

Antioxidants: Exploring their role in combating free radicals, reducing oxidative stress, and supporting overall health and well-being naturally.

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Introduction

Antioxidants are essential compounds that play a critical role in maintaining the body's health by neutralizing harmful free radicals. Free radicals are unstable molecules generated through natural metabolic processes and environmental factors such as pollution, UV radiation, and smoking [1]. Left unchecked, these molecules can cause oxidative stress, a state of imbalance that damages cells, proteins, and DNA, contributing to aging and the onset of chronic diseases like cancer, cardiovascular disorders, and neurodegenerative conditions [2].

By stabilizing free radicals and preventing oxidative damage, antioxidants support overall well-being, protect against disease, and promote longevity. Found abundantly in natural foods like fruits, vegetables, nuts, and seeds, as well as in dietary supplements, antioxidants like vitamins C and E, carotenoids, and polyphenols are integral to a healthy lifestyle [3]. This article delves into the science behind antioxidants, their mechanisms of action, and their diverse health benefits, emphasizing the importance of incorporating these powerful compounds into daily life [4].

Free radicals unstable molecules produced during normal metabolic processes or due to external factors like pollution, UV radiation, and smoking. They have unpaired electrons, making them highly reactive and potentially damaging to cells, proteins, and DNA. Oxidative stress a condition that occurs when the production of free radicals exceeds the body's ability to neutralize them with antioxidants, leading to cellular damage. This is associated with aging, inflammation, and chronic diseases like cancer, cardiovascular disorders, and neurodegenerative diseases [5].

Protect cells, proteins, and DNA from free radical-induced harm. Strengthen the immune system by minimizing oxidative stress. Delay signs of aging by protecting skin and cellular structures. Reduce the risk of diseases like heart disease, diabetes, and cancer. Reduce the risk of diseases like heart disease, diabetes, and cancer [6]. Produced by the body, including Superoxide Dismutase (SOD), catalase, and glutathione peroxidase. Incorporate a variety of fruits and vegetables, focusing on brightly colored options (e.g., blueberries, kale, and sweet potatoes). Include whole grains, nuts, and seeds in daily meals. Drink antioxidant-rich beverages like green tea

or pomegranate juice. Turmeric (curcumin), cinnamon, and cloves are potent sources of antioxidants. Avoid smoking and limit exposure to environmental pollutants. Exercise regularly to enhance the body's natural antioxidant defenses. Manage stress through practices like meditation or yoga [7].

In cases where dietary intake is insufficient, antioxidant supplements (e.g., vitamins C and E or glutathione) can be considered under medical guidance. While antioxidants are beneficial, excessive intake (especially through supplements) may have adverse effects, such as interfering with the natural balance of free radicals and antioxidants or reducing the effectiveness of certain medical treatments like chemotherapy [8]. Over-supplementation of antioxidants like vitamins C and E can disrupt the natural balance of free radicals and antioxidants in the body, leading to potential pro-oxidant effects. High doses may increase the risk of bleeding disorders or stroke. Associated with an increased risk of lung cancer in smokers or those exposed to asbestos. Some free radicals play critical roles in cellular signaling, immune responses, and the regulation of biological processes. Over-suppression of these radicals by excessive antioxidant intake might impair these functions [9].

Certain antioxidants may reduce the effectiveness of treatments by neutralizing the free radicals used to target cancer cells. Vitamin E in high doses may enhance the effects of anticoagulants, increasing the risk of bleeding. Many antioxidant supplements are not strictly regulated, leading to potential contamination, incorrect dosages, or poor-quality products. Relying solely on supplements and neglecting a diet rich in natural antioxidants may lead to a lack of essential nutrients found in whole foods, such as fiber, minerals, and phytonutrients. Natural antioxidants from whole foods are generally safer and more effective than synthetic supplements, as they work synergistically with other nutrients in the food. Synthetic antioxidants may not replicate the same protective effects as those found in natural sources. Some individuals may process antioxidants differently based on genetic predispositions. People with specific health conditions, such as kidney or liver issues, may not tolerate high doses of antioxidants well. Prioritize a balanced diet rich in fruits, vegetables, whole grains, and nuts to naturally provide antioxidants along with other essential nutrients. Avoid excessive intake of antioxidant supplements unless specifically recommended by a healthcare provider.

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Consult with healthcare professionals before starting antioxidant supplementation, especially if you have pre-existing conditions or are taking medications. Combine dietary antioxidants with other health-promoting habits, such as regular exercise, adequate sleep, and stress management, for maximum benefits. Symptoms such as fatigue, inflammation, chronic pain, frequent infections, premature aging, or difficulty healing wounds can indicate oxidative stress. History of exposure to environmental toxins, smoking, excessive alcohol consumption, or chronic diseases. Advanced techniques like Electron Paramagnetic Resonance (EPR) spectroscopy can detect free radical production in real-time. Analyzes genetic predispositions to oxidative stress, such as mutations in antioxidant enzyme genes (e.g., SOD, catalase). Evaluates factors contributing to oxidative stress, such as poor diet, lack of exercise, or high exposure to pollutants. Overuse of supplements can be assessed through patient history and symptoms of toxicity or imbalance.

