Vitamin C as cancer treatment? High doses boost chemotherapy in study - Los Angeles Times

Monte Morin

Could pumping roughly 2,000 oranges' worth of vitamin C into a patient's bloodstream boost the effectiveness of anti-cancer drugs and mitigate the grueling side effects of chemotherapy?

In research published Wednesday in the journal Science Translational Medicine, scientists found that high doses of vitamin C – administered intravenously – increased the cancer-killing effects of chemotherapy drugs in mice, and blunted toxic side effects in humans.

But even though the research seems to offer the promise of effectiveness for a new method of cancer treatment, vitamin C, or ascorbate, is unlikely to inspire the vigorous, and expensive, research necessary to become an approved tumor remedy, experts say.

Due to a decades-long history of discredited health claims, as well as the inability of pharmaceutical companies to patent an essential nutrient, vitamin C is among the unlikeliest compounds to attract funding for cancer research.

"There's been a bias since the late 1970s that vitamin C cancer treatment is worthless and a waste of time," said Dr. Jeanne Drisko, a study co-author and the director of integrative medicine at the University of Kansas Medical Center. "We're overcoming that old bias."

The furor surrounding vitamin C began with the chemist Linus Pauling, a two-time winner of the Nobel Prize, who proposed that heavy doses of ascorbate could prevent and treat most cancers. Although Pauling's broad claims could not be supported in clinical trials, large doses of vitamin C are still used as an alternative form of cancer treatment for thousands of patients, outside of mainstream medicine.

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Drisko and colleagues argue that vitamin C is worth re-examination, and say the federal government should fund further research. One of the problems with earlier studies, they say, is that ascorbate was taken orally, not intravenously.

"When you swallow a pill or eat an orange, vitamin C is absorbed at a certain rate by the gut and excreted very quickly by the kidneys," Drisko said. "But when you give it intravenously, you override that. Plasma levels can get very high."

Researchers examined the effects of vitamin C on a variety of cancer cells in the lab, and in ovarian cancer cells in mice. When high concentrations of ascorbate entered

the space between cells, they said, it formed hydrogen peroxide.

Senior author Qi Chen, an assistant professor of pharmacology, toxicology and therapeutics at the University of Kansas, said the hydrogen peroxide went to work on cancerous cells in several ways: It damaged their DNA, it stressed their metabolism and inhibited their growth.

This weakening improved the effectiveness of traditional cancer drugs like carboplatin and paclitaxel, the authors said.

Surprisingly, the hydrogen peroxide did not harm the non-cancerous cells, researchers found. While they said it remains unclear exactly why this is the case, they suspect it has to do with the inefficient way cancer cells convert glucose to energy, when compared with regular cells.

“Ascorbate causes an energy crisis for the cancer cells,” Chen said.

A third part of the research involved a small trial study with 27 cancer patients, a portion of which were given vitamin C with chemotherapy – provided they did not have kidney problems.

The purpose of the trial was to see if the vitamin C sickened patients, not whether it was more effective than standard treatment. Many more patients would be required to make that determination.

Not only did the patients who were given vitamin C do well, they tolerated chemotherapy better than those who did not receive it, the authors said. They had more energy, and experienced less nausea.

“That was surprising,” Drisko said. “We did not expect to find that.”

In addition to vitamin C’s controversial past, it is also an antioxidant. Some doctors fear that antioxidants will blunt or negate the effects of anti-cancer drugs, because those drugs seek to damage tumor cells through oxidation. The study authors and other experts point out, however, that by administering vitamin C intravenously, the concentrations are so high that the compound acts as an oxidant.

In an accompanying Focus article, two New Zealand cancer experts who were not involved in the study wrote that new drug combinations were badly needed in the fight against cancer, and that the vitamin C tumor drug “cocktail” showed promise.

The findings “strongly suggest that the time has come to test ascorbate combination therapy,” wrote cancer cell researchers Melanie McConnell, of Victoria University of Wellington, and Patries Herst, of University of Otago Wellington.

Dr. Robert Morgan, co-director of the gynecological cancers program at City of Hope, in Duarte, who was not involved in the study, agreed that the authors’ findings warranted further study. The trouble was, he said, there were now hundreds of other anti-cancer agents that also warranted further study.

“The issue with any type of cancer research is who’s going to pay for it,” Morgan said. “Pharma does it because they expect ultimately to find a drug that’s effective, helps patients and will make a profit for their shareholders. This is the kind of a drug that if somebody invested in it, they would not expect to make back their

investment. That's the issue."

While Drisko said she hoped government would step in to fund larger trials, she suspected agencies like the National Cancer Institute would avoid offering grants due to ascorbate's history.

At the NCI's Office of Cancer Complementary and Alternative Medicine, director Dr. Jeffrey White said the study had done much to explain the precise mechanisms by which ascorbate affects cancer cells, and that further investigation was warranted.

He also acknowledged that some grant reviewers might possibly view the subject with bias, but that he hoped they would focus on the science.

"There are certain things that carry with them a certain stigma, at least in the minds of some people who are involved with medicine and cancer research," White said. "If a reviewer were to make comments that weren't about the science, but that were more about the controversy, you hope the process would work that through ... research like this ought to carry the day."