

Ozone Therapy for Cancer

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In 1931, the German scientist Otto Heinrich Warburg was awarded the Nobel Prize for his theory on the metabolism of normal cells and cancer cells.¹ His work from the 1930s continues to be relevant, and many cancer treatments are built upon his theory, which is known as the "Warburg Effect."² Understanding the metabolism of cells is foundational in the development of cancer-targeting therapies. Researchers are continuing to explore mechanisms of the Warburg Effect, including cell respiration, cell signaling, transcription factor induction and mutations in glycolysis enzymes.

Targeting Hypoxia

One of the most important metabolic features of cancer cells is that they are hypoxic. Tumors are structured in a way that disturbs the microcirculation, which cut them off from adequate respiration. Tumors are also poor at diffusing oxygen between malignant cells.³ This oxygen deprivation results in tumor hypoxia. Warburg was correct back in the 1930s when he observed that cancer thrives in an anaerobic microenvironment. Hypoxia is strongly associated with tumor growth and spread, and it also makes cancer resistant to treatment. Hypoxia is a hallmark of cancer, and researchers have identified genes that are consistently affected by it. By observation of the correlation between hypoxia scores and the impact on genes, scientists have assigned what they call "meta-gene signatures."⁴ They have identified a unique "signature" for many different types tumors according to their hypoxic status. Because of this, hypoxia has also become an excellent prognostic tool.

Oxygenation is Key

A critical goal in cancer treatment is normoxia, which is the state of normal oxygen levels in cells. Hypoxia generates hypoxia-inducible transcription factor (HIF), which up-regulates and down-regulates over 100 genes.⁵ HIF is one of the primary elements that causes malignant cell proliferation. Hypoxia also makes cancer cells resistant to treatment. Oxygen is needed for effective cancer treatment, but due to tumors' chaotic vascularization and poor microcirculation, it is exceedingly difficult to deliver oxygen to malignant cells. Breathing pure oxygen (O₂) does not affect cancer at all. But clinicians have observed that ozone (O₃) is a safe and effective means to restore normoxia in malignant cells and unleash a cascade of other beneficial changes in a tumor's microenvironment.

Ozone is Safe and Beneficial

Ozone therapy, has been used medically for our a century. When properly administered, it is safe and effective. It is antibacterial, antiviral and antifungal.⁶ It is also a potent immune stimulator. Although opponents claim that oxygen therapies are "Expensive, unproven and harmful,"⁷ that could not be further from the truth. Oxygen is an inexpensive, readily available

element, and ozone has been used safely in millions of people around the world, with benefits observed across the board. Clinical trials have concluded that ozone administered in a medical setting does not cause any adverse effects such as organ damage, and it does not increase mortality.⁸ Ozone is only harmful to the human body if it is breathed.

The Partial Pressure of Oxygen in Tumors Can Be Increased

Ozone therapy has not only been shown to be safe and effective in animal studies; clinical trials in humans have produced similar outcomes. A very interesting study was conducted by researchers in Spain with 18 patients who had metastases that were accessible. The researchers were able to insert a probe into the metastatic tumor to measure the partial pressure of oxygen inside the mass and assign a hypoxia score. Remember, hypoxia is a major factor that increases cancer growth and makes it resistant to treatment. This is why this study is so groundbreaking. They were able to measure the level of hypoxia within the tumor. Once the oxygen levels were measured, each patient received Ozone Autohemotherapy (O₃AHT) three times on alternating days for just one week. At the end of the week, the partial pressure of oxygen was measured again. The result was that tumor hypoxia in all 18 patients decreased.⁹ No patient experienced any adverse effects. Again, the results of this clinical trial are paramount because the restoration of normoxia inhibits neoplastic growth and metastases.¹⁰

Immune System Is Activated and Inflammatory Response Is Suppressed

Ozone boosts the immune system by activating neutrophils and stimulating the production of cytokines. The cytokines send signals to other immune cells that release a cascade of changes in the immune system that help it resist disease.¹¹

As is found in a number of diseases, cancer activates the inflammatory response. This is important because cancer is able to obtain more of the nutrients it needs to progress when inflammation is present. One of the main culprits that provokes the inflammatory response is called NF Kappa B. Studies have demonstrated that the mild oxidative stress induced by ozone therapy will activate another nuclear transcriptional factor, Nrf2, which suppresses NF Kappa B. This in turn inhibits the inflammatory response.¹² This could result in cutting tumors off from the nutrients they require to survive.

