



Editorial

Physiochemical Significance of Vitamin E and other Tocopherols in the U.S. Diet: Cancer Promoters or Preventers?

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The Food and Nutrition Board only includes alpha-tocopherol (AT), among the 8 phytochemicals with similar structure, in determining the recommendations for vitamin E. This decision was made because AT provides the highest level of protection against fetal resorption in rat dams, the criterion used to determine vitamin E activity [1]. Several recent reviews, however, have described the numerous studies demonstrating the anticarcinogenic properties of the other vitamin E-like phytochemicals upon breast, prostate, colorectal and lung tumors in human populations, animal models and cell culture [2-6].

Vitamin E has been demonstrated to act as an antioxidant [7] and some theories of tumorigenesis have focused upon antioxidants being preventive [8]. The possible role of vitamin E in the form of alpha-tocopherol (AT) has been explored with respect to colon, rectal and prostate tumor prevention with only moderately successful results [9,10]. Numerous reviews, meta-analyses and research papers, however, have failed to provide evidence of a beneficial effect as a consequence of vitamin E (AT) treatment. Studies of human subjects as well as those using animal models have failed to show a reduction in tumors at all sites studied [11-14]. The authors of one of the reviews cited concluded that "often these (antioxidant) nutrients are consumed at mega-doses, with probably more detrimental effect" [14]. Evidence suggests that pathways to anticarcinogenesis promoted by several of the vitamin E-like phytochemicals actually depend upon normal cellular oxidation processes and thus are hindered by excessive levels of cellular antioxidant [15] and that AT hinders the anticancer actions of gamma-tocopherol (GT) in an animal breast cancer model [16].

The effects of GT upon anticarcinogenesis has recently been a major focus because it is generally consumed in quantities higher than AT in the U.S. diet [17], and dietary consumption results in a reasonably high serum level of GT [18]. While case-control and cohort studies strengthen the link between GT serum levels and a reduction in colorectal, lung and prostate cancer; clinical intervention studies have not yet been accomplished for GT.

Studies of cultured tumor cells supplemented with various

tocopherols have enabled researchers to evaluate possible mechanisms by which these phytochemicals exert their anticarcinogenic effects. These studies have resulted in some understanding of how GT and possibly other tocopherols may impact the growth of colon, breast, prostate and lung cancer. The overall findings are that GT has been demonstrated to be an extremely potent inducer of apoptosis, as well as an inducer of cell cycle arrest in some cancer cells [2]. Similar results have been obtained in our laboratories for salivary gland tumor cells [19].

Dietary supplementation with either vitamin E (AT) or GT is not yet warranted for the general U.S. population. In the case of AT, overconsumption could lead to an increase in various cancers due to its interference upon GT's anticarcinogenic mechanisms. Although GT appears to be anticarcinogenic upon cultured tumor cells and in human case-control and cohort studies, the absence of clinical trials using GT supplements precludes a recommendation for dietary supplementation at this time.

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