

Viewpoint

Does Mega-C Do More Good Than Harm, or More Harm Than Good?

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For genetic reasons, megadoses (>500 mg/day) of vitamin C are harmful to many people. It is not only unknown if they enhance the longevity of the overall population, but unknown whether they harm more people than they help. This article addresses some of the issues involved.

The recently reported study by Enstrom, Kanim and Klein¹ demonstrated that a group of individuals *with a healthy life-style*, manifested by four key healthy life-style markers ("confounding variables" in the jargon of science) that they weigh less (2.2 kg less body fat in the men, 4.4 in the women), smoke less, exercise more, eat more fruits and vegetables (including oranges, grapefruits, tomatoes and their juices), and *incidentally* also take regular vitamin supplements (averaging a "best guess" megadose of 800 mg of vitamin C/day), live longer than a group who weigh more, smoke more, exercise less, eat less fruits and vegetables and *incidentally* take no regular supplements.

However, Enstrom et al. ignored two of these four (weight loss and eating fruits and vegetables) and lumped the other two confounding variables, smoking and exercise, with eight other variables including total fat and calories consumed. All of these eight variables were identical in the men who took supplements and those who did not and

do not appear to be confounding in their study. The differences in the two were obscured by the non-differences in the other eight. Therefore, Enstrom et al. concluded that the supplements were responsible for the much greater longevity in the men in the supplemented compared to the nonsupplemented groups. Because the women taking supplements ate more fat than the women who did not take supplements, their increase in longevity was less.

Before one accepts their conclusion that the supplements were responsible for greater longevity, one would like to see the results if, instead of using the supplements as the index marker, they reevaluated their data, using the four key healthy life-style markers as principal markers in the same supplement and no supplement groups. One would anticipate that such a reevaluation would show an even greater increment in longevity due to those four markers than shown by using the incidental-to-a-healthy-life-style marker of consumption of vitamin C supple-

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ments. Vitamin supplement users are more likely to be from a higher socioeconomic status than non-users. People "into" a healthy life-style often also take vitamin C supplements, because of the relentless hype that vitamin pills are part of a healthy life-style, making vitamin C supplements a surrogate **pseudo-marker** for a number of unmeasured variables having to do with a healthy life-style and/or better access to medical care and appropriate nutrition.

One suspects that, if Enstrom et al. reevaluate their data using the above four healthy life-style markers to separate those into two groups (>500 mg/day and 50 to 500 mg/day). The group using mega-C (>500 mg/day) supplements will fare less well than the group using less, because of the harms from megadoses of vitamin C.

Promoters of vitamin C supplements claim that megadoses of vitamin C are harmless. Their incessant repetition of this fiction has so fixed it in concrete in the minds of Americans as "rock logic"² that even first-rate epidemiologists like Enstrom believe it. Circulated nationwide was his statement to the media, the day his article in *Epidemiology*¹ was published, that megadoses of vitamin C were harmless.

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Nothing could be further from the truth. Vitamin C is a double-edged sword, necessary for health in small amounts and harmful in large amounts. *High-dose* vitamin C supplements, deceptively represented as "high potency" to convey an aura of increased value, have produced great harm, ranging from serious illness to death.

The representation of vitamin C and β -carotene as antioxidants is both truth and misperception, because both are in fact redox agents and pro-oxidant rather than antioxi-

idant in appropriate circumstances. To quote Repka and Hebbel,³ and as others^{4,5} have also pointed out, "lipid peroxidation studies show that at physiologic levels ascorbate acts primarily as an antioxidant; however, as pharmacologic levels are reached, its pro-oxidant effects predominate."

In the presence of iron, vitamin C is one of the most potent pro-oxidants known.^{3,13} It converts iron stores to catalytic iron, one of the most oxidant of substances.⁶ About 10% of Caucasians and about 8% of African-Americans are born with a gene for increased iron absorption (heterozygous hemochromatosis), and about 1 in 250 have two genes for enhanced iron absorption (homozygous hemochromatosis).^{14,15} Vitamin C supplements, which enhance both iron absorption and the release of iron from body deposits, can act as a second gene for iron overload in those born with 1 gene for enhanced iron absorption.⁶ By producing iron overload in these people and releasing catalytic iron from their body stores, vitamin C supplements can maim and kill. In her formal statement¹⁶ supporting the position^{17,18} that the FDA-proposed lower U.S. RDIs protect consumers, Margit Krikker of the Hemochromatosis Research Foundation wrote: "Vitamin C, which accelerates iron absorption, has also been responsible for cardiac deaths in at least three athletes, unaware of their predisposition to iron-loading or of the hazards of daily megadoses for years."¹⁶

Some pertinent statistics:

1. Twice as many American adult men (1 in 250) have iron overload disease as have iron deficiency (1 in 500), so vitamin C supplements, which enhance iron absorption, are twice as likely to harm them as help them.^{14,19}
2. Almost twice as many Americans (about 10%) have a gene for positive iron balance as are in negative iron balance (about 6%, mainly infants, early adolescents, women in the reproductive years, and pregnant women), so vitamin C supplements, by enhancing iron ab-

sorption, if taken nonselectively by all Americans, are likely to do more harm than good.⁶

3. In a 5-year study of more than 1900 Finnish men, published in *Circulation* in September 1992, Dr. Jukka T. Salonen and his colleagues²⁰ found that **for each 1% increase in serum ferritin there was a more than 4% increase in risk of heart attack.** Finnish men with serum ferritin

The Finnish study suggests that the monthly blood loss, with its concurrent loss of iron protects women in the child-bearing years against heart attacks.

above 200 had 2.3 times as many heart attacks as Finnish men with serum ferritin of 100. High low-density lipoprotein (LDL) cholesterol level *per se* was not a risk factor. It only became one when there was concurrent high ferritin, which, particularly in the presence of vitamin C,^{6,21} releases catalytic iron which, in turn, converts the harmless LDL cholesterol to oxidized LDL cholesterol, which damages the walls of coronary arteries.

Olson and Hodges noted²² (and provided pertinent literature references for) all of the following harms from excess vitamin C:

Occasional large intakes of vitamin C may cause stomach cramps, nausea and diarrhea in some fasting persons but have no long-term adverse effects.

When daily large doses are ingested routinely for months or years, however, a number of adverse effects may occur, including uricosuria, reduced bactericidal activity of leukocytes, secondary hyperoxalemia (producing metastatic oxalosis) in hemodialysis patients, enhanced mobilization of bone calcium, impaired blood coagulation time, low-ered plasma B₁₂ levels, interruption of pregnancy, reduced insulin production and interference with anticoagulant therapy... These and other possible effects of high doses have been thoughtfully reviewed by Barnes and by Hornig and Moser.²²

The extent to which the routine ingestion of very high doses of vitamin C impairs health in a serious and lasting way is unknown. The frequency of reported toxic manifestations is unquestionably low relative to the number of persons routinely ingesting large doses. The mortality rate among health-conscious elderly Californians who routinely ingested large doses of nutritional supplements, including vitamin C, is significantly lower than that of one non-smoking reference population but not lower than that of another health-conscious group. The mortality rate was independent of the reported amount of vitamin C ingested daily.²²

The above section of their discussion²² on toxicity of vitamin C is quoted *in extenso* because, when the Subcommittee on the RDA edited it, in their enthusiasm for the *ignis fatuus* of vitamin C against cancer,²³ they edited out much of the toxicity section as well as literature references to that toxicity.

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