

## VITAMIN C and CANCER

*"...it takes much more than logic and clear-cut demonstrations to overcome the inertia and dogma of established thought." — Irving Stone*

Irving Stone was an early thinker and writer about vitamin C (its scientific name is ascorbic acid). He knew it would be an uphill battle to change the way the medical profession viewed vitamin C. While most doctors accept that scurvy is a vitamin C deficiency illness, few have made the rather humongous jump to seeing high dose intravenous vitamin C as a major player in the management of cancer.

There is actually a wide spectrum of medical uses for vitamin C. Evidence exists documenting it as the best antiviral agent now available ... *IF used at the proper dose*. Vitamin C can neutralize and eliminate a wide range of toxins. Vitamin C will enhance host resistance, greatly augmenting the immune system's ability to neutralize bacterial and fungal infections. Now the National Institutes of Health has published evidence demonstrating vitamin C's anti-cancer properties. With so many medical benefits, why do so few doctors know of them?

One explanation stems from ascorbic acid's designation as a "vitamin." Consider *Dorland's Illustrated Medical Dictionary's* definition of vitamin: *A general term for a number of unrelated organic substances that occur in many foods in small amounts that are necessary in trace amounts for the normal metabolic functioning of the body.*

As a vitamin, only a minuscule 60 mg of ascorbic acid is needed to prevent the emergence of scurvy symptoms. As a medical treatment for cancer and life-threatening infections and toxic exposures, tens of thousands of milligrams of ascorbic acid must be administered, often by the intravenous (IV) as well as the oral route.

Dr. Hugh Riordan was a true scientist who believed in the power of scientific measurement over dogma. He routinely checked plasma vitamin C levels in chronically ill patients. He found these sick patients to be consistently low in their plasma C levels. Interestingly enough, the cancer patients he was seeing had VERY LOW vitamin C reserves. This matched scientific literature documenting low vitamin C levels in cancer patients. Cancer cells were actively taking up vitamin C in a way that depleted tissue reserves of C.

PET scans are commonly ordered by oncologists to evaluate their cancer patients for metastases (cancer spread to other organs). What is actually injected into the patient at the start of the scan is radioactive *glucose*. Cancer cells are anaerobic obligates, which means they depend upon glucose as their primary source of metabolic fuel. Cancer cells employ transport mechanisms called glucose transporters to actively pull in glucose.

In the vast majority of animals, vitamin C is synthesized from glucose in only four metabolic steps. Hence, the molecular shape of vitamin C is remarkably similar to glucose. (Figure 1) Cancer cells will actively transport vitamin C into themselves, possibly because they mistake it for glucose. Another plausible explanation is that they are using the vitamin C as an antioxidant. Regardless, the vitamin C accumulates in cancer cells.

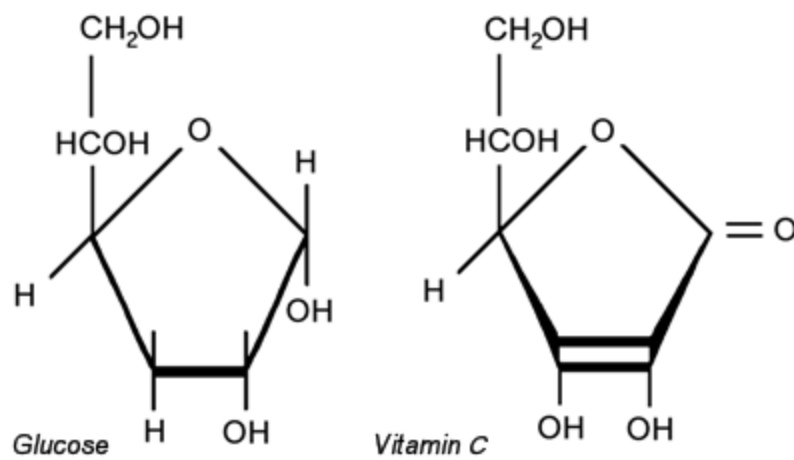


Figure 1

If large amounts of vitamin C are presented to cancer cells, large amounts will be absorbed. In these unusually large concentrations, the antioxidant vitamin C will start behaving as a pro-oxidant as it interacts with intracellular copper and iron. This chemical interaction produces small amounts of hydrogen peroxide.

Because cancer cells are relatively low in an intracellular anti-oxidant enzyme called catalase, the high dose vitamin C induction of peroxide will continue to build up until it eventually lyses the cancer cell from the inside out!

