

Chapter 13

Clinical Role of Antioxidants in the Treatment of Diseases

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ABSTRACT

Antioxidants are our first line of defense against free radical damage and are critical for maintaining optimum healthcare. Although most of the present day research is focused on the potential benefits of antioxidant nutrients or supplements, it has become clear that the best protection against oxidative stress involves a wide assortment of interrelated antioxidants and antioxidant cofactors. Additionally, the combination of several suboptimal concentrations of these kinds of detoxifying supplements may have an additive or even synergistic role to decrease the risk of some of diseases which are caused by aging. Adequate intake of fruit and vegetables have essential antioxidants like B-carotene and vitamin C, which are reported for decreasing the risk of cancer and coronary heart disease (CHD).

INTRODUCTION

Oxygen is a highly reactive atom that is capable of becoming part of potentially damaging molecules commonly called free radicals that are responsible to oxidative stress. Free radicals are capable of causing pathogenesis of healthy cells to lose their structures and functions causing degenerative diseases of aging such as cancer, cardiovascular disease, cataracts, immune system decline, and brain dysfunction. Antioxidants are capable of stabilizing, or deactivating these free radicals before they attack the healthy cells to maintain optimal cellular and systemic health and human well-being. The need for antioxidants becomes more important with increased

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exposure to free radicals due to pollution, cigarette smoke, drugs, illness, stress, and even exercise can increase free radical exposure that contribute to oxidative stress of every individual. So, many experts believe that the Recommended Dietary Allowance (RDA) for specific antioxidants may be required to live healthy lifestyle and a well-balanced, wholesome diet and adequate antioxidant supplementation to improving free radical protection. Many diseases become more prevalent with the increase of age such as inflammatory diseases, neurodegenerative diseases, diabetes, cancer, and cardiovascular diseases. Reactive oxygen species are believed to be involved in the etiology of these kinds of diseases and conversely, antioxidants are believed to be protective. A balanced diet (including plenty of fruit, vegetables, grains, oils and nuts) should provide most individuals with a complement of antioxidants that is sufficient to protect their body against many diseases. In the treatment of these diseases, antioxidants have a potential role being safe, the toxicity of three selected antioxidants such as vitamin E, beta-carotene, vitamin C and lipoic acid. It is believed that antioxidants have their protective effect by decreasing oxidative damage to DNA and by decreasing abnormal increases in cell division. Cigarette smoking and chronic inflammation have been reported to be two of the major causes of cancer that have strong free radical components in their mechanisms of action as compared to non-smokers are at an increased risk of having cancer and cardiovascular diseases. It can therefore be seen that although antioxidants are generally regarded as safe compounds, even at high concentrations, or after metabolism, reactive species may be generated, which can have a pro-oxidant effect. As well as, it is also important factor to consider in determining the safety of antioxidant supplements on our general health to understand the mechanism of action of antioxidants and their metabolites (both beneficial and toxic activities) which could contribute to a better knowledge of the optimum dose that could have a beneficial effect upon our health, without having a detrimental effect.

Poor diet, stress, lack of exercise, and genetic factors, all of these factors contribute many disease due to aging and tissue or cell degeneration that led to an interest in the potential role of antioxidants to slow down disease progression or prevent its manifestation. Free radicals are electrically charged molecules that 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 occurrence of chain reaction. And until subsequent free radicals are deactivated, thousands of free radical reactions can occur within seconds of the initial reactions. Antioxidants are capable of stabilizing, or deactivating, free radicals before they attack cells (Langseth, 1993). Reactive oxygen species (ROS) encompasses all highly reactive, oxygen-containing molecules, including free radicals like hydroxyl radical, the superoxide anion radical, hydrogen peroxide, singlet oxygen, nitric oxide radical,

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