



The Dark Side of Linus Pauling's Legacy

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Linus Pauling, Ph.D. (1901-1994), was the only person ever to win two unshared Nobel prizes. He received these awards for chemistry in 1954 and for peace in 1962. He contributed greatly to the development of chemical theories. His impact on the health marketplace, however, was anything but laudable.

Pauling is largely responsible for the widespread misbelief that high doses of vitamin C are effective against colds and other illnesses. In 1968, he postulated that people's needs for vitamins and other nutrients vary markedly and that to maintain good health, many people need amounts of nutrients much greater than the Recommended Dietary Allowances (RDAs). And he speculated that megadoses of certain vitamins and minerals might well be the treatment of choice for some forms of mental illness. He termed this approach "orthomolecular," meaning "right molecule." After that, he steadily expanded the list of illnesses he believed could be influenced by "orthomolecular" therapy and the number of nutrients suitable for such use. No responsible medical or nutrition scientists share these views.

Vitamin C and the Common Cold

In 1970, Pauling announced in *Vitamin C and the Common Cold* that taking 1,000 mg of vitamin C daily will reduce the incidence of colds by 45% for most people but that some people need much larger amounts [1]. (The RDA for vitamin C is 60 mg.) The 1976 revision of the book, retitled *Vitamin C, the Common Cold and the Flu*, suggested even higher dosages [2]. A third book, *Vitamin C and Cancer* (1979) claims that high doses of vitamin C may be effective against cancer. Yet another book, *How to Feel Better and Live Longer* (1986), stated that megadoses of vitamins "can improve your general health . . . to increase your enjoyment of life and can help in controlling heart disease, cancer, and other diseases and in slowing down the process of aging." [3] Pauling himself reportedly took at least 12,000 mg daily and raised the amount to 40,000 mg if symptoms of a cold appear [4]. In 1993, after undergoing radiation therapy for prostate cancer, Pauling said that vitamin C had delayed the cancer's onset for twenty years. This was not a testable claim. He died of the disease in August 1994.

Scientific fact is established when the same experiment is carried out over and over again with the same results. To test the effect of vitamin C on colds, it is necessary to compare groups which get the vitamin to similar groups which get a placebo (a dummy pill which looks like the real thing). Since the common cold is a very variable illness, proper tests must involve hundreds of people for significantly long periods of time. [At least 16 well-designed, double-blind studies have shown that supplementation with vitamin C does not prevent colds and at best may slightly reduce the symptoms of a cold](#) [5]. Slight symptom reduction may occur as the result of an antihistamine-like effect, but whether this has practical value is a matter of dispute. Pauling's views are based on the same studies considered by other scientists, but his analyses are flawed.

The largest clinical trials, involving thousands of volunteers, were directed by Dr. Terence Anderson, professor of epidemiology at the University of Toronto [6-9]. Taken together, his studies suggest that extra vitamin C may slightly reduce the severity of colds, but it is not necessary to take the high doses suggested by Pauling to achieve this result. Nor is there anything to be gained by taking vitamin C supplements year-round in the hope of preventing colds.

Another important study was reported in 1975 by scientists at the National Institutes of Health who compared vitamin C pills with a placebo before and during colds. Although the experiment was supposed to be double-blind, half the subjects were able to guess which pill they were getting. When the results were tabulated with all subjects lumped together, the vitamin group reported fewer colds per person over a nine-month period. But among the half who hadn't guessed which pill they had been taking, no difference in the incidence or severity was found [10]. This illustrates how people who think they are doing something effective (such as taking a vitamin) can report a favorable result even when none exists.

Vitamin C and Cancer

In 1976, Pauling and Dr. Ewan Cameron, a Scottish physician, reported that a majority of one hundred "terminal" cancer patients treated with 10,000 mg of vitamin C daily survived three to four times longer than similar patients who did not receive vitamin C supplements [11,12]. However, Dr. William DeWys, chief of clinical investigations at the National Cancer Institute, found that the study was poorly designed because the patient groups were not comparable [13]. The vitamin C patients were Cameron's, while the other patients were under the care of other physicians. Cameron's patients were started on vitamin C when he labeled them "untreatable" by other methods, and their subsequent survival was compared to the survival of the "control" patients after they were labeled untreatable by their doctors. DeWys reasoned that if the two groups were comparable, the lengths of time from entry into the hospital to being labeled untreatable should be equivalent in both groups. However, he found that Cameron's patients were labeled untreatable much earlier in the course of their disease—which means that they entered the hospital before they were as sick as the other doctors' patients and would naturally be expected to live longer.

Nevertheless, to test whether Pauling might be correct, the Mayo Clinic conducted three double-blind studies involving a total of 367 patients with advanced cancer. [The studies, reported in 1979, 1983, and 1985, found that patients given 10,000 mg of vitamin C daily did no better than those given a placebo](#) [14-16]. Pauling criticized the first study, claiming that chemotherapeutic agents might have suppressed the patients' immune systems so that vitamin C couldn't work [17]. But his 1976 report on Cameron's work stated clearly that: "All patients are treated initially in a perfectly conventional way, by operation, use of radiotherapy, and the administration of hormones and cytotoxic substances." And during a subsequent talk at the University of Arizona, he stated that vitamin C therapy could be used along with all conventional modalities [18]. The participants in the 1983 study had not undergone conventional treatment, but Pauling dismissed its results anyway.

