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«Ozone, reactive oxygen species,
nitric oxide and high-intensive physical
factors in biology and medicine»

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Abstract Book

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Fundamental problems of ozone therapy. Oxidative stress.

DESINFLAMATORY EFFECT OF OZONATED OILS AND PHYSIOLOGICAL SOLUTION

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Ozone's medical applications have been demonstrated several effects depending on the type of disease, ozone's application media and dose. One of them is desinflammatory effect, which has been observed mainly as a result of topical applications by ozonated oils. Several mechanisms have been proposed for the inflammatory - desinflammatory process induced by ozonation including steps such as vessel dilation, swelling and epidermal hyperplasia.

Today, it is not clear if those mechanisms are activated by ozone interaction with the systemic effect or by the reaction products generated by oils ozonation. Additionally, it is not clear how much oils should be ozonated, because then are not ozonation control methods based on kinetic fundamentals. Total unsaturation (TU) is a potent technique to quantify the oxidizable substrate by ozone. Using this method, the global kinetics is indeed monitored to control the oils ozonation degree, and is possible to correlate the reaction dynamics in oils with the in vivo desinflammatory effect observed.

In this work, the in-vivo ozone's desinflammatory effect was studied by two applications: ozonated oils and intraperitoneal applications of the ozonated physiological solution. Finally, the desinflammatory effect produced by ozone was compared with the one produce by indomethacin. The TU technique was used for the determination of the oils ozonation degree, and as the DB-index of mice blood plasma to control the desinflammatory effect.

The oils ozonation was carried out in a semi-batch reactor (10 mL) using an ozone generator "AZCO" with the ozone concentration of 30 mg/L and the gas flow of 0.5 mL /min. The ozonation degree of vegetable oils was measured and characterized by their total unsaturation (TU). Two oils were tested (grape seed and sunflower), both at 3% of the ozonation degree.

Nine groups of mice CD-1 (n=3) were used to test the ozone's desinflammatory effect. Briefly, inflammation was induced in mice's ear by croton oil. After one hour, ozonated oils and the ozonated physiological solution (via intraperitoneal) were applied. Three hours later, mice were sacrificed and an ear section was removed and weighted. Desinflammatory efficiency was measured by weight difference compared with the negative control (mice without treatment).

Both ozone's applications tested (ozonated oils and physiological solution) give rise to desinflammatory effect. This was related to the DB-index variation. Additionally, the oils TU were used to control their ozonation degree with medical purposes.

Key words: ozonized oil, ozonized physiological solution, inflammation.

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MOLECULAR ASPECTS OF OXIDATIVE STRESS FORMATION IN WOMEN WITH NORMAL PREGNANCY

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The purpose of the study was the assessment of myeloperoxidase and elastase blood activity in physiologic gestation course of 38-42 weeks. As a material for study there were chosen venous blood plasma and serum taken on an empty stomach from a cubital vein. A control group was represented by 30 apparently healthy nonpregnant women of reproductive age. A clinical group consisted of 30 apparently healthy pregnant women with physiologic gestation course. The MPO blood plasma activity was determined by Klebanoff method (1971) described by M.G. Shafran and S.N. Lyzlova (1975), leukocytic elastase was defined after V.L. Dotsenko and co-authors (1994) as well as the total arginine esterase activity (TAEA) was determined by the method of Fraitshold, Werle (1961) in modification of Pashkina, Yarovaya (1970). It was established that even the physiologic gestation course proceeded against the background of marked oxidative stress and was attended by the increased functional activity of blood neutrophilic granulocyte. It was proved by marked statistically-valid growth of marker enzymes of azurophilic granules.

Key words: pregnancy, oxidative stress, myeloperoxidase, leukocytic elastase, arginine esterase activity.

Fundamental problems of ozone therapy. Oxidative stress.

ROLE OF REACTIVE OXYGEN SPECIES IN PATHOGENESIS OF NEUROTIC AND SOMATOFORM DISORDERS IN PATIENTS OF HAZARDOUS OCCUPATIONS

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The purpose of the study was the assessment of the role of reactive oxygen species in pathogenesis of neurotic and somatoform disorders. A control group consisted of 35 apparently healthy volunteers aged 24.3 ± 1.5 years with no signs of somatic diseases. A clinical group was of 25 patients of the same age with neurotic and somatoform disorders. The activity of superoxide dismutase was determined by N.P. Misra, J. Fridovich method in O.G. Sarkisyan modification (2000), of catalase after M.A. Korolyuk (1988), of glutathione peroxidase (GPO) by V.M. Moin method (1986), the concentration of reduced glutathione (GTH) after G.L. Ellman (1959) with photoelectrocolorimeter КФК-2МП (Russia) and the activity of myeloperoxidase (MPO) was assessed spectrophotometrically by Klebanoff method described by M.G. Shafran (1975) with СФ-46 (LOMO, Russia). In serum and plasma the quantity of malondialdehyde (MDA) was determined by I.D. Stalnaya method (1974), oxidized-modified lipoproteins by G.I. Muz method (1999) with photoelectrocolorimeter КФК-2МП (Russia) and ectoglobular hemoglobin (EGH) with СФ-46 (LOMO, Russia) by A.V. Karakshev method (1973), respectively. It was determined, that neurotic and somatoform disorders may be referred to the group of diseases of free-radical nature and be attended by the oxidative stress development.

Key words: occupational pathology, neurotic disorders, somatoform disorders, oxidative stress.

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EFFECT OF DISSOLVED OZONE DOSE IN PHYSIOLOGICAL SOLUTION ON THE GROWTH KINETICS OF C6 TUMOR CELLS

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In living organisms, there is a natural equilibrium between the formation of oxidants (such as ROS) and the antioxidants generation. The oxidative stress refers to the imbalance between those two processes. It could cause cellular damage or cellular death, and has been linked to many diseases in the human being. ROS are mediators, triggers or executioners of essential protective mechanisms such as apoptosis, phagocytosis and detoxification reactions. Among these mechanisms, apoptosis, which eliminates precancerous and cancerous, virus-infected and otherwise damaged cells, is particularly important. Increase of ROS concentration by depletion of antioxidants enhances apoptosis and thereby inhibits tumor growth. Excessive antioxidants decrease ROS level, inhibit apoptosis and suppress the elimination of cancer cells induced by anticancer drugs. Production of ROS is essential for a number of biochemical reactions involved in the synthesis of prostaglandins, hydroxylation of proline and lysine, oxidation of xanthine and other oxidative processes. Numerous data demonstrate that ROS are capable of oxidizing cell constituents such as DNA, proteins, and lipids, thereby incurring oxidative damage to cell structures. Excessive oxidation leads to impairment of cell functions and development of morbid conditions.

It is well known that lipids are particularly susceptible to be oxidized. This is the reason to use the lipid peroxidation (LPO) as an indicator of the metabolic equilibrium between oxidation process and antioxidant system. According to many researches, if there are exceeds of ROS in the biological system could improve the negative effects on its functionality or even death. In the case of ozone application in medicine, some theories establish that there isn't the ozone, but the ROS and the LPO products cause the clinical effect reported in the medical field. There is the motivation to study reaction mechanisms that will have the potential application to regulate the ozone dosage.

In the present paper the effect of dissolved ozone in physiological solution of NaCl 0.9% (PS) over cancer C6 gliom cells was studied. This study was conducted *in vitro* and *in vivo* under different dose strategies (n=3).

The gaseous phase ozone concentration used was 4.2 ± 0.1 mg/L. Four animals groups were selected. A control group was fixed where no treatment was applied. Also, a second group was considered where just pure oxygen was dissolved

in PS and injected in the murine model. This group was used to observe the effect of the oxidant gas (no ozone) in the tumor development. A third group was treated with dissolved ozone using the subcutaneous pathway each two days with a volume of 100 μL . The last group was also treated with dissolved ozone, but with less dose (one injection with 100 μL each five days). During the treatment, the tumor volume as well as its activity was followed. Cell activity was analyzed by an image study based on the positron emission tomography (PET). After 15 days of treatment animals were sacrificed to collect blood and tumor tissue samples. All these samples were manipulated for extracting lipids by the Folch method to get the variation of the so-called double bounds index (DBI).

The DBI method was used for quantifying the double bonds in the tissue sample associated to lipid molecules. DBI is based on the measuring of ozone mass reacting to the lipids sample. Reactive oxygen species and lipid peroxidation can be estimated by the DBI determination. Therefore, DBI is considered to be an indirect method to characterize the ozone effect on the tumor activity as well as its volume.

The results achieved in this study showed that groups 3 and 4 increased the tumor volume (40% and 8 %, respectively) compared to the control group. The second group showed a diminishing on the tumor volume of 36% with respect to the same control group. However, DBI measurements in plasma, erythrocytes and tumor tissue showed that the number of reactive double bonds in group 4 was reduced in 50 and 75 %, respectively. These results were correlated with the imaging studies where the group number 4 demonstrated less tumor activity. Therefore, one can conclude that if less ozone dose is applied, then the organism can assimilate in a better way the therapy based on the oxidizing agent. Moreover, this assimilation is producing a positive effect in terms of the tumor activity. Finally, DBI measurements are directly correlated to the PET results. Similar results were observed in the *in vitro* studies.

