




Editorial

Detriments of Antioxidant Oversupply and Determination of the Oxidative Status



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The recent review article “Antioxidants for the treatment of non-communicable diseases” discussed the benefits of antioxidants in treating certain diseases.¹ Although the authors briefly mentioned the roles of oxidants in cell metabolism and defense, they may not have emphasized the potential detriments of an oversupply of antioxidants. The cellular antioxidant defense mechanism plays an important role in maintaining *in vivo* metabolism with a U-shaped dose-response relationship to health outcomes, meaning that both excessive and insufficient levels of antioxidants can cause metabolic disorders (details have been reviewed by Zhang).²

While antioxidants are often viewed as beneficial, it is important to recognize their double-edged nature and not overlook their detrimental effects. The market is saturated with over-the-counter antioxidant products and exaggerated advertising that lacks any proper indication of detrimental effects leading to the unrestrained use, and possible misuse, of these products, resulting in metabolic diseases. Supplemental antioxidants can only be effective in treating diseases when cells produce excessive reactive oxygen species that the endogenous antioxidant defense mechanism cannot counterbalance resulting in imbalanced oxidant homeostasis. However, over-supplementing with antioxidants can also disturb the homeostasis and induce metabolic diseases by excessively lowering levels of reactive oxygen species (ROS). Moreover, it can disrupt the body’s innate antioxidant defenses by interacting with enzymes such as superoxide dismutase, glutathione peroxidase, and catalase. Adequate levels of ROS are necessary for vital physiological functions such as signaling pathways and immune system responses. In some populations, excessive selenium supplementation may increase the likelihood of developing type 2 diabetes and metabolic syndrome.³ Moreover, vitamin E and A supplements have been found to disrupt cell metabolism in a peculiar manner, which may result in an elevated risk of type 2 diabetes, cardiovascular diseases, and even some cancers.⁴ It has also been indicated that excessive intake of selenium may hinder insulin signaling and associated glucose metabolism as well as dyslipidemia, contributing

to metabolic syndrome. Similarly, an overabundance of vitamin E or A, or both, can impede the immune system’s capacity to identify and eliminate cancer cells, potentially promoting their growth. To ensure the safe effective administration of antioxidants, it is essential to evaluate an individual’s oxidative status before providing antioxidant supplementation.

A recent publication suggests that before taking antioxidant supplements, an individual’s oxidative status should be determined as a baseline for correcting imbalanced oxidative homeostasis and avoiding a potential oversupply of antioxidants.² However, selecting a biomarker for the quantification of oxidative stress can be challenging due to the instability of oxidant molecules. To address this, the author developed a simple and reliable method for determining blood-free 3-Nitrotyrosine (3NT) as an oxidative stress marker and recommended it for clinical applications.⁵ 3NT is formed proportionally by the nitration of protein-bound and free tyrosine residues under oxidative stress through the reactive peroxynitrite molecules formed from the reaction between reactive oxygen and nitrogen species. An integrative panel of multi-markers for oxidative stress is also proposed for more extensive measurement in humans.⁶ By implementing the measurement, individuals should be able to safely and efficiently supplement with antioxidants without exerting significant detrimental effects.

In conclusion, while antioxidants have beneficial effects, it is important to recognize their potential detrimental effects. Timely measuring an individual’s oxidative status is essential for accurate supplementation of antioxidants and avoiding adverse effects.

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Abbreviations: 3NT, 3-Nitrotyrosine.

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