**0711 Ozone, An Effective Treatment For Dental Unit Water Lines**

**H.M. AL SHORMAN**, L. ABU-NABA'A, W.A. COULTER, and E. LYNCH, Queens University Belfast, United Kingdom

Ozone (O₃) has been used for purification of water due to its efficiency and lack of side effects. **Objectives:** The aim of this study was to apply ozone to control the contamination of dental unit water lines (DUWL). **Methods:** In this experiment the water lines in a dental unit with existing biofilm was treated with O₃ and subjected to microbiological assessment. The O₃ device used was the HealOzone unit (CurOzone USA), which delivers 2100 ppm O₃ in air at a rate of 615 ml/min. It was connected to the dental unit water bottle using a quick release coupling. The high-speed handpiece line was chosen for water sampling. A control water sample was collected before treatment. O₃ was applied for 3 minutes to the water bottle and the line was subsequently flushed for 2 minutes before water was immediately sampled into a sterile container, which contained L-Cysteine to neutralize any residual ozone. This was repeated daily morning for 5 days (Mon.-Fri.). After the weekend, on day 8, a final sample without O₃ treatment was collected. All the samples were cultured on nutrient agar plates and incubated at 35°C for 3 days after which bacterial count was carried out. **Results:** The bacterial count of samples collected showed a bacterial reduction from 5.2*10⁶ CFU/ml before treatment to 300 CFU/ml after the first O₃ application and then to 0 CFU/ml after the second application onwards. **Conclusions:** The results suggest that O₃ delivered in this way can play an important role in controlling the problem of contamination of DUWL. Investigations are currently being conducted to determine the minimum O₃ required to solve this problem.

**Impact of ozone and ozonated water on bond strengths:**


**Influence of Ozone Gas and Ozonated Water Application to Dentin and Bonded Interfaces on Resin-Dentin Bond Strength.**

Garcia EJ, Serrano AP, Urruchi WI, Deboni MC, Reis A, Grande RH, Loguercio AD.
dentin surfaces were treated either with ozone gas (2100 ppm), ozonated water (3.5 ppm), or distilled water for 120 s, and then bonded with SB2 or XP Conclusion: Ozone gas and ozonated water used before the bonding procedure or on resin/dentin bonded interfaces have no deleterious effects on the bond strengths and interfaces.


Activity of ozonated water and ozone against Staphylococcus aureus and Pseudomonas aeruginosa biofilms.

Białoszewski D, Pietruczuk-Padzik A, Kalicinska A, Bocian E, Czajkowska M, Bukowska B, Tyski S.

Abstract

BACKGROUND:

The known bactericidal properties of ozone have not been checked in relation to its action on bacterial biofilms. This is especially true of ozonated fluids. The aim of this study was to investigate the bactericidal activity of ozonated water and that of a mixture of ozone and oxygen against biofilms.

RESULTS:

Ozonated water was found to be an effective bactericidal agent against biofilms after as little as 30 seconds of exposure, while the bactericidal activity of the ozone-oxygen solution was much lower. Prolongation of the duration of biofilm exposure to the gaseous disinfectant to 40 minutes led to a reduction in the viable cell count, which nevertheless remained high.

CONCLUSIONS:

Unlike the ozone-oxygen mixture, ozonated water effectively destroys bacterial biofilms in vitro.


Effects of ozone on membrane permeability and ultrastructure in Pseudomonas aeruginosa.

Zhang YQ, Wu QP, Zhang JM, Yang XH.

Cell suspensions of Ps. aeruginosa ATCC27853 were treated with ozonated water

CONCLUSIONS:

Ozone inactivates Ps. aeruginosa ATCC27853 by the combined results of increased cytoplasmic membrane permeability and cytoplasm coagulation, rather than by severe membrane disruption and cell lysis.
Ozone inactivates Ps. aeruginosa ATCC27853 by the combined results of increased cytoplasmic membrane permeability and cytoplasm coagulation, rather than by severe membrane disruption and cell lysis.

SIGNIFICANCE AND IMPACT OF THE STUDY:

Pseudomonas aeruginosa is a common water-related pathogen. These insights into the leakage of cytoplasmic components and ultrastructural changes provide evidence for the mechanisms of ozone-mediated inactivation.


Management of gingival inflammation in orthodontic patients with ozonated water irrigation--a pilot study.

Dhingra K, Vandana KL.