This effectively makes high dose IVC a non-toxic chemotherapeutic agent that can be given in conjunction with conventional cancer treatments. Based on the work of several vitamin C pioneers before him, Dr. Riordan was able to prove that vitamin C was selectively toxic to cancer cells if given intravenously. This research was recently reproduced and published by Dr. Mark Levine at the National Institutes of Health.

As feared by many oncologists, small doses may actually help the cancer cells because small amounts of vitamin C may help the cancer cells arm themselves against the free-radical induced damage caused by chemotherapy and radiation. Only markedly higher doses of vitamin C will *selectively* build up as peroxide in the cancer cells to the point of acting in a manner similar to chemotherapy. These tumor-toxic dosages can only be obtained by intravenous administration.

Over a span of 15 years of vitamin C research, Dr. Riordan's RECNAC (cancer spelled backwards) research team generated 20 published papers on vitamin C and cancer. RECNAC even inspired its second cancer research institute, known as RECNAC II, at the University of Puerto Rico. This group recently published an excellent paper in *Integrative Cancer Therapies*, titled "Orthomolecular Oncology Review: Ascorbic Acid and Cancer 25 Years Later." RECNAC data has shown that vitamin C is toxic to tumor cells without sacrificing the performance of chemotherapy.

Intravenous vitamin C also does more than just kill cancer cells. It boosts immunity. It can stimulate collagen formation to help the body wall off the tumor. It inhibits hyaluronidase, an enzyme that tumors use to metastasize and invade other organs throughout the body. It induces apoptosis to help program cancer cells into dying early. It corrects the almost universal scurvy in cancer patients.

Cancer patients are tired, listless, bruise easily, and have a poor appetite. They do not sleep well and have a low threshold for pain. This adds up to a very classic picture of scurvy that generally goes unrecognized by their conventional physicians.

When cancer patients receive IVC, they report that their pain level goes down, and that they are better able to tolerate their chemotherapy. They bounce back quicker since the IVC reduces the toxicity of the chemotherapy and radiation without compromising their cancer cell killing effects. IVC is complementary to oncologic care. IVC is not “either/or” – it is a good “both/and” proposition.

IVC can help cancer patients withstand the effects of their traditional therapies, heal faster, be more resilient to infection, develop a better appetite, and remain more active overall. These things promote a better response to their cancer therapy.

IVC has been used for three decades and there have been no serious complications, but there are a couple of potential complications that need to be screened for:

- Because vitamin C enhances iron absorption, iron overload must be ruled out.
- The high sodium load of IVC can create a fluid overload in a patient with congestive heart failure, renal insufficiency or failure. ( High dosage IMC avoids this— Dr. Paul)

- We also check our patients for G6PD deficiency (an enzyme used to maintain stability of the red blood cell membranes).
- Although many physicians worry that large doses of vitamin C may cause kidney stones, we have rarely seen the phenomenon, and several huge clinical trials in the medical literature refute this misconception.

To summarize, most organisms make their own vitamin C. When they are under stress, either by illness or injury, Mother Nature has provided them with a means to facilitate healing: they synthesize more ascorbic acid. As a result, they are in less pain, they remain active, they can sleep, and they have a better appetite: all functions which promote healing.

Dr. Riordan once said “we do not treat cancer... we treat people who happen to have cancer.” IVC is a tool that allows physicians to harness a healing mechanism that our human ancestors lost long ago: the ability to dramatically increase tissue levels of vitamin C.

Research shows that the astonishingly high levels achievable only by IVC not only help fight the risk of infection and the pain of metastases, they actually aid in the defeat of the cancer cells themselves, through a very elegant mechanism that does no harm to healthy cells. It is a discovery that the medical world is only beginning to discover.

### **Protocol for its Application and Use**

High dose intravenous (IV) ascorbic acid (AA) has been used as therapy for infectious disease from bacterial and viral origin and adjuvant therapy for cancer. We describe a clinical protocol that has been developed over the past twenty years utilizing high dose IV AA

as therapy for cancer. This includes principles of treatment, rationale, baseline workup, infusion protocol, precautions and side effects.

High dose intravenous ascorbic acid (IAA) has been used as a therapy for bacterial infection, viral infection, and as adjuvant therapy for cancer. In general cancer patients have depressed circulatory, cellular and tissue ascorbate levels and reserves. Ascorbate administered in pharmacological doses enhances various parameters associated with better prognosis. There is also evidence that physiologically attainable concentrations by intravenous administration are selectively toxic to cancer cells; contrary to the limited levels of ascorbate that can be reached by oral intakes. Moreover, there is evidence of synergism between the conventional methods for cancer treatment (surgery, radiation and chemotherapy) when utilized with ascorbate.