Ozonated Liquids in Dental Practice – A Review
Author: Dr Julian Holmes, Lime Technologies Holdings Ltd, Clinical Director

Date: April 2008.

Ozonated Liquids in Dental Practice – A Review

Part 1: Introduction to Ozone
Part 2: The Chemistry of Ozone Gas
Part 3: The Chemistry of Ozone in Water
Part 4: The Chemistry of Ozone in Plant Oils
Part 5: Dental Unit Water Lines (DUWL's)
Part 6: Oral Hygiene & Infection Control
Part 7: Periodontal & Implant Care
Part 8: Disinfection in Dental Practice
Part 9: At-Home Care & Patient Compliance

Part 9: At-Home Care & Patient Compliance

Abstract: In Part 9, the role of ozonated fluids are examined for At-Home Care and Patient Compliance. Ozonated liquids potentially play a very important role in patient after care, at-home general usage, and may solve some of the treatment compliance issues clinicians face in everyday treatment. For example, a routine anti-fungal agent, 'Lamasil ™', comes in cream and tablet formulations. It is the standard product against which the efficacy of most anti-fungal agents are compared. However, treatment time may be measured in weeks to months with this product, depending on the location of the fungal infection and difficulty of direct access to it.

In comparison, the treatment of fungal infections in nails, one of the most difficult to successfully treat, is very simple with a twice daily application of ozonated plant oils, and the treatment may last just 5 days in some cases. Patient compliance becomes a real issue at extended treatment times. The most common issue is the observed resolution of the problem, so the course of treatment is discontinued, without a full understanding that residual tissue infection may lead to recurrence of the problem.

Another issue is compliance by clinicians themselves, as they fail to fully understand the treatment protocol, apply it and pass on that knowledge to patients and the public. Clinicians take short cuts as they observe good results with this 'modified' protocol. In doing so, practitioners create the potential for failure of treatment. The product is then blamed rather than the issue of compliance.

Dental researchers have started to examine the effects of ozonated fluids in periodontal disease. Huth *et al* in two papers in 2006 and 2007 (*Huth et al 2006, Huth et al 2007*) examined the effect of ozone on periodontal tissues. The 2007 paper compared traditional periodontal anti-microbial products with the use of ozonated water. Both papers concluded that ozonated water has an excellent anti-microbial effect.

Huth *et al* (*Huth et al 2007*) in their later paper examined the effect of ozone on the influence on the host immune response. These researchers chose the NF-kappaB system, a paradigm for inflammation-associated signaling/transcription. Their results showed that that NF-kappaB

activity in oral cells in periodontal ligament tissue from root surfaces of periodontally damaged teeth, was inhibited following incubation with ozonized medium. The Huth 2007 study establishes a condition under which aqueous ozone exerts inhibitory effects on the NF-kappaB system, suggesting that it has an anti-inflammatory capacity (*Huth et al 2007*). The use of ozonated water in dental ultrasonic systems, such as scalers, sonic preparation systems (KaVo Sonic-Sys, KaVo GmbH, Germany) and air abraision systems would seem to be supported by Huth *et al* 2006 and Huth *et al* 2007.

There are many benefits to control oral hygiene and as a source of sterile water. However, patients should also be informed that there is an interaction of aqueous ozone with anti-microbials. This research has been published, illustrating the importance of potential interactions of dissolved ozone and prescribed anti-microbials. Patients who are taking a course of antibiotics may need to be informed that the use of ozonated water inactivates antibacterial agents (*Dodd et al 2006*) and in particular amoxicillin (*Andreozzi et al 2005*), progesterone (*Barron et al 2006*) and tetracycline (*Dalmázio et al 2007*). For concern to dentists is that ozone may inactivate the anti-microbial effects of triclosan (*Suarez et al 2007*).

