

Dietary Antioxidants: “The Magic Bullets for Good Health”

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Abstract: *During metabolic processes in our body some reactive oxygen species (ROS) and free radicals are formed. Higher concentrations of these species causes cell damages resulting in certain cancers and cardiovascular diseases. Antioxidants are the compounds which scavenge these free radicals and reduce the oxidative stress. Many dietary antioxidants obtained from plants are found to be very useful for prevention against diseases. Among thousands of different antioxidants some important class of compounds are vitamin-C, vitamin-E, carotenoids, flavonoids, isoflavonoids, polyphenols, anthocyanins etc. besides these selenium, zinc are also important antioxidants. Because of their bioactivity and pharmacokinetics in prevention of health these have become a subject of increasing interest and promising field for further studies.*

Keywords: Reactive oxygen species (ROS), Antioxidants, polyphenols, carotenoids, flavonoids

1. Introduction

Oxygen is vital for most organisms, but during metabolism some unstable molecules are produced, these are called free radicals and Reactive Oxygen Species (ROS). Some common ROS produced are H₂O₂, hydroxide ion, and superoxide ion O₂⁻. [1] These free radicals are inevitable byproducts when food turns into energy in our body. Although the ROS play an important role in some physiological processes which include immune response, growth factors and damaged cell elimination (engulf and kill some bacterial stains). [2]

Our body can cope up with some free radicals and needs them for effective functioning, but overload of free radicals may become irreversible and causes damage to key biological sites leading to certain potent diseases which include cardiovascular diseases, cancers, diabetes, cataract, arteriosclerosis, Alzheimer disease, Parkinson’s disease, arthritis etc. [3]. These free radicals abstract electrons from other molecules and damage DNA, cell membranes and other structures resulting in a variety of pathological changes as they accumulate with age in body. During photosynthesis in plants the ROS are also produced in plants and plants employ antioxidants to defend them. [4]. So intake of plant based antioxidants rich food is supposed to be important in maintaining human health traditionally.

Antioxidants “the free radical fighters” are the compounds which neutralize free radicals by giving them electrons; they reduce the oxidative stress and thus scavenge free radicals from body. Antioxidants work according to situations, sometimes they are electron donors and sometimes they are electron grabbers and act like preoxidants.

Antioxidants got public attention in 1990’s. In 1991 scientists of United States Department of Agriculture, USA created a rating tool called ORAC (Oxygen Radical Absorbance Capacity) for antioxidant content of foods [5]. Some foods have the super food status because of high

antioxidant content. Antioxidants may be enzymatic or nonenzymatic. Enzymatic antioxidants include glutathione peroxidase, catalase, superoxide dismutase. Non enzymatic antioxidants include glutathione, some vitamins and metals and some phytochemicals like flavonoids, isoflavonoids, anthocyanins, poly phenols etc. [1]

There are thousands of different biologically active constituents of plants which have potential antioxidant activity. An antioxidant rich diet is useful in prevention of atherosclerosis. Poly phenols, vitamin-E, vitamin-C, carotenoids (lycopene and beta carotene), coenzymes prevent LDL and endothelium oxidation. [3]. Poly phenols and anthocyanins were found to contain increasing amount of non-vitamin antioxidants [4].

Antioxidant enzymes act as first line defense for the lungs. These help in reducing inflammation of chronic airways produced by ROS. [6]. In asthma reduced level of dietary antioxidants have been reported. Xanthones are found to be effective for neuroprotection, DNA protection and also act as anti-inflammatory agent [7, 8]. Isoflavone has preventive effect on prostate cancer. [9] and ovarian cancer [10]. Carotenoids are very effective against diabetes and eye problems [11]. Carotenoids lycopene and lutein were found to be useful in minimizing the risk of Alzheimer’s disease [12]. Vitamin-C works against many diseases. [13]. Vitamin-E was found helpful in reducing growth of tumors and mainly breast cancer. [14]. For prevention of cardiovascular and neurodegenerative diseases anthocyanins were found to be effective [15]. Polyphenols protect against UV radiations and many pathogens. [16].

Some important and familiar antioxidants with their sources are as under.

Vitamin-C: citrus fruits, peppers, black currant etc.
Vitamin-E: almonds, spinach, sunflower seeds, avocado etc.
Beta carotene and other carotenoids: carrots, tomatoes etc.

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Flavonoids (flavonoids, flavones, isoflavonoids, flavonols): Onions, lettuce, tomatoes, apples, grapes, berries,

Soyabeans etc.

Anthocyanins: strawberries, cherries, mulberries etc.