Key words: C6 tumor, growth kinetics, ozone.

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INFLUENCE OF OXIDATIVE STRESS ON STRUCTURAL AND FUNCTIONAL STATE OF COMMON CAROTID ARTERY (BASED ON DOPPLER SONOGRAPHY DATA) OF TEENAGERS WITH OBESITY AND ARTERIAL HYPERTENSION

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The purpose of the study is to assess the oxidative stress impact on the state of the vascular wall rigidity (the common carotid artery) based on Doppler sonography data in teenagers with obesity and arterial hypertension (true (labile or stable) AH and “white coat” AH). 80 teenagers (their average age was 12.8 years) with obesity and AH (true or “white coat” AH) were examined. The first group consisted of 35 children with “white coat” AH and obesity. The second group was of 45 children with true (labile or stable) AH and obesity. AP monitoring was carried out by using Holter monitor GE Medical Systems IT Cardio Soft V 5.02 (Germany). A control group consisted of 10 teenagers of the first health group. The assessment of free radical oxidation (FRO) parameters was carried out by the induced chemiluminescent method with domestic biochemiluminometer БЛМ 3606 М-01. A Doppler sonography with the study of the blood flow in the common carotid artery was performed on either side by using diagnostic complex Biomed (BIOSS, the RF) with the 4 MHz frequency sensor from the anterior cervical access. It was ascertained that oxidative stress in children with obesity was one of the factors of risk of vascular wall structural-functional changes resulting in its enhancing rigidity. In this case in children with obesity and “true” AH the most expressed changes in oxidative status were revealed as compared to children with obesity and “white coat” AH.

Key words: obesity, arterial hypertension, “white coat” hypertension, oxidative status.

Fundamental problems of ozone therapy. Oxidative stress.

OZONE THERAPY AND PRODUCTS OF NO AND VEGF ENDOTHELIUM MARKERS IN CASE OF ATHEROSCLEROSIS

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The purpose of this paper is to study the ozone therapy effect on endothelium states on products of NO and VEGF markers, the free radical oxidation activity in blood of patients with atherosclerosis on LPO and antioxidant protection system molecular products.

As objects of the study the blood serum of patients with atherosclerosis was used, about 56 blood tests before and after ozone therapy. Blood for tests was taken before and after ozone therapy. A course of treatment consisted of 10 intravenous infusions of ozonated saline solution every other day with the ozone concentration of 1400 µg/mL of ozone-oxygen gas mixture at the ozonator output. Blood samples before and after treatment were tested for the lipid peroxidation (LPO) activity, antioxidant activity, NO concentration and vessel growth factor (VEGF). For control the blood of apparently healthy people was tested, about 20 samples (a control group). Ozone therapy possessed a marked corrective action on the vascular endothelium state, what was demonstrated by the reduction of products of vessel and sodium oxide growth factor. This fact may be considered as a favourable effect on the functional activity of blood vessels in case of atherosclerosis.

Key words: atherosclerosis, ozone therapy, nitrogen oxide, VEGF.

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OXIDATIVE STRESS AS A PREDICTOR OF HYPERTENSION INITIAL STAGE

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The purpose of the study was to assess the enzyme activity of the first and second line of antioxidant protection (AOP) in this group of female patients. A control group consisted of 33 apparently healthy women of the reproductive age. A clinical group was of 45 female patients of the reproductive age with the 1st stage 1st degree verified hypertensive disease (HD). There was determined the activity of superoxidedismutase by H.P. Misra, J. Fridorovich method in O.G. Sarkisyan modification (2000), catalase after M.Y. Korolyuk (1988), glutathione peroxidase (GPO) nby V.M. Moin method (1986), the concentration of reduced glutathione (GSH) after G.L. Ellman (1959) and ceruloplasmin (CP) by the method described by V.B. Kolb (1982) with photoelectrocolorimeter КФК-2МП (Russia) and the activity of myeloperoxidase (MPO) was assessed spectrophotometrically by Klebanoff method described by M.G. Shafran (1975) on CФ-46 (LOMO, Russia). It was revealed that the initial stages of hypertensive disease development were attended by the disregulation of work of the enzymic antioxidant status of the body. A special role in this process belongs to blood plasma MPO, which may serve the dual function as antioxidant and prooxidant.

Key words: hypertensive disease, antioxidant system enzymes.

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INFLUENCE OF TOBACCO SMOKE ON FREE-RADICAL OXIDATION IN VITRO AND IN VIVO

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The impact of tobacco smoke on FRO was studied in model systems generating reactive oxygen species (ROS) in which lipid peroxidation (LPO) reactions took place and on smoker's mouth fluid. To assess the FRO state, the method of recording chemiluminescence (CL) - glow resulting from radical interaction was used. The model system CL was measured before and after passing tobacco smoke therethrough as well as the moth fluid CL before and after smoking. FRO process changes were assessed as per differing CL intensity. It was found that tobacco smoke while passing through model systems generating reactive oxygen species in which lipid peroxidation reactions took place enhanced free radical formation processes. The generation of radicals with microbicidal properties was suppressed in the mouth fluid at once after smoking. Within next one or two hours in the mouth fluid an increasing number of free radicals initiating lipid peroxidation was noted.

Key words: tobacco smoke, free radical oxidation, reactive oxygen species, model systems, spittle.

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NITROZYL COMPLEXES OF CYTOCHROME C AND SODIUM ASCORBATE AS COMPONENTS WOUND HEALING DRUGS

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The formation of complexes of cytochrome c and nitroso- or nitro- content medicine was studied in biogenic acid medium by UV – spectroscopy and HL chromatography.

Compositions of gels, solutions and sorbents for wound treatment were developed.

The effect of the wounds treatment was shown in experiments by rats.

Key words: cytochrome c, sodium ascorbate, wound healing.

Fundamental problems of ozone therapy. Oxidative stress.

COMBINATION THERAPY OF PLATELET RICH IN GROWTH FACTORS (PRP) AND OZONE: ITS APPLICATION IN DERMATOLOGY, AESTHETIC MEDICINE, VASCULAR MEDICINE AND TRAUMATOLOGY

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This presentation intends to expose the state of the art related to the clinical use of the combination of ozone and autologous plasma rich platelet in different procedures which belong to the field of dermatology, vascular medicine, traumatology and aesthetic medicine.

The treatments that use the plasma rich in platelet (PRP) are similar to the events that happen during the physiological healing process due to liberation of diverse growth factor. The fact that the PRP comes from the blood of the same patient (autologous), the safety of the procedure is very high.

The PRP is a concentrate of growth factors that it includes: the transforming growth beta 1 (TGF- β), vascular endothelial growth factor (VEGF) and growth factor derived from platelet (PDGF) between others. The strong mechanism of healing induced by supra-physiological concentrations of platelets in the damaged tissues has been demonstrated both, in basic and clinical studies. Due to the high concentration and liberation of these factors, the PRP can potentially increase the recruiting and the proliferation of the mothers cells and the endothelial cells. The ozone at the same time promotes the platelet aggregation and the liberation of these factors with mitogenic, angiogenic, motogenic and cito-protector properties.

The present work takes as an intention to demonstrate the biostimulating, healing effect and repairer effect of the ozone and the growth factors in the treatment of such diverse pathologies like: psoriasis, acne, burns, scars, correction of wrinkles, facial biostimulation, ulcers of diverse nature, especially in the diabetic foot and herniated disc of the column.

Key words: PRP, groth factor, wound healing, ozone.

Fundamental problems of ozone therapy. Oxidative stress.

METHOD OF ASSESSMENT OF OZONE THERAPY EFFECTIVENESS

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We have offered a diagnostic and prognostic method to assess the ozone therapy effectiveness based on the analysis of structural and functional parameters of peripheral blood erythrocytes. This method implies the high-accurate determination of specific surface area of an erythrocyte by means of analytical description of function $f(x)$ by approximating polynom, which is the function of basic formative parameters (D, H, h, l). The parameter values may be defined by using an interferential holography method. For this purpose an original optic-electronic device was designed, which enabled after appropriate software result processing to obtain linear dimensions of erythrocyte profile. The differential peculiarity of this method is the minimal impact on the subject of research both in the course of preparation an in the device itself, so it considerably increases the reliability of obtained results. There were analyzed erythrocytes in patients with different pathology (inflammatory or hypotoxic one) before and after the ozone therapy course. It has been shown that erythrocyte deformability deterioration finally results in cell metabolism disorganization and the membrane structure restoration is the main sanogenetic mechanism of ozone effect.

Key words: ozone therapy, state of erythrocytes, interferential holography.

Fundamental problems of ozone therapy. Oxidative stress

ADAPTIVE RESPONSE OF ERYTHROCYTES ON COLD EXPOSURE AND OXIDATIVE STRESS

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The purpose of this paper is to use the adaptive response of erythrocytes to oxidative stress as a method for the enhancement of their stability to cryoconservation factors.

