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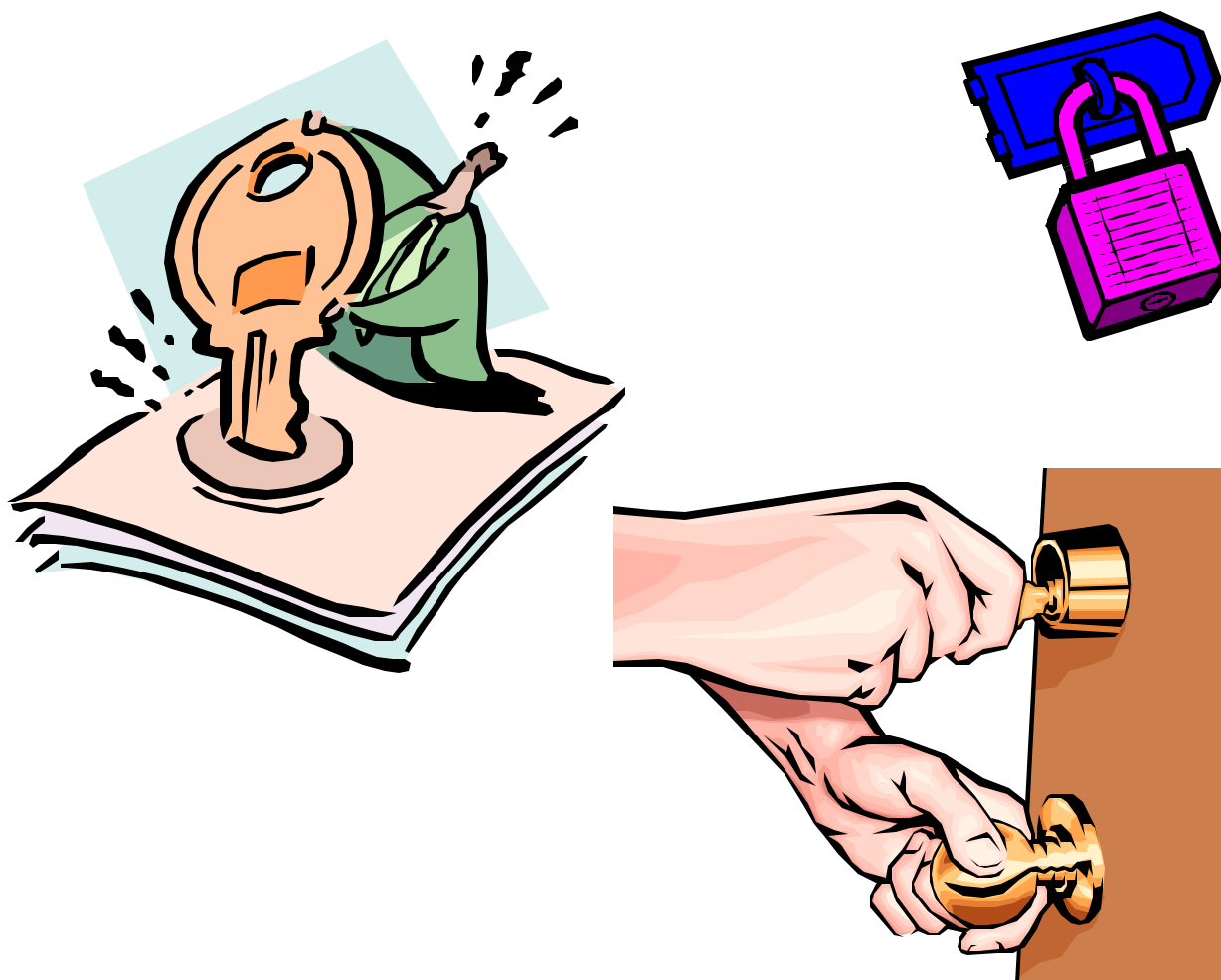
"Antioxidants Intake from Foods and  
Free Radical-Mediated Diseases"

**DIETARY REFERENCE INTAKE OF  
ANTIOXIDANTS - WHAT IS THE SCIENCE  
BEHIND THE CLOSED DOOR?**

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# Under Lock and Key *via* ã by the National Academy of Science