Glucosinolates: cabbages, broccoli etc.

Polyphenols: herbs and spices, cocoa powder, nuts, flax seeds, coffee, tea etc.

Hydroxy cinnamates: kiwi, plums, blue berries, cherries, lettuce, eggplant, wheat, coffee etc.2006

Catechins: green tea leaves, red wine, black grapes, apricot etc.

Selenium: brazil nuts, fish, beef, poultry, brown rise etc.

Zinc: beef, pumpkin seeds, sesame seeds etc.

2.Conclusion

So for proper functioning of body, a balance between free radicals and antioxidants should be maintained. Some synthetic antioxidants were reported to be dangerous for human health. [17]. As discussed above the importance of antioxidants as scavengers of free radicals and their vital role in maintaining body balance, preventing various diseases, these are a subject of increasing interest. Comparing them with synthetic drugs natural antioxidants are always found to have upper hand with the concept of natural healthcare systems. Now the target is to extract and preserve antioxidants with some innovative processes, to meet the demand of present society. So, innovative analytical and technical advancement for extraction of antioxidants is the need of hour.

References

- [1] Harold E Seifried, Darrell E Anderson et al; The journal of nutritional biochemistry; "A review ofreactive oxygen species" 18 (9), 567-579, 2007.
- [2] Michael H. Gordon,. "Dietary antioxidants in disease prevention" Royal society of Chemistry; Natural product reports; 13 (4), 265-273, 1996.
- [3] A. C. Kaliora,; H. Schmidt; "Dietary antioxidants in preventing atherogenesis", Atherosclerosis, volume 187. issue 1, pages 1-17, July 2006.
- [4] Harasym J, Oledzki R; "Effect of fruit and vegetable antioxidant capacity of blood plasma", Nutrition, 30 (5): 511-517, May 2014.
- [5] Lisa Offringa, M. V. Stanton, M. E Houser: "Fruits and vegetables versusvegetable and fruits: Rhyme and reason for word order in health message"; American Journal of Lifestyle Medicine; 13 (3): 155982761876960, May 2018.
- [6] Antero Salmei, Kai Kaarniranta etal; "Inflammaging Signaling in Health span and life span regulation: next generation target for longevity"; Inflammation, Advancing age and nutrition; pages 323-332, 2014.
- [7] J. Lin, Y. Gao, H. Li, et al., "DNA protective effect of mangosteen xanthenes: an in vitro study on possible mechanisms" Adv. Pharm. Bull.,4, 147-153, 2014.
- [8] M. P. Phyu, J. Tangpong, "Neuroprotective effect of xanthone derivative of Garcinia mangostana against lead induced acetylcholine sterase dysfunction and cognitive impairment", Food Chem. Toxicol, 70, 151-156, 2014.

- [9] S. Aufderklamm, F. Miller, et al., Chemoprevention of prostate cancer by isoflavonoids". Recent results cancer Res.202, 101-108, 2014.
- [10] A. H. Lee, D. Su et al., "Soy and isoflavone intake associated with reduced risk of ovarian cancer in southern Chinese women", Nutr. Res.34, 302-307; 2014.
- [11] R. A. Kowluru, Q. Zhong et al., "Beneficial effects of nutritional supplements on the development of diabetic retinopathy"; Nutr. Metab.11; 8, 2014.
- [12] J. Y. Min, K. B. Min; Serum lycopene, lutein and zeaxanthin, and the risk of Alzheimer's disease mortality in older adults, Dement, Geriatr. Cogn. Disord.37; 246-256, 2014.
- [13] M. P. Schnieder, C Delles, B. M. Schmidt, et al., "Superoxide scavenging effects of N-acetylcysteine and Vitamin-C in subjects with essential hypertension, Am. J. Hypertens.18, 1111-1117, 2005.
- [14] G. S. Sundaram, R, London et al., " Serum hormones and lipoproteins in benign breast disease, Cancer Res.41, 3814-3816, 1981.
- [15] S. Zafra-Stone, T. Yasmin, et al., "Berry anthocyanins as novel antioxidants in human health and disease prevention" Mol. Nutr, Food Res.51, 675-683.
- [16] Kanti Bhushan Pandey, Syed Ibrahim Rizvi. " Plant Polyphenols as dietary antioxidants in human health and disease", Oxidative medicine and cellular longevity; 2 (5), 270-278; 2009.
- [17] V. Lobo, A. Patil, N. Chandra; "Free radicals, antioxidants and functional foods: Impact on human health"; Pharmacogn Rev.4 (8): 118-126. Jul-Dec., 2010