A current topic of debate in dental material science and long term potential effects, are endocrine disruptors found in resin-based dental restorative materials. Deborde *et al* (*Deborde et al 2005*) showed endocrine disruptors were destroyed by ozonated water. This paper potentially points towards a pathway to remove these chemicals from the body system after placement of 'modern' tooth-coloured or 'white' fillings.

Ozonated Oils and Oil-Gels – General Information

The LT-Oil ™ range of ozonated oils is made to strict manufacturing standards with medical grade oxygen. This oxygen is 99% pure, and is passed into a converter to form ozone. Ozone is then combined with pure vegetable oils and extracts.

Storage - Please refrigerate or keep in a cool, dark place. Do not freeze. Replace the container lid when not in use.

Spillage: Clean up oil spills and dispose of carefully. The oils are non-toxic.

Container Disposal: Dispose of the containers with care and consideration to your environment. Use a recycling centre if possible.

Inflammability: This product is not inflammable under normal conditions and use. Do not expose to heat sources.

Directions for use – These products are not toxic, and if swallowed, there are no special precautions that should be taken. If in doubt, consult your usual doctor. Ozonated fluids are available in encapsulated form. Please contact Lime Technologies Medical Ltd on info@limetechnologies.net for further details.

Treatment Duration – For areas of infection, the treatment time is from 2-3 weeks. For the treatment of skin surface ulcers, the treatment time for small areas is 3-4 weeks, for large ulcers, from 3 to 4 months. Healing time is dependant on the age of the patient, the medical status of the patient, and the size of the lesion being treated. If in any doubt, contact Dr Julian Holmes at julianholmes@mweb.co.za or your own medical practitioner who you normally consult with. Further information is available from the Internet and World Wide Web on www.the-o-zone.cc.

Presentation: - Ozonated oils are pure plant extracts, through which pure oxygen and ozone are passed. The plant extracts undergo a chemical reaction to form a thick, viscous oil, or in some cases, a petroleum jelly like product. The final products contain ozonides. These ozonoids have a pharmaceutical activity similar to ozone gas, but at a reduced activity level. They are bactericidal, fungicidal, and veridical. The oils are chosen for their innate healing properties, and the ozonides enhance this effect.

Directions for use - Medical:

These oils have been used for periodontal and surgical healing work. Several dental and medical practitioners are using it for skin and nail-bed infections, all with positive results. In severe ulceration cases that 'modern pharmacology' has not been able to resolve, ozonated oils have allowed full ulcer granulation and wound closure within 3 months, with resolution of pain and discomfort. Several football clubs use these oils after on-pitch wounds. The ozonated oil prevents infection, resolves pain within about 30 minutes, and promotes accelerated healing.

Skin Surface Abrasions and Cuts: Clean the affected skin surface with cooled boiled or sterile water. It is important if possible to remove all foreign bodies from the skin surface, such as gravel, small stones, sand, and dirt. Dry and apply a thin layer of the ozonated oil over the affected skin surface.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface.

There is no need to cover unless protection from further trauma is required, or work place health and safety regulations require wound coverage.

Skin Ulceration: Clean the ulcer site and surrounding area with cooled boiled or sterile water. Dry to a damp surface if possible and apply a thin layer of the ozonated oil over the ulcer site and surrounding skin edge.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected area.

There is no need to cover unless protection from further trauma is required, or work place health and safety regulations require wound coverage.

Nail Infections: Clean the nail and surrounding finger/toe skin surface with cooled boiled or sterile water.

Dry and apply a thin layer of the ozonated oil over the nail and surrounding skin surface. If possible, work the oil/oil-gel below the nail and into the creases on either side of the nail.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected area.

On fingers, a finger cot, or gloves will help keep the oil/oil-gel in the correct place, and prevent touched areas being left with an oil film.

On toes, there is no need to cover unless protection from further trauma is required, or work place health and safety regulations require treatment area coverage.

Skin Penetrations: eg Thorns /Splinters If possible clean your hands and the affected skin surface with cooled boiled or sterile water.

