

# Bio-Oxidative Therapy

Triatomic Oxygen Therapy AKA Oxygen-Ozone Therapy

An Alternative Therapeutic Approach for Podiatrists

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## Abstract:

Oxygen! The human body is composed of it, most of our metabolic energy comes from it, and all our internal metabolic processes are regulated by it. Let's face it! We can't live without it. When cells are oxygenated, the Immune system functions relatively undisturbed. (4) Furthermore, oxygen delivery and utilization by the cell is essential for maintaining good health and preventing disease.

Even during normal oxygenation utilization, free radicals will form. A healthy cell will produce antioxidant enzymes to control the number of free radicals formed, thus preventing acute or chronic disease development. (13)

## Introduction:

Oxygen- Ozone (O<sub>2</sub>-O<sub>3</sub>) therapy has improved patients with musculoskeletal disorders and autoimmune diseases including rheumatoid arthritis and osteoarthritis. It has helped reduce pain and inflammation of muscles, tendons, and joints by injection (peri-articular, intra-articular, intramuscular, or percutaneous) with greater symptom relief after one year, as compared to steroid injections. (19)

For non-healing wounds due to peripheral arterial disease, O<sub>2</sub>-O<sub>3</sub> therapy has helped stimulate revascularization creating tissue hyper-oxygenation.

## Background

Historically, physicians in the United States began using O<sub>2</sub>-O<sub>3</sub> therapy after Dr. Charles Kenworthy MD, the President of the Florida Medical Association, published an article called "Ozone" in 1885. (23) In 1915, during World War 1, German physicians used ozone therapy to treat infected wounds, frostbite, gangrene, and decubitus ulcers. (13) During WWII, Dr. Robert Mayer, MD learned of O<sub>2</sub>-O<sub>3</sub> therapy from German prisoners on Ellis Island and used O<sub>2</sub>-O<sub>3</sub> therapy to successfully treat children with viral meningitis. (23)

Some patients with co-morbidity that present with decubitus, varicose, or diabetic ulcers, often cannot adequately oxygenate their blood and circulate sufficient oxygen to the affected tissues.

Secondly, antibiotic resistance is increasing, and pharmaceutical companies are concerned with recouping their investment to develop new antibiotics. However, the combination of antibiotics **with** O<sub>2</sub>-O<sub>3</sub> therapy should prevent many amputations from drug resistance. (1)

According to Frank Shallenberger, MD: "I have never treated a case of osteomyelitis or MRSA (multidrug-resistant staph aureus) that didn't respond to a combination of O<sub>2</sub>-O<sub>3</sub> therapy with an appropriate antibiotic, even when some cases have become antibiotic-resistant. O<sub>2</sub>-O<sub>3</sub> therapy makes antibiotics more effective." (13) (there a number of papers showing o<sub>3</sub> is beneficial to eliminate MRSA and should be cited)

## Biochemistry:

According to V. Bocci, "Ozone (O<sub>3</sub>) is an oxidizing molecule, a type of super-active oxygen that produces many chemical messengers by reacting with blood components, which are responsible for activating critical biological functions including oxygen supply, immune activation, the release of hormones, and the induction of antioxidant enzymes. O<sub>2</sub>-O<sub>2</sub> Therapy has an exceptional ability to correct chronic oxidative stress in atherosclerosis and diabetes. Moreover, O<sub>2</sub>-O<sub>3</sub> therapy can mobilize endogenous stem cells by stimulating nitric oxide synthesis, which promotes the regeneration of ischemic tissues."

Medical grade O<sub>2</sub>-O<sub>3</sub> is likely the most potent oxidant in nature. When O<sub>2</sub>-O<sub>3</sub> enters the blood, it has shown to destroy harmful bacteria and viruses and suppress fungi and yeast growth. "Microbes have never been found to be resistant to O<sub>3</sub>."