Mechanism of Action

Ozone (O₃) increases oxygen delivery to ischemic tissue, causing the formation of hydrogen peroxide (H₂O₂).¹³ O₃ is very unstable and will react with any number of substances in the blood, including polyunsaturated fatty acids, ascorbic acid, uric acid and albumin, to name a few. These compounds act as electron donors to O₃, and when combined, reactive oxygen species (ROS) and lipid oxidation products (LOP) are formed. In cancer treatment, the most important ROS molecule is hydrogen peroxide (H₂O₂). When H₂O₂ is formed in the blood, it diffuses quickly into the cytoplasm, triggering numerous biological effects and stimulating multiple biochemical pathways. Several benefits are obtained, including a significant increase in adenosine triphosphate (ATP), which provides energy to cells, and the release of oxygen into malignant cells. Increasing oxygen levels in malignant cells makes them vulnerable to oxidative

treatments (treatments that require oxygen to react with) such as High Dose Vitamin C, chemotherapy and radiation.

Ozone Autohemotherapy (O₃AHT)

The means of administration of oxygen therapies is important. Breathing pure oxygen (O₂) has no anti-cancer effect. To get oxygen to dissolve into the cytoplasm, many clinicians have patients breathe pure O₂ under increased atmospheric pressure. The increased pressure is achieved by the use of a hyperbaric chamber. Hyperbaric oxygen therapy (HBOT) provides numerous benefits to patients, but studies have shown that the increase in oxygen levels only lasts 10 to 15 minutes, whereas the increased oxygenation produced by ozone autohemotherapy (O₃AHT) can last 48 hours.¹⁴

Oasis of Hope administers O₃AHT because it is the most effective at oxygenating tumors and causing a cascade of therapeutic benefits. We draw 200ml of a patient's blood and introduce O₃ to the blood in a sterile container. Then the patient's ozonized blood is returned via a slow infusion. This therapy is well tolerated and valuable in the treatment of cancer because of the numerous positive biological and biochemical reactions it induces. We also infuse High Dose Vitamin C to react with O₃ to produce the best anti-cancer effects.

Conclusion

Tumors are hypoxic, which makes cancer resistant to oxidative treatments such as High Dose Vitamin c, chemotherapy and radiation because they require adequate oxygen levels to work. Medical ozone is an effective way to increase the partial pressure of oxygen in tumors and overcome hypoxia. Ozone produces a number of benefits to cancer patients, including:

- increased oxygen delivery to hypoxic tissues¹⁵;
- inhibition of growth of cancer cells¹⁶;
- inhibition of metastases (spread of cancer to other organs)¹⁷;
- induction of apoptosis (cell death) in cancer cells¹⁸;
- decreased side effects in radiation therapy and chemotherapy¹⁹;
- improved therapeutic outcomes in patients undergoing radiotherapy²⁰;
- lowered chemo-resistance in tumors²¹;
- protection of liver function²²;
- facilitation of arrest hepatic dysfunction²³; and
- mitigation of rectal bleeding induced by radiation treatments in prostate cancer patients²⁴.

The scientific evidence for the use of ozone as an adjuvant cancer treatment is ample. At Oasis of Hope, we have administered it to thousands of patients with no adverse effects and with favorable therapeutic outcomes. We encourage further investigation into the anti-cancer effects of ozone.

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