The oxidative stress of erythrocytes was induced by ozone introduced in erythrocyte suspension as ozonated saline solution. Ozone was produced with a barrier-type ozonator of our design. The concentration of dissolved ozone in ozonated saline solution (OSS) was measured by spectrophotometric method with device Specord UV VIS according to extinction value on Hartley band. The osmotic erythrocyte brittleness was assessed by hemoglobin liberation from cells in hypotonic sodium chloride solutions. The obtained results give grounds for the development of a new approach to the enhancement of erythrocyte cryoconservation efficiency and possibly other cells based on ozone technologies. The said approach was conditionally named by us the so-called non-cryoprotective method of cryoconservation efficiency enhancement. It consists in the living system natural resource mobilization under adaptive response to oxidative stress and may be used in addition to available cell protective methods during their cryoconservation.

Key words: erythrocytes, cryoconservation, ozone, osmotic brittleness.

Fundamental problems of ozone therapy. Oxidative stress.

OZONE ACTION ON MEMBRANE POTENTIAL OF THROMBOCYTE MITOCHONDRIA

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The purpose of the research was to study the ozone effect on the membrane potential of thrombocyte mitochondria. Venous blood samples were taken from 16 volunteers for testing. Blood was drawn 4 times as follows: before exposure to ozone, immediately after ozone injection, 3 h and 6 h later the ozone introduction. Ozone was administered intravenously drop-by-drop as 200 mL ozonated saline solution with concentration of 6 mg/l. Mitochondrial membrane potential was determined in thrombocytes by using O. Safranin stain. MMP was calculated by Nernst equation. Findings of the investigation testify that ozone exerts an influence on mitochondrial membrane potential. The ozone effect on thrombocyte mitochondria consists in electrolyte metabolism modulation, active transport of ions via biological membranes.

Key words: ozone, membrane potential, mitochondria.

Fundamental problems of ozone therapy. Oxidative stress.

EFFECT OF OZONIZED SALINE SOLUTION ON MICROELEMENT CONTENT AND LIPOPEROXIDATION INDICES IN TUMOR GROWTH

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The purpose of the research was to study the ozonated saline solution (OSS) effect on microelement content and lipide peroxidation indices in tumor growth under experimental conditions. The investigation was performed with laboratory animals, namely, white nonlinear female rats (75 species) under conditions of neoplasia simulation by means of subinoculation of breast cancer strain PMK-1 subcutaneously to the right axillary crease. The animals were involved in experiment on the 30th day after subinoculation of a tumor, which size reached 5-6 cm³at that time. The animals were divided into the following 5 groups, each of 15 species: the 1st group of rats with neoplasm not subjected to any curative actions; the 2nd group of rats with neoplasm given Doxorubicin as drug every other day, 5 procedures in total; the 3rd group of rats with neoplasm treated by OSS intraperitoneal introduction, 6 procedures every other day; the 4th group with neoplasm to which 5 doses of Doxorubicin and 6 OSS were administered every other day; the 5th group consisted of intact animals (a control group). To determine microelement spectrum, an atom emission spectrometer with inductively coupled plasma AES ICP, model I, CAP6300 INTERTECH (the USA) was used. Free radical oxidation state was studied in animals' blood and myocardium tissue homogenates based on induced chemiluminescence data by using biochemiluminometer БХЛ 07 as well as contents of lipide peroxidation (LPO) products: primary - diene conjugate (DC), secondary - malondialdehyde (MDA) and final - Schiff's bases (SB). The histologic examination of a tumour tissue was carried out by conventional method. It was found that the use of ozonated saline solution reduced the metal-depressive activity of cytostatic agents with respect to normal tissues, thus, providing for more effective microelement composition to be attended by antitumor drug potentiation and associated with the most evident therapeutic pathomorphism.

Key words: ozone, oncology, microelements, lipoperoxidation.

Fundamental problems of ozone therapy. Oxidative stress.

ESTIMATION OF OZONE AND SODIUM HYPOCHLORITE USE EFFECTIVENESS FOR PREVENTION OF INFECTIOUS COMPLICATIONS IN PROSTHETIC HERNIOPLASTY (EXPERIMENTAL STUDY)

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The purpose of the research is to study antibacterial and wound-healing effects of physical-chemical methods and to assess their influence on reparation processes during plastic repair of a simulated abdominal wall defect with mesh polypropene endoprosthesis. As a mesh implant a standard polypropene endoprosthesis Esfil (EP) was used. Experiments were divided into groups as follows: for the 1st group of 40 animals the mesh prosthesis implantation was done; for the 2nd group of 40 animals (the main group) in the course of prosthesis implantation ozone (O₃) and sodium hypochlorite (NaClO) were applied. In the second animal group after prosthesis implantation a wound was washed with 0.03% NaClO and a subclavian catheter was put above implant, therethrough up to 4.0 mL of ozone-oxygen mixture (OOM) with 15-20 mg/LI of O₃ were injected with syringe after stitching up. For bacterial testing wipe-samples were taken from the endoprosthesis implantation region: immediately after the implant fixation before and after NaClO (intraoperative) treatment, after cutaneous suture stitching and on the 1st day after operation (before and after NaClO and OOM treatment). The visual assessment of the evidence of tissue inflammatory response on the mesh prosthesis implantation was performed. The dynamics of the prosthesis integration in the anterior abdominal wall was assessed by histological examination. It was demonstrated that the use of the elaborated technology for the application of ozone and sodium hypochlorite promoted the improvement of a wound reparatory process and enhanced the forming cicatrix strength.

Key words: abdominal wall defect, sodium hypochlorite, polypropene endoprosthesis.

Fundamental problems of ozone therapy. Oxidative stress.

EFFECT OF OZONIZED SALINE SOLUTION ON ENDOCCANABIROID SYSTEM ACTIVITY

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The purpose of the research is to study the effect of ozonized saline solution effect on the expression of endocannabinoid CB₂ receptors by immune system cells *in vivo*. 16 healthy volunteers aged 24-48 (30.4±6.2 years) were involved in the study. The intravenous 0.9% NaCl saline solution injection was applied. Solution was ozonated by Medozons-BM (Russia). 200 mL of solution was preliminary ozonated with the concentration of 6 mg/l and further administered intravenously drop-by-drop. The expression of surface markers of endocannabinoid receptors on mononuclear leukocytes was determined with the aid of appropriate antibodies (Santa Cruz Biotechnology, the USA). Findings were recorded by the multiparametric flow cytometry method on flow cytometer FACSCalibur (Becton Dickinson, the USA). Data obtained on the inhibition effect of ozonated saline solution to the activity of the expression of endocannabinoid CB₂ receptors disclose new mechanisms for the immune response regulation by ozone and may be used for purposeful action to the immune response by organism via the endocannabinoid system.

Key words: endocannabinoid system, ozone.

Fundamental problems of ozone therapy. Oxidative stress.

THE POSSIBLE OF USE OF OZONE FOR THE CULTIVATION OF MYCOBACTERIUM TUBERCULOSIS

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There was determined the positive effect of ozone on the rate and intensity of growth of *Mycobacterium tuberculosis*. Stimulating effect has ozonized saline solution with concentration of ozone 0.25-0.5 mg/L, it accelerates and increases the intensity of growth of mycobacteria in different nutrient media in 1.8-2 times.

Key words: bacteriological diagnosis, mycobacteria, ozone, speed and intensity of growth.

Fundamental problems of ozone therapy. Oxidative stress.

STRUCTURAL AND MOLECULAR TRANSFORMATIONS OF ELECTROLYTES WATER SOLUTIONS UNDER OZONE ACTION

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We studied the structural changes in saline water under the influence of medical ozone. The molecular structure of water has been studied using the protonography. Studies have shown that ozone concentrations of 5-20 mg/L destroy megaklastery, greatly increasing the amount of water associates simplest and, in particular, the hexamers (hexagonal structures). This to some extent explains the therapeutic effect of medical ozone, since it is known that the hexagonal structure of water easily pass the cell membrane.

Keywords: ozone therapy, the molecular structure of water, hexagonal water structure.

Fundamental problems of ozone therapy. Oxidative stress.

INFLUENCE OF OZONIZED SOLUTION OF SODIUM CHLORIDE ON MICROELEMENTAL COMPOSITION OF TISSUES OF ANIMALS WITH EXPERIMENTAL TUMORS

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To pioneer the analysis of the micro elemental composition in liver, kidney, brain, lung, heart tissues as well as tumor tissue and blood serum. The influence of doxorubicin, ozonize saline as well as ozonize saline and doxorubicin on the micro elemental composition was investigated. Ozonized saline has been shown to potentiate cytostatic anticancer action, which has the action to change micro elemental metabolism in tumor-inoculated organism.

Key words: ozone, micro elements, tumor, cytostatics.

Fundamental problems of ozone therapy. Oxidative stress.

BLOOD PRO- AND ANTIOXIDANT SYSTEMS STATE UNDER ACTION OF REACTIVE OXYGEN AND NITROGEN SPECIES

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The aim of this work is investigation of blood lipoperoxidation and antioxidant activity under reactive oxygen and nitrogen species action in vitro. Blood specimens (n=9) are processed by gas flow with molecular oxygen, singlet oxygen, ozone-oxygen mixture (500 µg/L) or nitric oxide (800 µg/L). Control sample was free to any actions. Lipoperoxidation initial stage, antioxidant potential and erythrocytes peroxide resistance in blood samples were estimated with biochemiluminescent method. Our experiments shown, that blood nitroxilation leads to negative effect on pro- and antioxidant balance (oxidative stress generation), but its processing with molecular, singlet oxygen and ozone-oxygen mixture causes to minimal changes of estimated parameters.