O<sub>2</sub>-O<sub>3</sub> therapy modulates the immune system by balancing inflammatory and anti-inflammatory cytokines. Medical grade O<sub>2</sub>-O<sub>3</sub>, reacts with blood products virtually instantly and is used up in approximately ten minutes. As opposed to pharmaceuticals, no chemical residue is left behind for the body to metabolize." (4) (23)

## Creation:

To create medical-grade O<sub>2</sub>-O<sub>3</sub>, 99% pure Oxygen flows through an electric ozone generator. The generator's voltage and O<sub>2</sub> inflow rate determine the concentration (ug of O<sub>3</sub> per ml of O<sub>2</sub>-O<sub>3</sub> gas). Therefore, decreasing the Oxygen flow rate or increasing the amount of electricity you will increase the amount of O<sub>3</sub> within the O<sub>2</sub>-O<sub>3</sub> mixture.

## Most Common Routes of Administration:

- DIV - Direct Intravenous
- MAH - Major Autohemotherapy
- HBO<sub>3</sub>T- Hyperbaric High Dose Ozone Therapy with Multi-Pass
- HOCATT – Transdermal Ozone Therapy (Ozone Sauna)
- PROLO-OZONE – Musculo-Skeletal Injection Therapy
- Topical Application of Oxygen-Ozone

There are several ways to administer O<sub>2</sub>-O<sub>3</sub>. O<sub>2</sub>-O<sub>3</sub> gas can be injected into the blood in several ways. The most common are:

Pushing the oxygen-ozone mixture slowly into an upper extremity vein aka Direct Intravenous (DIV)

Major Autohemotherapy (MAH), which draws out approximately 200-300 ml of blood, normobarically, similar to a blood donation, immediately followed by an O<sub>2</sub>-O<sub>3</sub> push into the blood container with an equal amount of O<sub>3</sub> while mixing, and then transfusing the oxygen-ozonated blood back into the body(30-50 minutes)

Hyperbaric Ozone Therapy (HBO<sub>3</sub>T) which does the same as MAH but uses negative pressure (vacuum) to draw the blood out and then positive hyperbaric pressure to transfuse the O<sub>2</sub>-O<sub>3</sub> blood mixture back into the body at an extremely fast rate (4-5 minutes). (4)

Transdermal Ozone therapy is delivered into the body in a steam sauna. The foremost O<sub>2</sub>-O<sub>3</sub> sauna sold today is called HOCATT. HOCATT is an acronym that stands for Hyperthermic, Ozone, Carbonic Acid, Transdermal Technology. It's an individual Sauna whereby patients sit with their heads exposed to the air. Simultaneously, their body gets infused with carbon

dioxide, steam, high energy photon light, and a mixture of O<sub>2</sub>-O<sub>3</sub> gas. The effects of HOCATT are often considered comparable to other forms of Oxygen-Ozone therapy; it can help reduce pain and inflammation, calm inflamed nerves, and relax tight muscles. It can also help inactivate viruses, bacteria, yeast, fungus, and parasites. A HOCATT sauna will increase blood circulation and aid healing. Bagging non-healing wounds with Oxygen-Ozone gas is similar to O<sub>2</sub> gas bagging by itself. HOCATT can improve walking, which improves the cardiovascular system.

Prolo-ozone therapy combines Prolotherapy and O<sub>2</sub>-O<sub>3</sub> to treat a variety of degenerative joint conditions like arthritis. The first syringe is filled with 1% lidocaine and methylcobalamin (vitamin B12). A second syringe is filled with O<sub>2</sub>-O<sub>3</sub> gas. These syringes are then injected into painful joint(s) or soft tissues to reduce pain and inflammation and promote healing.

Topical application of O<sub>2</sub>-O<sub>3</sub> gas dissolved in distilled water or saline can be used for irrigation to decrease inflammation and any secondary superficial infection. O<sub>2</sub>-O<sub>3</sub> oils are used topically to a wound and covered with a moist wet to dry dressing. Lastly, O<sub>2</sub>-O<sub>3</sub> bagging around the foot will enhance the healing of intractable ulcers.

