Intravenous Vitamin C[2]

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Overview  
This cancer information summary provides an overview of the use of intravenous (IV) vitamin C (also known as ascorbate or L-ascorbic acid) as a treatment for people with cancer. This summary includes a brief history of early clinical trials of the use of IV vitamin C; reviews of laboratory, animal, and human studies; and current clinical trials.  
  
This summary contains the following key information:  
  
Vitamin C is an essential nutrient with redox functions at normal physiologic concentrations.  
Case series and observational studies from the 1970s of cancer patients who received IV vitamin C seemed to indicate a clinical benefit.  
Two early randomized placebo-controlled trials that used oral vitamin C (10 g/d) without IV vitamin C noted no significant differences between ascorbate-treated and placebo-treated groups for symptoms, performance status, or survival.  
Laboratory studies have reported that IV vitamin C has redox properties and decreased cell proliferation in prostate, pancreatic, hepatocellular, colon, mesothelioma, and neuroblastoma cell lines.  
IV vitamin C has been generally well tolerated in clinical trials.  
IV administration of vitamin C of doses over 500 mg produces much higher blood concentrations of ascorbate than oral administration of the same dose.  
The use of IV vitamin C alone as ascorbate versus ascorbate formulations plus certain standard cancer therapies have been shown to be well tolerated in clinical trials.  
Two studies that used IV vitamin C in cancer patients reported improved quality of life and decreases in cancer-related toxicities.  
Although early observations from preclinical and clinical trials of IV vitamin C with and without conventional cancer therapies appear promising and the therapy well tolerated, these studies have several limitations due to lack of rigor in trial design.  
Many of the medical and scientific terms used in this summary are hypertext linked (at first use in each section) to the NCI Dictionary of Cancer Terms, which is oriented toward nonexperts. When a linked term is clicked, a definition will appear in a separate window.  
  
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General Information  
Vitamin C is an essential nutrient that has redox functions, is a cofactor for several enzymes, and plays an important role in the synthesis of collagen.[1] A severe deficiency in vitamin C results in scurvy, which is associated with malaise, lethargy, easy bruising, and spontaneous bleeding.[2] One of the effects of scurvy is a change in collagen structure to a thinner consistency. Normal consistency is achieved with administration of vitamin C.  
  
In the mid-20th century, a study hypothesized that cancer may be related to changes in connective tissue, which may be a consequence of vitamin C deficiency.[3] A review of evidence published in 1974 suggested that high-dose ascorbic acid may increase host resistance and be a potential cancer therapy.[4]  
  
Vitamin C is synthesized from D-glucose or D-galactose by many plants and animals. However, humans lack the enzyme L-gulonolactone oxidase required for ascorbic acid synthesis and must obtain vitamin C through food or supplements.[1]  
  
Some companies distribute vitamin C as dietary supplements. In the United States, dietary supplements are regulated as foods, not drugs. Therefore, premarket evaluation and approval of such supplements by the U.S. Food and Drug Administration (FDA) are not required unless specific disease prevention or treatment claims are made. Because dietary supplements are not formally reviewed for manufacturing consistency, ingredients may vary considerably from lot to lot and there is no guarantee that ingredients claimed on product labels are present (or are present in the specified amounts). The FDA has not approved the use of high-dose vitamin C as a treatment for cancer.  
  
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History  
The earliest experience of using both oral and intravenous (IV) vitamin C for cancer treatment was by a Scottish surgeon, Ewan Cameron, and his colleague, Allan Campbell, in the 1970s.[1] This work led to a collaboration between Cameron and the Nobel Prize winning chemist Linus Pauling, further promoting the potential of vitamin C therapy in cancer management.[2,3] As a result, two clinical trials of oral vitamin C were conducted in the late 1970s and early 1980s.[4,5] These two trials did not use IV vitamin C.  
  
For more information about these early studies, see the Human Studies section.  
  
