

## Vitamin and mineral supplements: Miracle potions, silent dangers or both?

What is quackery and does the use of vitamin and mineral supplements fall into this category?

For Children's Hospital of Philadelphia (CHOP) pediatrician and rotavirus vaccine co-inventor Paul Offit, any practice or product advocated by alternative medicine qualifies as quackery when it replaces effective conventional therapy, or when it otherwise causes harm.

Together with other CHOP leaders, Offit is helping to expose the dark side of the supplement industry—a \$22 billion per year market—for its opposition to regulation of its products and its tactic of scaring consumers about non-existent health dangers into buying supplements, many of them useless, in large quantities.

Known nutritionally as micronutrients, the value of vitamins and minerals have been appreciated only during the last century and a half. By learning how these chemical agents work in biochemistry, medicine has been able to stop numerous diseases with relatively simple intervention. But during the last half century, the unproven idea that if small doses of vitamins are good, huge doses must be great has gone viral—not necessarily in the science literature, but in the public's mind. And those views are supported by a multi-million dollar marketing effort that supports the incredibly lucrative vitamin/mineral industry.

For many people, there is good reason to supplement certain vitamins, but supplementing everything for everything may not be a good idea, and in many cases vitamin supplements are outright harmful. And that is why Offit is going after the supplement industry. *Primum non nocere*, is the Latin term used in medicine – first, do no harm.

### **An urban myth that won't go away**

Why do we think we need supplements? This question forms the basis of an [article](#) that Offit wrote two years ago in *The Atlantic*. Here is the gist of it:

Nutrition experts contend that all we need is what's typically found in a routine diet. Industry representatives, backed by a fascinating history, argue that foods don't contain enough, and we need supplements. Fortunately, many excellent studies have now resolved the issue.

According to Offit, the public's fascination with vitamins can all be traced back to the famed biochemist and multiple Nobel Prize winner Linus Pauling. During the mid 20th century, Pauling made a series of fundamental discoveries that literally transformed chemistry, made biochemistry into a modern science that could interact with virtually every scientific field, and launched the field of molecular biology. His early scientific paper proposing a new understanding of chemical bonds between atoms was so revolutionary that the editor of the journal receiving it could not find anyone qualified to peer review it. Pauling had no peers, because he'd discovered something so completely fundamental about nature, something that even Albert Einstein thought was too complicated to do anything but shrug his shoulders.

The dark side of Pauling's legacy was his obsession with vitamins. During the mid sixties, he was persuaded that he could reduce his cancer risk significantly and extend his lifespan by at least a quarter century by taking oodles of vitamin C. How much? Pauling started off with 3,000 milligrams per day and within a few years was taking up to 18,000 milligrams daily—that's a typical bottle of vitamin C per day.

Personally consuming mega amounts of vitamins was not enough. By the 1970s, Pauling was making very specific predictions, hypothesizing that mega doses of vitamin C would reduce the cancer incidence in the population by 75 percent and predicting that life expectancy could soar to above 110 years with no other interventions. Over the next few years, he promoted other supplements: vitamin A, vitamin E, and selenium, based on the idea that these micronutrients all absorb entities known in chemistry as free radicals, which can cross-link DNA.

Linus had not a shred of hard data or evidence to support the proposition that taking massive vitamin doses would reduce one's risk of cancer. But because he was such a trusted scientist, the public and even many in the medical profession embraced his radical views. Yes, one needs a small amount of vitamin C (which you get from a good diet) to maintain a protein called collagen, used throughout numerous body tissues. And yes, one also needs small amounts of vitamin A and E, and selenium.

Because Pauling was such a respected biochemist, numerous studies were carried out to find out if he perhaps was on to something. It turns out that even for the common cold, the only thing that high doses of vitamin C will do is dry your nose out slightly and temporarily; they do not fight off the cold virus or eliminate the symptoms (other than the nose drying effect of vitamin C). Excessive doses of vitamin A and E do not help either (although in some rare cases of deficiency diseases, massive doses are the conventional therapy). Vitamin E deficiency is extremely rare, but vitamin A deficiency is fairly common in certain environments. Still, for healthy, well-fed individuals, taking extra amounts of these vitamins offers little or no benefit in terms of preventing cancer, heart disease or common ailments.