Remove all parts of the thorn or splinters if possible. Dry and apply a thin layer of the ozonated oil over the affected skin surface.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface.

Cover with a dressing if possible. Seek medical help if parts remain embedded below the skin surface.

Skin Wounds: If possible clean your hands and the affected skin surface with cooled boiled or sterile water.

Remove all parts of the thorn or splinters if possible. Dry and apply a thin layer of the ozonated oil over the affected skin surface. Seek medical help if necessary.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface. Cover with a dressing if possible. Seek medical help if necessary.

Skin Infections:

1. Bacterial: eg Acne Clean the affected skin surface with cooled boiled, sterile water or skin cleanser.

Dry and apply a thin layer of the ozonated oil over the affected skin surface. Seek medical help if necessary. An alternative product is the LT-HN Acne Gel.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface. There is no need to cover with a dressing.

2. Fungal: eg Athlete's Foot Clean the affected skin surface with cooled boiled or sterile water.

Dry and apply a thin layer of the ozonated oil over the affected skin surface and between the toes. Seek medical help if necessary.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface. Wear open shoes to allow the foot to remain dry.

Change socks every day and wash following manufacturer's instructions.

3. Viral: eg Shingles, Lip Herpes Clean the affected skin or lip surface with cooled boiled or sterile water.

Dry and apply a thin layer of the ozonated oil over the affected skin surface. Seek medical help if necessary.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface.

There is no need to cover unless protection from further trauma is required, or work place health and safety regulations require wound coverage.

Superficial Burns: Clean the affected skin surface with cooled boiled or sterile water.

Dry and apply a thin layer of the ozonated oil over the affected skin surface. Seek medical help urgently.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface.

Cover with a dressing if possible. Seek medical help urgently if the burn is extensive.

Deep Burns: Clean the affected skin surface with cooled boiled or sterile water if possible.

Dry and apply a thin layer of the ozonated oil over the affected skin surface. Cover with a dressing if possible. Seek medical help urgently.

Trauma Injuries: Clean the affected skin surface with cooled boiled or sterile water if possible.

Dry and apply a thin layer of the ozonated oil over the affected area. Cover with a field dressing if possible. Seek medical help urgently.

Surgery Sites / Surgical Suture Lines: Clean the suture line with cooled boiled or sterile water. Dry and apply a thin layer of the ozonated oil over the affected skin surface.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface.

There is no need to cover unless protection from further trauma is required, or work place health and safety regulations require wound coverage.

Insect Bites & Stings: Clean the affected skin surface with cooled boiled or sterile water. Make sure any residual sting or insect parts are removed from the bite/sting area.

Dry and apply a thin layer of the ozonated oil over the bite or sting surface. Seek medical help if necessary.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface.

There is no need to cover unless protection from further trauma is required, or work place health and safety regulations require wound coverage.

Directions for use - Dental:

Dental Caries: Ozonated oils play ***NO*** part in the treatment of caries.

The ozonoid oil product is not sufficiently active enough to destroy superficial micro-biological niches and demineralisation in enamel, nor deep micro-biological niches in dentine tooth structure.

Ozonated oils may help to reduce pain and infection is gross caries with pulpal exposure, but this has not been tested or reported.

The oil-base will interfere with dentine and enamel bonding systems.

Ozone gas delivered from the LT CMU3 Unit is the only ozone gas product that should be used in these cases. For further comment and information, see www.limetechnologies.net.

Gum Tissue Infections:

1. Bacterial: Clean the affected area with cooled boiled or sterile water or hydrogen peroxide mouth rinse.

Apply a thin layer of the ozonated oil over the affected skin surface. Seek dental help if necessary.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface. There is no need to cover with a dressing.

Dry Socket: Dry socket is a superficial bone and soft tissue infection, usually following the removal of a tooth or teeth (especially 8's) but this can occur in any site in the mouth after surgery. It is painful, and can take a long period of time to settle and heal with routine antibiotics.