Abstract

OBJECTIVE:

Ozonated water irrigation has recently been tried for its antimicrobial and anti-inflammatory effects in treatment of periodontitis. During orthodontic treatment, gingival inflammation occurs along with increased lactate dehydrogenase (LDH) enzyme levels in gingival crevicular fluid (GCF). Thus, the aim of this pilot study was to evaluate the clinical effects of a single subgingival irrigation with ozonated water on gingival inflammation in orthodontic patients and also to correlate the clinical effects with LDH enzyme activity in GCF.

METHODS:

Fifteen systemically healthy orthodontic patients (seven men and eight women, mean age 17.3 years) with full-mouth brackets were included in this prospective, cross-sectional, clinical and laboratory investigation. Clinical parameters, LDH enzyme activity and GCF volume were measured at baseline (0 day) followed by subgingival irrigation with 0.01 mg l(-1) ozonated water. These parameters were again assessed on 14th and 28th day.

RESULTS:

There was significant (P < 0.05) reduction in values of clinical parameters, GCF LDH activity and GCF volume after subgingival irrigation with ozonated water. Also, a significant correlation
(r = 0.50, P = 0.01) was observed only between the post-treatment changes of plaque index and LDH values, among the clinical parameters assessed.

CONCLUSIONS:

A single subgingival irrigation of 0.01 mg l(-1) ozonated water can effectively reduce the gingival inflammation in orthodontic patients, which is also reflected in the reduction of LDH enzyme levels. However, further randomized controlled trials are required to validate the use of ozone irrigation in orthodontic patients for plaque control measures.


The use of ozonated water and 0.2% chlorhexidine in the treatment of periodontitis patients: a clinical and microbiologic study.

Kshitish D, Laxman VK.

Abstract

BACKGROUND:

The development of periodontal disease has been thought to be associated with several restricted members of the oral anaerobic species, such as black-pigmented Porphyromonas species and Actinobacillus actinomycetemcomitans (Aa), in the subgingival environment. Apart from bacteria, certain viruses and fungi that are associated with periodontal disease are also present in the subgingival plaque.

MATERIALS AND METHODS:

A randomized, double-blind, crossover split-mouth design was performed. A total of 16 patients suffering from generalized chronic periodontitis were selected for the study. The study period of 18 days was divided into two time-intervals, i.e. baseline (0 days) to 7 th day, with a washout period of 4 days followed by a second time interval of 7 days. The use of ozone and chlorhexidine gluconate (CHX) irrigation was randomized. Both the patient and the clinician evaluating the clinical parameters were blinded regarding the type of irrigation used.

RESULTS:

The interpretation of clinical and microbial data is from baseline to 7 th day. A higher percentage of plaque index (12%), gingival index (29%) and bleeding index (26%) reduction was observed using ozone irrigation as compared to chlorhexidine. The percentile reduction of Aa (25%) using ozone was appreciable as compared to no change in Aa occurrence using chlorhexidine. By using O 3 and chlorhexidine, there was no antibacterial effect on Porphyromonas gingivalis (Pg) and Tannerella forsythensis. The antifungal effect of ozone from baseline (37%) to 7 th day (12.5%) was pronounced during the study period, unlike CHX, which did not demonstrate any antifungal effect.
CONCLUSION:

Ozone may be considered as an alternative management strategy due to its powerful ability to inactivate microorganisms. Also, there is growing evidence that ozone can be employed as a useful therapeutic agent in both dentistry and medicine.


Antimicrobial activity of ozonated water.

Białoszewski D, Bocian E, Bukowska B, Czajkowska M, Sokół-Leszczyńska B, Tyski S.

Source

Department of Physiotherapy, 2nd Medical Faculty, Medical University of Warsaw, Warsaw, Poland. dariusz.bialoszewski@wum.edu.pl

Abstract

BACKGROUND:

The purpose of this study was to analyze basic bactericidal and fungicidal activity of ozonated water according to EN 1040 "Chemical disinfectants and antiseptics--Quantitative suspension test for the evaluation of basic bactericidal activity of chemical disinfectants and antiseptics" and EN 1275 "Chemical disinfectants and antiseptics--Quantitative suspension test for the evaluation of basic fungicidal or basic yeasticidal activity of chemical disinfectants and antiseptics" with additional clinical multidrug-resistant bacterial strains and evaluate whether the ozonated water acts as a rapid and efficient antimicrobial agent and as such could be applied during intraoperative ozone treatment for tissue protection against infection with pathogenic bacteria.

