Review Article

Eye Diseases-Treatment and Prevention with Antioxidants

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Abstract

Modern medical science development without the knowledge or some ideas about free radical can not be accepted. So it is impossible to improve the medical science without the sufficient knowledge of anti-oxidants. Oxidative stress appears to be an important part of many human diseases, the use of antioxidants in pharmacology is intensively studied, particularly as treatments for age related macular degeneration, stroke and neurodegenerative diseases. However, it is unknown whether oxidative stress is the cause or the consequence of disease. Antioxidants are frequently added to industrial products. A common use is as stabilizers in fuels and lubricants to prevent oxidation, and in gasolines to prevent the polymerization that leads to the formation of engine-fouling residues. They are widely used to prevent the oxidative degradation of polymers such as rubbers, plastics and adhesives that causes a loss of strength and flexibility in these materials.

Oxidation is a chemical reaction that transfers electrons or hydrogen from a substance to an oxidizing agent. Oxidation reactions can produce free radicals. In turn, these radicals can start chain reactions. When the chain reaction occurs in a cell, it can cause damage or death to the cell. Antioxidants terminate these chain reactions by removing free radical intermediates, and inhibit other oxidation reactions. They do this by being oxidized themselves, so antioxidants are often reducing agents such as thiols, glutathione, vitaminC,and vitamin E as well as enzymes such as catalase, superoxide dismutase and various peroxidases.

Introduction

Before going to know something about anti-oxidants it is essential primarily to acquire some knowledge about free radicals or free ions.

Antioxidant is a molecule capable of inhibiting the oxidation of other molecules. Oxidation is a chemical reaction that transfers electrons or hydrogen from a substance to an oxidizing agent. Oxidation reactions can produce free radicals. In turn, these radicals can start chain reactions. When the chain reaction occurs in a cell, it can causedamage or death to the cell.

Low levels of antioxidants, or inhibition of the antioxidant enzymes, cause oxidative stress and may damage or kill cells.

Antioxidants are widely used as ingredients in dietary supplements and have been investigated for the prevention of eye diseases such as age related macular degenerative diseases, corneal,epithelial and endothelial diseases ,early onset cataract ,degenerative changes in the vitreous, ocular muscles weakness like ocular motility defects, drooping of upper eye lids, sphincter pupillae, dilator papillae and ciliary smooth musle diseases etc. Antioxidant supplements might promote health.

As oxidative stress appears to be an important part of many human diseases, the use of antioxidants in pharmacology is intensively studied, particularly as treatments for stroke and neurodegenerative diseases.

Antioxidants are widely used as ingredients in dietary supplements and have been investigated for the prevention of some other diseases such as cancer, coronary heart disease and even altitude sickness. Although initial studies suggested that antioxidant supplements might promote health, later large clinical trials did not detect any benefit and suggested instead that excess supplementation is harmful.

Source of antioxidants

Antioxidants are found in varying amounts in foods such as vegetables, fruits, grain cereals, eggs, meat, legumes and nuts[1]. Some antioxidants such as ascorbic acid can be destroyed by long-term storage or prolonged cooking. Other antioxidant compounds are more stable, such as the polyphenolic antioxidants in foods such as whole-wheat cereals and tea. The effects of cooking and food processing are complex, as these processes can also increase the bioavailability[4] of antioxidants, such as some carotenoids in vegetables In general, processed foods contain fewer antioxidants than fresh and uncooked foods

Antioxidant compounds	Foods containing high levels of these antioxidants
Vitamin C (ascorbic acid)	Fresh Fruits and vegetables
Vitamin E (tocopherols, tocotrienols)	Vegetable oils
Polyphenolic antioxidants (resveratrol,flavonoids)	Tea, coffee, soy, fruit, olive oil,
Carotenoids (lycopene, carotenes,lutein)	Fruit, vegetables and eggs.[230]

Metabolites

Antioxidants are classified into two broad divisions[1], depending on whether they are soluble in water (hydrophilic) or in lipids (hydrophobic). In general, water-soluble antioxidants react with oxidants in the cell cytosol and the blood plasma, while lipid-soluble antioxidants protect cell membranes from lipid peroxidation[5]. These compounds may be synthesized in the body or obtained from the diet[4]. The different antioxidants are present at a wide range of concentrations in body fluids and tissues, with some such as glutathione[3] mostly present within cells, while others such as uric acid are more evenly distributed.

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Ascorbicacid or "vitaminC" isa monosaccharide oxidationreduction[13] catalyst found in both animals and plants. Most animals are able to produce this compound in their bodies and do not require it in their diets.

Uric acid (UA) is an oxypurine[4] produced from xanthine by the enzyme xanthine oxidase, and is an intermediate product of purine metabolism., Urate oxidase further catalyzes the oxidation of uric acid to allantoin SerumGlutathione is a cysteine-containing peptide found in most forms of aerobic acid. It is not required in the diet and is instead synthesized in cells from its constituent amino acids.