Studies over the last several years do support some benefits of taking vitamin D, which is really not a vitamin but a hormone. Researchers now suspect that people use up their vitamin D supplies more easily than what was thought, so it could be that the daily recommended amount was set too low. Because many people living at high latitudes do not get enough sun exposure and because those who are lactose intolerant do not eat many dairy products, taking vitamin D supplements may have some benefits, and many doctors prescribe it.

## **Multivitamins?**

When it comes to multivitamins, things get complicated. In 2011, a large study published in the prestigious *Journal of the American Medical Association* (JAMA) known as the [Iowa Health Study](#) found that taking multivitamins correlates with reduced lifespan in older women. A study in Europe showed a similar result. The increased mortality was associated with supplementation of vitamin B-6 and iron, both of which are components of multivitamins (although many multivitamin preparations are available without iron).

It's not known if the result carried over to men or to younger people taking multivitamins, B-6 or iron and of

course there are reasons for some people to take supplements or vitamins when faced with distinct health issues and when physicians prescribe them. Vegetarians for example often have low vitamin B-12 levels, which lead to a type of anemia in which red blood cells are over-sized (megaloblastic anemia) and to severe neurological problems.

Just over a year ago, an [editorial](#) in the *Annals of Internal Medicine* concluded that multi-vitamin-mineral supplements were a waste of money; “the debate is over” was the take home message. However, responses from various researchers, including nutritionists at [Oregon State University](#) (at the institute named for Pauling himself) pushed back. They responded that the cited studies that showed no benefit (and in some cases harmful effects) of supplemental vitamins used only the most common and immediate causes of mortality—heart disease and cancer—as endpoints for assessing effects of supplements. But the studies didn’t look at borderline anemia cases, mild osteoporosis, slow onset senility, and a range of issues that might result from Americans having less than perfect nutrition and could impact health in a major way.

Although most everyone now agrees that megadose vitamin therapy poses more harm than potential good, the debate is not yet closed on whether some extra vitamins and minerals—mild not massive doses—could benefit the population, or certain segments of it. While nutritionists agree that food, rather than supplements, is the best way to get all of the micronutrients, recognizing that not everyone will eat the appropriate amounts of fruits and vegetables or milk products, some responsible health professionals recommend a low dose multivitamin for patients with no signs of a particular micronutrient deficiency.

### **Supplement industry is not waiting for the science**

To help sell their products, the supplement industry does not shy away from making exaggerated claims about its products, and it’s the misleading marketing that scientists and doctors such as Paul Offit are fighting. Unlike drugs, which have to go through long, painstaking preclinical and clinical studies before they are approved as treatments for particular conditions, the FDA allows dietary supplements to be marketed with no such research track record.

Often a supplement manufacturer will cite a clinical study on the container of its product, which makes the claim look as impressive as possible, but it’s often totally out of context vis-à-vis the full collection of scientific studies on the issue. Zinc lozenges sold on the basis that they’ll speed recovery from the common cold cite various claims on the box based on studies published in respectable medical journals. One that I tracked down, from Cold-Eeze, a very popular zinc lozenge, claimed numerous benefits:

In double-blind, placebo-controlled clinical studies at Dartmouth College and the Cleveland Clinic, Cold-EEZE lozenges were found to shorten patients’ colds by almost half. That’s three to four days cut from the length of the typical cold, as reported by these rigorous scientific studies that were peer-reviewed and published in prominent medical journals.

What is not stated is that these were small studies published more than a decade ago; most mainstream researchers, drawing on newer more extensive research, today believe zinc lozenges offer no benefits at

all. More recent [studies](#) and meta-analyses (data are combined from numerous studies for a more powerful statistical result) suggest that while high doses of zinc may shorten colds modestly, the typically marketed lozenges do not contain such high levels. And taking zinc at high levels may pose other health problems.

### **Chemistry genius leaves a strange legacy**

In spite of Pauling's unprecedented accomplishments in chemistry, by the 1980s he was known by the public mostly for his vitamin C legacy. His obsession may even have produced a tragic result. Pauling was often asked whether taking such megadoses of vitamins might possibly have some negative effect, and he always replied that he was sure it would not. But his wife died relatively young of stomach cancer, which is an extremely rare disease in western countries in Caucasian women. Many researchers have speculated that she may have died from taking astronomical doses of vitamins recommended by her husband.

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