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Mechanisms of Action and Characteristics of Antioxidants

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Description

Oxidative stress in biological systems is a complex process characterized by an imbalance between the production of free radicals and the body's ability to eliminate these active forms through endogenous and external antioxidants. During metabolic processes, a wide variety of reactions occur, with the promoters being the active form of oxygen, such as hydrogen peroxide and superoxide radical anion, among others. The biological system in which there is an overdose of ROS can produce a variety of pathologies, from heart disease to cancer promotion. Biological systems have antioxidant mechanisms to control enzymatic and non-enzymatic environmental damage that allows ROS to be inactive. Endogenous antioxidants are enzymes, such as superoxide dismutase, catalase, glutathione peroxidase, or non-enzymatic compounds, such as bilirubin and albumin. When a substance is exposed to high concentrations of ROS, the endogenous antioxidant system is compromised and, as a result, fails to ensure complete immune protection. To compensate for the deficiency of antioxidants, the body can use external antioxidants that are supplied with food, nutritional supplements, or medications. Among the most important external antioxidants are phenolic compounds carotenoids and vitamin C and other minerals such as selenium and zinc.

Characteristics of antioxidants

A key component of a compound or antioxidant system is the prevention or detection of oxidative propagation, by stabilizing the produced radical, thus helping to reduce oxidative damage in the human body. There are two main types of antioxidants, primary (chain reaction, free radical scavengers) and secondary or preventive. Secondary antioxidant methods may include iron blockade, inhibition of lipid hydroperoxides by disrupting the production of unwanted volatiles, reactivation of key antioxidants, and termination of singlet oxygen. Therefore, antioxidants can be defined as "those substances, in small amounts, that work to prevent or significantly delay the oxidation of oxidizable substances such as fats.

Mechanisms of action of antioxidants

The compound that reduces *in vitro* radicals does not really work as an antioxidant in the *vivo* system. This is because FR is fragile and easily spread. Some have very short life spans, in nanoseconds, so it is difficult for an antioxidant to be present at a time and place where oxidative damage is produced. Additionally, the reaction between antioxidants and FR is a secondary reaction. Therefore, they depend not only on the concentration of free antioxidants and radicals but also on factors related to the chemical structure of reagents, medium and reaction conditions.

Metabolism of hydroxycinnamates: Hydroxycinnamic acids are among the most abundant antioxidant foods, found in many vegetables, fruits, grains and beverages. These compounds can be present in plants in free form, or as compounds (e.g. as esters in chlorogenic acid, rosmarinic acid, etc.), and are widely known as structural elements in the biosynthesis of many phenolic compounds of plants such as lignans or flavonoids.

Metabolism of resveratrol: Resveratrol is probably the most popular antioxidant in the diet. This stilbene is best known for the "magic" that combines the skin of green grapes and red wine, and it occurs in low amounts in several foods that include a variety of berries, tomato skin, peanuts, pistachios, cocoa, etc.

Metabolism of luteolin: Luteolin is a type of catechol-B-ring that contains flavone, which is found in many plants, vegetables and medicinal plants, and is essential for many health benefits including anti-inflammatory, neuroprotective and chemo-preventive effects.

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