The recent report

## Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids

Panel on Dietary Antioxidants and Related Compounds, Subcommittees on Upper Reference Levels of Nutrients and Interpretation and Uses of DRIs, Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board 529 pages, 6 x 9, 2000

can be read free online at: <http://www.nap.edu/catalog/9810.html>

## ABSTRACT

### **DIETARY REFERENCE INTAKE OF ANTIOXIDANTS: WHAT IS THE SCIENCE BEHIND THE CLOSED DOORS?**

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The Food and Nutrition Board of the Institute of Medicine, NAS, has undertaken the development of a comprehensive set of reference values for recommended nutrient intakes for healthy U.S. and Canadian populations. Recently, the report on Dietary Reference Intakes (DRIs) for Vitamin C, Vitamin E, Selenium and Carotenoids from the Panel on Dietary Antioxidants and Related Compounds has been released. The DRIs take into account the potential role of nutrients and other food components in long-term health, going beyond deficiency diseases. This presentation will review the process used to establish DRIs. In addition, the findings of that report, including the rationale for the criteria used for the selection of appropriate health outcomes for these nutrients will be discussed.

Summary points of presentation:

1. The definitions of DRI, EAR, RDA, UL and AI will be provided;
2. The types of research needed to develop DRIs will be discussed;
3. The criteria for NAS panel membership and process followed by panels will be outlined;
4. The biological endpoints considered by the panel for setting DRIs for vitamins C, E, selenium and carotenoids will be listed; and
5. Priorities for future research needs for each nutrient will be discussed

The following is the full press release from the National Academy of Science on the announcement of the new recommendations.

**Date: April 10, 2000**

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### **FOR IMMEDIATE RELEASE**

#### **Antioxidants' Role in Chronic Disease Prevention Still Uncertain; Huge Doses Considered Risky**

**WASHINGTON** -- Insufficient evidence exists to support claims that taking megadoses of dietary antioxidants, such as selenium and vitamins C and E, or carotenoids, including beta-carotene, can prevent chronic diseases, says the latest report on Dietary Reference Intakes (DRIs) from the Institute of Medicine of the National Academies. In fact, extremely large doses may lead to health problems rather than confer benefits. But the report does call for increases in daily intakes of vitamins C and E to exploit their role in maintaining good health, and recommends an even larger amount of vitamin C for smokers.

For the first time, the report also sets a ceiling on daily consumption of selenium and vitamins C and E to reduce the risk of adverse side effects from overuse.

Dietary antioxidants are nutrients that help protect cells from a normal -- but damaging -- physiological process known as "oxidative stress." Such nutrients are a part of the natural makeup of many types of food, particularly fruits and vegetables. They also have been added to some foods and are available in the form of dietary supplements. For years, researchers have sought to understand the role of these antioxidants in reducing the risk of chronic diseases such as cancer, cardiovascular disease, eye diseases, and neurodegenerative diseases, which include Alzheimer's and Parkinson's. But many unanswered questions remain.

"A direct connection between the intake of antioxidants and the prevention of chronic disease has yet to be adequately established," said Norman I. Krinsky, chair of the study's Panel on Dietary Antioxidants and Related Compounds, and a professor of biochemistry, Tufts University School of Medicine, Boston. "We do know, however, that dietary antioxidants can in some cases prevent or counteract cell damage that stems from exposure to oxidants, which are agents that affect a cell's molecular composition. But much more research is needed to determine whether dietary antioxidants can actually stave off chronic disease."

The report -- the third in a series on dietary recommendations for healthy Americans and Canadians -- expands on the Recommended Dietary Allowances (RDAs) that the National Academy of Sciences has set periodically since 1941, and on Canada's Recommended Nutrient Intakes. DRIs contain four categories of reference intakes -- including RDAs, which are a set of values intended to help people maintain their health; and another set of values to help them avoid taking too much of a nutrient. Scientists from the United States and Canada collaborated on the studies. Additional reports will be issued on DRIs for trace elements and other vitamins; electrolytes and water; protein, carbohydrates, fiber, and fats; and other food components.

## Setting New Dietary Recommendations

The report examines available scientific data on both beneficial and harmful health effects of four nutrients typically found in food: vitamins C and E; selenium; and carotenoids, some of which are sources of vitamin A for human beings. Whether carotenoids, including beta-carotene, function as antioxidants when consumed is still unknown. Although numerous epidemiological studies have suggested that foods rich in dietary antioxidants have a positive effect on chronic diseases, insufficient evidence exists to conclude that such nutrients, even in very high doses, will reduce the risk of diseases such as cancer; cardiovascular disease; cataracts; age-related macular degeneration, a common form of blindness in elderly people; diabetes mellitus; and neurodegenerative diseases.

