

# Abstract

Bibl Nutr Dieta. 1995;(52):75-91.

## **Cardiovascular disease and vitamins. Concurrent correction of 'suboptimal' plasma antioxidant levels may, as important part of 'optimal' nutrition, help to prevent early stages of cardiovascular disease and cancer, respectively.**

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**BACKGROUND:** Epidemiological surveys provided abundant evidence that under steady-state conditions diets rich in antioxidants (from vegetables/fruits and suitable vegetable oils) reduce the relative risk of premature death from CVD and cancer.

**GENERAL FINDINGS:** Material relative risks seem to disappear at 'optimal' antioxidant plasma levels in the order of  $\geq 50$  micromol/l vitamin C,  $\geq 30$  micromol/l lipid-standardized vitamin E (alpha-tocopherol/cholesterol ratio  $\geq 5.1$ -5.2),  $\geq 2.2$  micromol/l vitamin A, and  $\geq 0.4$  micromol/l beta-carotene or  $\geq 0.4$ -0.5 micromol/l alpha-plus beta-carotene. Levels 25-35% below these thresholds predict an at least 2-fold higher risk. 'Suboptimal' levels of any single antioxidant may increase the relative risk independently. Accordingly, 'suboptimal' levels of several antioxidants predict a further increase of risk.

**DISCUSSION:** Data on habitual voluntary multivitamin supplements providing an adequate supply of either vitamins A, C or E, and of beta-carotene in smokers, indicates that steady-state 'optimization' reduces more or less regularly the relative risk of CVD and cancer respectively. Simple counting of multivitamins regardless of their composition did not reveal any risk reduction. The antioxidant-related health benefits seem to depend on an adequacy of all antioxidants, and possibly of nonantioxidant nutrients as well. Thereby, an overall 'optimal' antioxidant defense system may be more important than excess of any particular 'magic bullet' antioxidant. Although antioxidants may represent a crucially important fraction within a health-maintaining diet, any nonantioxidant co-nutrients remain to be identified which could condition the health benefits of antioxidants.

**ADDITIONAL FINDINGS:** In randomized antioxidant intervention trials during 5-6 years in middle-aged to elderly subjects in China and Finland, only earlier stages of CVD and cancer respectively were prevented by rectifying previously poor levels. Correspondingly, the incidence of prostate cancer (developing mostly not until the male menopause) was reduced by correction of a previously poor vitamin E status in Finland. In contrast, irreversible precancerous lesions (such as esophageal dysplasia), clonically established common cancers (highly probable for the lung of elderly heavy smokers) as well as (presumably advanced, complicated) vascular lesions of chronic smokers did not respond favorably. (ABSTRACT TRUNCATED)

PMID: 8779654