Preventing oxidative stress and free radical damage involves a proactive approach to maintaining a balance between the production of free radicals and the body's ability to neutralize them with antioxidants. Prioritize brightly colored options like berries, oranges, spinach, kale, and carrots, which are rich in vitamins (C and E), carotenoids, and flavonoids. Wear sunscreen and protective clothing to reduce free radical production from sun exposure. Regular moderate-intensity exercise enhances the body's natural antioxidant defenses. Excessive, intense exercise can increase free radical production, so recovery periods are essential. Incorporate activities like yoga, meditation, or tai chi to reduce cortisol levels, which are linked to increased oxidative stress. Maintain a consistent sleep schedule, as insufficient sleep can exacerbate oxidative stress. Include yogurt, kefir, and kimchi to promote gut health, as a balanced microbiome supports antioxidant function. Herbs like ashwagandha and Rhodiola may help regulate stress responses and reduce oxidative stress.

Periodic evaluations of antioxidant levels and oxidative stress markers can identify imbalances early. Effective management of conditions like diabetes, hypertension, or obesity reduces oxidative stress contributors. Increase intake of vitamin C-rich foods to counteract oxidative damage caused by smoking. Consume polyphenol-rich foods like green tea to combat pollution-related oxidative stress. Focus on antioxidants that support brain and heart health, such as lutein, zeaxanthin, and resveratrol. Effective management of conditions like diabetes, hypertension, or obesity reduces oxidative stress contributors. Periodic evaluations of antioxidant levels and oxidative stress markers can identify imbalances early [10].

Conclusion

Antioxidants are essential in combating free radicals, reducing oxidative stress, and promoting overall health and well-being. By neutralizing free radicals, antioxidants help protect cellular structures, delay aging, and reduce the risk of chronic diseases such as cardiovascular conditions, diabetes, cancer, and neurodegenerative disorders. Antioxidants also support the body's natural defense systems, enhance immune function,

and promote longevity. By integrating antioxidant-rich foods and healthy habits into daily life, individuals can create a foundation for improved resilience, vitality, and overall well-being. Emphasizing prevention and maintaining a balanced oxidative state is a proactive step toward living a healthier, more vibrant life. A diet rich in fruits, vegetables, nuts, seeds, and whole grains provides a spectrum of antioxidants, such as vitamins C and E, carotenoids, and polyphenols. Regular exercise, stress management, adequate sleep, and minimizing exposure to environmental toxins contribute to reducing oxidative stress.

References

1. Rai D, Adelman AS, Zhuang W, et al. Longitudinal changes in lactoferrin concentrations in human milk: a global systematic review. *Crit Rev Food Sci Nutr*. 2014;54(12):1539-47.
2. Hennart PF, Brasseur DJ, Delogne-Desnoeck JB, et al. Lysozyme, lactoferrin, and secretory immunoglobulin A content in breast milk: influence of duration of lactation, nutrition status, prolactin status, and parity of mother. *Am J Clin Nutr*. 1991;53(1):32-9.
3. Brock JH. The physiology of lactoferrin. *Biochemistry and Cell biology*. 2002;80(1):1-6.
4. Prentice A, Ewing G, Roberts SB, et al. The nutritional role of breast-milk IgA and lactoferrin. *Acta Pædiatrica*. 1987;76(4):592-8.
5. Liu L, Guo Q, Cui M, et al. Impact of maternal nutrition during early pregnancy and diet during lactation on lactoferrin in mature breast milk. *Nutrition*. 2022;93:111500.
6. Suttman U, Ockenga J, Schneider H, et al. Weight gain and increased concentrations of receptor proteins for tumor necrosis factor after patients with symptomatic HIV infection received fortified nutrition support. *J Am Diet Assoc*. 1996;96(6):565-9.
7. Ranganathan S, Sesikeran B. Development of the double-fortified salt from the national institute of nutrition. *Compr Rev Food Sci Food Saf*. 2008;7:390-6.
8. Sossen L, Bonham M, Porter J. Can fortified, nutrient-dense and enriched foods and drink-based nutrition interventions increase energy and protein intake in residential aged care residents? A systematic review with meta-analyses. *Int J Nurs Stud*. 2021;124:104088.
9. Hughes BH, Muzzy HM, Laliberte LC, et al. Oxidative stability and consumer acceptance of fish oil fortified nutrition bars. *J Food Sci*. 2012;77(9):S329-34.
10. Torrejón CS, Castillo-Durán C, Hertrampf ED, et al. Zinc and iron nutrition in Chilean children fed fortified milk provided by the Complementary National Food Program. *Nutr*. 2004;20(2):177-80.