MATERIAL/METHODS:

A prototype device for intraoperative ozone therapy was used. Besides standard bacterial and fungal strains, 60 clinical bacterial isolates were analyzed.

RESULTS:

The ozone concentration in ozonated water was sufficient to kill almost all cells of the bacterial and yeast strains tested after 30 seconds. Effective action against Aspergillus brasiliensis spores required a longer time than those required in the case of bacterial cells or vegetative cells of yeast.

CONCLUSIONS:
The prototype device used in our study produced high ozone concentrations in freshly prepared ozonated water. This liquid complied with the requirements of the EN Standards: basic bactericidal and basic yeasticidal activities.


Antimicrobial effect of ozonated water on bacteria invading dentinal tubules.

Nagayoshi M, Kitamura C, Fukuizumi T, Nishihara T, Terashita M.

Source

Department of Operative Dentistry and Endodontics, Kyushu Dental College, Kitakyushu, Japan.

Abstract

Ozone is known to act as a strong antimicrobial agent against bacteria, fungi, and viruses. In the present study, we examined the effect of ozonated water against Enterococcus faecalis and Streptococcus mutans infections in vitro in bovine dentin. After irrigation with ozonated water, the viability of E. faecalis and S. mutans invading dentinal tubules significantly decreased. Notably, when the specimen was irrigated with sonication, ozonated water had nearly the same antimicrobial activity as 2.5% sodium hypochlorite (NaOCl). We also compared the cytotoxicity against L-929 mouse fibroblasts between ozonated water and NaOCl. The metabolic activity of fibroblasts was high when the cells were treated with ozonated water, whereas that of fibroblasts significantly decreased when the cells were treated with 2.5% NaOCl. These results suggest that ozonated water application may be useful for endodontic therapy.


Antimicrobial efficacy of ozonated water, gaseous ozone, sodium hypochlorite and chlorhexidine in infected human root canals.

Estrela C, Estrela CR, Decurcio DA, Hollanda AC, Silva JA.

Source

Department of Endodontics, Federal University of Goiás, Goiânia, GO, Brazil.
estrela3@terra.com.br

Abstract

AIM:

To determine the antimicrobial efficacy of ozonated water, gaseous ozone, sodium hypochlorite and chlorhexidine in human root canals infected by Enterococcus faecalis.
METHODOLOGY:

Thirty human maxillary anterior teeth were prepared and inoculated with E. faecalis for 60 days. Eppendorf tubes were connected to the coronal portion of the teeth. Urethane hoses were attached to the tubes and to the entrance of a peristaltic pump. The exit of the apparatus corresponded to the apical portion of the root canals. The test irrigating solutions were ozonated water, gaseous ozone, 2.5% sodium hypochlorite (NaOCl), 2% chlorhexidine that circulated at a constant flow of 50 mL min\(^{-1}\) for 20 min. Samples from the root canals were collected and immersed in 7 mL Letheen Broth (LB), followed by incubation at 37 degrees C for 48 h. Bacterial growth was analysed by turbidity of the culture medium and subculture on a specific nutrient broth. A 0.1 mL inoculum obtained from LB was transferred to 7 mL of brain heart infusion and incubated at 37 degrees C for 48 h. Bacterial growth was checked by turbidity of the culture medium carried out in triplicate.

RESULTS:

No solution used as an irrigant over a 20-min contact time demonstrated an antimicrobial effect against E. faecalis.

CONCLUSION:

The irrigation of infected human root canals with ozonated water, 2.5% NaOCl, 2% chlorhexidine and the application of gaseous ozone for 20 min was not sufficient to inactivate E. faecalis.


Ozonated water improves lipopolysaccharide-induced responses of an odontoblast-like cell line.

Noguchi F, Kitamura C, Nagayoshi M, Chen KK, Terashita M, Nishihara T.

Source

Department of Cariology and Periodontology, Division of Pulp Biology, Operative Dentistry, and Endodontics, Kyushu Dental College, Kitakyushu, Japan.

Abstract

INTRODUCTION:

It is important to develop an antimicrobial agent without any damage on dental pulp. In the present study, we examined whether pretreatment of bacterial lipopolysaccharides (LPS) with ozonated water (O(3)aq) improves LPS-induced responses of rat odontoblastic cell line, KN-3.
METHODS:

After the pretreatment of LPS with O(3)aq, effects of LPS and O(3)aq-treated LPS on cell viability; calcification ability; expression of cyclooxygenase 2 (COX-2), interleukin 6 (IL-6), and tumor necrosis factor alpha (TNF-alpha); and activation of p38 of KN-3 cells were examined.