In addition to setting daily intakes for vitamins C and E and selenium, the report establishes "tolerable upper intake levels" for each of these three nutrients. The report underscores the finding that upper levels, or ceilings, should not be considered the recommended amount. Instead, they represent the maximum intake of a nutrient that is likely to pose no risk of adverse health effects in almost all individuals in the general population. Following are highlights of the report's recommendations:

**Vitamin C** -- Recommended intake levels of this nutrient were increased to achieve maximum saturation in the body. Women should consume 75 milligrams per day, and men should consume 90 milligrams daily. Because smokers are more likely to suffer from biological processes that damage cells and deplete vitamin C, they need an additional 35 milligrams per day. Food sources of the nutrient include citrus fruit, potatoes, strawberries, broccoli, and leafy green vegetables.

The report sets the upper intake level for vitamin C, from both food and supplements, at 2,000 milligrams per day for adults. Intakes above this amount may cause diarrhea.

**Vitamin E** -- Recommended daily intake levels also were increased for this nutrient; both women and men should consume 15 milligrams from food. This is equivalent to 22 International Units (IU) of natural-source vitamin E or 33 IUs of the synthetic form. Alpha-tocopherol is the only type of vitamin E that human blood can maintain and transfer to cells when needed. Food sources include vegetable oils, nuts, seeds, liver, and leafy green vegetables.

The upper level, based only on intake from vitamin supplements, is 1,000 milligrams of alpha-tocopherol per day for adults. This amount is equivalent to roughly 1,500 IU of "d-alpha-tocopherol," sometimes labeled as "natural source" vitamin E, or 1,100 IU of "dl-alpha-tocopherol," a synthetic version of vitamin E. People who consume more than this amount place themselves at greater risk of hemorrhagic damage because the nutrient can act as an anticoagulant.

**Selenium** -- The recommended intake level for this nutrient was set at the amount associated with the highest activity of enzymes that guard against oxidants in the body. Women and men should take 55 micrograms per day, the report says. Food sources include seafood, liver, meat, and grains.

The report set the upper intake level for selenium at 400 micrograms per day. The level is based on nutrients from all sources. More than this amount could cause selenosis, a toxic reaction marked by hair loss and nail sloughing.

The report noted that most American and Canadian adults already get sufficient quantities of these three nutrients from their food.

**Beta-carotene and Other Carotenoids** -- In laboratory tests, these nutrients have been shown to act as antioxidants, but the results have not been consistently duplicated in humans. In addition, data on the adverse effects of carotenoid overconsumption are contradictory. For these reasons, the report does not recommend a daily intake level or an upper intake level for consumption of carotenoids. People should use caution before taking them in high doses; the report recommends beta-carotene supplementation only for the prevention and control of vitamin A deficiency.

### **More Research Needed**

As a general rule, healthy people should not routinely exceed upper intake levels, the report advises. How nutrient consumption above these levels may affect human health should be studied further in well-controlled clinical trials. Likewise, much more research is needed to investigate the role of dietary antioxidants and carotenoids in the prevention of chronic diseases; to explore the nutrient needs of specific groups of people, including children and the elderly; and to look into how selenium, vitamins C and E, and beta-carotene interact with each other and with other food components.

The study was funded in part by the U.S. Department of Health and Human Services; Health Canada; the Institute of Medicine; the Dietary Reference Intakes Private Foundation Fund, including the Dannon Institute and the International Life Sciences Institute; and the Dietary Reference Intakes Corporate Donors' Fund. Corporate fund contributors include Daiichi Fine Chemicals Inc., Kemin Foods Inc., M&M/Mars, Mead Johnson Nutrition Group, Nabisco Foods Group, Natural Source Vitamin E Association, Roche Vitamins Inc., U.S. Borax, and Weider Nutrition Group.

The study was undertaken by a group of more than 40 scientists working under the auspices of the Institute of Medicine's Food and Nutrition Board. The Institute is a private, nonprofit organization that provides health policy advice under a congressional charter granted to the National Academy of Sciences.

Pre-publication copies of [\*Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids\*](#) are available from the National Academy Press at the mailing address in the letterhead; tel. (202) 334-3313 or 1-800-624-6242. The cost of the report is \$45.00 (prepaid) plus shipping charges of \$4.50 for the first copy and \$.95 for each additional copy. Reporters may obtain a copy from the Office of News and Public Information at the letterhead address (contacts listed above).

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