

Intravenous Vitamin C Therapy (IVC)

High dose Vitamin C is given intravenously to treat and / or ameliorate the symptoms of a number of medical conditions.

Conditions for which IVC may be useful:

Cancer

Vitamin C has quite a long history of use in treating cancer, stretching back to the 1970s¹ and has been used extensively since then², although it remains controversial within the medical community. Much of the more recent research has been done in the laboratory, in animals and in people with advanced cancer.

Vitamin C, in very high doses can be used in cancer:

- as an adjunct to chemotherapy, enhancing the effect of the chemotherapy drug to kill the cancer cells³
- with chemotherapy to help to reduce the side-effects⁴
- as a chemotherapeutic (cancer killing) agent in itself⁵
- improve quality of life⁶

Vitamin C taken by mouth (even in the same doses as are given intravenously) does not result in high enough levels of Vitamin C in the blood to fight cancer cells.⁷ This is probably due to a number of factors including the way the body controls the uptake of Vitamin C from the bowel.⁸ This is why it is necessary to give Vitamin C intravenously. In one study patients with the highest concentration of Vitamin C in the blood were able to maintain their physical quality of life, despite suffering with advanced cancer.⁹

IVC and other anti-oxidants appear to enhance the cancer-killing effects of chemotherapy and radiation, although how this works is not fully understood.^{3,5,10,11} Also, IVC and other anti-oxidants may decrease the side-effects of chemotherapy and radiotherapy.¹² Patients who have received IVC and other nutrients, as well as chemotherapy appear to improve more than expected.⁴ Vitamin C has not been studied in all the different types of cancer, but the general trend across the board in people with cancer is positive.

While there have been reports of prolonged survival using IVC¹³, indications are that people with cancer receiving IVC often feel better and may possibly live longer.^{14,15} Patients receiving IVC report less fatigue, nausea, vomiting, sleep problems and depression, as well as increased appetite and quality of life.^{4,6}

Other Conditions¹⁶

IVC is used to treat numerous other conditions, although these conditions have not been as extensively studied:

- infections
- rheumatoid arthritis
- fatigue

IVC is considered to be part of complementary and alternative medicine and is not generally supported by mainstream medicine. Although there is some evidence for benefits from IVC, as referenced, we do not suggest it is scientifically validated.

Side Effects

High dose IVC of up to 1.5g / kg (higher doses have also been used) given daily has been shown to be generally safe with few side-effects¹⁷ and can be used over a long period of time.⁵

Other side-effects experienced by a small number of patients are related to the infusions of a concentrated fluid solution and include: abdominal cramps, diarrhea, nausea, vomiting, headache, dizziness, fatigue, facial flushing, perspiration and weakness. Irritation can occur at the site of the drip and recurrent infusions can cause thickening and collapse of the vein. These side-effects can usually be prevented by drinking fluids before and during the infusion and are also helped by the addition of calcium gluconate to the infusion (which we do routinely)^{2,9}. If the needle becomes dislodged from the vein it can temporarily cause discomfort from the vitamin C escaping into the surrounding tissue.

The development of kidney stones have been described in patients receiving IVC who had a past history of kidney stones.² However, whether the Vitamin C, the carrier fluid passing through the kidney or other factors cause the kidney stones is not known. IVC is not used in patients with severe kidney failure and a blood test for kidney function needs to be available prior to starting treatment and may be monitored at intervals during treatment.

People with a rare genetic disorder called *glucose-6-phosphate dehydrogenase deficiency* are unable to tolerate high dose IVC.¹⁸ You will need to have a blood test for this prior to receiving high dose IVC (there is now a charge for this test by Medlab and you will need to pay in cash when the blood is taken).

IVC has occasionally caused severe bleeding from cancer tumours in a few patients with end-stage rapidly growing cancers.¹⁹ Suddenly stopping high doses of vitamin c (whether taken by mouth or given intravenously) may cause a rebound effect resulting in suppressed immunity. In the early studies on IVC, patients were given up to 10g of Vitamin C by mouth when the IVC was stopped.²⁰

Practical details

All patients need to sign a consent form.

Scheduling of infusions is done either through the receptionists or by the doctor. It takes time to make up the IV fluids and they cannot be used after 24hrs once made up, so it is important to let us know if you are unable to attend an IV appointment, by 9am that day at the absolute latest (if an IV infusion has been prepared and a patient misses the appointment without letting us know, a fee for the infusion may be charged).