RESULTS:

The formation of mineralized nodules by KN-3 cells was suppressed by LPS, whereas that suppression was inhibited by the pretreatment of LPS with ozonated water. We also found that LPS-induced expression of COX-2, IL-6, and TNF-alpha and p38 activation were markedly suppressed when LPS was pretreated with ozonated water. Furthermore, expression of COX-2, IL-6, and TNF-alpha by LPS were mainly induced through p38 activation.

CONCLUSION:

These results suggest that odontoblastic cells exhibit inflammatory responses against LPS and that ozonated water has the ability to improve LPS-induced inflammatory responses and suppression of odontoblastic properties of KN-3 cells through direct inhibition of LPS.


The influence of gaseous ozone and ozonated water on microbial flora and degradation of aflatoxin B(1) in dried figs.

Zorlugenç B, Kiroğlu Zorlugenç F, Oztekin S, Evliya IB.

Source

Department of Food Engineering, Cukurova University, 01330 Adana, Turkey. bulentz@cukurova.edu.tr

Abstract

In this study, the effectiveness of gaseous ozone and ozonated water on microbial flora and aflatoxin B(1) content of dried figs were investigated. After dried figs were exposed to 13.8mgL(-1) ozone gas and 1.7mgL(-1) ozonated water for 7.5, 15 and 30min, variation of aerobic mesophilic bacteria (AMB), E. coli, coliform, yeast and mold counts were determined. Before and after ozone treatments molds on dried figs were also isolated and identified. In both ozone treatments, AMB was not exactly inactivated whereas E. coli was completely destroyed at 7.5min. Coliform, and yeast were also destroyed at 7.5 and 15min in ozonated water, respectively. Ozone applications at 15min were sufficient for inactivation of all molds. Aspergillus flavus and Aspergillus parasiticus which cause aflatoxin formation were isolated from dried figs. Artificially contaminated with aflatoxin B(1) samples were also treated with gaseous ozone and ozonated water for 30, 60 and 180min, respectively. In both of treatments,
degradation of aflatoxin B(1) was increased due to increasing of ozonation time. Results indicated that gaseous ozone was more effective than ozonated water for reduction of aflatoxin B(1), whereas ozonated water was affected for decreasing microbial counts.


Effectiveness of ozonated water on Candida albicans, Enterococcus faecalis, and endotoxins in root canals.

Cardoso MG, de Oliveira LD, Koga-Ito CY, Jorge AO.

Source

Dental School, University of Taubaté, Taubaté.

Abstract

The aim of this study was to evaluate the effectiveness of ozonated water in the elimination of Candida albicans, Enterococcus faecalis, and endotoxins from root canals. Twenty-four single-rooted human teeth were inoculated with C. albicans and E. faecalis, and 24 specimens were inoculated with Escherichia coli endotoxin. Ozonated water (experimental group) or physiologic solution (control group) was used as irrigant agent. Antimicrobial effectiveness was evaluated by the reduction of microbial counts. Lipopolissacharide complex presence was assessed by limulus amebocyte lysate test and B-lymphocyte stimulation. Data were analyzed by Wilcoxon and Mann-Whitney tests (5%). Ozonated water significantly reduced the number of C. albicans and E. faecalis at the immediate sampling, but increased values were detected after 7 days. Ozonated water did not neutralize endotoxin. It could be concluded that ozonated water was effective against C. albicans and E. faecalis but showed no residual effect. No activity on endotoxin was observed.


Effectiveness of ozone against endodontopathogenic microorganisms in a root canal biofilm model.


Source

Department of Restorative Dentistry & Periodontology, Ludwig-Maximilians University, Munich, Germany. khuth@dent.med.uni-muenchen.de

Abstract
AIM:

To assess the antimicrobial efficacy of aqueous (1.25-20 microg mL(-1)) and gaseous ozone (1-53 g m(-3)) as an alternative antiseptic against endodontic pathogens in suspension and a biofilm model.