To treat with ozone oils, clean the affected area with cooled boiled or sterile water or hydrogen peroxide mouth rinse.

A small syringe with a blunt end, for example the Ultradent 1.2ml syringe with a fine acid etchant delivery tip, is filled with ozonated oil. The syringe tip is introduced into the dry socket to its full depth if possible, and the oil is expelled into the socket as the syringe tip is withdrawn.

The patient should be sent home with a supply of the oil, syringes, delivery tips, and instructions, and instructed in oral hygiene care, and the case reassessed at regular time intervals.

2. Fungal: eg Denture Sore Mouth: Clean the affected gum tissue surface with cooled boiled or sterile water or hydrogen peroxide mouth rinse. Clean the denture with soap and water, rinse, and dry.

Apply a thin layer of the ozonated oil over the fitting surface (the surface that touches the gum tissue) of the denture and replace.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface.

3. Viral: eg Lip Herpes

Clean the affected skin surface with cooled boiled or sterile water or hydrogen peroxide.

Apply a thin layer of the ozonated oil over the affected lip surface.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface.

Mouth & Tongue Ulceration: Clean the affected skin surface with cooled boiled or sterile water or hydrogen peroxide mouth rinse.

Apply a thin layer of the ozonated oil over the ulcer site and surrounding skin edge.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected area.

Aphthous Ulcers: Either ozone gas from the LT-CMU3 unit can be delivered onto the ulcer surface, or ozonised oils can be placed onto the ulcer surface directly.

Clean the affected skin surface with cooled boiled or sterile water or hydrogen peroxide mouth rinse.

Apply a thin layer of the ozonated oil over the affected skin surface. Seek medical help urgently.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface.

Superficial Burns: Clean the affected skin surface with cooled boiled or sterile water or hydrogen peroxide mouth rinse.

Apply a thin layer of the ozonated oil over the affected skin surface. Seek medical help urgently.

The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface.

Periodontal Pockets: These oils should be used in conjunction with thorough scale and debris prophylaxis. They are ***NOT*** an alternative to routine professional oral hygiene care.

All periodontal pockets should be charted and measurements noted. Points of bleeding and pocket depth should be recorded.

After professional prophylaxis, a small syringe with a blunt end, for example the Ultradent 1.2ml syringe with a fine acid etchant delivery tip, is filled with ozonated oil.

The syringe tip is introduced into the periodontal pocket to its full depth, and the oil is expelled into the pocket as the syringe tip is withdrawn. At no time should the oil be injected into the soft tissue. The aim is to fill the pocket with the ozone oil or gel as an adjunct to debris removal.

The patient should be instructed in oral hygiene care, and the case reassessed at regular time intervals.

Ozonated oil can be re-applied at 1 week intervals in all cases, or in severe cases, more frequently.

Surgery Sites / Surgical Suture Lines:

Clean the suture line with cooled boiled or sterile water, or hydrogen peroxide solution.

Apply a thin layer of the ozonated oil over the affected skin surface with a suitable instrument, such as a ‘Micro-Brush’. The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface. There is no need to cover, such as with a perio-pack, unless protection from further trauma is required.

References:

Al Shorman, Abu-Naba'a, Coulter W, Lynch E. Ozone, An Effective Treatment For Dental Unit Water Lines. IADR Abstract 2002.

Al Shorman, Abu-Naba'a, Coulter W, Lynch E. Primary Colonization of DUWL by P. aeruginosa and its Eradication by Ozone. IADR Abstract 2003.

Andreozzi R, Canterino M, Marotta R, Paxeus N. Antibiotic removal from wastewaters: the ozonation of amoxicillin. J Hazard Mater. 2005 Jul 15;122(3):243-50.

Arteaga ME, Molerio J, Bada A, González B, Zamora Z, Remigio AC. Clasificación toxicológica del OLEOZON®", Revista CENIC Ciencias Biológicas, 32(1):57-59, 2001.

