

Benefits of Ozone in Dentistry

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Abstract

Ozone or Ozein is derived from the Greek word "to smell". Ozone does have a very distinctive smell, a fresh aroma that is noticeable just before/during a thunderstorm. Ozone is manufactured for medical and dental use.

Medical grade Ozone is created using an ozone generator and pure oxygen that is used as a preventive and therapeutic measure.

Medical Ozone was used in World War 1 as a disinfectant that could help prevent infection in wounds and treat different types of diseases.

Ozone now has a place in dentistry. It can be applied as a gas, as ozonated water or used as ozonated oil. The mouth is a complex oral microbiome where over 700 types of bacteria can survive along with viruses, protozoa and fungi which can develop into a variety of dental problems. Tooth decay, TMJ problems to gum disease/periodontal disease are a few of the problems that can exist within the oral cavity. The utilization of ozone gas, ozonated water or ozonated oil can provide an effective, painless, inexpensive modality of treatment for the patient.

Ozone therapy is a form of alternative treatment that is designed to increase the amount of oxygen delivered to the body through the use of pure ozone gas.

Ozone is a triatomic molecule made up of three oxygen atoms that is highly reactive.

It's a very unstable molecule and has huge oxidative properties and has distinctive smell.

Ozone is the strongest antimicrobial agent known.

Keywords: Ozone; Dentistry; Tooth Decay; TMJ

Mechanism of action

"Inactivation of bacteria, viruses, fungi, yeast and protozoa: Ozone therapy disrupts the integrity of the bacterial cell envelope through oxidation of the phospholipids and lipoproteins. In fungi, O₃ inhibits cell growth at certain stages" [1].

“Ozone has been used to medically to disinfect & treat disease since its discovery. In 1896 Nikola Tesla patented the first ozone generator in the United States. Ozone has been used as a safe and effective water purifier for more than a century. Ozone deactivates pathogenic microbes in the human body in much the same way it does in water, unsurprising since our bodies are made up of 70% water” [2].

Ozone

It's kinder and gentler treatment modality, it doesn't make the patient uncomfortable because there isn't any pain involved with ozone treatments. It's versatile and can be used on every patient, every day.

Ozone therapy is successful in treating infections caused by bacteria, fungi, protozoa, viruses and yeast. Ozone breaks down the polysaccharides in their cell walls or disrupts their replication cycles which effectively lysis them.

Most antibiotics show specificity towards certain bacterial strains.

Ozone shows generalized bactericidal effects against all bacterial strains.

Ozone has proven to:

- Be less toxic than chlorine, healthier than chlorine
- Is 150 x more powerful sterilant
- 3500x faster acting in bactericidal action
- Eliminate pathogens
- Bacteria, fungi, viruses and prions lack antioxidants.
- Immune modulation
- Improve blood circulation and oxygen delivery to tissues in the area [3].

How is medical grade ozone made?

An ozone generator must be made with medical grade, chemically inert components to ensure high purity for ozone therapy.

Ozone is made by passing pure oxygen gas through a crystal tube through which an electrical spark is directed. The electrical energy breaks apart the oxygen molecules as described above, and what emerges from the other side is a mixture of oxygen and ozone. The potential application of ozone therapy in human body and its biological horizons are summarized by Nat Sci Biol Med, 2018 [4].

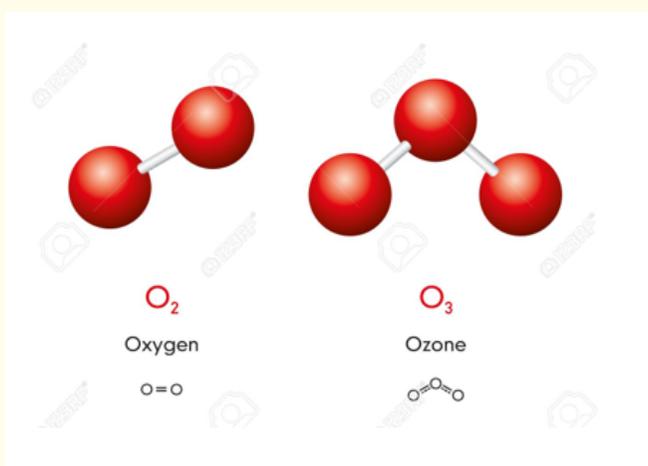


Figure: Ozone is a triatomic molecule made up of three oxygen atoms.

As dental professionals we have the honour of helping people become healthier. We are aware of the role biofilm plays in tooth decay and periodontal disease, as there are many harmful microorganisms present in the mouth. There are different methods of treatment for dental decay, gum disease and other oral health conditions.

One of the not so new modalities of treatment in dentistry is ozone.

Ozone treatment has been around since the 1st world war and been used in Dentistry dating back to 1930 by Dr. E. A. Fisch, a German Dentist.

Ozone is used as a chair side disinfectant because of its synergistic part of the treatment, both in eliminating bacteria and oxygenating in a chair side environment [5].