METHODOLOGY:

Enterococcus faecalis, Candida albicans, Peptostreptococcus micros and Pseudomonas aeruginosa were grown in planctonic culture or in mono-species biofilms in root canals for 3 weeks. Cultures were exposed to ozone, sodium hypochlorite (NaOCl; 5.25%, 2.25%), chlorhexidine digluconate (CHX; 2%), hydrogen peroxide (H(2)O(2); 3%) and phosphate buffered saline (control) for 1 min and the remaining colony forming units counted. Ozone gas was applied to the biofilms in two experimental settings, resembling canal areas either difficult (setting 1) or easy (setting 2) to reach. Time-course experiments up to 10 min were included. To compare the tested samples, data were analysed by one-way anova.

RESULTS:

Concentrations of gaseous ozone down to 1 g m(-3) almost and aqueous ozone down to 5 microg mL(-1) completely eliminated the suspended microorganisms as did NaOCl and CHX. Hydrogen peroxide and lower aqueous ozone concentrations were less effective. Aqueous and gaseous ozone were dose- and strain-dependently effective against the biofilm microorganisms. Total elimination was achieved by high-concentrated ozone gas (setting 2) and by NaOCl after 1 min or a lower gas concentration (4 g m(-3)) after at least 2.5 min. High-concentrated aqueous ozone (20 microg mL(-1)) and CHX almost completely eliminated the biofilm cells, whilst H(2)O(2) was less effective.

CONCLUSION:

High-concentrated gaseous and aqueous ozone was dose-, strain- and time-dependently effective against the tested microorganisms in suspension and the biofilm test model.


Comparison of the microbicidal activities of superoxidized and ozonated water in the disinfection of endoscopes.


Source

Second Department of Internal Medicine, Nagasaki University School of Medicine, Nagasaki, Japan.
Abstract

The microbicidal activities of superoxidized water (electrolysed strong acid water [ESAW] or electrolysed weak acid water [EWAW]), ozonated water, 0.05% chlorhexidine and 2% glutaraldehyde were tested against seven strains of clinical micro-organism isolates. Following incubation of bacterial suspensions in ESAW and EWAW for 10 s, the number of micro-organisms was reduced below the detection limit. The microbicidal activities of ESAW and EWAW were similar to that of glutaraldehyde, and superior to ozonated water and 0.05% chlorhexidine. The microbicidal activities of ESAW, EWAW and ozonated water were markedly diminished in the presence of albumin. Microbial contamination of upper gastrointestinal endoscopes was detected after 90 endoscopic procedures, but treatment of the endoscope with ESAW, EWAW or ozonated water eradicated the microbes. These results indicate that ESAW and EWAW are effective disinfectants after mechanical cleaning of upper gastrointestinal endoscopes, and can, therefore, be used in the endoscopy unit.


[The effectiveness of ozonated water for hand washing before surgery].

[Article in Japanese]
Isosu T, Kan K, Hayashi T, Fujii M.

Source

Department of Anesthesia, Southern Tohoku General Hospital, Southern Tohoku Research Institute for Neuroscience, Koriyama 963-8563.

Abstract

Using an ozonated water-dispensing machine for sterilization of hands (Mediaqua MA-III; Core Medical Co., Ltd, Tokyo, Japan), we investigated the effectiveness of ozonated water as a disinfectant for hand washing before surgery. The effectiveness of this new hand-washing method, using 4 ppm of ozonated water, which is expected to have a short-term bactericidal effect, and 0.2% benzalkonium chloride/83% ethanol solution (Welpas), which is expected to have a long-term bactericidal effect, was compared with that of the conventional hand-washing method (Fürbringer's method using a scrubbing agent containing povidone-iodine). The results showed no significant differences in the numbers of live bacteria and exponential reduction rates in live bacteria. Thus, this new method for hand washing using ozonated water is an effective method for sterilization of the hands before surgery.

PMID: 11452482
[PubMed - indexed for MEDLINE]

In vitro testing of a denture cleaning method using ozone.

Oizumi M, Suzuki T, Uchida M, Furuya J, Okamoto Y.