Science aside, it is clear that Pauling was politically aligned with the promoters of unscientific nutrition practices. He said his initial interest in vitamin C was aroused by a letter from biochemist Irwin Stone, with whom he subsequently maintained a close working relationship. Although Stone was often referred to as "Dr. Stone," his only credentials were a certificate showing completion of a two-year chemistry program, an honorary chiropractic degree from the Los Angeles College of Chiropractic, and a "Ph.D." from [Donsbach University](#), a nonaccredited correspondence school.

In a little-publicized chapter in *Vitamin C and the Common Cold*, Pauling attacked the health-food industry for misleading its customers. Pointing out that "synthetic" vitamin C is identical with "natural" vitamin C, he warned that higher-priced "natural" products are a "waste of money." And he added that "the words 'organically grown' are essentially meaningless—just part of the jargon used by health-food promoters in making their excess profits, often from elderly people with low incomes." But *Vitamin C, the Common Cold* and the Flu, issued six years later, contained none of these criticisms. This omission was not accidental. In response to a letter, Pauling informed me that, after his first book came out, he was "strongly attacked by people who were also attacking the health-food people." His critics were so "biased," he decided, that he would no longer help them attack the health-food industry while another part of their attack was directed at him [19].

The Linus Pauling Institute of Science and Medicine was founded in 1973 and operated under that name until 1995 [20]. The institute was dedicated to "orthomolecular medicine." For many years, its largest corporate donor was Hoffmann-La Roche, the pharmaceutical giant that produces most of the world's vitamin C. Many of the institute's fundraising brochures contained questionable information. During the 1980s, for example, they falsely stated that no significant progress had been made in cancer treatment during the previous twenty years.

A dispute between Pauling and Arthur Robinson, Ph.D., gives additional evidence of Pauling's defense of vitamin C megadosage was less than honest. Robinson, a former student and long-time associate of Pauling, helped found the institute and became its first president. According to an investigative report by James Lowell, Ph.D., in *Nutrition Forum* newsletter, Robinson's own research led him to conclude in 1978 that the high doses (5-10 grams per day) of vitamin C being recommended by Pauling might actually promote some types of cancer in mice [18]. Robinson told Lowell, for example, that animals fed quantities equivalent to Pauling's recommendations contracted skin cancer almost twice as frequently as the control group and that only doses of vitamin C that were nearly lethal had any protective effect. Shortly after reporting this to Pauling, Robinson was asked to resign from the institute, his experimental animals were killed, his scientific data were impounded, and some of the previous research results were destroyed. Pauling also declared publicly that Robinson's research was "amateurish" and inadequate. Robinson responded by suing the Institute and its trustees. In 1983, the suit was settled out of court for \$575,000. In an interview quoted in *Nature*, Pauling said that the settlement "represented no more than compensation for loss of office and the cost of Robinson's legal fees." However, the court-approved agreement stated that \$425,000 of the settlement was for slander and libel. The Institute's own legal fees were close to a million dollars [21].

In 1994, Robinson and two colleagues summarized the results of four mouse studies he had carried out while working at the Pauling Institute [22]. Nearly all of the mice developed skin cancers (squamous cell carcinomas) following exposure to ultraviolet radiation. Altogether, 1,846 hairless mice received a total of 38 different diets. The researchers found that (a) the rate of onset and severity of tumors could be varied as much as 20-fold by just modifying dietary balance; (b) diets with the worst balance of nutrients had the greatest inhibitory effect on cancer growth; and (c) no cures or remissions were observed (although the researchers were not looking for this). In 1999, Robinson commented:

The results of these experiments caused an argument between Linus and me, which ended our 16-year period of work together. He was not willing to accept the experimentally proved fact that vitamin C in ordinary doses accelerated the growth rate of squamous cell carcinoma in these mice.

At the time, Linus was promoting his claim that "75% of all cancer can be prevented and cured by vitamin C alone." This claim proved to be without experimental foundation and not true. . . . Vitamin C increased the rate of growth of cancer at human equivalents of 1 to 5 grams per day, but suppressed the cancer growth rate at doses on the order of 100 grams per day (near the lethal dose), as do other measures of malnutrition [23].

Recent laboratory studies have found that vitamin C may interfere with the effectiveness of five anti-cancer drugs. First, the researchers gave a vitamin C product to cancer cells that were treated with chemotherapy and found that the 30% to 70% fewer cancer cells were killed. Then they injected mice with cancer cells, administered chemotherapy, and found that cells grew into tumors much faster in the mice that received pre-treatment vitamin C. The researchers warned that although results in animals are not necessarily applicable to humans, vitamin C supplementation during cancer treatment may interfere with the effect of chemotherapy in humans [24].