Key words: lipoperoxidation, antioxidant activity, blood, ozone, singlet oxygen, nitric oxide.

Fundamental problems of ozone therapy. Oxidative stress

DYNAMICS OF DISTILLED WATER PHYSICAL AND CHEMICAL PARAMETERS UNDER PROCESSING OF REACTIVE OXYGEN SPECIES

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The aim of this work is investigation of reactive oxygen species (ROS) action on some physical and chemical parameters of distilled water. We studied pH, oxidative and restoring potential and dissolved oxygen level of distilled water before and after sparging by different gaseous ROS (oxygen; darsonvalized oxygen, singlet oxygen). It was stated, that water processing by ROS leads to radicals generation and changes investigated parameters.

Key words: reactive oxygen species, water, darsonvalization, singlet oxygen.

Fundamental problems of ozone therapy. Oxidative stress

EFFECT OF REACTIVE OXYGEN SPECIES TO ENERGY METABOLISM IN ANIMALS' BLOOD AND TISSUES

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The aim of this work is comparative analysis of singlet oxygen (SO) action on energy metabolism parameters. Our experiment was executed with 45 Wistar line rats, divided in 3 groups [control group (n=15); first main group with SO inhalations every day (n=15), second main group with 60 µg/l ozone inhalations (n=15)]. We studied lactate dehydrogenase activity in direct and reverse reactions in animals blood and organs homogenates. Protein level was estimated by Louri method. For integral scrutiny of energy metabolism state coefficient of energy reactions was calculated. It was stated, that gaseous reactive oxygen species (ozone and singlet oxygen) lead to activation of energy metabolism in different organs and tissues, which caused by predominance of direct lactate dehydrogenase reaction to reverse one.

Key words: singlet oxygen, inhalation, lactate dehydrogenase, lactate.

Fundamental problems of ozone therapy. Oxidative stress

ACTION OF DIFFERENT NITRIC OXIDE (NO) CONCENTRATIONS ON LIPOPEROXYDATION INTENSITY IN BLOOD PLASMA IN VITRO

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The aim of this work is action of different nitric oxide (NO) concentrations on lipoperoxydation intensity in human blood plasma in vitro. We executed sparging of blood samples by NO-containing gaseous flow (NO concentration – 20, 50, 75 и 100 ppm), generating in RFNC. In blood samples we estimated malonic dialdehyde level, lipoperoxydation intensity and antioxidant activity. It was stated, that blood NO processing leads to dose-dependent stimulation of lipoperoxydation without oxidative stress generation.

Key words: nitric oxide, lipoperoxydation, malonic dialdehyde.

Fundamental problems of ozone therapy. Oxidative stress

EFFECT OF BLOOD PROCESSING BY NO-CONTAINING COLD PLASMA ON NITROTYROSINE LEVEL IN VITRO

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The aim of this work is estimation of nitrosative stress laboratory marker (nitrotyrosine) at blood processing by gas flow with nitric oxide. We used samples of whole blood of 14 healthy people. They were divided in 3 parts (at 5 mL). First portion of blood was processed by 100 mL. of NO-contained cold plasma (by «Plazon» apparatus), second portion was treated by 100 mL. of cold plasma, diluted by atmospheric air (1:9), third one was control. Nitrotyrosine level was tested with ELISA kit («Hycult Biotech»). It was stated, that blood processing by NO-contained cold plasma leads to nitrosative stress signs only at high NO concentration (800 µg/L) use.

Key words: nitric oxide, blood plasma, nitrotyrosine, nitrosative stress.

Fundamental problems of ozone therapy. Oxidative stress

ADAPTATIVE HYPOTHESIS OF SYSTEMIC OZONE THERAPY OR WHY OZONE ALWAYS CHANGES BIOCHEMICAL PARAMETERS TO NORMAL LEVEL?

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Reported a theoretical and practical study of the hypothesis about the central role of adaptive systems of the body in the implementation of the therapeutic effects of ozone therapy system (adaptive hypothesis of ozone therapy). It is shown that the positive dynamics of psychosomatic condition of the patients in the period following completion of the course of ozone therapy corresponds to a reduction, caused by aging, tension adaptive reactions and formally consistent rejuvenation. A program, assess the effectiveness of the course of ozone therapy by monitoring the estimated age of the patient according to the psychological testing and leukocyte counts, used as an indicator of the hormonal balance, was developed. Based on the adaptive hypotheses and Internet software O3Navigator (www.ozoneprotocols.org) developed tactics for primary ozone therapy patients and patients of repeated courses of treatment.

Key words: ozone therapy, adaptation.

Fundamental problems of ozone therapy. Oxidative stress

WAY OF PRETRANSFUSION REHABILITATION CANNED ERYTHROCYTES

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Introduction: packed red blood cells substantial shelf life, according to most authors, contains a significant amount of functionally and morphologically defective red blood cells. Transfusion of a transfusion environment leads only to further sludging and microvascular thrombosis, and impaired thereby compromised the basic pathological process gas transport function of blood. In order to optimize the properties of preserved red cells use different ways to pretransfusion treatment (UV irradiation, a helium-neon laser, hemosorption, sodium hypochlorite, etc. These works show the need and opportunities for improvement of morphological and functional properties of the transfusion environment. however, is not enough to study the question of the potential of improving the basic - gas transport function of red blood cells transfused, methodologies and capabilities of its rehabilitation before transfusion. As the physical and chemical factors that can effectively influence the morpho- and functional properties of red blood cells *in vivo*, our attention ozonated saline.

Materials and methods. We studied stabilized gemokonservantom CFDA 1 1:4 packed red blood cells in human blood. Packed red blood cells stored at 4, 7, 14, 21 and 30 days after saving. Packed red blood cells from various donors in the experiments do not mix. Donor blood was obtained by blood transfusion. In the course of ozonation packed red blood cells (2 ml), and various storage times mixed with ozonized sodium chloride 0.9% in an equal volume containing various concentrations of ozone. Used ozone concentrations of 0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15 mg/l. Ozonation of saline produced immediately prior to it in red cell mass. Ozonation saline Manufactured on ozonizer therapeutic automatic Wat-60-01-"Medozone Ltd.". The concentration of ozone in the ozonized solution was measured by sampling the built-in device for measuring concentration. After 1 hour of exposure to red cell suspensions obtained the concentrations of adenosine triphosphate (ATF) and 2,3 diphosphoglycerate (2,3-DFG). The content of 2,3-DFG and ATF in the suspension of washed red cells examined non-enzymatic method. The data were processed using the software packages Statistica 6.0 and Microsoft Excel using the methods of one-dimensional statistics. The significance of differences was determined by the average t-test. Differences were considered significant at a significance level of $p < 0.05$.

Results: The study found that ozone treatment of various red cell storage time results in a nonlinear change in the concentration of ATF and 2,3 DFG in erythrocytes. Effects of ozone content of 2.3 DFG in erythrocytes caused the

growth of the indicator regardless of the red cell storage time and also had a non-linear dependence. Ozone dose of 0.5 mg/l, 1 mg/l and 2 mg/l stimulated the increase in concentration of 2,3 DFG in red blood cells of all storage times. Ozone concentrations greater than 5 mg/l also caused increase in the content 2.3 DFG in erythrocytes, but the range of stimulating concentrations of ozone on the contents of this metabolite was dependent on the timing of red cell storage. Thus, the action of ozone on erythrocyte mass storage period to 7 days growth in concentration of 2,3 DFG appeared only at a dose of 6 mg/l, erythrocyte 14-21 day shelf life growing concentration of 2,3 DFG was recorded in the range of 5-10 mg/l. Quantitative changes of the metabolite in the range of ozone were the same type of character.

When red cell storage time to 30 days increase in concentration of 2,3 DFG recorded in almost all ozone concentrations with the exception of 4, 8 and 10 mg/L. It should be noted that the increase of 2.3 DFG in red blood cells during storage of 30 days was observed against the background of the pool of ATF depletion in cells.

It has been shown that the application of different concentrations of ozone detected at least two concentrations of ozone, causing the rise of ATF and 2,3 DFG in red blood cells in terms of their storage 7, 14, 21 days. Thus, the increase in ATF concentration in the cells was detected by the action of ozone in concentrations of 2 - 3 mg/L, the second region of the stimulating effect of ozone was present when its concentration of 6 - 10 mg/L, and if the stimulating effect of the ozone concentration of 2-3 mg/L occurred for periods storage of packed red blood cells per day 7-21, the severity of the effect in the range of 6 - 10 mg/L significantly depended on the time of red cell storage. When red cell storage time to 7 days the entire range of doses of ozone causes a marked increase in the concentration of ATF in the cells, the retention period to 14 days of ATF reliable growth registered only when the effects of ozone at a concentration of 9 mg / ml, with 21-day shelf life - under the influence of ozone in the range of 6-8 mg/L.

It should be noted that the most pronounced effect on the ATF content in erythrocytes ozone had on the erythrocyte mass storage period to 7 days, whereas the use of ozone on erythrocyte mass storage period to 30 days did not cause any significant change in ATF concentration in red blood cells, and even bore a tendency to a decrease in its cells.