Pharmacokinetic studies later revealed substantial differences in the maximum achieved blood concentrations of vitamin C based on the route of administration. When vitamin C is taken orally, plasma concentrations of the vitamin are tightly controlled, with a peak achievable concentration less than 300 M. However, this tight control is bypassed with IV administration of the vitamin, resulting in very high levels of vitamin C plasma concentration (i.e., levels up to 20 mM).[6,7] Further research suggests that pharmacological concentrations of ascorbate, such as those achieved with IV administration, may result in cell death in many cancer cell lines.[8]  
  
Health care practitioners attending complementary and alternative medicine conferences in 2006 and 2008 were surveyed about usage of high-dose IV vitamin C in patients. Of the 199 total respondents, 172 had administered vitamin C to patients. In general, IV vitamin C was commonly used to treat infections, cancer, and fatigue.[9]  
  
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Laboratory/Animal/Preclinical Studies  
In This Section  
In Vitro Studies  
Animal Studies  
In Vitro Studies  
Numerous studies have demonstrated that supraphysiologic concentrations of ascorbic acid (0.1 100 mM) decrease cell proliferation in a variety of cancer cell lines.[1-5] Specifically, decreases in cell proliferation after ascorbic acid treatment have been reported for prostate,[6] pancreatic,[7,8] hepatocellular,[9] colon,[10] mesothelioma,[11] and neuroblastoma [12] cell lines.  
  
The potential mechanisms through which treatment with pharmacological doses of ascorbic acid may exert its effects on cancer cells have been extensively investigated. Several studies have demonstrated that the in vitro direct cytotoxic effect of ascorbic acid on various types of cancer cells is mediated through a chemical reaction that generates hydrogen peroxide.[1,7,13,14] Treating colon cancer cells with 2 mM to 3 mM of ascorbic acid resulted in downregulation of specificity protein (Sp) transcription factors, iron metabolism disruption, and Sp-regulated genes involved in cancer progression.[10,15] One study suggested that ascorbate-mediated prostate cancer cell death may occur through activation of an autophagy pathway.[6] Data from a 2018 study demonstrated that labile iron and hydrogen peroxide play important roles in the mechanisms of selective toxicity of ascorbate and induction of oxidative DNA damage/cancer cell death.[16] Another in vitro study found that ascorbic acid killed colorectal cancer cells with KRAS or BRAF mutations by inhibiting the enzyme glyceraldehyde 3-phosphate dehydrogenase.[17]  
  
Differences in chemosensitivity to ascorbate treatment in breast cancer cell lines may depend on expression of the sodium-dependent vitamin C transporter 2 (SVCT-2).[18]  
  
Research has suggested that pharmacological doses of ascorbic acid enhance the effects of the following:  
  
Arsenic trioxide on ovarian cancer cells.[19]  
Gemcitabine on pancreatic cancer cells.[8]  
A combination treatment of gemcitabine and epigallocatechin-3-gallate (EGCG) on mesothelioma cells.[20]  
Findings from one study reported in 2012 suggested that high-dose ascorbate increases radiosensitivity of glioblastoma multiforme cells, resulting in more cell death than from radiation alone.[21]  
  
However, not all studies combining vitamin C with chemotherapy have shown improved outcomes. Treating leukemia and lymphoma cells with dehydroascorbic acid (the oxidized form of vitamin C that increases levels of intracellular ascorbic acid) reduced the cytotoxic effects of various antineoplastic agents tested, including doxorubicin, methotrexate, and cisplatin (relative reductions in cytotoxicity ranged from 30% to 70%).[22] In another study, multiple myeloma cells were treated with bortezomib and/or plasma obtained from healthy volunteers who had taken oral vitamin C supplements. Cells treated with a combination of bortezomib and volunteers plasma exhibited lower cytotoxicity than did cells treated with bortezomib alone.[23]  
  
Animal Studies  
Using oral N-acetylcysteine and vitamin C, researchers showed in 2007 that these compounds, both thought to act predominantly as antioxidants, may have antitumorigenic actions in vivo by decreasing levels of hypoxia-inducible factor-1, a transcription factor that targets vascular endothelial growth factor and plays a role in angiogenesis.[24]  
  
Studies have demonstrated tumor growth inhibition after treatment with pharmacological ascorbate in animal models with the following:  
  