References

1. Cameron, E. & Pauling, L. Ascorbic acid and the glycosaminoglycans. An orthomolecular approach to cancer and other diseases. *Oncology* **27**, 181-192 (1973).
2. Mikirova, N.A.C., J.J.; Hunninghake, R.E.; Riordan, N.H. Intravenous ascorbic acid protocol for cancer patients: scientific rationale, pharmacology, and clinical experience. *Functional Foods in Health and Disease* **3**, 344-366 (2013).
3. Abdel-Latif, M.M., Raouf, A.A., Sabra, K., Kelleher, D. & Reynolds, J.V. Vitamin C enhances chemosensitization of esophageal cancer cells in vitro. *Journal of chemotherapy (Florence, Italy)* **17**, 539-549 (2005).
4. Drisko, J.A., Chapman, J. & Hunter, V.J. The use of antioxidants with first-line chemotherapy in two cases of ovarian cancer. *J Am Coll Nutr* **22**, 118-123 (2003).
5. Gonzalez, M.J., *et al.* Orthomolecular oncology review: ascorbic acid and cancer 25 years later. *Integrative cancer therapies* **4**, 32-44 (2005).
6. Yeom, C.H., Jung, G.C. & Song, K.J. Changes of terminal cancer patients' health-related quality of life after high dose vitamin C administration. *Journal of Korean medical science* **22**, 7-11 (2007).
7. Padayatty, S.J., *et al.* Vitamin C pharmacokinetics: implications for oral and intravenous use. *Ann Intern Med* **140**, 533-537 (2004).
8. Levine, M.K., A.; Padayatty, S.J. Vitamin C. in *Modern Nutrition in Health and Disease* (ed. Shils, M.E.) (Lippincott Williams & Wilkins, Baltimore, 2005).
9. Hoffer, L.J., *et al.* Phase I clinical trial of i.v. ascorbic acid in advanced malignancy. *Ann Oncol* **19**, 1969-1974 (2008).
10. Sarna, S. & Bhola, R.K. Chemo-immunotherapeutical studies on Dalton's lymphoma in mice using cisplatin and ascorbic acid: synergistic antitumor effect in vivo and in vitro. *Archivum immunologiae et therapiae experimentalis* **41**, 327-333 (1993).
11. Nagy, B., Mucsi, I., Molnar, J., Varga, A. & Thurzo, L. Chemosensitizing effect of vitamin C in combination with 5-fluorouracil in vitro. *In vivo (Athens, Greece)* **17**, 289-292 (2003).
12. Lamson, D.W. & Brignall, M.S. Antioxidants and cancer therapy II: quick reference guide. *Altern Med Rev* **5**, 152-163 (2000).
13. Cameron, E. & Pauling, L. Supplemental ascorbate in the supportive treatment of cancer: reevaluation of prolongation of survival times in terminal human cancer. *Proc Natl Acad Sci U S A* **75**, 4538-4542 (1978).
14. Cameron, E. & Pauling, L. Supplemental ascorbate in the supportive treatment of cancer: Prolongation of survival times in terminal human cancer. *Proc Natl Acad Sci U S A* **73**, 3685-3689 (1976).
15. Murata, A., Morishige, F. & Yamaguchi, H. Prolongation of survival times of terminal cancer patients by administration of large doses of ascorbate. *International journal for vitamin and nutrition research. Supplement = Internationale Zeitschrift fur Vitamin- und Ernahrungsforschung. Supplement* **23**, 103-113 (1982).
16. Kurbacher, C.M., *et al.* Ascorbic acid (vitamin C) improves the antineoplastic activity of doxorubicin, cisplatin, and paclitaxel in human breast carcinoma cells in vitro. *Cancer Lett* **103**, 183-189 (1996).
17. Riordan, H.D., *et al.* A pilot clinical study of continuous intravenous ascorbate in terminal cancer patients. *Puerto Rico health sciences journal* **24**, 269-276 (2005).
18. Levine, M., Rumsey, S.C., Daruwala, R., Park, J.B. & Wang, Y. Criteria and recommendations for vitamin C intake. *JAMA* **281**, 1415-1423 (1999).
19. Cameron, E. & Campbell, A. The orthomolecular treatment of cancer. II. Clinical trial of high-dose ascorbic acid supplements in advanced human cancer. *Chemico-biological interactions* **9**, 285-315 (1974).
20. Block, K.I. & Mead, M.N. Vitamin C in alternative cancer treatment: historical background. *Integrative cancer therapies* **2**, 147-154 (2003).