#### Podiatric Applications:

- Arthritis and Other Degenerative Joint Diseases
- Bursitis
- Neuromas
- Plantar Fasciitis
- Skin conditions, including fungus, psoriasis, eczema, viral eruptions, bacterial skin infections
- Poor Circulation in the Foot
- Trauma to the Foot or Ankle (Delayed Healing Fractures, Sprains, and Strains, Partial Tears)

- Helps Repair Injured Muscles, Tendons, and Ligaments of the Foot and Ankle – from direct pedal injury or secondary pathology such as
  - pharmaceutical toxic side effects (e.g., Quinolone antibiotics: Cipro, Levaquin)
- Reduction of Pain and Inflammation
- Helps Promotes Healing
- Soft tissue and Bone Infections
- Wounds of all depths
- Delayed Wound and Surgical Healing
- Podiatric Complications from Autoimmune diseases
- Peripheral Neuropathy from Diabetes Mellitus and Other Diseases
- Osteomyelitis
- Fungal nails

#### Highlights of Peer-Reviewed Studies:

##### A. Infections and Non-Healing Wounds:

1. Oxygen is critical for wound-healing, ATP production, reactive oxygen species, redox signaling, H<sub>2</sub>O<sub>2</sub> production, antioxidant generation, collagen synthesis, and wound bed blood vessel creation. (18) In fact, according to Frickberg et.al, "Topical oxygen therapy (TOT) has been used for over fifty years. In his study of problematic or non-healing wounds, all followed cases improved using topical wound oxygen, as opposed to "stand-alone" (SAT) treatment. All TOT cases healed within twelve weeks." (18)
2. Oxygen-Ozone therapy can offer a better scientific answer when treating stubborn or non-healing foot, ankle, and lower leg conditions. (16) It is estimated that 150,000 lower

extremity amputations occur annually in the US due to combined arterial vascular disease and peripheral neuropathy, of which "eighty-two percent are related to Diabetes Mellitus." (17) Also, "When antibiotics are used in combination with ozone therapy, they are much more effective. (13) Today, antibiotic failure is on the rise globally. Its estimated 46 people per 100,000 population will likely die of unresolved infections, some from so-called "superbugs." In addition, antibiotic overuse, misuse, and biofilms have increased antibiotic resistance. (16)

3. According to Shallenberger, antibiotics are either designed to kill a specific microorganism or a particular group of microorganisms. Whereas, Oxygen-Ozone therapy will destroy every pathogen and stimulate the immune system to cleanse and detoxify the body from any free radical damage created by the infection. This is why a procedure called "pre-conditioning" with Oxygen-Ozone therapy has been shown to diminish the chance of a slow or non-responsive infection, as well as antibiotic resistance. Many studies have shown that most infections respond faster, with less antibiotic resistance when Oxygen-Ozone therapy is used in combination with antibiotics instead of antibiotic treatment alone. Other reviews of "pre-conditioning" with Oxygen-Ozone therapy before surgery reveal better outcomes and fewer postoperative infections.

This pre-conditioning concept can be applied to any condition besides infections and wounds that can affect the foot or ankle, including toxins, irritants, injuries, neuropathy, just to name a few. (15)

4. Robins has utilized medical-grade Oxygen-Ozone therapy for various Podiatric conditions for more than thirty years. In 1995, he pioneered special techniques using intravenous and topical Oxygen-Ozone treatment in conjunction with conventional medical/surgical care to treat foot and ankle wounds. Medical-grade Oxygen-Ozone gas is infused directly into a vein (Direct Intravenous Oxygen-Ozone therapy) to help heal infected and non-infected wounds, improve circulatory problems, and aid the healing process. He will also inject the gas in and around wounds to destroy biofilm (the protective covering of bacteria), local infection, increase micro-circulation, and stimulate stem cells for active healing.
  
