



# Ozone and caries

More than half a million people in the United Kingdom have had their dental caries treated with ozone. It takes just one minute of ozone to kill the bacteria and reverse the decay. In a clinical practice study of 277 patients, 100 percent preferred ozone to conventional drilling and filling. Even more surprising, 95 percent would gladly pay more for this treatment than the conventional restorative approach taking longer than 30 minutes. It sounds like science fiction, doesn't it? Ozone is the newest technology in dentistry ... not here, but in

Europe. Research studies are now complete at 15 sites in the United Kingdom alone.

Ozone is blue, has a strong odor and contains three oxygen atoms ( $O_3$ ). The oxygen ( $O_2$ ) we breathe has two oxygen atoms, is colorless and odorless.  $O_2$  is much more common, accounting for two million out of 10 million air molecules, compared to just three ozone molecules. Ozone is primarily found in the earth's upper atmosphere from about 10 km out to 50 km — the stratosphere. It is thinnest at the equator and thicker towards the poles. This ozone layer absorbs some of the sun's harmful ultraviolet rays, protecting us from them.

Harmful levels of ozone are also associated with photochemical smog. Ground level ozone is considered a harmful pollutant attributed to gasoline-powered vehicles of all kinds, paints, cleaning products, aerosols, and the list goes on. Ozone levels may be elevated during hot summer days with very little wind. Ozone can exert toxic effects on erythrocytes, the lungs, and other organs after prolonged exposure. However, there is evidence that nature also produces and uses ozone, together with nitric oxide for killing infected and neoplastic cells.

The term "ozone" comes from the ancient Greeks who noticed the strong smell after electrical storms and the good fishing that followed. Native Americans made the same connection and the custom of fishing after an electrical storm remains a custom today.

Medical uses for ozone include carefully selected doses for management of circulatory disorders, viral diseases, and cancer. The first  $O_3$  generator to treat inflammatory bowel disorders was developed by Werner von Siemens in Germany as early as 1857. In 1870 it was reported as a therapeutic approach for purifying blood. Today, ozone is a recognized therapy in 16 countries.

Ozone is also considered the agent of choice for the disinfection of public water supplies. Ozone kills bacteria by rupturing cell membranes within two seconds. Chlorine, on the other hand, simply diffuses into the cell and requires 30 minutes to achieve bactericidal effects. Ozone decomposes to a harmless, non-toxic and environmentally safe material — oxygen. Ozone has successfully been employed for the treatment of dental unit water lines since the 1990s.

Now ozone is available in dentistry for the treatment of early carious lesions. Nearly 30 studies have been published recently on dental uses for ozone, including root caries, occlusal caries, denture cleaners, endodontics, and the effect of ozone on various dental materials.

The leader in ozone research is Dr. Edward Lynch of Queens University in Belfast, Ireland. He uses the HealOzone machine in his research, made by an American company — CurOzone, USA, Inc. The company is awaiting FDA approval for use in the United States. KaVo is the exclusive distributor of the unit in Europe and the Middle East.

The HealOzone system produces oxidizing gas filtered through a dental handpiece fitted with a special

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*The medical profession has used ozone for more than 100 years. It's time for dentistry to replace 'amputation' with this radically different approach that patients definitely prefer.*

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# Periodontics

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rubber cup to direct and control the ozone gas as it is delivered to the tooth surface. A seal is established between the rubber cup and the surface to be treated, preventing the escape of the gas. Exposure time ranges between 10 and 60 seconds, depending on the procedure. No anesthesia is needed.

Ozone isn't harmful to existing dental restorations or gingival tissues. A sealant is placed after ozone treatment on cavitated lesions. Ozone effectively treats occlusal carious lesions determined to need drilling and filling by eradicating the bacteria and remineralizing the surface. In just 10 seconds, 99 percent of microorganisms are eliminated. That includes bacteria, fungi, and viruses. Over 97 percent of carious lesions are clinically reversed

and the remainder don't progress further.

In a private practice study of procedure time, 40 adults with early primary occlusal caries were treated. Half received traditional drilling and filling, while the other half were treated with the HealOzone. Traditional treatment averaged 35 minutes per tooth, compared to eight minutes with the HealOzone. Actual application time for the ozone was just one minute.

Several studies have measured the mineral density of tooth surfaces using either QLF (quantitative light-induced fluorescence) or the Diagnodent® (laser fluorescence). The majority of surfaces treated with ozone consistently showed remineralization. Steady deterioration was seen on the control surfaces.

Early root caries are also effectively treated with ozone. With no adverse effects to dental materials or tissue, this is a welcome treatment for those problem areas. Leathery root surfaces are hardened with a 10 to 20 second application of ozone. When sealants were placed in areas of root caries, those placed after ozone treatment were better retained than those placed without ozone treatment. Ozone is clinically safe, with detectable levels inside the mouth at or below safe levels identified by both the European Union and the FDA. The potential toxicity of ozone should not preclude its use for medical and dental purposes. The medical profession has used ozone for over 100 years. It's time for dentistry to replace "amputation" with this radically different approach that patients definitely prefer. Soon ozone will be an option for patient care in the United States.