Arteaga ME, Moleiro J, Zamora Z, Bada AM, González B, Remigio AC. Evaluación del Oleozon® en ensayo de Toxicidad de Clases. OZ-P-130.

Barron E, Deborde M, Rabouan S, Mazellier P, Legube B. Kinetic and mechanistic investigations of progesterone reaction with ozone. Water Res. 2006 Jun;40(11):2181-9.

Bocci V. Ozone as a bioregulator. Pharmacology and toxicology of ozone therapy today. J Biol Regul Homeost Agents 1996: 10: 31-53

Brauner A. Clinical studies of therapeutic results from ozonized water for gingivitis and periodontitis. *Zahnarztl Prax* 1991: 42:48–50.

Cardon B, Eleazer P, Miller R, Staat R. Low concentration ozone treatment insufficient to control DUWL biofilm. IADR Abstract 2002.

Chahverdiani B, Thadj-Bakhche A. Ozone treatment in root canal therapy. Introduction and general discussion. Acta Med Iran. 1976:19(3):192-200.

Chang H, Fulton C, Lynch E. Antimicrobial Efficacy of Ozone on Enterococcus faecalis. IADR Abstract 2003.

Claxson AWD, Smith C, Turner MD, et al. Oxidative modification of salivary biomolecules with therapeutic levels of ozone. *J Dent Res* 2002: 81:A-502.

Cruz C, Menéndez S, Martínez ME, Clavera T. Application of Ozonised Oil in the Treatment of Alveolitis.

Dalmázio I, Almeida MO, Augusti R, Alves TM. Monitoring the degradation of tetracycline by ozone in aqueous medium via atmospheric pressure ionization mass spectrometry. J Am Soc Mass Spectrom. 2007 Apr;18(4):679-87. Epub 2007 Jan 17.

Deborde M, Rabouan S, Duguet JP, Legube B. Kinetics of aqueous ozone-induced oxidation of some endocrine disruptors. Environ Sci Technol. 2005 Aug 15;39(16):6086-92.

Díaz M, Gavin J, Hernández F, Ledea O, Moleiro J. "1H NMR Study of methyl linoleate Ozonation", Ozone Sci. & Eng., 2002.

Díaz M, Hernández F, Alvarez I, Vélez H, Ledea O, Molerio J. "1H-NMR studies of the ozonation of methyl oleate", Boletín de la Sociedad Chilena de Química, 42(3):349-353, 1997.

Díaz M, Hernández F, Alvarez I, Velez H, Ledea O, Moleiro J. "La espectroscopía de resonancia magnética nuclear protónica en el seguimiento de la reacción del ozono con los ácidos grasos insaturados", Revista CENIC Ciencias Químicas, 29:89 93, 1998.

Díaz M, Lezcano I, Molerio J and Hernández F. "Spectroscopic characterization of ozonides with biological activity", Ozone Sci. & Eng., 23(1):35-40, 2001.

Dodd MC, Buffle MO, Von Gunten U. Oxidation of antibacterial molecules by aqueous ozone: moiety-specific reaction kinetics and application to ozone-based wastewater treatment. Environ Sci Technol. 2006 Mar 15;40(6):1969-77.

Durnovo F, Kinyapina I, Kontorschikova C. Ozone Influence on Pro-Inflammatory Process in Maxillo-Facial Part of Head and Neck.

Ebensberger U, Pohl Y, Filippi A. PCNA-expression of cementoblasts and fibroblasts on the root surface after extraoral rinsing for decontamination. *Dent Traumatol* 2002: 18:262–266.

Fernández S, Quinsan C, Menéndez S, Gómez M. "Evaluación mutagénica del aceite ozonizado administrado intragástricamente", Revista CENIC Ciencias Biológicas, 20(1-2-3):14-16, 1989.