Thus, the effectiveness of ozone on red blood cells depends on the ozone dose and the timing of red cell storage. Small concentrations of ozone activate metabolic processes, manifested increasing content of 2.3 DFG (at a concentration of ozone 0.5-2 mg/L) and an increase of ATF (with ozone concentration of 2-3mg/l) in erythrocytes with a shelf life of 21 days. Moreover, the increase in concentration of 2,3 DFG is observed at concentrations of ozone above 5 mg/L, but the range of doses of ozone affect the shelf life depends on red blood cells and is always combined with the concentration of ATF in the cells: at low red cell storage time (7 days), there is a marked increase in the ATF, against less significant accumulation of 2.3 DFG, whereas with increasing red cell storage time (14-21 days) is more development and less than 2.3 DFG significant accumulation of ATF. Growth of concentration of 2,3 DFG in erythrocytes with a shelf life of 30 days is the depletion of the pool of ATF.

Complex character of the level of ATF and 2,3 DFG in erythrocytes from ozone (multiple minima and maxima) may be due, in our opinion, its complex and ambiguous effects on membrane proteins, lipids and other cell components.

Increased production of red blood cells in 2,3 DFG facilitates the release of oxygen in the tissues and helps to maintain a pO_2 in the blood and tissues to a sufficient level. ATF serves as the phosphate donor for protein kinase phosphorylation reaction was carried out membrane proteins, which in turn leads to an increase in red blood cell deformability with increasing surface area and volume reduction, also improves oxygen transport function of the cells.

Conclusions. Thus, the action of low concentrations of ozone in oxygen-enhanced function of red blood cells, both by increasing the concentration of 2,3 DFG, and due to the increase of ATF. The optimum concentration, in our opinion, is the ozone dose 2 mg/L, which registered growth of both forms of inorganic phosphate. The increase in ozone concentration does not increase the effectiveness of its action on the metabolism, it is not always accompanied by an increase and ATF and 2,3 DFG in cells, which in its turn, is most likely due to ozone or the activation of anaerobic glycolysis with increasing concentrations of ATF, or the activation of its lateral path with increasing 2,3 DFG and requires additional accounting shelf packed red cells. The use of red cell storage period of more than 30 days at its ozonation causes depletion of energy resources cells.

Key words: pretransfusion, erythrocytes, adenosine triphosphate, 2,3 diphosphoglycerate, ozone.

Fundamental problems of ozone therapy. Oxidative stress

MODIFICATION OF THE BLOOD ENERGY METABOLISM UNDER SOME PHYSICAL FACTORS ACTION

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We tested action of oxygen, ozone (500 µg/L, nitric oxide (800 µg/L) and singlet oxygen on energy metabolism in human blood specimens in vitro. Estimated parameters were lactate dehydrogenase activity, blood lactate and some special coefficients. It was stated, that blood oxygenation, ozonation or processing by singlet oxygen stimulated energy reserves, and nitroxilation depressed it. This tendency associated with injection of relatively high concentrations of nitric oxide and reactive oxygen species in biological fluid at its processing by «Plazon» apparatus.

Key words: molecular oxygen, ozone, nitric oxide, singlet oxygen, lactate dehydrogenase, blood lactate.

Fundamental problems of ozone therapy. Oxidative stress

REDOX STATE OF RATS' BRAIN UNDER ITS ISCHEMIA-REPERFUSION AND ACETILCESTEIN USE

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The purpose of this paper is to study the rats' brain redox state under conditions of its ischemia-reperfusion (IR) and the introduction of Acetylcystein (ACC). Experiments were carried out on 22 Wistar-line rats weighted 20-250 g. The first series (n=8) consisted of falsely-operated animals (control). The second series was represented by IR animals, n=7. To rats of the third group with brain IR (n=7) ACC was administered in the dose of 100 mg/kg one hour before IR simulation. BIR was simulated by clipping common carotid arteries and subsequent clip removal under anaesthetic. In homogenates of liquid-nitrogen pre-frozen brain the concentration of reduced glutathione, common sulfhydryl groups of glutathione and peroteins, glutathioneperoxidase activity, products reacting with thiobarbitur acid were determined. Results comply with reference data on the ACC capability to further the correction of thiolene-sulfide relations.

Key words: redox-state, brain, ischemia, reperfusion, acetylcystein.

Fundamental problems of ozone therapy. Oxidative stress

OZONE-XENONIC CORRECTION OF STRESS

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20 male volunteers were involved in the study. Their average age was 47 ± 7 years. Their average weight was 78 ± 6 kg. The volunteers were also selected according to the type of adaptive response intensity, which was determined by the specially designed program O₃Navigator. Based on results of the performed investigations the following was established: the basic adaptogenic effect of xenon therapy was the selective enhancement of lymphocyte contents in blood; xenon correction of adaptive responses of organism of the testees being in the state of higher activation and re-activation was ineffective; the reduction of leukogram intensity had a transient character and may not be used for long-term correction of adaptive response intensity; ozone causes the complex correction of adaptive response including correction of leukogram, responsiveness and psychosomatic condition; the combined application of xenon and ozone correction of non-specific adaptation system was shown in lymphopenia.

Key words: adaptation, xenon-oxygen therapy, ozone therapy, lymphocytes.

Fundamental problems of ozone therapy. Oxidative stress

THE MORPHOLOGICAL RECONSTRUCTION OF MOTOR AND ASSOCIATIVE CELLULAR ELEMENTS OF THE SPINAL CORD AT THE INFLUENCE OF MOTOR LOADS TO THE FULL UNDER PRELIMINARY ACTION OF OZONATED ISOTONIC SOLUTION

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The fourth lumbar spine segment was studied in the paper, i.e. motoneurons of ventrolateral nucleus and interneurons of plate VII according to Rexed. An experiment was carried out, which allowed to assess the ozone effect combined with motor load to the full and to single out those changes, which were associated with the effect of ozone itself. 250-300 ml of ozonated saline solution with the ozone concentration of 250-300 µg per liter was intravenously administered to animals within 10 consecutive days. The total ozone dose received by animals came to at average 600-800 µg. It was shown that the blood ozonation as well as the effect of single motor loads furthered the increase of glial index. It was found that changes in structural-functional parameters of the examined experimental group as compared to intact animals and animals to which single loads were dosed to the full without blood pre-ozonation were caused to the greatest extent by performance of loads to the full than by blood ozonation though single parameter are available, with changes therein associated only with ozone.

Key words: ozone, motor loads to the full, glial index.

Clinical aspects of ozone therapy

OZONE THERAPY AND LIPOPEROXIDATION PARAMETERS IN COMPLEX TREATMENT OF PREGNANT WOMEN WITH ASIDEROTIC ANEMIA

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The purpose of the study was: to assess the effect of medical ozone on factors of active products of thiobarbituric acid in treatment of pregnant women with hypoferric anemia (HFA). An examined group consisted of 68 pregnant women in 20-30-week gestation with hypoferric anemia first revealed during that pregnancy. The first (main) group was composed of 28 women treated with ozone therapy along with taking ferrous preparation, the second (comparative) group of 18 pregnant women was given ozonated saline solution for anemia treatment and the third (control) one of 22 pregnant took only ferrous preparation. As HFA traditional therapy used for pregnant women of the main and control groups Ferro-Folgamma of Woerwag Pharma GmbH (Germany) production was prescribed. As HFA additional therapy medical ozone was used by way of intravenous infusions of ozonated saline solution prepared directly before its administration in medical ozonization device 4МП.01 of Medozone production (Russia) by means of ozone-oxygen gas mixture barbotage into a 400 ml sterile bottle with 0.9% sodium chloride solution within 10-15 min up to concentration of 400 mg/L. A course of treatment consisted of five 200 mL procedures every other day. Examinations were carried out before the treatment, 15 and 30 days after the beginning of the treatment, just before the childbirth and on the 3rd-4th day of the puerperal period. For lipid peroxidation analysis the method of lipid peroxidation assessment was used as per the sum of active products of thiobarbituric acid in blood serum by Jagi method in M. Ishihara modification. The obtained results demonstrated the great efficiency and effectiveness of medical ozone in HFA therapy of pregnant women enabling to reduce the time of treatment.

Key words: anemia of pregnancy, ozone therapy, assessment of efficiency, lipid peroxidation.

Clinical aspects of ozone therapy

OZONE THERAPY IN COMPLEX TREATMENT OF GLOSSALGIA

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The complex treatment of 58 patients with glossalgia aged 36-75 years (48 women and 10 men) was carried out by using ozone therapy. The drug treatment consisted in the prescription of antidepressants, sedatives, neuroleptics and anxiolytics as well as vascular preparations, hypersalivants, immune correctors. In local therapy a particular attention should be paid to ultratotherapy or treatment of supersonic-frequency current (SFC). The procedure was performed with the use of Ultraton-AMP-2M. In complex treatment of glossalgia the methods of intravenous drop infusions with ozonated saline solution were used (the ozone concentration in ozone-oxygen mixture was 1200 µg/L, the course consisted of 7-8 procedures. Positive clinical effects of the applied scheme of treatment were shown.