Abstract

The purpose of this study was to compare the microbicidal effect of gaseous ozone with that of ozonated water in order to determine its usefulness as a method for disinfecting dentures. Although a large number of research studies have been done on the bactericidal effect of ozone, little is known about its microbicidal effects on oral microorganisms. Therefore, we tested the effect of ozone on three standard strains of oral microorganisms: Streptococcus mutans (strain IID 973), Staphylococcus aureus (strain 209-P), and Candida albicans (strain LAM 14322). When the gaseous ozone injection method was used, the numbers of cells of all three strains decreased to 1/10(5) at 1 min, and by 3 min they were below the detection limit. Thus, the microbicidal effect of gaseous ozone was ascertained in a short time. In contrast, when ozonated water at 1 ppm and 3 ppm was used, C. albicans decreased to 1/10. A 700 mg/h ozone production level was needed to prepare 1 ppm ozonated water, whereas 20 mg/h of ozone was required by the gaseous ozone generator. These findings indicate that direct exposure to gaseous ozone seems to be a more effective microbicide compared with ozonated water, and that gaseous ozone can be clinically useful for disinfection of dentures.


A study on the bactericidal action of aqueous solution of O3 in dentistry.

Onouchi T.


Ozonated water improves lipopolysaccharide-induced responses of an odontoblast-like cell line.

Noguchi F, Kitamura C, Nagayoshi M, Chen KK, Terashita M, Nishihara T.

Source

Department of Cariology and Periodontology, Division of Pulp Biology, Operative Dentistry, and Endodontics, Kyushu Dental College, Kitakyushu, Japan.

Abstract
INTRODUCTION:

It is important to develop an antimicrobial agent without any damage on dental pulp. In the present study, we examined whether pretreatment of bacterial lipopolysaccharides (LPS) with ozonated water (O(3)aq) improves LPS-induced responses of rat odontoblastic cell line, KN-3.

METHODS:

After the pretreatment of LPS with O(3)aq, effects of LPS and O(3)aq-treated LPS on cell viability; calcification ability; expression of cyclooxygenase 2 (COX-2), interleukin 6 (IL-6), and tumor necrosis factor alpha (TNF-alpha); and activation of p38 of KN-3 cells were examined.

RESULTS:

The formation of mineralized nodules by KN-3 cells was suppressed by LPS, whereas that suppression was inhibited by the pretreatment of LPS with ozonated water. We also found that LPS-induced expression of COX-2, IL-6, and TNF-alpha and p38 activation were markedly suppressed when LPS was pretreated with ozonated water. Furthermore, expression of COX-2, IL-6, and TNF-alpha by LPS were mainly induced through p38 activation.

CONCLUSION:

These results suggest that odontoblastic cells exhibit inflammatory responses against LPS and that ozonated water has the ability to improve LPS-induced inflammatory responses and suppression of odontoblastic properties of KN-3 cells through direct inhibition of LPS.

PMID: 19410080
[PubMed - indexed for MEDLINE]

Inactivation of E. coli O157:H7 on Blueberries by Electrolyzed Water, Ultraviolet Light, and Ozone.

Kim C, Hung YC.

Source

Author Kim is with Agricultural Research Station, Virginia State Univ., Petersburg, Va. 23806, U.S.A. Author Hung is with Dept. of Food Science and Technology, Univ. of Georgia, Griffin, Ga. 30223, U.S.A. Direct inquiries to author Hung (E-mail: Yhung@uga.edu).

Abstract

Increased interest in blueberries due to their nutritional and health benefits has led to an increase in consumption. However, blueberries are consumed mostly raw or minimally processed and are susceptible to microbial contamination like other type of fresh produce. This study was, therefore, undertaken to evaluate the efficacy of electrostatic spray of electrolyzed oxidizing (EO) water, UV light, ozone, and a
combination of ozone and UV light in killing Escherichia coli O157:H7 on blueberries. A 5-strain mixture of E. coli O157:H7 were inoculated on the calyx and skin of blueberries and then subjected to the treatments. Electrostatic EO water spray reduced initial populations of E. coli O157:H7 by only 0.13 to 0.24 log CFU/g and 0.88 to 1.10 log CFU/g on calyx and skin of blueberries, respectively. Ozone treatment with 4000 mg/L reduced E. coli O157:H7 by only 0.66 and 0.72 log CFU/g on calyx and skin of blueberries, respectively. UV light at 20 mW/cm(2) for 10 min was the most promising single technology and achieved 2.14 and greater than 4.05 log reductions of E. coli O157:H7 on the calyx and skin of blueberries, respectively. The combination treatment of 1 min ozone and followed by a 2 min UV achieved more than 1 and 2 log additional reductions on blueberry calyx than UV or ozone alone, respectively. Practical Application: Outbreaks of foodborne illnesses have been associated with consumption of fresh produce. Many methods for removing pathogens as well as minimizing their effect on quality of treated produce have been investigated. UV technology and its combination with ozone used in this study to inactive E. coli O157:H7 on blueberries was found effective. Results from this study may help producers and processors in developing hurdle technologies for the delivery of safer blueberries to consumers.

