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Short Communication

Antioxidant Therapy to Protect Against Free Radical Damage Implicated in Coronary Heart Disease and Cancer

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Abstract

Free radical exposure is a causative factor in both cancer and coronary artery disease (atherosclerosis). Free radicals are highly reactive unstable molecular fragments that alter DNA creating mutant cells that proliferate out of control causing tumors throughout the body and bulges inside artery walls. The body produces enzymes which act as *free radical scavengers* that neutralize as many free radicals as possible before they can cause harm. Unfortunately, our modern lifestyle generates far more free radicals than the body has mechanisms for coping. Fortunately, there are naturally occurring antioxidants that protect against free radical damage. This study provides the therapeutic levels of five supplementary nutrients required to protect cells from the damaging effects of oxygen radicals.

Keywords: Antioxidants; Free Radicals; Coronary Artery Disease; Atherosclerosis; Cancer

Introduction

Free radicals are highly reactive unstable molecular fragments that have a lifespan of only a fraction of a second but during that time can cause genetic change, including chromosomal rearrangement and mutations that precipitate both carcinogenic and atherosclerotic processes [1-3].

Exogenous sources of free radicals include environmental pollution, tobacco smoke, industrial solvents, radiation (X-rays, gamma rays), ozone, and chlorinated drinking water. Dietary sources of free radicals include fried foods, polyunsaturated vegetable oils, and nitrite food preservatives. Polyunsaturated oils are chemically unstable because of multiple loose double carbon bonds in their chemical structure. When subject to heat, polyunsaturated molecules oxidize rapidly to form hazardous free radicals [4-6].

Fortunately, there are naturally occurring antioxidants and free radical scavengers that protect against free radical damage [7, 21]. These include vitamin C, vitamin E, selenium, manganese, and zinc [8-16].

Free Radicals and Abnormal Cell Growth

A free radical is a renegade molecule containing an unpaired electron in its outer orbital [4]. The odd number of electrons of a free radical makes it unstable, short lived, and highly reactive. A first free radical instantly pulls an electron from a molecule, thus turning it into a second free radical that starts a chain reaction cascade that finally damages the living cell [2]. Cascading free radicals alter DNA to create mutant cells that proliferate out of control.

Tumor suppressor genes are proteins that regulate a cell during cell division and replication [6]. When a tumor suppressor gene is mutated by free radicals, the cell it used to regulate proliferates out of control, leading (a) to the growth and development of cancers; and (b) to abnormal growth and swelling between the endothelium lining and smooth muscle wall of arteries, which growths structurally resemble benign tumors. Free radical exposure precedes both cancer and atherosclerosis [2, 5].

Free radicals attack the smooth muscles in arteries [23-27]. These attacks create mini-tumors within arterial walls. As each tumor grows, a tiny tear develops in the endothelium. The blood's coagulating mechanism responds by depositing fibrin, a clotting protein that retracts to stop the loss of blood. This rough scab-like structure becomes a matrix that traps calcium, heavy metals, macrophages, and cellular debris [26-29]. To prevent obstruction from additional debris becoming trapped in the burgeoning atherosclerotic matrix, the body covers it over with a smooth layer of cholesterol. Note that cholesterol is the last substance laid down in the arterial plaque and not the first. This outer layer of cholesterol tends to become oxidized from further free radical attack [29]. Cholesterol thus appears to serve a dual protective role: (1) to improve blood flow by adding a smooth surface to the damaged arterial wall; and (2) to prevent free radicals from causing further damage to the artery itself.

Free Radical Scavengers

Oxygen free radicals are especially dangerous because they react with so many other kinds of molecules. The body pro-

duces enzymes which act as *free radical scavengers* that neutralize as many free radicals as possible before they can cause harm. Catalase breaks down hydrogen peroxide, glutathione peroxidase neutralizes other peroxides, and superoxide dismutase (SOD) neutralizes superoxide. These scavenger enzymes require an adequate supply of selenium, zinc, and manganese in order to function well [17]. Unfortunately, our modern lifestyle generates far more free radicals than the body has mechanisms for coping.

Vitamin C

Vitamin C facilitates the body's production of coenzyme Q10, an internally generated antioxidant [18].

Relatively large amounts of vitamin C (ascorbic acid) are required; if you want results, you have to use enough to get the job done [20]. Supplementation required to provide optimal levels of CoQ10 appears to fall within the range of 4,000 to 4,500 mg daily [22]. Vitamin C is most efficiently utilized when taken throughout the day in divided amounts with meals.

Vitamin E

Vitamin E is a fat-soluble antioxidant that protects against free radicals, including superoxides, hydroxyl radicals, peroxides, and hydroperoxides [18]. Supplementation required to provide optimal antioxidant protection appears to fall within the range of 600 to 650 IU daily [22]. Most efficiently utilized are the two natural forms of vitamin E, d-alpha tocopherol and d-alpha tocopheryl succinate.

Selenium

Selenium may be hundreds of times more potent than vitamin E as an antioxidant [19]. The body incorporates selenium into glutathione peroxidase; an antioxidant enzyme that detoxifies hydrogen peroxide and fatty acid peroxides [18]. Supplementation required providing optimal antioxidant protection appears to fall within the range of 200 to 350 mcg daily [22]. The safest and most efficient source of this micro mineral is selenium amino acid chelate.

Manganese

Manganese facilitates the body's production of free radical scavengers [18]. Supplementation required to provide optimal benefits from manganese appears to fall within the range of 15 to 25 mg daily [22]. The most efficient source of this mineral is the organic molecule, manganese gluconate.

Zinc

Zinc facilitates the body's production of free radical scavengers [18]. Supplementation required to provide optimal benefits from zinc appears to fall within the range of 25 to 35 mg daily. The most efficient source of this mineral is the organic molecule, zinc gluconate.

Conclusion

Free radicals are highly reactive molecular fragments that damage DNA to create mutant cells that proliferate out of control. This rampant cellular proliferation damages arteries and creates tumors throughout the body. Our modern lifestyle generates far more free radicals than the body has mechanisms for coping. This study recommends therapeutic levels of five naturally occurring antioxidants to protect cells from the damaging effects of oxygen radicals.

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