TOXICOLOGY AND FORENSIC MEDICINE

Openventio PUBLISHERS

ISSN 2474-8978

Open Journal

Editorial

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Article History
Accepted: January 7th, 2024
Published: January 28th, 2024

Citation
Rezk BM, van der Vijgh WJF, Bast A, Haenen GRMM. Antioxidant Toxicity. *Toxicol Forensic Med Open J*. 2024; 9(1): e3-e4.

Antioxidant Toxicity

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The risk-benefit analysis is the cornerstone of toxicology. This implies that it is necessary to evaluate and relate the health benefits and drawbacks of any substance, including antioxidants. This is the only way to assess the justification for a compound's use.

Antioxidants' capacity to fend off damage from free radicals accounts for their positive benefits. The biochemistry of illnesses and other pathological conditions that include free radicals can vary significantly, including the types of radicals involved, their flux, the location of their generation, and the target they attack.One Therefore, in order for an antioxidant to be effective, it must meet certain requirements for each type of radical damage. Nitrogen-centered and oxygen-centered free radicals are frequently used to categorize biologically significant free radicals. Both oxygen-centered radicals and some oxygen-containing non-radicals that are oxidizing agents or readily transformed into radicals are referred to as reactive oxygen species (ROS). The reactivity of the species is found on or close to a nitrogen atom in the Reactive Nitrogen Species (RNS). Since H2O2, O2•-, and NO• only react rapidly with a small number of molecules, the descriptor "reactive" is not necessarily accurate. OH• responds to practically anything instantly. The reactivity of RO2•, RO•, HOCl, NO2•, ONOOH, and O3 is in the middle of these ranges.

In terms of safety, Paracelsus already claimed in the 16th century that all substances are poisonous at high enough doses. Antioxidants shouldn't be an exception to this rule, according to any logic. On the contrary, safety is a highly important problem for antioxidants because of the mega-doses that are occasionally advised. The majority of antioxidants have biological origins, which contributes to the public's increased acceptance of antioxidant supplementation. The belief is that antioxidants' biological nature ensures their safety; the terms "natural" and "biological" are mistakenly used interchangeably.2

It appears that the maxim about the use of antioxidant supplements is: The more, the better. Indeed, despite our limited understanding of the safety and positive health effects of antioxidant supplements, a large portion of the population regularly takes them at relatively high doses. To further rationalize and enhance antioxidant therapy, it is necessary to have a deeper understanding of the free radical processes and antioxidant profiles from a toxicological perspective.3

Metabolism is a key consideration while using antioxidants.4. Metabolites produced by phase 1 and phase 2 enzymes can contribute to the harmful and beneficial effects of an antioxidant, just as other bioactive substances. More significantly, a free radical scavenging antioxidant is transformed into a metabolite during its actual antioxidant activity.One Since the metabolite typically includes some residual reactivity of the radical that has been scavenged, its impact on a biological system is significant.

Over 65,000 cases of vitamin toxicity are reported to US poison control centers each year, according to the 2013 Annual Report of the American Association of Poison Control Centers (AAPCC): National Poison Data System (NPDS).5. Intentional and inadvertent exposures remain a major contributor to illness and mortality in the US.4.

Determining which populations are at risk is crucial. Priority should be given to identifying those that are likely to benefit, even when the focus is on the negative effects of vitamins and antioxidants.6.

The basic line is that in order to evaluate antioxidants, the chemical mechanism behind their advantages must be clarified. The next step is to determine the molecular mechanism causing the dangers. It is necessary to calculate the ideal benefit-risk ratio for each antioxidant and person independently, while also accounting for dosage.7.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interests.

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