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Inactivation of template-directed misfolding of infectious prion protein by ozone.

Ding N, Neumann NF, Price LM, Braithwaite SL, Balachandran A, Belosevic M, Gamal El-Din M.

Source

Address correspondence to Mohamed Gamal El-Din, mgamalel-din@ualberta.ca, or Norman F. Neumann, Norman.Neumann@albertahealthservices.ca.

Abstract

Misfolded prions (PrP(Sc)) are well known for their resistance to conventional decontamination processes. The potential risk of contamination of the water environment, as a result of disposal of specified risk materials (SRM), has raised public concerns. Ozone is commonly utilized in the water industry for inactivation of microbial contaminants and was tested in this study for its ability to inactivate prions (263K hamster scrapie = PrP(Sc)). Treatment variables included initial ozone dose (7.6 to 25.7 mg/liter), contact time (5 s and 5 min), temperature (4°C and 20°C), and pH (pH 4.4, 6.0, and 8.0). Exposure of dilute suspensions of the infected 263K hamster brain homogenates (IBH) (0.01%) to ozone resulted in the in vitro destruction of the templating properties of PrP(Sc), as measured by the protein misfolding cyclic amplification (PMCA) assay. The highest levels of prion inactivation (≥4 log(10)) were observed with ozone doses of 13.0 mg/liter, at pH 4.4 and 20°C, resulting in a CT (the product of residual ozone concentration and contact time) value as low as 0.59 mg · liter(-1) min. A comparison of ozone CT requirements among various pathogens suggests that prions are more susceptible to ozone degradation than some model bacteria and protozoa and that ozone treatment may be an effective solution for inactivating prions in water and wastewater.
[Effect of ozone water on the inflammation and repair in infected wounds].

[Article in Chinese]
Huang HJ, Yu B, Lin QR, Wang BW, Chen HQ.

Source

Department Orthopedic Surgery, Nanfang Hospital, Southern Medical University, Guangzhou, China.

Abstract

OBJECTIVE:

To study the effect of ozone water in promoting the healing of infected wounds.

METHODS:

Fifty Wistar rats were randomly divided into 5 groups, namely chlorhexidine treatment group, 5, 10, and 20 mg/L ozone water treatment groups, and the control group without any treatment. Infected wounds were induced on the back of the rats, and at 48 h of infection, chlorhexidine or ozone water was applied once daily for 9 days. Before and at days 3, 6, and 9 of the treatment, the wound changes were observed. The WBC in the tail venous blood was detected and the incised skin and muscular tissues were pathologically examined.

CONCLUSION:

Ozone water showed better effects in promoting the healing of the infected wound, especially at higher doses of 10 and 20 mg/L.

[A complex medical rehabilitation of patients with coronary heart disease underwent coronary shunting using air-ozone baths].

[Article in Russian]
Shchegol'kov AM, Budko AA, Sychev VV, Azarova EK, Arsenii TV.

Abstract

Ozone therapeutics is one of not medicated methods of treatment of coronary heart disease (CHD). For external application of ozone therapeutics was elaborated an air-ozone bath. Endurance of procedure is 20 minutes, ozone concentration is 8-10 mg/l in ozonized water and
temperature of air-ozone mix is 36 degrees C. Course of treatment consisted of 10 daily procedures. Searches are founded on the base of analyze of results of remedial treatment of 160 patients with CHD. Patient—men, aged from 41 to 65 years (average age is 55.6 +/- 5.6). 130 patients of them, underwent an operation of coronary shunting (CS), admitted to unit on 7-18th day after operation (in average—on 14.4 +/- 3.6th) and 30 patients without operational treatment. Program of patient observe consisted of general-clinical, laboratorial, functional and psychological methods of searches. It was established that using of air-ozone bath in complex program of rehabilitation of patients with CHD, after operation of CS, promotes to improvement of oxygen transporting, flow characteristics of blood, microcirculation, lowering of hypoxemia and hypoxia of tissue.


Therapeutic efficacy of mammary irrigation regimen in dairy cattle diagnosed with acute coliform mastitis.

Shinozuka Y, Hirata H, Ishibashi I, Okawa Y, Kasuga A, Takagi M, Taura Y.