Ozone can be used to treat:

- Restorative dentistry- decay/prevention of caries, manage root caries/remineralize tooth surfaces
- Periodontal disease
- Oral surgery, tooth extraction
- Oral lesions
- Pit fissure treatment
- Temporomandibular joint treatment
- Pain management
- Infection control
- Oral medicine
- Whitening
- Desensitizing teeth
- Implantology
- Pedodontics
- Denture stomatitis
- To sterilize water lines.

The main methods of ozone delivery in dentistry are ozonated gas, ozonated oil and ozonated water.

Ozonated water and olive oil have the capacity to entrap and then release oxygen/ozone, an ideal delivery system [6].

Ozonated gas

There are many factors involved when tooth enamel and dentin wear away, the tooth surfaces can become very sensitive causing hypersensitivity. Erosion can create very sensitive teeth as well as tooth grinding, abrasion/root caries and occlusal interferences/trauma.

Ozonated gas can be used to desensitize teeth, Ozone application has been found to reduce sensitivity in exposed enamel and dentin and also in cases of root sensitivity [7].

Ozonated gas will arrest decay and can be used on decayed (soft) dentin. The gas is placed on to the tooth via a "ozone cap". The goal is to harden the lesion and remineralize the dentin, not the removal of infected tissue [8].

Ozonated Gas can also be used in Oral surgery. Ozonated gas can be injected into tissue where there is infection/inflammation present.

Ozonated Gas can be applied to herpetic lesions/cold sores, lichen planus, candida, aphthous ulcers to speed up the healing process. It can be used prior to pit and fissure sealants.

Used during implant placement and surgical regenerative therapy (SRT) to promote healing.

Ozonated water

Periodontal disease

Periodontal Disease/gum disease is an inflammatory infection caused by disease related bacteria that is able to survive in the oral cavity. Periodontal Disease/gum disease is the leading cause of early tooth loss among adults. The signs of periodontal disease are a loose tooth/teeth, pus, tenderness of the gums, bleeding gums and swollen gum tissue. Usually, pain is not associated with periodontal disease/gum disease but once a tooth becomes loose, it needs to be removed.

Ozonated water has antibacterial properties that can be used to use to treat the gram-negative and gram-positive bacteria (disease related bacteria), fungi and viruses that contribute to periodontal disease. These types of disease related bacteria survive under the gum-line so targeting these areas will help to improve the overall health of the oral cavity. Ozonated water used as a pre- procedural rinse and irrigation into the gum spaces "pockets" prior to scaling and root planning.

This process will reduce the initial pathogenic load on the patient locally and systemically before the root planing and scaling procedure begins [9].

Clinicians can use the ozonated water during full mouth scaling with. an ultra-sonic scaling instrument that has an independent source for delivering ozonated water or a canula to irrigate the pocket spaces after all the scaling and root planning have been completed.

Ozone used to disinfect dental water lines will not damage pipes or fittings, will not affect the Ph of water, helps to reduce/dissolves solids in water and doesn't leave any chemical by-products in the water.

Oral surgery

Ozonated water can be used as a pre-wash for surgical sites and for disinfection after a tooth has been extracted.

Ozonated oils

Custom trays can be used to treat sensitive teeth, root caries and periodontal disease. Ozonated oil is placed into these specially designed trays.

Ozonated oils can also be placed under the gumline to reduce inflammation and to help speed up the healing process.

Ozonated oils can be scrubbed into a sensitive tooth surface as a complement to completely get rid of sensitivity.

Ozone and orthodontic care

One of the downfalls of orthodontic brackets is the potential for decay/decalcification around every bracket. Using ozonated water, gas or oils will help to prevent decalcification. While ozonated gas and water are used in the dental office, by a clinician, ozonated oils can be used at home by the patient.

Ozone therapy drawbacks

Ozone is an intrinsically toxic gas that cannot be breathed in higher concentrations. Ozone is irritating to lung and eye tissues. Ozonated gas must be used with caution, competence and care. Ozonated water can't be stored, it has a very limited shelf life.

Contra-indications of using ozone: Pregnancy, Autoimmune disorders, hyperthyroidism, anemia, myasthenia, alcohol intoxication, CVD - myocardial infarction, hemorrhage, ozone allergy [10].

Conclusion

Dentistry is changing on a daily basis. Ozone offers another tool to be used in a clinical setting. There are many factors that affect the oral health of a patient's mouth. Patients are becoming aware of the Oral Systemic Connection, how their mouth affects the rest of the body. They hear it from the media and are able to do their own research on different modalities of treatment on the internet. They are searching for dental offices that meet their needs - to become healthier. They are looking for a more natural, holistic centered dental practice that works with every patient to provide safe, effective treatment plan/outcome and a positive experience/outcome.

Ozone has been shown to help to reduce inflammation, help to speed up the healing process and to help decrease pain. Ozone does not have any toxic properties that chloride solutions have. Ozone is very economical to use in everyday clinical practice. With the focus on health, it is time for a paradigm shift, to help our patient become healthier.

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