

Literaturhinweise zu neueren Forschungsarbeiten über Ozontherapie

A)

Mutat Res. 1999 Jan 2; 438(1): 23-7.

[Related Articles.](#) [Links](#)

Evaluation of 8-oxodeoxyguanosine, typical oxidative DNA damage, in lymphocytes of ozone-treated arteriosclerotic patients.

Foksinski M, Bialkowski K, Skiba M, Ponikowska I, Szmurlo W, Olinski R.

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In the present study we measured the amount of 8-oxo-2'-deoxyguanosine (8-oxo-dG) in DNA isolated from lymphocytes of arteriosclerotic patients undergoing ozonotherapy. Treatment of the patients with therapeutic concentration of ozone caused a significant increase over the control value in the amount of 8-oxo-dG of DNA isolated from their lymphocytes. However, only three out of six patients examined responded positively to the treatment in terms of the base damage. The increases varied among patients, and were in the range of 100-450%. This interindividual difference may at least be partly explained by recently demonstrated heritable susceptibility to ozone. Copyright 1999 Elsevier Science B.V.

PMID: 9858672 [PubMed - indexed for MEDLINE]

B)

[J Craniofac Surg.](#) 2006 Nov;17(6):1080-1083.

[Links](#)

New Therapeutic Protocol in the Treatment of Avascular Necrosis of the Jaws.

[Agrillo A](#), [Petrucci MT](#), [Tedaldi M](#), [Mustazza MC](#), [Marino SM](#), [Gallucci C](#), [Iannetti G](#).

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Osteonecrosis of the jaws is being increasingly reported in patients with bone metastasis from a variety of solid tumors and disseminated multiple myeloma receiving intravenous bisphosphonates. Agreement exists that these drugs can initiate vascular endothelial cell damage and accelerate disturbances in the microcirculation of the jaws, possibly resulting in thrombosis of nutrient-end arteries. The role of bisphosphonates in cancer patients with previously treated jaws has yet to be elucidated. The signs and symptoms that may occur before the appearance of evident osteonecrosis include changes in the health of periodontal tissues, nonhealing mucosal ulcers, loose teeth and unexplained soft tissue infection. A series of 30 periodontally involved patients showing osteonecrosis of the jaws that appeared following the intravenous use of bisphosphonates is reported. Clinical management of the avascular necrosis of the jaws in patients treated with bisphosphonates presents several

problems. An analysis of the international medical literature shows that surgical treatment of the necrotic jaws in patients treated with bisphosphonates has proven to be ineffective in stopping the pathological process. The use of hyperbaric oxygen and antibiotics are not effective, either. The authors have developed a new protocol for the management of these lesions. Compared with other therapeutic choices, this protocol has introduced the use of ozone therapy as therapeutic support.

PMID: 17119409 [PubMed - as supplied by publisher]

C)

[Radiologe](#). 2006 Jun;46(6):513-9.

[Links](#)

[Nucleolysis in the herniated disk]

[Article in German]

[Lehnert T](#), [Mundackatharappel S](#), [Schwarz W](#), [Bisdas S](#), [Wetter A](#), [Herzog C](#), [Balzer JO](#), [Mack MG](#), [Vogl TJ](#).

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Back pain associated with a herniated disk has become an important and increasing general health problem in Germany and other industrialized countries. After all methods of conservative treatment have been exhausted, nucleolysis may be a minimally invasive alternative to surgery. In nucleolysis, chondrolytic substances or other substances, which reduce the pressure within the disk by other means, are injected into the nucleus pulposus under CT guidance. Among various substances, which have been employed for nucleolysis, an ozone-oxygen mixture appears to be very promising. The water-binding capacity of ozone results in a reduction of pain for several months. Moreover, it has an anti-inflammatory effect and results in an increase of perfusion. Ozone is converted into pure oxygen in the body and has a low allergic potential. Recent minimally invasive therapeutic methods such as percutaneous nucleotomy or laser treatment do not result in superior results compared with nucleolysis.

PMID: 16786388 [PubMed - indexed for MEDLINE]

D)

[Arch Med Res](#). 2006 May;37(4):425-35.

[Links](#)

Comment in:

[Arch Med Res](#). 2006 Oct;37(7):917-8; author reply 919.

Scientific and medical aspects of ozone therapy. State of the art.

