Editorial

Antioxidant therapy in cardiovascular diseases: still a matter of debate

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Reactive Oxygen Species (ROS) are highly reactive chemical species, which are responsible for oxidative stress inside the cell. They are mainly generated in vascular cells by NAD(P)H oxidases, uncoupled endothelial nitric oxide (NO) synthase, and other enzymatic sources, or as a byproduct of mitochondrial respiration. Imbalanced production of ROS lead to exacerbation of pathophysiological processes in both humans and in animal models.[1] For example, in a number of cardiovascular pathologies, including hypertension, atherosclerosis, myocardial infarction, ischemia/reperfusion injury, and restenosis after angioplasty or venous bypass grafting, excessive production of reactive oxygen species has been implicated to play an important role.[2] As ROS can be neutralized by antioxidants, many studies proposed antioxidants as a treatment option in ameliorating diseases.

At the same time, American Heart Association (AHA) in their Dietary Guidelines recommends a dietary pattern that is rich in fruits, vegetables, whole grains, low-fat or nonfat dairy products, fish, legumes, poultry, and lean meats to maintain a healthy heart. A diet containing these items has a low energy density to promote weight control and a high nutrient density to meet all nutrient needs.[3] Nutrients, especially the antioxidants (ie, vitamins such as vitamin E, vitamin C, and β-carotene) within these foods, may beneficially affect CVD risk. For example, reports have shown that successful use of antioxidants can suppress ROS-mediated oxidative processes in the development of the atherosclerotic plaque in the artery wall.[3] Several smaller studies also reported a beneficial role of α-tocopherol, α-tocopherol and slow-release vitamin C, and vitamin C plus vitamin E on cardiovascular endpoints.[4–7] In contrast, clinical trial evidence has not shown beneficial effects of antioxidant supplements. In a different study, vitamin E plus vitamin C supplement increased the cardiovascular mortality rate of postmenopausal women, who were on hormone replacement therapy and having coronary disease, compared with the vitamin placebo women.[8] Likewise, a study showed, subjects having coronary artery disease relied on simvastatin/niacin and an antioxidant cocktail (vitamin E, β-carotene, vitamin C, and selenium) have an increase in the progression in stenosis after 3 years, compared with a control group treated with simvastatin/niacin. Implicating, the interference of antioxidant supplements on the efficacy of statin-plus-niacin therapy. Further study showed no increase in the protective HDL-2 cholesterol and apolipoprotein A1 subfractions of HDL after antioxidant vitamins supplement in those patients.[9] However, it is now postulated that global attenuation of cellular reactive oxygen species (ROS) may not be advantageous. Rather spatial activity of the antioxidants might be beneficial. Recent studies implicating this finding, where they have shown ROS produced by plasmalemmal membrane-bound NADPH oxidase as a key mediator of cardiovascular diseases.[2] Similarly, development of angiotensin II–induced hypertension can be prevented by specific attenuation of mitochondrial-derived oxidants in the mouse.

In general, all the studies showing either positive or adverse effect are much smaller in size compared to the larger clinical trials that consistently have not shown any beneficial effects of antioxidant supplements on several CVD end points. It is mentionable that most of the studies differ with regard to subject populations studied, type and dose of antioxidant/antioxidant cocktail administered, the length of study, and study end points. In addition to dosage differences, some trials used the synthetic form of antioxidants, whereas others used the natural form of the vitamin (eg, for β-carotene, vitamin C and E). Moreover, the antioxidant cocktail formulations used was also varied. Therefore, it is very difficult to compare the study findings. Another perception is that the lifelong exposure to an antioxidant-rich diet and a limited exposure to antioxidant supplements may be responsible for the unpredictability between the observational data and the clinical trials. It is therefore recommended to begin the antioxidant treatment earlier in life to make it effective. As mentioned above, other factors could also be important in explaining the lack of agreement between the predicted positive benefits and the results of the clinical trials conducted to date.

Currently available scientific research data, therefore, does not support the routine use of antioxidant supplements for the prevention and treatment of CVD. Thus, it is not recommended to advise the individuals to take antioxidant supplements to reduce the risk of CVD. Rather, it is now suggested to consume a diet rich in antioxidants and other cardioprotective nutrients, such as fruits, vegetables, whole grains, and nuts, instead of antioxidant supplements to reduce the risk of CVD. As our knowledge is very little about the oxidative signaling *in vivo* and lacks biochemical markers with which to evaluate candidate antioxidant compounds, future research is definitely needed to answer the exact role of oxidants and antioxidants in both physiological as well as pathophysiological circumstances.

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Conflict of interest

The author declares no conflict of interest.

References

1. Thannickal VJ, Fanburg BL. Reactive oxygen species in cell signaling. *Am J Physiol Lung Cell Mol Physiol*. 2000;279(6):L1005–1028.
2. Sugamura K, Keaney JF. Reactive oxygen species in cardiovascular disease. *Free Radic Biol Med*. 2011;51(5):978–992.
3. Kris Etherton PM, Lichtenstein AH, Howard BV, et al. Antioxidant vitamin supplements and cardiovascular disease. *Circulation*. 2004;110:637–641.
4. Stephens NG, Parsons A, Schofield PM, et al. Randomised controlled trial of vitamin E in patients with coronary disease: cambridge heart antioxidant study (CHAOS). *Lancet*. 1996;347(9004):781–786.
5. Boaz M, Smetana S, Weinstein T, et al. Secondary prevention with antioxidants of cardiovascular disease in endstage renal disease (SPACE): randomised placebo-controlled trial. *Lancet*. 2000;356(9237):1213–1218.
6. Salonen JT, Nyyssonen K, Salonen R, et al. Antioxidant supplementation in atherosclerosis prevention (ASAP) study: a randomized trial of the effect of vitamins E and C on 3-year progression of carotid atherosclerosis. *J Intern Med*. 2000;248(5):377–386.
7. Fang JC, Kinlay S, Beltrame J, et al. Effect of vitamins C and E on progression of transplant-associated arteriosclerosis: a randomised trial. *Lancet*. 2002;359(9312):1108–1113.
8. Waters DD, Alderman EL, Hsia J, et al. Effects of hormone replacement therapy and antioxidant vitamin supplements on coronary atherosclerosis in postmenopausal women: a randomized controlled trial. *JAMA*. 2002;288(19):2432–2440.
9. Brown BG, Zhao XQ, Chait A, et al. Simvastatin and niacin, antioxidant vitamins, or the combination for the prevention of coronary disease. *N Engl J Med*. 2001;345(22):1583–1592.

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