Source

Laboratory of Veterinary Surgery, United Graduate School of Veterinary Medicine, Yamaguchi University, Yamaguchi, Japan. shino@urban.ne.jp

Abstract

The objective of this field study was to determine the therapeutic efficacy of mammary irrigation for the treatment of dairy cattle diagnosed with acute coliform mastitis caused by gram-negative bacteria. Additionally, the effects of different mammary irrigation regimen fluids such as ozone water and normal saline were compared. Dairy cattle clinically diagnosed with acute coliform mastitis (n = 57) were enrolled in the study, randomly assigned to 1 of 3 groups, and received the following treatments: systemic antibiotic administration (SAA group; n = 40), mammary irrigation regimen (MIR group; n = 10), and both treatments (MIX group; n=7). Significant antipyretic effects, as assessed by rectal temperature measurement, were observed in the MIX and MIR groups. Although 2 irrigating fluids were used, namely, ozone water and normal saline, no significant difference was observed between the 2 groups. Fourteen days after the onset of the treatments, the milk yield recovery rate in MIR group tended to be higher (p = 0.06) than that in the SAA group. Additionally, after 30 days of treatment, the MIR group cows demonstrated significantly higher successful recovery rates (p<0.05) than the SAA group cows. These results indicate that mammary irrigation with normal saline is an effective treatment for acute coliform mastitis in dairy cattle.


Biomechanical and microbiological changes in natural hog casings treated with ozone.

Benli H, Hafley BS, Keeton JT, Lucia LM, Cabrera-Diaz E, Acuff GR.

Source

Department of Animal Science, 2471 TAMU, Texas A&M University, College Station, TX 77843-2471, USA.
Abstract

The objective of this study was to determine the biomechanical and microbiological effects of exposing natural hog casings to ozonated water ≈7mg/l for 0, 2 or 4h at 16°C. A total of 450 casing segments representing 10 hanks were used over five testing days and arranged in a randomized block split-plot design. For each treatment, pH, temperature, actual ozone concentration, bursting strength, maximum rupture force, and L(∗), a(∗) and b(∗) color space values were determined. The bursting strength and the maximum rupture force values suggested that casings can be treated by ozone up to 2h without deterioration. After ozone treatments, changes in L(∗), a(∗) and b(∗) color space values made the casings appear lighter than the control samples. Microbiological studies showed that 1 and 2h ozonation reduced counts of Escherichia coli biotype I, which expressed green fluorescent protein, by 0.4 and 0.6log(10)CFU/25.4cm casing, respectively.


[Ozone therapy in gastroduodenal pathology associated with Helicobacter pylori].

[Article in Russian]
Fedorov AA, Gromov AS, Sapronenok SV, Kurochkin VIu, Zhernakova ZM.

Abstract

Three methods of ozone therapy (intravenous injection of ozonized physiologic saline, oral intake of ozonized low-mineral water and combination of the two treatments) were compared by efficacy in 215 patients with gastroduodenal pathology associated with Helicobacter pilori. All the techniques of ozone therapy proved effective in relation to regress of clinical symptoms, regeneration processes, eradication of Helicobacter pylori, but the combined regimen was the best.


Antimicrobial potential of ozone in an ultrasonic cleaning system against Staphylococcus aureus.

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Source

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Abstract

The aim of this study was to evaluate the antimicrobial potential of ozone applied to 3 different solutions in an ultrasonic cleaning system against Staphylococcus aureus. A total of 120 mL of S. aureus were mixed in 6 L of the experimental solutions (sterile distilled water, vinegar and sterile distilled water + Endozime AWpluz) used in a ultrasonic cleaning system (UCS). Ozone was produced by an electric discharge through a current of oxygen and bubbling with flow rate at
7 g/h ozone (1.2%) into the microbial suspensions. Ten mL of each experimental suspension were collected and 5 fold dilutions were made in 9 mL of BHI and incubated at 37 degrees C for 48 h. Bacterial growth was evaluated by turbidity of the culture medium. At the same time, 1 mL of bacterial samples was collected and inoculated in BHIA plates. After incubation at 37 degrees C for 48 h, the number of colony forming units (cfu) per mL on BHIA surface was counted. In dilution test in BHI tubes and in BHIA plates (cfu/mL), bacterial growth was not observed in any of the experimental solutions when ozone was added. Under the tested conditions, it may be concluded that the addition of ozone to a ultrasonic cleaning system containing different experimental solutions resulted in antibacterial activity against S. aureus.