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The aim of this review is to dispel misconceptions and skepticism regarding ozone therapy and to clarify the biochemical and pharmacological mechanisms of action of ozone dissolved in biological fluids. The work performed in the last decade in our laboratory allows drawing a comprehensive framework for understanding and recommending ozone therapy in some diseases. It is hoped that this report will open a dialogue among clinical scientists and will inform physicians about the beneficial effects of ozone therapy.

PMID: 16624639 [PubMed - indexed for MEDLINE]

E)

[Shock](#). 2006 Jan;25(1):23-9.

[Links](#)

Efficiency of tazobactam/piperacillin in lethal peritonitis is enhanced after preconditioning of rats with O₃/O₂-pneumoperitoneum.

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Insufflation of ozonized oxygen into the peritoneum (O₃/O₂-pneumoperitoneum [O₃/O₂-PP]) of rats reduced the lethality of peritonitis. We evaluated the prophylactic effect of O₃/O₂-PP combined with tazobactam/piperacillin (TZP) in polymicrobial lethal peritonitis. Wistar rats were conditioned by daily repeated insufflation of ozone for 5 days, and hematologic parameters were determined. Sepsis was induced by i.p. injection of cecal material derived from donor rats. Simultaneously, TZP was applied at a single dosage of 65 mg/kg or at two dosage schedules of 65 mg/kg each at an interval of 1 h. The conditioning effect of O₃/O₂-PP on the number of blood cells was measured before inoculation of bacteria. The mRNA levels of proinflammatory cytokine IL-1beta and TNF-alpha were determined at 4 h post infection in spleen and liver by semiquantitative in situ hybridization analysis. Preconditioning of rats by O₃/O₂-PP enhanced the number of blood leukocytes and granulocytes and increased the survival rate of septic rats up to 33%. The combination of O₃/O₂-PP and TZP further enhanced the survival rate up to 93%. This effect was accompanied by a reduced amount of IL-1beta and TNF-alpha mRNA in spleen and liver. In contrast, in non-infected animals the combination of O₃/O₂-PP and TZP enhanced IL-1beta and TNF-alpha mRNA in the spleen and IL-1beta mRNA in liver when compared with TZP- and sham-treated controls. The preconditioning effect of O₃/O₂-PP seems to support the biological effectiveness of TZP by altering the immune status before and during the onset of sepsis. The combined therapy could be a simple, preoperative intervention for abdominal surgery to reduce postoperative morbidity and mortality.

PMID: 16369182 [PubMed - indexed for MEDLINE]

F)

[Int J Artif Organs](#). 2005 Oct;28(10):1039-50. [Links](#)

Extracorporeal blood oxygenation and ozonation (EBOO): a controlled trial in patients with peripheral artery disease.

[Di Paolo N](#), [Bocci V](#), [Salvo DP](#), [Palasciano G](#), [Biagioli M](#), [Meini S](#), [Galli F](#), [Ciari I](#), [Maccari F](#), [Cappelletti F](#), [Di Paolo M](#), [Gaggiotti E](#).

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BACKGROUND: Since 1990 our group has been using extracorporeal circulation to ozonate blood by an original method, known as extracorporeal blood oxygenation and ozonation (EBOO), with the aim of amplifying the results observed with ozone autohemotherapy. **OBJECTIVE:** To verify the hypothesis that EBOO improves the skin lesions typical of peripheral artery disease (PAD) patients. **METHODS:** Twenty-eight patients with PAD were randomized to receive EBOO or intravenous prostacyclin in a controlled clinical trial. The primary efficacy parameters were regression of skin lesions and pain, and improvement in quality of life and vascularisation. **RESULTS:** Patients treated with EBOO showed highly significant regression of skin lesions with respect to patients treated with prostacyclin. Other parameters that were significantly different in the two groups of patients were pain, pruritus, heavy legs and well-being. No significant differences in vascularisation of the lower limbs before and after treatment were found in either group. No side effects or complications were recorded during the 210 EBOO treatments. **CONCLUSION:** EBOO was much more effective than prostacyclin for treating skin lesions in PAD patients and also had a positive effect on patient general condition without any apparent change in arterial circulation. This suggests other mechanisms of action of EBOO.

PMID: 16288443 [PubMed - indexed for MEDLINE]

G)

[Eur J Pharmacol](#). 2005 Oct 31;523(1-3):151-61. Epub 2005 Sep 29.[Links](#)

Therapeutic efficacy of ozone in patients with diabetic foot.