5. A study published by Teuvov A et al. called "Intravenous Ozonated Saline and Local Ozonated Saline irrigation was performed in the following case pre and post-operatively on diabetic wounds." Some found that diabetic wounds, when treated with intravenous O<sub>2</sub>-O<sub>3</sub> saline and irrigated with O<sub>2</sub>-O<sub>3</sub> saline drains, had reduced pain, swelling, and improved healing as opposed to similar wounds not using O<sub>2</sub>-O<sub>3</sub> therapy. (3)
  
6. According to a study by Julio Wainstein et al., using topical Oxygen-Ozone alone over twelve weeks found the O<sub>2</sub>-O<sub>3</sub> group "promoted the complete healing of diabetic foot ulcers." (6)
  
7. Lei et al. described a patient with a gangrenous hallux who required digital amputation. The postoperative wound was treated with daily wound care along with O<sub>2</sub>-O<sub>3</sub> gas bagging. They reported significant growth of granulation tissue with a relatively clean wound environment. (12)

8. According to Song, Mingsheng, et al., applying topical Oxygen-Ozonated Oils to Gram-positive Staph and Strep infections, including MRSA. They found that "the killing rates of ozonated oil for S. aureus and MRSA were more significant when compared with the control oil group. They also used ozonated water instead of oil and found MRSA elimination even faster than using oil. Topical ozonated oils or water used on the wounds led to complete healing. (13)
9. Studies published by Degli Agosti et al. Describe how subcutaneous injections of Oxygen-Ozone in and around non-healing surgical wounds helped heal them in five weeks. The injection reduces pain, disinfects the wound, and shortened healing time. (8)

## B. Peripheral Vascular Disease

Peripheral Vascular Diseases are known to diminish the quality of life for affected patients. Studies show that intravenous O<sub>2</sub>-O<sub>3</sub> therapy improves lower extremity circulation, improves wound healing, and lowers amputation risk. Oxygen-Ozone therapy can be paramount for elderly patients unable to undergo revascularization. Finally, O<sub>2</sub>-O<sub>3</sub> treatment is estimated to reduce the cost of care by 25% when used in combination with traditional care. (20)

Recently, Dr. Robert Rowen, MD (in California), performed an intra-arterial (radial artery) Oxygen-Ozone injection to save a vascular compromised hand from amputation. A similar event could be imagined in the foot.

## C. Plantar Fasciitis

1. Arash Babaei-Ghazani, MD et al. performed a study: "Comparison of Ultrasound-Guided Local Ozone (O<sub>2</sub>-O<sub>3</sub>) Injection vs. Corticosteroid Injection in the Treatment of Chronic Plantar Fasciitis." The study found that patients injected with corticosteroid had more significant pain relief, improved ambulation, and reduced abnormal signals on Ultrasound at two weeks compared to the O<sub>2</sub>-O<sub>3</sub> injected group. However, although both groups improved by the end of twelve weeks, the O<sub>2</sub>-O<sub>3</sub> group was functioning better. "There are no reported allergic side effects or destructive adverse effects on tendons or cartilage with use of Ozone (O<sub>2</sub>-O<sub>3</sub>). It can be used in patients with diabetes mellitus, hypertension, gastritis, etc." (8)
2. According to Umit Yalcin\* in a study "Comparison of the effectiveness of platelet-rich plasma (PRP) and Oxygen-Ozone therapy in plantar fasciitis treatment." The comparison study found both PRP and O<sub>2</sub>-O<sub>3</sub> patients greatly improved in their pain and function. However, they found that the PRP group achieved more significant relief in all parameters studied. (9)

## D. Pain Management

1. According to R. Rowens MD and H. Robins, DPM in a clinical study called "Ozone Therapy for Complex Regional Pain Syndrome: Review and Case Report" (4)

CRPS is usually the result of limb, hand, or foot trauma and is mostly unilateral. Peripheral and central nerves are affected, resulting in microcirculation abnormalities causing pain, inflammation, temperature changes, red or bluish skin color, abnormal sweat, hair, and nail dysfunction. Muscles and joints also have functional abnormalities due to decreased oxygen availability making ambulation challenges. CRPS increases inflammatory chemicals (cytokines) and is more common in individuals with other inflammatory and autoimmune conditions, including asthma. (14)

Ozone therapy alleviates many of the mechanisms promoting chronic pain and inflammation, including hypoxia, inflammatory mediators, and infection.