Key words: glossalgia, ozone therapy, ultratotherapy.

Clinical aspects of ozone therapy

THE EXPERIENCE OF APPLICATION OF MEDICAL OZONE IN THE TREATMENT OF BACTERIAL VAGINOSIS IN WOMEN WITH A HISTORY OF MISCARRIAGE

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We present the results of testing the effectiveness of medical ozone in preparing for pregnancy for women with bacterial vaginosis and miscarriage of early history. An assessment of clinical and microbiological efficacy of different ways of treatment was held. Mixed etiology vagina's microocenosis violations imply the need for adjuvant therapy, aimed, above all, to restore vaginal biocenosis.

Key words: miscarriage, bacterial vaginosis, medical ozone.

Clinical aspects of ozone therapy

CORRECTION OF PARAMETERS OF LIPID PEROXIDATION UNDER THE INFLUENCES OF OZONE THERAPY IN PATIENTS WITH CLIMACTERIUM

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100 patients with severe climacterium were examined, 50 of them underwent general ozone therapy. The levels of endogenous lipid peroxidation (LPO) and antioxidant protection system were abnormal. Ozone therapy had positive influences on the parameters of LPO and clinical picture. Traditional treatment was not so effective.

Key words: climacterium, ozone therapy, lipid peroxidation, antioxidant protection.

Clinical aspects of ozone therapy

THE USE OF MEDICAL OZONE FOR PREVENTION OF POST-OPERATIVE HYPERSENSITIVITY DURING THE ESTHETIC PROSTHETICS WITH VENEER APPLICATION

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The study was aimed to evaluate the effectiveness of the use of medical ozone for prevention of postoperative tooth sensitivity in aesthetic prosthetics with veneer application

The study was conducted at the Dental Clinic of Odessa National Medical University in 2010-2012. The study involved 23 patients who underwent aesthetic prosthetics using veneers. For the prevention of postoperative hypersensitivity in 12 patients there was used an original method of prevention (I group), and in 11 patients - the traditional means of processing and surface preparation for porcelain veneer (II group).

At the time of the preparation of the tooth beneath the veneer on the treated teeth for 1-2 min wore a custom gouttière, which is fed with the ozone-oxygen mixture at a concentration of 15-30% active ozone. For medical ozone generation there was used BOZON-H (NPP "Ekonika", Ukraine). After removing the pattern for the veneer, handling the ozone-oxygen mixture was repeated after 10-15 minutes. Patients in both groups were examined using the apparatus for electroodontometry Digitest (Parkell USA). Statistical processing was performed using the software Statistica 7.0 (StatSoft Inc., USA).

In assessing the clinical effect of the application of veneers at follow-up visits (in a week, 1, 3, 6, 12 months) their aesthetic parameters (matching the color and surface roughness) were optimal for all veneers. We did not find a hypersensitivity of the teeth after the installation of porcelain veneers patients of the main group. Dental pulp irritation study occurred in two (6.7%) patients in group comparison. In another case, a 2-year follow-up found a dead tooth pulp, which had a considerable area of composite restorations and secondary caries. In all these cases, the root canal treatment was carried out. Cases of endodontic complications of teeth were absent in the main group.

The electrical excitability of the pulp of the teeth treated with ozone before fixing veneers differed little from those of intact teeth - sensitivity has leveled to 6.7 ± 0.1 mA. At the same time, there was a decrease electroexcitability pulp of teeth with veneers set up to 16.5 ± 0.2 mA in the Group II, which may indicate a disorders of local blood flow and the

risk of inflammatory processes in the pulp Indicators of electroodontometry correlated with subjective satisfaction with treatment ($r = -0.69$ $p < 0.05$).

Conclusions:

1. The use of medical ozone in the preparation of the surface of the teeth for veneers leads to the stabilization of the pulp, which is the prevention of endodontic complications
 2. The proposed method of prevention of endodontic complications with the use of medical ozone gives a high degree of satisfaction of patients with treatment and good functional and aesthetic results.
 3. After the treatment of dental surgery field with ozone the electrical excitability of the pulp does not differ from that of intact teeth.
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Key words: esthetic dentistry, prosthetics, veneers, ozone, prevention.

Clinical aspects of ozone therapy

VAGINAL OZONE THERAPY AND MEDICATION TOMED-AQUA IN THE COMPLEX TREATMENT OF CHRONIC RECURRENT VULVOVAGINAL CANDIDIASIS

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Vulvovaginal candidiasis already for many years remains one of the most important problems in Obstetrics and Gynecology, currently second only to bacterial vaginosis among all infections of the vagina. The prevalence of disease, caused by variants of fungus *Candida*, induction of chronic inflammatory processes in the vagina, often in violation of microbial associations and adherence of pathogenic microflora, resistance to therapy (*C. glabrata* develops resistance to fluconazole in the treatment process, and *C. krusei* is genetically resistant to fluconazole) and long, often relapsing, his over-here is a partial list of problems that characterize this pathology. Vulvovaginal candidiasis is 24-36% in the structure of the Infectious Pathology of the lower division of the genitalia, its frequency is not declining. The use of antimycotic drugs of various immunomodulators, eubiotics.

The aim of the study was to investigate the influence of combined use of ozone therapy and drug on the basis of humic liquor Tomed-Aqua at the base clinic and a number of systemic and local immunity in patients with chronic recurrent vulvovaginal candidiasis.

Were examined 90 patients of childbearing age (27.9 ± 1.5 years) suffering from recurrent vulvovaginal candidiasis, with 4-6 times peaking a year. The most common complaints of patients in acute period were: discomfort, burning sensation in the vagina, dyspareunia, white discharge from the genital tract. Mycological survey included microscopy smear, as well as cultural examination (100% of cases *Candida albicans* was diagnosed).

All the patients were undergone basic therapy - fluconazole 150 mg orally three times at intervals of 72 hours. In the treatment of 30 of them (I group) along with antimycotic therapy applied method vaginal instillation of sterile distilled water with ozone (5000 µg/l concentration was used in gas for the preparation). Procedures were carried out daily for 7-10 days depending on clinical and laboratory results. II Group of 30 patients received, in addition to basic and new drug Tomed-Aqua (vaginal instillation). III Group of 30 patients will receive only basic therapy. The generally accepted research methods were used: physical, bakterioskopical, bacteriological, immunological. Study population and subpopulation composition of lymphocytes in the peripheral blood was conducted by the method of indirect immunofluorescence with the use of monoclonal antibodies To assess local immunity were studied following cervical

mucus: lysozyme activity indices, secretory immunoglobulin A (sIgA), mieloperoxidase of macrophages of vaginal mucosa and cervical canal, IL-6. Study all the above indicators had 3-multiple: pre-treatment, through 1 month after treatment and after 6 months, clinical observation covered 1 year. In all three groups showed reduction of intensity of the complaints in conjunction with the normalization of bakterioskopical paintings. A number of laboratory effects, like distant clinical results vary considerably depending on the method of treatment.

In all three groups was noted by reducing the intensity of complaints in conjunction with the normalization of the bacterioscopic picture. In this series of laboratory effects, how and long-term clinical results were significantly differed depending on the applied method of treatment. In the analysis of population-based composition of lymphoid cells the cervical canal were almost decrease percentage of cells CD4+. In connection with this, the ratio of cells CD4+/CD8+ also decreased. In patients there was a pronounced tendency to increase in the activity of the mieloperoxidase and the level of IL-6 in the decreased activity of lysozyme and concentration of sIgA. Our study (at the end of the course of treatment) showed that in the first group there has been an increase in the level of activity of lysozyme activity indices with $21.3 \pm 1.2\%$ to 29.5% , i.e. $38.4 \pm 1.7\%$ ($p < 0.05$), sIgA- 0.011 ± 0.001 g/l to 0.017 ± 0.002 g/l, i.e., 54.5% ($p < 0.05$) in significant decrease of IL-6 by 20% ($p < 0.05$) and mieloperoxidase macrophages in the cervical mucus to 18% ($p < 0.05$). In the second group, the result was more pronounced - lysozyme activity rose from $20.2 \pm 1.0\%$ to $34.6 \pm 1.3\%$, i.e., 71.2% ($p < 0.05$), sIgA- 0.013 ± 0.002 g/l to 0.023 ± 0.001 g/l, which is 76.9% ($p < 0.05$).

However, we have determined that immunotropic effect in groups I and II are not limited to local status, there are also changes in the system.

The study of indicators of CD3+ after ozone therapy in the first group showed a significant increase in groups I and II, respectively, 1.4 and 1.38 times ($p < 0.05$). Similarly, after the end of the treatment with the use of ozone was observed significant increase of CD4+, respectively, in 1.62 and 1.64 times ($p < 0.05$), which led to the normalization of this indicator. The effect was persistent and kept for six months. Levels of CD8+, on the contrary, remained unchanged as in the study of over 1, and 6 months later. When studying the dynamics of immune regulatory index reduce revealed his strong normalization in groups I and II.

On the contrary, in the III group of all the studied indicators has not demonstrated considerable growth as against the background of treatment, and after its termination.