Other Questionable Activities

During the mid-1970s, Pauling helped lead the health-food industry's campaign for a federal law that weakened FDA protection of consumers against misleading nutrition claims. In 1977 and 1979, Pauling received awards and presented his views on vitamin C at the annual conventions of the National Nutritional Foods Association (the major trade association of health-food retailers, distributors and producers). In 1981, he accepted an award from the National Health Federation (NHF) for "services rendered in behalf of health freedom" and gave his daughter a life membership in this organization. NHF promotes the gamut of quackery. Many of its leaders have been in legal difficulty and some have even received prison sentences for various "health" activities. Pauling also spoke at a Parker School for Professional Success Seminar, a meeting where chiropractors were taught highly questionable methods of building their practices. An ad for the meeting invited chiropractors to pose with Pauling for a photograph (which presumably could be used for publicity when the chiropractors returned home).

In 1981, after learning that Pauling had donated money to NHF (for his daughter's life membership), I asked whether he knew about NHF's shady background and the fact that it was the leading anti-fluoridation force in the United States. I also asked whether he cared that the money might be used to help fight fluoridation. In a series of letters, he replied that he: (a) strongly supported fluoridation, (b) was aware of NHF's opposition, (c) had tried to pressure the organization to change its views, (d) had spoken out for it often and over many years, and (e) thought other issues were more important [19]. He also sent me a [profluoridation statement](#) he had issued in 1967 [25]. His claim that he had spoken out for fluoridation surprised me. Although I have read thousands of documents related to Pauling's views and activities, I had never encountered any other indication that he had publicly supported fluoridation.

In 1983, Pauling and Irwin Stone testified at a hearing on behalf of Oscar Falconi, a vitamin promoter charged by the Postal Service with making false claims for several products. Pauling supported Falconi's contentions that vitamin C was useful not only in preventing cancer, but also in curing drug addicts and destroying both viruses and bacteria. The Administrative Law Judge concluded that Pauling could not substantiate his claims [26].

Pauling also testified in 1984 before the California Board of Medical Quality Assurance in defense of Michael Gerber, M.D., who was accused of improperly administering to patients. One was a 56-year-old woman with treatable cancer who—the Board concluded—had died as a result of Gerber's neglect while he treated her with herbs, enzymes, coffee enemas, and chelation therapy. The other patients were three-year-old twin boys with ear infections for which Gerber had prescribed 70,000 or more units of vitamin A daily and coffee enemas twice daily for several weeks. The Board found Gerber guilty of gross negligence and incompetence, repeated similar negligent acts, and other similar charges and revoked his California medical license. [He now practices in Nevada under a homeopathic license.](#)

A flyer distributed in 1991 by the Linus Pauling Institute recommended daily doses of 6,000 to 18,000 mg of vitamin C, 400 to 1,600 IU of vitamin E, and 25,000 IU of vitamin A, plus various other vitamins and minerals. These dosages have no proven benefit and can cause troublesome side effects. In the Gerber case, Pauling testified that the proper intake of vitamin C for adults was "around 10 or 20 grams per day," that this would significantly reduce death rates, and that he knew of people who had taken 150 grams of vitamin C daily for years without serious side effects [27].

Today's Linus Pauling Institute

After Pauling died, fundraising appeals expressed concern that his death would make it more difficult to raise funds to continue the institute's operations. In 1996, the assets of the Linus Pauling Institute of Science and Medicine were used to establish the Linus Pauling Institute (LPI) as a research institute at OSU to investigate the function and role of micronutrients, phytochemicals and microconstituents of food in maintaining human health and preventing and treating disease; and to advance the knowledge in areas which were of interest to Linus Pauling through research and education [28].

The LPI Web site has excellent articles about the function and role of many nutrients. Except for vitamin E, the LPI's recommended nutrient levels are in line with prevailing scientific opinions. One article notes that Pauling's vitamin C recommendations were based on "theoretical arguments" and that we now have much more scientific information upon which to base recommendations [29]. This certainly is true but glosses over the fact that Pauling's meganutrient theories were absurd and were maintained even after scientific studies refuted them. Overall, however, the LPI is now a respectable education and research facility.

The Bottom Line

Although Pauling's megavitamin claims lacked the evidence needed for acceptance by the scientific community, they have been accepted by large numbers of people who lack the scientific expertise to evaluate them. Thanks largely to Pauling's prestige, annual vitamin C sales in the United States have been in the hundreds of millions of dollars for many years. Pauling also played a role in the health food industry's successful campaign to weaken FDA consumer protections laws. The Linus Pauling Institute that bears his name has evolved into a respectable organization. But Pauling's irrational advice about supplements continues to lead people astray.

For Additional Information

- [Does Vitamin C Prevent Colds?](#)
- [High Doses of Vitamin C Are Not Effective as a Cancer Treatment](#)

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The Linus Pauling Quartet is a psychedelic rock group which specializes in a specific subgenre known as "Texas Psych", but frequently dabbles also in garage rock, stoner rock, punk rock, and heavy metal at various points throughout their discography. The LP4 was formed in 1994 by veterans of various local groups from the Houston and Clear Lake areas of Texas. Born of the same musical cauldron that birthed such renowned Texas Psych favorites as The Mike Gunn, Dry Nod, and Schlong Weasel, bands which