Pancreatic cancer.[1,7,8]  
Liver cancer.[3]  
Prostate cancer.[25]  
Sarcoma.[26]  
Mesothelioma.[11]  
Ovarian cancer.[4]  
The effects of parenterally administered ascorbic acid in combination with standard treatments on tumors have been investigated. In a mouse model of pancreatic cancer, the combination of gemcitabine (30 or 60 mg/kg every 4 days) and intraperitoneal injection of ascorbate (4 g/kg daily) resulted in greater decreases in tumor volume and weight, compared with gemcitabine treatment alone.[8] A study of mouse models of ovarian cancer found that ascorbate enhanced the tumor inhibitory effect of carboplatin and paclitaxel, first-line chemotherapy used in ovarian cancer.[27] One study working with xenograft models of non-small cell lung cancer and glioblastoma multiforme showed that the combination of chemotherapy (carboplatin for lung cancer and temozolomide for glioblastoma), radiation therapy, and pharmacologic ascorbate (4 g/kg/d) intraperitoneal injection resulted in prolonged survival compared with just the combination of chemotherapy and radiation therapy.[15]  
  
A study explored the efficacy of parenterally injected ascorbate with gemcitabine or radiation treatment in a mouse sarcoma xenograft model. Treatment involved intraperitoneally administered doses of ascorbate (4 g/kg) combined with gemcitabine (60 mg/kg) or radiation therapy (12 Gy in 2 fractions). Compared with the control group, the combination treatments produced significantly greater inhibition of tumor growth, greater survival rate, and no increase in toxicity, suggesting cancer cell selective toxicity.[16]  
  
There have also been reports of animal studies in which vitamin C has interfered with the anticancer activity of various drugs. In a study reported in 2008, administration of dehydroascorbic acid to lymphoma-xenograft mice prior to doxorubicin treatment resulted in significantly larger tumors than did treatment with doxorubicin alone.[22] Notably, this study used dehydroascorbate, the oxidized form of vitamin C that is known to be transported actively into cells and then reduced to vitamin C, but is not routinely used. Treating multiple myeloma xenograft mice with a combination of oral vitamin C and bortezomib resulted in significantly greater tumor volume than did treatment with bortezomib alone.[23] This increase in tumor volume was caused by a chemical reaction that occurs in the gastrointestinal tract but does not appear to be relevant to intravenous administration.  
  
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Human/Clinical Studies  
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Recent Case Series Studies and Clinical Trials With Ascorbate Only  
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Early Case Series Studies and Clinical Trials With Ascorbate Only  
In the early 1970s, a consecutive case series was conducted in which 50 patients with advanced cancer were treated with intravenous (IV) and oral doses of ascorbic acid.[1] These patients began ascorbic acid treatment after conventional therapies were deemed unlikely to be effective. Patients received IV ascorbic acid (10 g/day for 10 consecutive days; some patients received higher doses), oral ascorbic acid (10 g/day), or both. The patients exhibited a wide variety of responses to treatment, including the following:  
  
No or minimal response.  
Tumor regression.  
Tumor hemorrhage.  
However, the authors noted that lack of controls prevented definitive assignment of any beneficial responses to the ascorbic acid treatment.[1] A case report published in 1975 detailed one of the patients who had experienced tumor regression.[2] Diagnosed with reticulum cell sarcoma, the patient exhibited improvement in well-being and resolution of lung masses after being treated with IV and oral ascorbic acid. When the patient's daily dose of ascorbic acid was reduced, some of signs of the disease returned; however, remission was achieved again after the patient reverted to the higher initial dose.  
  
A larger case series of terminal cancer patients treated with ascorbate was reported in 1976. In this study, 100 terminal cancer patients (50 of whom were reported on previously) [1] were treated with ascorbate (10 g/day for 10 days IV, then orally) and compared with 1,000 matched controls from the same hospital. The mean survival time for ascorbate-treated patients was 300 days longer than that of the matched controls.[3,4]  
  
Two studies tried to reproduce earlier results. These studies were randomized, placebo-controlled trials in which cancer patients received either 10 g of oral vitamin C or placebo daily until signs of cancer progression. No IV vitamin C was given in these studies. At the end of each study, no significant differences were noted between the two ascorbate-treated and placebo-treated groups for symptoms, performance status, or survival.[5,6]  
  
Recent Case Series Studies and Clinical Trials With Ascorbate Only  
One study reported three case reports of cancer patients who received IV vitamin C as their main therapy. During vitamin C therapy, the patients used additional treatments, including vitamins, minerals, and botanicals. According to the authors, the cases were reviewed in accordance with the NCI Best Case Series guidelines. Histopathologic examination suggested poor prognoses for these patients, but they had long survival times after being treated with IV vitamin C.[7] Vitamin C was given at doses ranging from 15 g to 65 g, initially once or twice a week for several months; two patients then received it less frequently for 1 to 4 years.  
  
