases

When skin is exposed to high levels of ultraviolet light, photo-

oxidative damage is induced by the formation of different types of reactive species of oxygen, including singlet oxygen, superoxide radicals, and peroxide radicals. These forms of reactive oxygen damage cellular lipids, proteins, and DNA, and they are considered to be the primary contributors to erythema (sunburn), premature aging of the skin, photodermatoses, and skin cancers.

Astaxanthin, followed by beta-carotene combined with vitamin E has been shown to be one of the most powerful antioxidant combinations for helping protect the skin from reactive species of oxygen.

Antioxidants and Immune System Support

Singlet oxygen can compromise the immune system, because it has the ability to catalyze production of free radicals. Astaxanthin and Spirulina have been shown to enhance both the non-specific and specific immune system, and to protect cell membranes and cellular DNA from mutation. Astaxanthin is the single most powerful quencher of singlet oxygen, and is up to ten times stronger than other carotenoids (including beta-carotene), and up to 500 times stronger than alpha tocopherol (Vitamin E), while Spirulina has a variety of antioxidants and other substances that are beneficial in boosting immunity.

Parkinson's disease (PD) is one of the major progressive neurological disorders for which no

preventative or long-term effective treatment strategies are available. Epidemiologic studies have failed to identify specific environmental, dietary or lifestyle risk factors for PD except for toxic exposure to manganese, meperidine (Demerol®), the □ designer drug □ version of which often contains a toxic byproduct of the synthesis, 1-methyl-4-phenyl 1,2,3,6 tetrahydropyridine [MPTP]), and some herbicides and pesticides. The search for genetic risk factors such as mutation, overexpression or under expression of nuclear genes in DA neurons in idiopathic PD has not been successful as yet. Polymorphism in certain genes appears to be a risk factor, but there is no direct evidence for the causal relationship between polymorphism and increased risk of PD. Although the nature of neurotoxins that cause degeneration in DA neurons in PD is not well understood, oxidative stress is one of the intermediary risk factors that could initiate and/or promote degeneration of DA neurons. Therefore, supplementation with antioxidants may prevent or reduce the rate of progression of this disease. Supplementation with multiple antioxidants at appropriate doses is essential because various types of free radicals are produced, antioxidants vary in their ability to quench different free radicals and cellular environments vary with respect to their lipid and aqueous phases. L-dihydroxyphenylalanine (L-dopa) is one of the agents used in the treatment of PD. Since L-dopa is known to produce free radicals during its normal metabolism, the

combination of L-dopa with high levels of multiple antioxidants may improve the efficacy of L-dopa therapy.

Neuro Degenerative Disorders

Due to lack of oxygen free radicals generally produces disorders in brain which in turn results in neurological disorders. Diseases Alzheimer□s, Parkinson□s, Down syndrome which are a type of neuro degenerative can be treated using nutraceutical antioxidants.

Other diseases like Type 2 diabetics, inflammation, lowering cholesterol, wound healing; blood clotting, liver fibrosis and many more can be treated by nutraceutical antioxidants.

Antioxidants as supplements

Randomized controlled trials provides the strong evidence that offering little support from evidence that antioxidants in the treatment provides substantial protection against heart diseases, cancer and other chronic disorders. Antioxidants can be taken as supplements directly or with combination of existing drugs used in treatment of diseases.

But taking of high dosage of antioxidant supplements results in severe health issues like high doses of beta □carotene increase the chances of lung cancer in smokers, high dosage of Vitamin E supplements may increase prostate cancer. Overdosing has serious symptoms such as struggling in breathing, passing out, nausea, vomiting.

Taking too many antioxidant supplements especially Vitamin C and E can interfere with how your body adapts to exercise and eliminates the health benefits associated with exercises. Generally, Vitamin A is important for fetal growth and development but high dosages of Vitamin A supplement led to increase in the risk of birth defects.

Antioxidants in Pharmaceutical Products

Antioxidants are used to improve the shelf life of pharmaceutical products by inhibiting oxidation of molecules of a product and preventing early damage of the drug compounds like ascorbic acids, Butylated Hydroxy Anisole, Butylated Hydroxyl Toluene, etc are used as antioxidants in pharmaceutical products like

Ascorbic acid

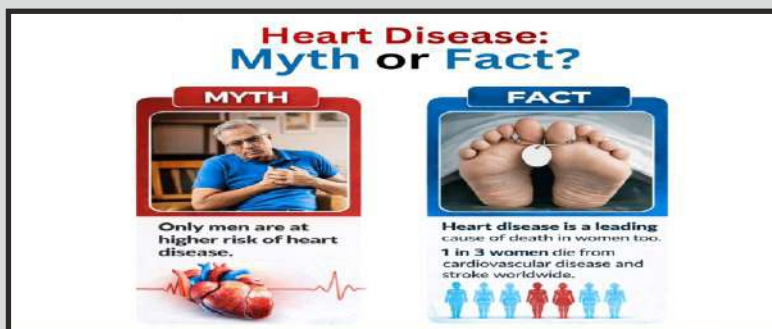
Ascorbic Acid is mainly used as antioxidants in food industries as preservatives. They prevent spoilage

of the food and maintains freshness of the food and also used in cosmetic products by stimulating the activity of enzymes involved in collagen production and tissue regeneration. It is also used as acidity regulators, stabilize biological materials prior to microscopically examinations in pharmaceutical industries.

Increasing one's antioxidant intake is essential for optimum health, especially in today's polluted world. Because the body just can't keep up with antioxidant production, a good amount of these vitamins, minerals, phytochemicals, and enzymes must come from one's daily diet. ★

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