Fernández SI, Quinzan C, Menéndez S, Gómez M. "Estudio en animales de experimentación de posibles efectos teratogénicos y mutagénicos por vía intraperitoneal e intramuscular", Revista CENIC Ciencias Biológicas, 20(1-2-3):45-47, 1989.

Gell A, Pérez O, Lastre M. "Ozonoterapia en gerbils infectados experimentalmente con Giardia lamblia", Revista CENIC Ciencias Biológicas, 20(1-2-3):55-58, 1989.

González M, Molerio J. "Evaluación de la acción fungicida del ozono frente a Aspergillus flavus y a productos vegetales contaminados con este hongo", Revista CENIC Ciencias Químicas, 20(1-2-3):118-121, 1989.

Hernandez F, Moleiro J, Fernandez I, Regüeiferos MG. "Estudio in vitro del Lipofundin S-20 ozonizado", Revista CENIC Ciencias Biológicas, 20(1-2-3):5-8, 1989.

Holmes J. Management of Volatile Sulphur Compounds with Ozone. ISBOR 2003

Holmes J. The use of Ozonated Water as a Mouth Rinse to Reduce Bad Breath. IADR, 2003

Holmes J. Ozone – an Overview: Part 1 & Part 2. Published 2005

Holmes J. Ozonoids and Omega 3, 6 and 9 Fatty Acids in Skin Care: an Innovative Perspective. WWW LTH February 2006.

Holmes J. Application of Modern Chemistry to Historical Uses of Vegetable and Plant Extracts. WWW LTH, February 2006.

Holmes J. A New Dental Practice. WWW LTH, January 2007.

Holmes J. Changes in Dental Care. WWW LTH, January 2007.

Holmes J. Dental Unit Water Lines (DUWL's) – A Review of The Problem & Solutions. WWW LTH, 2007.

Holmes J. Treatment of the Erupting Dentition – A Review and a New Treatment Protocol. WWW LTH March 2007.

Holmes J. New Research into Skin Care. WWW LTH, January 2007.

Holmes J. Ozone, Ozonoids and Omega 3, 6 and 9 Fatty Acids in Skin Care: an Innovative Perspective. WWW LTH, April 2007.

Holmes J. Honey - Rediscovering Natural Additives for Skin Treatment. WWW LTH, April 2007.

Holmes J, Grootveld M, Smith C, Claxson AWD, Lynch E. Bleaching of Components Responsible for Extrinsic Tooth Discoloration by Ozone. IADR Abstract 2003.

Holmes J, Lynch E. Modern Dental Care: Published 2005.

Holmes J, Lynch E: Modern Management of Caries. Lecture Series,: 2003 - 2008

Huth KC, Jakob FM, Saugel B, Cappello C, Paschos E, Hollweck R, Hickel R, Brand K. Effect of ozone on oral cells compared with established antimicrobials. Eur J Oral Sci. 2006 Oct;114(5):435-40.

Huth KC, Saugel B, Jakob FM, Cappello C, Quirling M, Paschos E, Ern K, Hickel R, Brand K. Effect of aqueous ozone on the NF-kappaB system. J Dent Res. 2007

Jardines D, Ledea O, Zamora Z. Dicarboxylic Acids and their Origins in the Oral Administration of Oleozon®. OZ-P-128.

Jardines D, Ledea O, Zamora Z. "Triglicéridos insaturados ozonizados como precursores de ácidos dicarboxílicos urinarios de ratas Wistar", Revista CENIC Ciencias Químicas, 32(2):65-69, 2001.

Jardines D, Zamora Z, Correa T, Rosado A, Moleiro J. "Perfil de ácidos orgánicos urinarios en ratas tratadas con oleozon por vía oral", Revista CENIC Ciencias Químicas, 29(2):79-84, 1998.

Ledea O, Correa T, Molerio J, Jardines D, Escobar M, Rosado A. "Volatile Components of Ozonized Sunflower Oil (OLEOZON®), Ozone Sci. & Eng., 23(2):121-126, 200).