[Martinez-Sanchez G](#), [Al-Dalain SM](#), [Menendez S](#), [Re L](#), [Giuliani A](#), [Candelario-Jalil E](#), [Alvarez H](#), [Fernandez-Montequin JI](#), [Leon OS](#).

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Oxidative stress is suggested to have an important role in the development of complications in diabetes. Because ozone therapy can activate the antioxidant system, influencing the level of glycemia and some markers of endothelial cell damage, the

aim of this study was to investigate the therapeutic efficacy of ozone in the treatment of patients with type 2 diabetes and diabetic feet and to compare ozone with antibiotic therapy. A randomized controlled clinical trial was performed with 101 patients divided into two groups: one (n = 52) treated with ozone (local and rectal insufflation of the gas) and the other (n = 49) treated with topical and systemic antibiotics. The efficacy of the treatments was evaluated by comparing the glycemic index, the area and perimeter of the lesions and biochemical markers of oxidative stress and endothelial damage in both groups after 20 days of treatment. Ozone treatment improved glycemic control, prevented oxidative stress, normalized levels of organic peroxides, and activated superoxide dismutase. The pharmacodynamic effect of ozone in the treatment of patients with neuroinfectious diabetic foot can be ascribed to the possibility of it being a superoxide scavenger. Superoxide is considered a link between the four metabolic routes associated with diabetes pathology and its complications. Furthermore, the healing of the lesions improved, resulting in fewer amputations than in control group. There were no side effects. These results show that medical ozone treatment could be an alternative therapy in the treatment of diabetes and its complications.

PMID: 16198334 [PubMed - indexed for MEDLINE]

H)

[Arch Med Res.](#) 2005 Sep-Oct;36(5):549-54.

[Links](#)

Ozone therapy effects on biomarkers and lung function in asthma.

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BACKGROUND: The relationship and behavior of serum immunoglobulin E (IgE) level, peripheral blood mononuclear cell (PBMC) human leukocyte antigen DR (HLA-DR) expression and erythrocyte glutathione antioxidant pathway in asthma patients treated with systemic ozone therapy have not been studied before. **METHODS:** Asthma patients were treated about 1 year with three cycles (5 or 6 months each) with three different ozone therapy protocols. Ozone major autohemotherapy (MAHT) was applied at doses of 4 and 8 mg, 15 sessions each cycle; and ozone rectal insufflations (RI) at a dose of 10 mg, 20 sessions each cycle. Serum IgE, HLA-DR expression in PBMC and biomarkers for antioxidant pathway were measured before and at the end of each cycle. Lung function and symptoms test were recorded at the beginning and after the third cycle. **RESULTS:** IgE and HLA-DR decreased with the three types of treatments, while increments in reduced glutathione, glutathione peroxidase, glutathione reductase and glutathione S-transferase were achieved with all treatments. Lung function and symptoms test were markedly improved. However, in all parameters the best response was obtained in the order: MAHT at 8 mg better than MAHT at 4 mg better than RI at 10 mg. Before ozone treatment, glutathione antioxidant parameters were under the normal reference values, suggesting the occurrence of oxidative stress

associated with atopic asthma. **CONCLUSIONS:** This study demonstrates the effectiveness of ozone therapy in reducing IgE and inflammatory mediators along with the induction of antioxidant elements. The study raises the role of systemic ozone therapy in atopic asthma by means of its immunomodulatory and oxidative stress regulation properties.

PMID: 16099337 [PubMed - indexed for MEDLINE]

I)

[AJNR Am J Neuroradiol. 2005 May;26\(5\):996-1000.](#)

[Links](#)

Comment in:

[AJNR Am J Neuroradiol. 2005 May;26\(5\):988-9.](#)

[AJNR Am J Neuroradiol. 2006 Mar;27\(3\):471; author reply 471.](#)

Intraforaminal O(2)-O(3) versus periradicular steroidal infiltrations in lower back pain: randomized controlled study.

