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IADSA SCIENTIFIC RESPONSE IADSA SCIENTIFIC ALERT SERVICE

Issue: High doses of antioxidant supplements induce stem cell

Publication: STEM CELLS (Vol 9999; 999A). 2010 May online

Title: Physiological Levels of Reactive Oxygen Species are Required to Maintain Genomic Stability in Stem Cells

Authors: Tao-Sheng Li, Eduardo Marbán

Publication Date: May 4, 2010 [online publication]

IADSA Comments

In an experimental study on cells grown in petri dish, the authors of the paper reported a reduction in cellular genetic abnormality at low concentrations of antioxidants but cellular genetic abnormality at high concentrations of antioxidants.

The study finding is in line with IADSA's view point that it is safe to take high quality multivitamin-mineral daily (including Vitamins C and E), within the upper limit as part of a healthy lifestyle and diet for health maintenance. The authors stated that health problem may arise if one takes excessive amount, such as 10 or 100 times the amount in a daily multivitamin.

Readers should also note that this is a preliminary finding from an in-vitro (test-tube) experiment and does not automatically translate to human situation. Further studies in human are necessary.

10 May 2010

Abstract

Physiological Levels of Reactive Oxygen Species are Required to Maintain Genomic Stability in Stem Cells

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Author contributions: T.S.L.: Conception and design, Manuscript writing, Collection and/or assembly of data, Data analysis and interpretation.; E.M.: Conception and design, Manuscript writing, Financial support, Final approval of manuscript.

Disclosure of Potential Conflicts of Interest: E.M. is a founder and holds equity in Capricor, Inc. Capricor is developing products in the stem cell field, but provided no support for the present studies. T-S. L. has no financial interests to disclose.

Funded by: NIH; Grant Number: R01HL083109

Stem cell cytogenetic abnormalities constitute a roadblock to regenerative therapies. We investigated the possibility that reactive oxygen species (ROS) influence genomic stability in cardiac and embryonic stem cells. Karyotypic abnormalities in primary human cardiac stem cells were suppressed by culture in physiological (5%) oxygen, but addition of antioxidants to the medium unexpectedly increased aneuploidy. Intracellular ROS levels were moderately decreased in physiological oxygen, but dramatically decreased by the addition of high-dose antioxidants. Quantification of DNA damage in cardiac stem cells and in human embryonic stem cells revealed a biphasic dose-dependence: antioxidants suppressed DNA damage at low concentrations, but potentiated such damage at higher concentrations. High-dose antioxidants decreased cellular levels of the ATM (ataxia-telangiectasia mutated) and other DNA repair enzymes, providing a potential mechanistic basis for the observed effects. These results indicate that physiological levels of intracellular ROS are required to activate the DNA repair pathway for maintaining genomic stability in stem cells. The concept of an oxidative optimum for genomic stability has broad implications for stem cell biology and carcinogenesis.

Received: 22 February 2010; Accepted: 21 April 2010