One study demonstrated that IV vitamin C treatment resulted in improved quality of life and a decrease in cancer-related side effects in cancer patients.[8]  
  
A single-arm pilot study of weekly infusions of 60 g of ascorbic acid for 9 weeks in castration-resistant prostate cancer patients failed to observe a reduction in serum prostate-specific antigen or tumor regression.[9]  
  
Studies have shown that vitamin C can be safely administered to healthy volunteers or cancer patients at doses up to 1.5 g/kg and with screening to eliminate treating individuals with risk factors for toxicity (e.g., glucose-6-phosphate dehydrogenase deficiency, renal diseases, or urolithiasis). These studies have also found that plasma concentrations of vitamin C are higher with IV administration than with oral administration and are maintained for more than 4 hours.[10,11]  
  
Early Phase Ascorbate Trials Combined With Standard Cancer Therapies  
A phase I study published in 2012 examined the safety and efficacy of combining IV ascorbate with gemcitabine and erlotinib in patients with stage IV pancreatic cancer. Fourteen patients entered the study and planned to receive IV gemcitabine (1,000 mg/m2 over 30 minutes, once a week for 7 weeks), oral erlotinib (100 mg daily for 8 weeks), and IV ascorbate (50 g/infusion, 75 g/infusion, or 100 g/infusion 3 times per week for 8 weeks). Minimal adverse effects were reported for ascorbic acid treatment. Five patients received fewer than 18 of the planned 24 ascorbate infusions and thus did not have follow-up imaging to assess response. Three of those patients had clinically determined progressive disease. All of the other nine patients had repeat imaging to assess tumor size, and each met the criteria for having stable disease.[12]  
  
A 2013 phase I clinical study (NCT01049880) evaluated the safety of combining pharmacological ascorbate with gemcitabine in treating patients with stage IV pancreatic cancer. During each 4-week cycle, patients received gemcitabine weekly for 3 weeks (1,000 mg/m2 over 30 minutes) and twice-weekly ascorbate infusions for 4 weeks (15 g over 30 minutes during the first week, followed by weekly escalations in dose until plasma levels reached at least 350 mg/dL [20 mM]). Among nine patients, mean progression-free survival was 26 weeks and overall survival was 12 months. The combination treatment was well tolerated, and no significant adverse events were reported.[13]  
  
In 2014, a phase I/IIA clinical trial evaluated the toxicities of combining IV ascorbate with carboplatin and paclitaxel in stage III/IV ovarian cancer. Twenty-seven patients were randomly assigned to receive either chemotherapy alone or chemotherapy and IV vitamin C concurrently. Chemotherapy was given for 6 months, and IV vitamin C was given for 12 months. The addition of IV vitamin C was associated with reduced chemotherapy-related toxicities.[14]  
  
A 2015 phase I/II clinical trial of high-dose IV vitamin C (approximately 1.5 g/kg body weight) combined with various chemotherapies, depending on the specific cancer diagnosis, was conducted to do the following:[15]  
  
Observe the associated adverse events.  
Assess the pharmacokinetic profiles of vitamin C and oxalic acid levels prechemotherapy- and postchemotherapy.  
Assess clinical responses.  
Assess changes in mood.  
Assess changes in quality of life.  
High-dose IV vitamin C was analyzed in 14 patients and was generally well tolerated and safe. Minor temporary adverse effects included increased urinary flow, thirst, nausea, vomiting, and chills, some of which could be prevented. Chemotherapy administration did not affect the plasma concentration of vitamin C. Although a few patients experienced temporary stable disease, functional improvement, and increased energy, the sample size is so small that the generalizability of these results is uncertain.[15]  
  
In 2017, a phase I/IIA study reported using IV vitamin C with standard-of-care gemcitabine chemotherapy in patients with newly diagnosed pancreatic cancer.[16] Seven participants were initially enrolled. When safety was confirmed, an additional seven participants were enrolled. Twelve of the 14 enrolled participants completed the phase I pharmacokinetic evaluation. The evaluation consisted of IV vitamin C and gemcitabine pharmacokinetic measurements, each as single drugs, and then followed by the pharmacokinetic measurement of IV vitamin C combined with gemcitabine. IV vitamin C administration did not interfere with gemcitabine.  
  