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BACKGROUND AND PURPOSE: Reports about steroids and oxygen-ozone therapy to treat lower back pain have been increasing. The purpose of our study was to compare the clinical outcomes in patients treated with infiltrations of O(2)-O(3) gas or steroids at short-, medium-, and long-term follow-up. **METHODS:** A total of 306 patients (166 with primarily disk disease, 140 with nondisk vertebral disease) with acute or chronic low back and sciatic nerve pain received a CT-guided intraforaminal infiltration of an O(2)-O(3) gas mixture or an periradicular infiltration of steroids. Neurologists unaware of the type of treatment assessed the patients. **RESULTS:** At 1-week follow-up, most patients had a complete remission of pain, regardless of the treatment. At 6-month follow-up, differences in favor of O(2)-O(3) treatment were significant in patients with disk disease ($P = .0021$) but not in those without disk disease ($P = .0992$). Clinical outcomes were poor in 13 (15.1%) of 86 patients receiving O(2)-O(3) infiltration and in 18 (22.5%) of 80 patients receiving steroid injection ($P = .2226$). Among patients without disk disease, six (8.6%) of 70 patients receiving O(2)-O(3) infiltration but 21.4% of the patients receiving steroid injections had poor outcomes ($P = .0332$). **CONCLUSION:** Oxygen-ozone treatment was highly effective in relieving acute and chronic lower back pain and sciatica. The gas mixture can be administered as a first treatment to replace epidural steroids.

PMID: 15891150 [PubMed - indexed for MEDLINE]

J)

[Acta Neurochir Suppl. 2005;92:139-42.](#)

[Links](#)

The different outcomes of patients with disc herniation treated either by microdiscectomy, or by intradiscal ozone injection.

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Disc herniation with radiculopathy and chronic discogenic pain are the result of degenerative processes. Treatment approach in face of this problem has largely been debated in the last years. A number of reviews on surgical treatments in the '80s and '90s have been published and various new techniques have been introduced among which ozone discolysis is one non-invasive intradiscal treatment method. In a 3-year follow-up period we have investigated the different outcomes of 150 patients who received microdiscectomy and 150 patients who received intradiscal ozone injection. In this series results are in favour of discolysis for contained disc herniations and of microdiscectomy for large migrated fragments with pain so severe that open surgery was obligatory. Apart from this, our results with the two techniques are equivalent also concerning mild neurological motor deficits.

PMID: 15830986 [PubMed - indexed for MEDLINE]

K)

[Transpl Int.](#) 2005 May;18(5):604-12.

[Links](#)

Role of protein synthesis in the protection conferred by ozone-oxidative-preconditioning in hepatic ischaemia/reperfusion.

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The liver is damaged by sustained ischaemia during liver transplantation, and the reperfusion after ischaemia results in further functional impairment. Ozone oxidative preconditioning (OzoneOP) protected the liver against ischaemia/reperfusion (I/R) injury through different mechanisms. The aim of this study was to investigate the influence of the inhibition of protein synthesis on the protective actions conferred by OzoneOP in hepatic I/R. Rats were treated with cycloheximide (CHX) in order to promote protein synthesis inhibition after OzoneOP treatment. Plasma transaminases, malondialdehyde and 4-hydroxyalkenals and morphological characteristics were measured as an index of hepatocellular damage; Cu/Zn-superoxide dismutase (SOD), Mn-SOD, catalase, total hydroperoxides and glutathione levels as markers of endogenous antioxidant system. OzoneOP increased Mn-SOD isoform and ameliorated mitochondrial damage. CHX abrogated the protection conferred by OzoneOP and decreased Mn-SOD activity. Cellular redox balance disappeared when CHX was introduced. Protein synthesis is involved in the protective mechanisms mediated by OzoneOP. Ozone treatment preserved mitochondrial functions and cellular redox balance.

PMID: 15819811 [PubMed - indexed for MEDLINE]

L)

[Mediators Inflamm.](#) 2005 Feb 24;2005(1):16-22.[Links](#)

Effects of ozone oxidative preconditioning on TNF-alpha release and antioxidant-prooxidant intracellular balance in mice during endotoxic shock.