Analysis of indicators through 6 months revealed that in I and II patients, saving lysozyme activity indices and the level of sIgA. In the third group remained on the previous lowest IgA figures and lysozyme activity has diminished.

Monitoring patients for one year after treatment showed that the likelihood of the recurrence of the disease amounted to 20% in Group II, only 10% , while in the third she was at the level of 60% .

In the third group all immunological indices have not demonstrated substantial dynamics.

The data obtained are correlated with the results of Nikishova et al. et al. that using vaginal instillation ozonized water had a similar effect in patients with chronic pelvic inflammatory processes. The importance of the correction of indicators of local immunity in patients with candidiasis is obvious, it is this fact, apparently, and is the lead in the prevention of recurrence of the disease. However, the local immunomodulating effect of ozone therapy can be strengthened due to the combination with Tomed-Aqua.

Thus, it is obvious that the most pronounced and long-term, was the result of combined use of ozone therapy and Tomed-Aqua, which serves as the rationale for their use in the therapy of recurrent vulvovaginal candidiasis.

Key words: chronic recurrent vulvovaginal candidiasis, ozone therapy, humic liquor, immunity.

Clinical aspects of ozone therapy

MODIFICATION OF BLOOD SERUM CRYSTALLOGENIC PROPERTIES AT PATIENTS WITH ACNE UNDER INTRAVENOUS INJECTIONS OF OZONIZED SOLUTION OF SODIUM CHLORIDE

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The aim of this work is estimation of metabolic response of blood serum crystallogenic properties of patients with acne on systemic ozone therapy.

We studied crystallogenesis of blood serum of patients with acne (n=21). All patients got intravenous injections of ozonized solution of sodium chloride with different ozone doses (7 procedures every other day). We fixed there are non-linear dynamics of teziographic parameters changes with extremum in 5000 µg/l.

Our data indicate that low-dose ozone therapy is most optimal for treatment of patients with acne.

Key words: acne, ozone therapy, blood serum, crystallogenic properties.

Clinical aspects of ozone therapy

THE STUDY OF OZONETHERAPY EFFECTS IN LUMBO-SACRAL PAIN DISORDERS

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Based on medical data on our own clinical observation upon a consistent lot of patients we have describe the beneficial effect of ozonotherapy on different type of low-back pain, developing either a retrospective study or a prospective longitudinal study with patients suffering from L4-S1 radiculopatía, algic and dysfunctional post neurosurgical sequel for lumbar disc hernia and non specific low-back pain.

The patients were evaluated upon a number of clinical and functional parameters such as: pain, sensitive troubles, physical dysfunctions, disabilities, use of medical drugs and the quality of life, according to the requests of Evidence based Medicine.

The results of these studies confirm the beneficial either on the pain or on some dysfunctions, as well as the reducing of drug use after three-four week of ozonotherapy.

A continuous monitoring of all these patients for a longer period is mandatory, for the aim of better evolution of the lasting effects and of possible falls.

Keywords: low-back pain, ozone therapy, effectiveness.

Clinical aspects of ozone therapy

INVESTIGATION OF BLOOD SERUM BALANCE OF PRO- AND ANTIOXIDANT SYSTEMS AT PATIENTS WITH ALCOHOL ABSTINENCE SYNDROME IN CONNECTION WITH OZONE THERAPY USE

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The aim of this work is estimation of oxidative stress presence at patients with alcohol abstinence syndrome in connection with ozone therapy use.

Patients of main group (n=30) got a ozone therapy course (400 mL of ozonized solution of sodium chloride; ozone dose – 1.6 mg/procedure) in addition to standard treatment scheme. Patients of control group (n=45) got standard treatment only. We tested state of blood pro- and antioxidant systems in treatment dynamics. Lipoperoxidation level and antioxidant activity of patients blood serum were estimated.

It was stated, that oxidative stress, forming in patients with abstinence syndrome, was particularly removed by complex therapy. Ozone therapy use allows accelerating normalization of blood serum balance of pro- and antioxidant systems.

Key words: alcohol, abstinence syndrome, ozone therapy, lipoperoxidation.

Clinical aspects of ozone therapy

OZONE THERAPY EFFICIENCY IN CORRECTION OF IMMUNOLOGICAL PARAMETERS AT PATIENTS WITH HYSTEROMYOMA IN POSTOPERATIVE PERIOD

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Positive effect of ozone therapy in complex treatment of uteri myoma patients has been shown. In the group of patients that were administered complex treatment with intravenous ozonized saline injection the content of CD8+, CD20+ mononuclear cells as well as serum level of soluble molecules sHLA-I, sCD95, sCD38 и sHLA-DR had been shown to improvement. No significant changes in immunological parameters were in patients after standard therapy in postoperative period.

Key words: ozone therapy, peripheral blood mononuclear cells, soluble differentiation antigens, uteri myoma.

Clinical aspects of ozone therapy

EFFECTS OF OZONE THERAPY ON HOMEOSTATIC AND OXIDATIVE STRESS INDEX IN CORONARY ARTERY DISEASE

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Coronary artery disease (CAD) is the most common cause of sudden death, and death of peoples over 20 years age. Because ozone therapy can activate the antioxidant system, improve blood circulation and oxygen delivery to tissue, the aim of this study was to investigate the therapeutic efficacy of ozone in patients with CAD, treated with antithrombotic therapy (AT), Aspirin® and policosanol. A randomized controlled clinical trial was performed with 53 patients divided into two groups: one (n=27) treated with AT and other (n=26) treated with AT plus rectal insufflation of O₃. A parallel group (n=26) age and gender matched was used as reference for the experimental variables. The efficacy of the treatments was evaluated by comparing homeostatic indexes and biochemical markers of oxidative stress in both groups after 20 days of treatment. Ozone treatment significant (p<0.001) improved prothrombin time when compared to AT group, without modify bleeding time. Combination TA+O₃ improve the antioxidant status of patients reducing biomarkers of protein and lipid oxidation, enhance total antioxidant status and modulate level of superoxide dismutase and catalase with a reduction in 57% and 32 % of SOD and CAT activities respectively, moving the redox environment to a status of low production of O₂⁻ with an increment in H₂O₂ detoxification. No side effects were observed. These results show that medical ozone treatment could be a complementary therapy in the treatment of CAD and its complications.

Keywords: Ozone, coronary artery diseases, oxidative stress, aspirin.

Clinical aspects of ozone therapy

OZONE THERAPY AS PREDICTIVE MEASURE OF METABOLIC SYNDROME COMPLICATIONS

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Metabolic syndrome (MS) tends to the development of severe cardiovascular and diabetic complications. Early detection of the disease and suitable measures can slow or block the growth of life-threatening symptoms. Ozonated saline may be used as an alternative or adjunctive therapy in MS. The efficacy of ozonotherapy has shown to be comparable to standard therapy leading to improvement lipid profile and a significant decrease in the activity of matrix metalloproteinases.

Key words: ozonotherapy, metabolic syndrome, lipid profile, free fatty acids, matrix metalloproteinases.

Clinical aspects of ozone therapy

EXPERIENCE OF USE OF OZONE THERAPY COMBINED METHODS AT DISSEMINATED SCLEROSIS

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The purpose of the study was to assess the efficiency of combinative methods of ozone therapy in case of cerebral and cerebellar forms of disseminated sclerosis with remittent course. 6 patients were under 2-year supervision with the diagnosed disseminated sclerosis in its remittent course at the stage of complete or partial remission of cerebral and cerebellar form. In addition to immunomodulatory the basic therapy such as taking betha-1a Interferon (Avonex) and Glatiramer Acetate (Copaxon) the intravenous administration of ozonated saline solution (200 mL with the ozone concentration of 1.3 mg/L) and the subcutaneous intravenous administration of ozone-oxygen gas mixture with the ozone concentration of 1.6 mg/L was made into reflexogenic zone of the upper and lower extremities of the patients. After ozone therapy performed during standard treatment the positive dynamics were noted, namely: no-acute conditions, the regress of sensory, motor disorders, the improvement of the general state and, hence, of the life quality and social adaptation.

Key words: disseminated sclerosis, ozone therapy, clinical effect.

Clinical aspects of ozone therapy

OZONE THERAPY AS METHOD IN COMPLEX TREATMENT OF ALCOHOL ABSTINENCE SYNDROME

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The main idea of therapeutic approach is in the synergetic combination of two effective multifunctional methods of intensive therapy: single-needle membrane plasmapheresis and oral administration of ozonated olive oil. The study involved 22 male patients with alcohol abstinence syndrome, the drink abuse time was 5 to 15 years. The main group was of 12 patients (aged 39.5 ± 10.7 years), the control group consisted of 10 patients (aged 37.5 ± 1.4 years). The combined detoxication therapy was carried out in the traditional complex of pharmacologic preparations together with oral administration of ozonated olive oil for internal use with the initial ozone barbotage concentration of 4000-5000 mcg/l in ozone-oxygen mixture, 1 teaspoon 3-4 times a day, 30 minutes before eating, within 7-10 days and during the course treatment by using the method of membrane plasmapheresis (2-3 procedures per course, at 3-day intervals between procedures), with exfused plasma volume of 600 to 1000 ml). The assessment of therapeutic detoxication effect was carried out with regard for dynamics of laboratory findings (bilirubin, ALT, ACT etc.). The obtained results prove the reasonable selection of the combination therapy of alcohol abstinence state with using the method of ozone therapy and plasmapheresis for reduction of somato-neurologic and psychopathologic disorders preconditioned by alcohol dependence syndrome.