Melatonin is a powerful antioxidant and, unlike conventional antioxidants such as vitamins C and E and glutathione, it is both produced in the human body and is acquired in the diet.

VitaminE is the collective name for a set of eight related tocopherols[3] and tocotrienols, which are fat-soluble vitamins with antioxidant properties. Of these, α-tocopherol has been most studied as it has the highest bioavailability, with the body preferentially absorbing and metabolising this form.

Results of antioxidants in eye

The reactive oxygen species produced in cells include hydrogen peroxide (H_2O_2), hypochlorous acid (HClO), and free radicals such as the hydroxyl radical (•OH) and the superoxide anion (O_2^-). The hydroxyl radical is particularly unstable and will react rapidly and non-specifically with most biological molecules. This species is produced from hydrogen peroxide in metal-catalyzed redox reactions. These oxidants can damage cells of corneal epithelium,lens epithelium,retinal cells by starting chemical chain reactions such as lipid peroxidation or by oxidizing DNA or proteins Damage to DNA cancause mutations and possibly cancer.

Measurement of antioxidants is not a straightforward process, as this is a diverse group of compounds with different reactive oxygen species.

Effects of physical exercise

During exercise, oxygen consumption can increase by a factor of more than one. This leads to a large increase in the production of oxidants and results in damage that contributes to muscular fatigue during and after exercise. The inflammatory response that occurs after strenuous exercise is also associated with oxidative stress, especially in the 24 hours after an exercise session. The immune system response to the damage done by exercise peaks 2 to 7 days after exercise, which is the period during which most of the adaptation that leads to greater fitness occurs. During this process, free radicals are produced by neutrophils[8] to remove damaged tissue.

Adverse effects: There is evidence that antioxidant supplements promote disease and increase mortality in humans. It was previously proposed on a hypothetical basis that free radicals may induce an endogenous response culminating in more effective adaptations which protect against exogenous radicals[6]

Treatment

Recent experimental evidence strongly suggests that this is indeed the case, and that such induction of endogenous free radical production extends the life span. Consequently, antioxidants are commonly used as medications to treat various forms of macular diseasee2.

Disease Prevention

As with the chemical antioxidants, cells are protected against oxidative stress by an interacting network of antioxidant enzymes. Here, the superoxide2 released by processes such as oxidative phosphorylation4 is first converted to hydrogen peroxide and then further reduced to give water. This detoxification pathway is the result of multiple enzymes. As with antioxidant metabolites, the contributions of these enzymes to antioxidant defenses can be hard to separate from one another.

Oxidative stress in disease

Oxidative stress is thought to contribute to the development of a wide range of diseases including Alzheimer's disease, Parkinson's disease[4] the pathologies caused by diabetes, rheumatoid arthritis, age related macular degeneration and neurodegeneration in motor neuron diseases[5] .

Oxidative damage in DNA can cause cancer. However, several antioxidant enzymes such as superoxide dismutase, catalase, glutathione peroxidase, glutathione reductase, glutathione S-transferase etc. protect DNA from oxidative stress[6].

The macular cells are uniquely vulnerable to oxidative injury, due to its high metabolic rate and elevated levels of polyunsaturated lipids[7], the target of lipid peroxidation Consequently, antioxidants are commonly used as medications to treat various forms of macular injury[8] Here, superoxide dismutase, mimetic sodium thiopental and propofol are used to treat reperfusion injury and brain injury and in the treatment of stroke. These compounds appear to prevent oxidative stress[9] in neurons and prevent apoptosis and neurological damage. Antioxidants are also being investigated as possible treatments for neurodegenerative diseases such as Alzheimer's disease Parkinson's disease[10] and amyotrophic lateral sclerosis[11], and as a way to prevent noise-induced hearing loss. Targeted antioxidants may lead to better medicinal effects. Mitochondria-targeted ubiquinone, for example, may prevent damage to the reina caused by excessive alcohol.[11]

People who eat fruits and vegetables have a lower risk of retinal disease[12] and some neurological diseases and there is evidence that some types of vegetables, and fruits in general, protect against some cancers[13] Since fruits and vegetables happen to be good sources of antioxidants, this suggested that antioxidants might prevent some types of diseases.. This suggests that these health benefits come from other substances in fruits and vegetables or come from a complex mix of substances.

Combinations of antioxidants, like the "ACES"[14] products that contain beta carotene (provitamin A), vitamin C, vitamin E and Selenium, or herbs that contain antioxidants-such as green tea . While antioxidant supplementation is widely used in attempts to prevent the development of cancer, it has been proposed that antioxidants may, paradoxically, interfere with cancer treatments.

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