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Supplemental evidence

Stephen B Hanauer

According to the Webster Dictionary, 1913, a supplement is "That which supplies a deficiency, or meets a want". It appears that vitamin supplements, at least for the general public, provide more of the latter than the former. What we want is improved or prolonged health and, in many epidemiologic investigations, individuals who have consumed higher quantities of vitamin E, vitamin A, vitamin C, and so on appear to have more health benefits. As Lichtenstein and Russell discussed in *JAMA* on July 20th, however, recent attempts to provide single-nutrient supplementation have failed to improve outcomes for cardiovascular disease and lung cancer and, in fact, outcomes of controlled clinical trials have demonstrated harmful rather than helpful effects.[1] Whereas cohorts of individuals consuming low fat diets high in fruits and vegetables have reduced risks of heart disease, hypertension and certain cancers, most interventional trials using high doses of single nutrients "…to prevent, affect, or mitigate a disease…or disease outcomes… for the most part have been disappointing."

The recent negative findings related to high-dose vitamin E supplements in lung cancer and cardiovascular disease, vitamin A in lung cancer, vitamin C in upper respiratory infections, and folic acid in patients with vitamin B_{12} deficiency have led *The Medical Letter* to limit its 1998 recommendations to the use of folic acid in young women and "…possibly of vitamin D and B_{12} in the elderly."[2] In fact, women are warned against taking vitamin A supplements during pregnancy (increased risk of birth defects) or after menopause (increased risk of bone fractures).

So, where are we in 2005, regarding the role of vitamin and nutritional supplements for the general public? Probably no further than Aristotle's notion of moderation, regarding a balanced diet, rich in fruits and vegetables.

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SB Hanauer is Editor-in-Chief of Nature Clinical Practice Gastroenterology & Hepatology.

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As *The Medical Letter* concludes, "No biologically active substance taken for a long term can be assumed to be free of risk."[2] In fact, we seem to have been duped by epidemiologic studies implying a role for single nutrients, whereas, instead, it is more likely that it is the lifestyle of individuals who consume more healthy foods and exercise regularly that provides benefits. As the evidence unfolds and associations from epidemiologic studies are unraveled in prospective controlled trials, our public health recommendations need to shift towards targeted supplementation for individuals at risk (e.g. folic acid for young women or during pregnancy, or vitamin B_{12} for the elderly) rather than generic recommendations of high-dose vitamin supplements that are proving to be harmful rather than helpful.

From the public health standpoint, these might be difficult concepts to sell, particularly when there is a substantial marketing effort being made by the health food industry. Furthermore, vitamin supplements are relatively inexpensive compared with a healthy diet. Nevertheless, the medical community and public health authorities need to publicize the health risks of supplements as scientific data accumulate. We must not, however, be naive and think that the negative health and health economic impacts (as demonstrated by scientific data), in contrast to public preconceptions based on 'alternative health' marketing, will be readily accepted. We have a great deal of belief to overcome, and what's next after vitamins? Well, herbs, of course—try convincing the general public that *Echinacea* doesn't help to treat or prevent the common cold!

Supplementary information, in the form of a reference list, is available on the *Nature Clinical Practice Gastroenterology & Hepatology* website.