In May 2019, a phase I study was published that examined the safety, pharmacokinetics, and efficacy of high-dose IV vitamin C combined with the combination chemotherapy regimens mFOLFOX6 (oxaliplatin + leucovorin + fluorouracil) or FOLFIRI (leucovorin + fluorouracil + irinotecan hydrochloride). This study consisted of 36 patients with metastatic colorectal cancer or gastric cancer. The main goal was to determine the maximum-tolerated dose and the recommended phase II dose of ascorbic acid with coadministration of either mFOLFOX6 or FOLFIRI. Patients received chemotherapy treatment on a 14-day cycle with vitamin C infusions occurring for 3 consecutive days for 3 hours at a time. For the dose-escalation portion of the study, ascorbic acid doses ranged from 0.2 g/kg to 1.5 g/kg. To determine the optimal administration rate of ascorbic acid, patient cohorts received infusion rates set at 0.6 g/min, 0.8 g/min, or 1 g/min. The study showed no dose-limiting toxicity for all doses and dosing rates; thus a maximum-tolerated dose was not reached, leading to a recommended phase II dose of 1.5 g/kg for ascorbic acid. Overall, no severe adverse reactions occurred, and the treatments were deemed safe and tolerable. A randomized phase III trial (NCT02969681) is being conducted to determine the clinical efficacy of ascorbic acid with mFOLFOX6 with or without bevacizumab in patients with metastatic colorectal cancer.[17]  
  
Informed by their preclinical data,[19] researchers at the University of Iowa treated patients with non-small cell lung carcinoma (NSCLC) and glioblastoma multiforme (GBM) in two pilot clinical trials (NCT02420314 and NCT01752491).[24] Participants in both trials were given conventional therapy plus IV vitamin C, with dosing individualized to achieve a 20 mM peak plasma concentration of ascorbate in each patient. The GBM study was a phase I design with 13 total patients. IV vitamin C was given with both radiation therapy and temozolomide and toxicity, progression-free survival, and overall survival all compared favorably to the outcomes of historical controls. The NSCLC trial was a phase II design of 14 patients with advanced cancer who received both chemotherapy and IV vitamin C (median maximum plasma concentration, 16.4 mM). The disease control and confirmed objective response rates of the study group again compared favorably with those of historical controls. Limitations of these studies included the use of historical controls and small numbers of enrolled participants.  
  
Various trials of high-dose IV vitamin C with other drugs are ongoing. There are currently five trials being conducted by researchers at the University of Iowa; four phase II studies and one phase IB/II study. The four phase II clinical trials are investigating the efficacy of high-dose ascorbate combined with standard anticancer regimens. The studies are exploring the combination of high-dose ascorbate with the following:  
  
Standard non-small cell lung cancer therapy, including radiation therapy, carboplatin, and paclitaxel (NCT02905591).  
Standard therapy for metastatic pancreatic adenocarcinoma, including gemcitabine and nab-paclitaxel (NCT02905578).  
Standard therapy for localized pancreatic adenocarcinoma with gemcitabine and radiation therapy (NCT03541486).  
Standard therapy for glioblastoma multiforme, including temozolomide and radiation therapy (NCT02344355).  
Another phase IB/II trial (NCT03508726) is studying the safety and efficacy of high-dose ascorbate with preoperative radiation therapy in locally advanced soft tissue sarcoma patients.  
  
Several studies have included IV ascorbic acid treatment at a fixed dose of 1,000 mg with arsenic trioxide regimens, with mixed results. Researchers using this approach suggested that the pro-oxidant properties of IV ascorbic acid may have helped to increase the effects of arsenic trioxide by sensitization of malignant cells to arsenic s cytotoxic effects.[25] The combination therapies were well tolerated and suggested beneficial effects in multiple myeloma patients, although the specific contribution of vitamin C could not be determined.[18-21] However, similar combination regimens resulted in severe side effects, disease progression, and no anticancer effect in patients with refractory metastatic colorectal cancer [22] and metastatic melanoma.[23] Because these were not placebo-controlled trials, the extent that ascorbate contributed to the toxicity or efficacy demonstrated in these studies is unclear.  
  
Current Clinical Trials  
Use our advanced clinical trial search to find NCI-supported cancer clinical trials that are now enrolling patients. The search can be narrowed by location of the trial, type of treatment, name of the drug, and other criteria. General information about clinical trials is also available.  
  
