



Pharmacological Ascorbate: a.k.a. HDIVC

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High Dose Intravenous Vitamin C (HDIVC), championed by Nobel Laureate Linus Pauling, became “alternative” when two randomized clinical trials using *oral* doses of 10 grams of vitamin C showed no benefit in cancer. As this was neither high dose nor intravenous, how it somehow disproved the clinical benefits of HDIVC demonstrates the enormous bias against natural therapies that exists and how physicians seem to understand very little about science.

Furthermore, the superficial understanding of vitamin C (which is ascorbic acid, also called ascorbate) as an antioxidant led to fear in the medical community that HDIVC might counteract radiation therapy or chemotherapy, both of which work in part due to their induction of oxidative stress. Thus the simplistic statement by physicians to avoid antioxidant supplements seems superficially true.

But Science! Translating basic science into normal language always leaves me unfulfilled. So many mechanisms of action could explain pharmacological ascorbate that proclaiming any one mechanism of action most vital would fall short of the mark, but here goes.

HDIVC, and not oral C, can provide levels of ascorbate that concentrate in the extracellular fluid sites with higher inflammation/blood flow.

The tumor microenvironment, already marked by anaerobic glycolysis and high free radical production, allows for dramatic increases in the local production of hydrogen peroxide with a loss of the enzyme catalase (due to the shift in metabolism associated with cancer, catalase being necessary to regenerate ascorbate radicals back to ascorbate) turning ascorbate into a free radical generator.

What this means is that HDIVC works as a pro-oxidant delivering hydrogen peroxide to cancer cells while protecting normal cells with its healthy antioxidant effect! The term targeted chemotherapy gets used a lot in the oncology world today, and HDIVC has always been that! As you can further imagine understanding that HDIVC acts as pro-oxidant within tumors and antioxidant for normal tissues it also serves as a near-universal synergist with chemotherapy and radiation therapy while minimizing toxicity and side effects.

The only exceptions appear to be methotrexate and Velcade (bortezomib) only if HDIVC is given within 24 hours of Velcade infusion, otherwise all basic science, in vitro and in vivo studies, indicate positive or neutral effects of ascorbate when combined with *any* other chemotherapeutic agent or radiation, at the levels found in HDIVC. Every person who chooses the route of chemotherapy and/or radiation therapy should include HDIVC to improve the outcome of these approaches!

Fortunately research is at least making headway through the bias of the current medical dogma. Please refer to the following researchable articles found on Pub Med:

1. Metabolomic Alterations in Human Cancer Cells by Vitamin C-Induced Oxidative Stress March 2015 PMID 26350063
2. Pharmacological Ascorbate Radiosensitizes Pancreatic Cancer Aug 2015 PMID 26081808
3. Treatment of Pancreatic Cancer with Pharmacological Ascorbate Jun 2016 PMID 26201606
4. High Dose Parenteral Ascorbate Inhibited Pancreatic Cancer Growth and Metastasis... Dec 2017 PMID 29215048

As pancreatic cancer rates continue to increase and no significant improvement in mortality has occurred in the last 20 years, doctors have revisited much in the HDIVC world. All tumor cell lines show sensitivity to pharmacological ascorbate, all normal host tissue enjoys the protective effect of ascorbic acid.

Middle Path Medicine has provided IVC in Myer's cocktails and Immune drips for over 10 years. As our integrative oncology practice has grown in the last decade we have revised and simplified our protocol. We test our patients who receive doses greater than 25 grams of C for a rare enzyme deficiency known as G6PD. Only people with this deficiency can have serious complications with this benign therapy.

We give supportive oral nutrients, such these from Source Naturals: Alpha Lipoic Acid TR 300mg Thrice Daily (to improve delivery of C to cancer cells) and Activated Quercetin three tabs Thrice Daily (to prevent efflux of C from the tumor microenvironment). We also provide thorough lab testing to search for other therapeutic nutrients that may optimize the efficacy of HDIVC. We use a protocol developed by Naturopathic Physician Paul Anderson's group at Bastyr University, giving twice weekly HDIVC starting at 25 grams, proceeding to 50 grams and then 75 grams as the goal dosage. Adequately hydrating the patients is key.

After 12 weeks we evaluate either through scan or other tumor marker and guide further therapy based on clinical response. Even those with complete responses are encouraged to get at least monthly infusions as ongoing care is almost always needed in the care of Stage III and IV cancers of all types.

Hopefully this is a review you can send to family members and cancer physicians as you regain control of your treatment decisions in cancer therapy backed by science, not bias.

Your Journey to Health and Healing,
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