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Ozone oxidative preconditioning is a prophylactic approach, which favors the antioxidant-prooxidant balance for preservation of cell redox state by the increase of antioxidant endogenous systems in both in vivo and in vitro experimental models. Our aim is to analyze the effect of ozone oxidative preconditioning on serum TNF-alpha levels and as a modulator of oxidative stress on hepatic tissue in endotoxic shock model (mice treated with lipopolysaccharide (LPS)). Ozone/oxygen gaseous mixture which was administered intraperitoneally (0.2, 0.4, and 1.2 mg/kg) once daily for five days before LPS (0.1 mg/kg, intraperitoneal). TNF-alpha was measured by cytotoxicity on L-929 cells. Biochemical parameters such as thiobarbituric acid reactive substances (TBARS), enzymatic activity of catalase, glutathione peroxidase, and glutathione-S transferase were measured in hepatic tissue. One hour after LPS injection there was a significant increase in TNF-alpha levels in mouse serum. Ozone/oxygen gaseous mixture reduced serum TNF-alpha levels in a dose-dependent manner. Statistically significant decreases in TNF-alpha levels after LPS injection were observed in mice pretreated with ozone intraperitoneal applications at 0.2 (78%), 0.4 (98%), and 1.2 (99%). Also a significant increase in TBARS content was observed in the hepatic tissue of LPS-treated mice, whereas enzymatic activity of glutathione-S transferase and glutathione peroxidase was decreased. However in ozone-treated animals a significant decrease in TBARS content was appreciated as well as an increase in the activity of antioxidant enzymes. These results indicate that ozone oxidative preconditioning exerts inhibitory effects on TNF-alpha production and on the other hand it exerts influence on the antioxidant-prooxidant balance for preservation of cell redox state by the increase of endogenous antioxidant systems.

PMID: 15770062 [PubMed - indexed for MEDLINE]

M)

[Mediators Inflamm.](#) 2004 Dec;13(5-6):307-12.[Links](#)

Reversion by ozone treatment of acute nephrotoxicity induced by cisplatin in rats.

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BACKGROUND: Ozone therapy has become a useful treatment for pathological processes, in which the damage mediated by reactive oxygen species is involved. Several lines of evidence suggest that cisplatin-induced acute nephrotoxicity is partially mediated by reactive oxygen species. **AIMS:** To analyze the effect of ozone administration after cisplatin-induced acute nephrotoxicity. **METHODS:** Male Sprague-Dawley rats were treated with five intra-rectal applications of ozone/oxygen mixture at 0.36, 1.1 and 1.8 mg/kg after cisplatin intraperitoneal injection (6 mg/kg). Serum and kidneys were taken off 5 days after cisplatin treatment. Creatinine was measured in the serum and the activities of antioxidant enzymes and thiobarbituric acid reactive substances and glutathione content were analyzed in renal homogenate. **RESULTS:** Ozone treatment diminished the increase in serum creatinine levels, the glutathione depletion and also reversed the inhibition of superoxide dismutase, catalase and glutathione peroxidase activities induced by cisplatin in the rat kidney. Also, the renal content of thiobarbituric reactive substances was decreased by ozone/oxygen mixture applied after cisplatin. **CONCLUSION:** Intrarectal applications of ozone reversed the renal pro-oxidant unbalance induced by cisplatin treatment by the way of stimulation to some constituents of antioxidant system in the kidney, and thereby it decreased the renal damage.

PMID: 15770045 [PubMed - indexed for MEDLINE]

N)

Mediators of Inflammation, 7, 289–294 (1998)

Ozone oxidative preconditioning: a protection against cellular damage by free radicals

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THERE is some anecdotal evidence that oxygen-ozone therapy may be beneficial in some human diseases. However so far only a few biochemical and pharmacodynamic mechanisms have been elucidated. On the basis of preliminary data we postulated that controlled ozone administration would promote an oxidative preconditioning preventing the hepatocellular damage mediated by free radicals. Six groups of rats were classified as follows: (1) negative control, using intraperitoneal sunflower oil; (2) positive control using carbon tetrachloride (CCl₄) as an oxidative challenge; (3) oxygen-ozone, pretreatment via rectal insufflation (15 sessions) and after it, CCl₄; (4) oxygen, as group 3 but using oxygen only; (5) control oxygen-ozone, as group 3, but without CCl₄; group (6) control oxygen, as group 5, but using oxygen only. We have evaluated critical biochemical parameters such as levels of transaminase, cholinesterase, superoxide dismutase, catalase, phospholipase A, calcium dependent ATPase, reduced glutathione, glucose 6 phosphate dehydrogenase and lipid peroxidation. Interestingly, in spite of CCl₄ administration, group 3 did not differ from group 1, while groups 2 and 4 showed significant differences from groups 1 and 3 and displayed hepatic damage. To our knowledge these are the first experimental results showing that repeated administration of ozone in atoxic doses is able to induce an adaptation to oxidative stress thus enabling the animals to maintain hepatocellular integrity after CCl₄ poisoning.