Case Study: Direct intravenous oxygen/ozone gas was administered nearly daily to an 11-year-old girl diagnosed with reflex sympathetic dystrophy and persistent pseudo-seizures. She rapidly improved. After 120 sessions, all symptoms had disappeared.

Summary Ozone's novel biochemical properties make it a unique, safe, relatively inexpensive, and effective modality for the treatment of pain. In this particular case, it resolved the chronic condition when opiates were ineffective for even pain relief.

2. According to \* Bin hu<sup>1</sup>, \* Jie Zheng<sup>2</sup>, Qing liu<sup>1</sup> Yunkuan Yang<sup>1</sup> Ying Zhang<sup>2</sup> in the Journal of Pain Research "The effect and safety of ozone autohemotherapy combined with pharmacological therapy in postherpetic neuralgia" The study revealed that combining Intravenous O<sub>2</sub>-O<sub>3</sub> therapy with traditional pharmaceuticals resulted in more remarkable improvement than medications alone. (11)

#### E. Warts

1. According to Ibrahim, Alshimaa M. et.al 44 patients with common warts were injected with Oxygen-Ozone weekly. Twenty-five patients (56.8%) had complete resolution with an excellent cosmetic outcome, 15 patients (34.1%) showed significant improvement, and four patients (9.1%) had no response. 30 patients with warts were also studied after injecting their warts with saline. Results showed that many more patients responded to Oxygen-Ozone than to saline ( $p < .001$ ). Ozone therapy had mild side effects, including pain at the time of injection. In conclusion, intralesional ozone is effective and safe for the treatment of multiple warts. (21)

## F. Burns

1. According to El Tobgy, Khaled, 140 patients with recent burns were treated with topical ozonized water and Oxygen-Ozone (Sauna or Bagging), and ozonized olive oil. All burn patients improved with Topical Ozone. Healing times of Oxygen-Ozone treated wounds was significantly lower than that of the control wounds. The full-thickness infected necrotic wounds revealed diminished necrotic tissue and infection over the control wounds and were ready faster for skin grafting. Conclusions: Topical application of ozone significantly reduces burn injury healing time. (2)

### Conclusion

In our experience, Direct IV, Hyperbaric (Ten Pass), HOCATT O<sub>2</sub>-O<sub>3</sub> Sauna and Prolo-Ozone Injection therapies all produce analgesia and anti-inflammatory effects, as well as increased energy and endurance, a better night's sleep, better blood flow, and increased uptake of oxygen by the cells. All these modalities help the body detoxify, which is often 50% of healing. HOCATT Saunas has shown admirable results with pain reduction, increased mobility, and resumption to normal activities in as little as six to nine therapies. Saunas have also shown commendable results after trauma, musculoskeletal disorders, quinolone tendinopathies, various neurologic conditions that affect the foot including those related to Lyme disease, Diabetes Mellitus, and Heavy Metal Toxicity. Toenail fungus, yeast infections, many Papulo-squamous skin disorders like Psoriasis and Eczema, and viral skin infections, like warts and even herpes simplex, which can shed to the foot. O<sub>2</sub>-O<sub>3</sub> therapy can be used pre and post-operatively to hasten the healing of the skin, muscles, tendons, and bone. Most importantly, it can be used to diminish the risk of infection and treat antibiotic-resistant organisms,

prevent hospitalizations exposing patients to worse infections, that can affect the GI tract, the heart, and the lungs.

O<sub>2</sub>-O<sub>3</sub> therapy is not always successful, but neither are many other treatments. We must all keep an open mind to many long-forgotten therapies that continue to offer value. O<sub>2</sub>-O<sub>3</sub> gas is simple to create, easily and safely administered and should be available to your patients.

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Dr. Robins has become one of the foremost experts on using O<sub>2</sub>-O<sub>3</sub> therapy in the world, with over 35 years' experience. He educates and trains Podiatrists and Medical Doctors from around the world. Dr. Robins has freely given his time and knowledge to help physicians understand the power of Triatomic Oxygen, which many O<sub>2</sub>-O<sub>3</sub> practitioners call "The Miracle Medicine."

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