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Adverse Effects  
In This Section  
Drug Interactions  
Intravenous (IV) high-dose ascorbic acid has been generally well tolerated in clinical trials.[1-9] Renal failure after ascorbic acid treatment has been reported in patients with preexisting renal disorders.[10] One study reported fluid overload related to ascorbic acid infusion, but this may be caused by the delivery method and not the product.[11]  
  
Case reports have indicated that patients with glucose-6-phosphate dehydrogenase (G-6-PD) deficiency should not receive high doses of vitamin C because of the risk of developing hemolysis.[12-14]  
  
Administration of IV vitamin C at high doses has been shown to interfere with the measurement of serum biochemical parameters. A study of the administration of high-dose IV vitamin C has been observed to interfere with certain laboratory tests such as strip-based glucose meters, showing false elevations in the glucose measurements.[15,16]  
  
Drug Interactions  
When administered in high doses, vitamin C may result in adverse interactions with some anticancer agents. These interactions have primarily been detected in preclinical studies. Two early clinical studies evaluated the safety of combining high-dose IV ascorbate with gemcitabine in patients with stage IV pancreatic cancer. The combination therapy was well tolerated by patients, and no significant adverse events were reported.[9,17]  
  
In vitro and in vivo animal studies have suggested that combining oral vitamin C with bortezomib interferes with the drug s ability to act as a proteasome inhibitor and blocks bortezomib-initiated apoptosis.[18-20] This interference occurred even with the oral administration of vitamin C (40 mg/kg/day) to animals. Studies in cell culture and performed by adding blood plasma from healthy volunteers given oral vitamin C (1 g/day) also showed a significant decrease in bortezomib s growth inhibitory effect on multiple myeloma cells. Another study found similar results. Plasma from healthy volunteers who took 1 g of oral vitamin C per day was shown to decrease bortezomib growth inhibition in multiple myeloma cells and to block its inhibitory effect on 20S proteasome activity.[20] However, a study that utilized mice harboring human prostate cancer cell xenografts failed to find any significant effect of oral vitamin C (40 mg/kg/day or 500 mg/kg/day) on the tumor growth inhibitory action of bortezomib.[21] Because IV administration of vitamin C is known to produce higher concentrations of ascorbate than oral administration, these results should be a warning for cancer patients who are receiving treatment with bortezomib. Study results of the co-administration of IV vitamin C and bortezomib in humans would help guide clinical recommendations.  
  
Several studies have been performed to assess the potential synergistic or inhibitory action of vitamin C on certain chemotherapy drugs, with variable results. A series of studies in cell culture and in animals bearing tumors has shown that when given at high concentrations or dosages, dehydroascorbic acid (an oxidized form of vitamin C) can interfere with the cytotoxic effects of several chemotherapy drugs.[22] However, dehydroascorbic acid is generally present only at low concentrations in dietary supplements and fresh foods.  
  
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Summary of the Evidence for Intravenous Vitamin C  
To assist readers in evaluating the results of human studies of integrative, alternative, and complementary therapies for cancer, the strength of the evidence (i.e., the levels of evidence) associated with each type of treatment is provided whenever possible. To qualify for a level of evidence analysis, a study must:  
  
Be published in a peer-reviewed scientific journal.  
Report on a therapeutic outcome or outcomes, such as tumor response, improvement in survival, or measured improvement in quality of life.  
Describe clinical findings in sufficient detail that a meaningful evaluation can be made.  
Separate levels of evidence scores are assigned to qualifying human studies on the basis of statistical strength of the study design and scientific strength of the treatment outcomes (i.e., endpoints) measured. The resulting two scores are then combined to produce an overall score. For an explanation of the scores and additional information about levels of evidence analysis for cancer, see Levels of Evidence for Human Studies of Integrative, Alternative, and Complementary Therapies.  
  
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This summary was comprehensively reviewed.  
  
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About This PDQ Summary  
Purpose of This Summary  
This PDQ cancer information summary for health professionals provides comprehensive, peer-reviewed, evidence-based information about the use of intravenous vitamin C in the treatment of people with cancer. It is intended as a resource to inform and assist clinicians in the care of their patients. It does not provide formal guidelines or recommendations for making health care decisions.  
  
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