Ledea O, Escobar M, Rosado A, Correa T, Jardines D, Molerio J. "Determinación de los compuestos polares presentes en el OLEOZON", Revista CENIC Ciencias Químicas, 31(3):195-202, 2000.

Ledea O, Jardines D, Moleiro J et al. "Nuevo método para el análisis de ozónidos del oleato de metilo por CG-EM", Revista CENIC Ciencias Químicas, 28:139-140, 1997.

Ledea O, Moleiro J, Díaz M, Jardines D. "Análisis de ozónidos y compuestos peroxídicos en la ozonización de oleato de metilo", Revista CENIC Ciencias Químicas, 29(2):75-78, 1998.

Legrá G, Turrent J, Menéndez S, Luis M. Experiences with Ozone Therapy in the Sutton Disease (Peridentitis Mucous Necrotica Recurrens). A Case Report.

Lemus L, Ordaz E. Application of Oleozon in the Treatment of Subprosthesis Stomatitis.

Lemus L, Ordaz E, Rodríguez E. Application of Oleozon in the Treatment of Subprosthesis Stomatitis.

Lynch E, Grootveld M, Holmes J, Silwood CJ, Claxson AWD, Prinz J, Toms H. 1H NMR Analysis of Ozone-treated Grapeseed, Olive, and Sunflower Seed Oils. IADR Abstract 2003

Lukinikh LM, Kosjuga SY. The use of Ozone for the Intensification and Optimization of Oral Hygiene.

Matsamura K, Ikumi K, Nakajima N, et al. A trial of regeneration of periodontal ligament around dental implants. *J Dent Res* 2002: 81:A-101.

Menéndez S, Falcón L. "Ozonized sunflower oil in the treatment of tinea pedis", Mycoses, 44, 2001.

Menéndez S, Moleiro J, Díaz W, Lezcano I, León FL, Ledea O, Falcón L, Simón RD, Pérez O, Moya S, Landa N, Hernández C, Fernández LA, Díaz M, Gómez M, Jardines D, Aquino A, Mora C, Pérez C. Registro Sanitario sobre la Application del Aceite de Girasol Ozonizado Oleozon® en la Epidermofitosis®". OZ-P-132.

Nagayoshi M, Fukuizumi T, Kitamura C. Efficacy of ozone on survival and permeability of oral microorganisms. *Oral Microbiol Immunol* 2004: 19:240–246.

Noa M, Hernández F, Herrera M, Menéndez S, Capote A, Aguilar C. "Estudio histológico de vías digestivas de ratones tratados con aceite ozonizado", Revista CENIC Ciencias Biológicas, 20(1-2-3):23-24, 1989.

Ozone: The Revolution in Dentistry. Copenhagen: Quintessence Publishing, 2004:155–164, ISBN 18-5097-08-82.

Sechi LA, Lezcano I, Nuñez N, Espino M, Dupre I, Pinna A, Molicotti P, Fadda G, Zanetti S. "Antibacterial activity of ozonized sunflower oil (Oleozon)", J Appl. Microbiology, 90(2):279-284, 2001

Sorokina S, Lukinych L. Ozone Therapy as a Part of a Complex Treatment of a Paradontium Disease.

Sorokina S, Zaslavskaja M. A Comparative Study of a Bactericidal Activity of Ozonized Solutions during Treatment of Inflammatory Diseases of Paradontium.
.

Suarez S, Dodd MC, Omil F, von Gunten U. Kinetics of triclosan oxidation by aqueous ozone and consequent loss of antibacterial activity: relevance to municipal wastewater ozonation. Water Res. 2007 Jun;41(12):2481-90.

Yamayoshi T, Tatsumi N. Microbicidal effects of ozone solution on methicillinresistant *Staphylococcus aureus. Drugs Exp Clin Res* 1993: 19:59–64.