Key words: alcohol abstinence, ozone therapy, detoxication.

Clinical aspects of ozone therapy

THE USE OF OZONE THERAPY IN COMPLEX REHABILITATION OF PATIENTS WITH INFANTILE CEREBRAL PARALYSIS WITH MOTOR DYSFUNCTIONS

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The purpose of work was to study the possibility for applying the ozone therapy in case of infantile cerebral paralysis in craniopuncture zones used in classical reflexotherapy in a number of severe CNS diseases, namely: after-effects of apoplectic attack, posttraumatic encephalopathy, parkinsonism, epilepsy, speech disturbance and visibility deterioration of central genesis, Meniere's disease etc. Depending on rehabilitation methods patients with similar anamnesis and course of disease were divided into two equal groups. The patients of the first group were treated with the use of ozone therapy by intravenous drop-by-drop introduction of saline solution (the total course was 10 days). For ozonation sterile isotonic sodium chloride solution (200 mL) was used with ozone-oxygen mixture of the ozone concentration of 10 mg/L fed therein. The second group of patients was treated under such original method as the administration of saline solution (SS) with the ozone concentration of 10 mg/L into craniopuncture zones (the total course was 10 days). The results of the SS administration into craniopuncture zones with the combined action to such zones in the course of practical rehabilitation of ICP patients with clinical implications expressed not only in motor defects, spastic paresis, diminution of muscle strength but causing also mental retardation or pathology, speech disturbance, hearing and visibility deterioration etc. enabled to come to the following conclusion: in the second group of patients treated under suggested methods there were noted: a quicker effect of treatment, more stable remission of disease (for 1 year as compared to 6 months in the control group), more complete social adaptation of ICP patients.

Key words: ozone therapy, rehabilitation, infantile cerebral paralysis.

Clinical aspects of ozone therapy

POSSIBILITIES OF OZONE THERAPY IN CORRECTION OF IMMUNE DISORDERS IN PATIENTS WITH PSORIASIS VULGARIS

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The purpose of the research was to study the effect of intravenous injection of ozonated saline solution to some immunologic parameters of patients with psoriasis vulgaris. 84 patients were examined at progressive stage of psoriasis vulgaris aged between 18 and 66 years (average age was 37.7 years); including men -68(81.0%), women - 16 (19.0%). Patients of the 1st group (n=42) were treated by conventional psoriatic therapy (desensitizing drugs, antihistamines, sedatives, hepatoprotectors, vitamins, local exfoliating and allowable therapy, general ultraviolet skin exposure). Patients of the 2nd group (n=42) were subjected to 5-10 intravenous administrations of ozonated saline solution (of 200ml, with the ozone concentration of 2.5 mg/l) in complex therapy. In dynamics there were determined in peripheral blood samples subpopulations of lymphocytes bearing antigens CD3, CD4, CD8, CD20; the activity of phagocytosis; HCT-test; circulating immune complexes. The immunoregulatory balance was calculated by CD4/CD8 ratio. A control group consisted of 26 healthy persons. It was established that for patients with exacerbation of widespread psoriasis vulgaris the secondary granulocytopathy with higher absorbing and killing neutrophil activity, disbalance in the T-cell immunity system, the increasing level of circulating immune complexes were typical. In psoriatic patients treated by intravenous drop-to-drop infusions of ozonated saline solutions the normalization of T-lymphocyte subpopulation and the reduction of the level of circulating immune complex of different diameter occurred.

Key words: ozone therapy, psoriasis vulgaris, immunologic parameters.

Clinical aspects of ozone therapy

POSSIBILITIES OF OZONE THERAPY IN TREATMENT OF CHRONIC PROTOZOIC UROGENITAL INFECTION AND ITS COMPLICATIONS

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There were treated 150 patients with mixed infection conditioned by concurrent protozoan (trichomonads, gardnerellas) and urogenital (chlamydiae, micoplasma and ureoplasma) infection. 82 (54.7%) of them were men and 68 (45.3%) were women. The treatment of all patients was carried out in the course of major autohemoozone therapy (intravenous injection of saline solution with the ozone concentration of 5.0 to 20 mg/l - Pat. 8550u UA every other day). Herewith in local treatment complex for men microclysters with Ozonide oil were included in volume of 20.0 ml and the ozonide concentration 20.0 ± 1 mg/l, by course № 30, and inscillations into urethra with its massage with Ozonide oil of 10.0 ± 2.0 mg/l, by 10 ml within 20 min daily № 10, then 5.0 ± 2.0 mg/l within 10 days more (Pat. 54447u UA) as well as paraprostatic blockade with OSS with the increasing ozone concentration from 3 mg/l to 7 mg/l №4-5 twice a week with small autohemoozone therapy every other day № 5-7 with the ozone concentration of 10mg/l to 20 mg/l (Pat. 39601u UA) [3]. In case of associated sexual disorders (erection, coitus, ejaculation and spermatogenesis abnormalities) the local therapy was supplemented by zono-quazilaser phototherapy with magnetotherapy (red and infrared low-energetic electromagnet radiation with a wave length of 625-670 nm and 840-920 nm - Pat. 63832u UA). The results of treatment including ozone therapy methods for the most severely ill patients with concurrent chronic and recurrent protozoan-bacterial-viral infection show the significant enhancement of efficiency of both the primary recovery of sick persons and the prevention of mixed infection recurring. It was the systemic and local pathogenetic effect obtained in the combinative use of ozone therapy methods that enabled 30 (97.75%) married couples to solve the problem of infertile marriage.

Key words: Urogenital and protozoan infection, complications, ozone therapy, phototherapy.

Clinical aspects of ozone therapy

OXYGEN-OZONE THERAPY AS IMMUNOMODULATING METHOD AT DERMATOSES

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The purpose of the research was to reveal the commonability of main pathogenetic mechanisms of widespread immune-dependent dermatoses by studying the dynamics of basic anti-inflammatory cytokines and autoantibodies-markers of natural autoimmunity states under effect of OOT. The determination of parameters of cytokine profile: serum levels IL-2 and IL-17A, TNF and its soluble receptor TNF-R1 was carried out. The said parameters were determined in blood serum of 136 patients representing all groups of dermatoses under study by method of enzyme-linked immunosorbent assay (EASIA): in the main group of 25 patients with psoriasis, 22 patients with AC, 22 patients with lichen acuminatus and 24 patients with morphea pigmentosa, 96 persons in total. A control group consisted of 40 patients: 10 persons with each kind of studied dermatoses. There were also determined natural autoimmunity parameters, namely: serum levels of autantibodies (AAB) reflecting the availability of system inflammatory process (AAB to DNA; AAB to β -2-g-p; AAB to β -2-g-p AB; Fc-Ig; AAB to gamma-IFN and its receptors); determining connective tissue state: (AAB to collagen and myosin); characterizing the availability of vascular changes (AAB to NO_s; ANCA; AAB to thrombocyte membrane proteins TrM-001-15, TrM-008-10, TrM-015-12). The said parameters were determined by the IEA method in 143 patients representing all groups of dermatoses under study. 103 patients of the main group were treated with OOT: 27 with lichen acuminatus; 28 patients with psoriasis; 22 patients with morphea pigmentosa and 26 patients with different types of AC. The results of performed investigations led to the conclusion on the unambiguous immunomodulatory effect of OOT. First, it exerted significant influence on levels of anti-inflammatory cytokines, secondly, for the first time its effect on autoimmune component of inflammatory process was proved in case of dermatoses: thus, the multi-factor and multi-directional mechanism of OOT immunotropic action was convincingly shown.

Key words: dermatoses, ozone therapy, immunologic parameters, autoantibodies.

Clinical aspects of ozone therapy

IMMUNE DISORDERS AND THEIR OZONE CORRECTIONS AT INFANT VARIANT OF SEVERE ATOPIC DERMATITIS

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The purpose of the research was to study the clinical and immunomodulatory effect of ozone therapy for children of preschool and junior-school age suffering from severe atopic dermatitis. 64 patients with atopic dermatitis (AD) at the age of 5-10 years (children form of disease) were under supervision. In all of them widespread heavy atopic dermatitis was diagnosed. The first group of AD patients (33 persons) was treated by complex conventional therapy. The second group of AD patients (31 persons) was prescribed complex therapy combined with two courses of ozone therapy. A course of ozone therapy consisted in applying ozonated olive oil to affected skin areas (twice a day within 15 days) and making rectal ozone-oxygen mixture insufflations (8 procedures in total, every other day). To assess the immunoreactivity state of AD patients in periods of acute condition and clinical remission, the parameters of cellular and humoral components of immune system, phagocytosis and the levels of inflammatory cytokines in blood serum were studied. In patients with infantile form of heavy atopic dermatitis treated by complex conventional therapy some marked immunoreactivity changes were revealed in the period of clinical remission. The inclusion of ozone therapy in the complex treatment of patients with infantile form of heavy atopic dermatitis will result in quicker incoming of clinical remission and normalization of the most parameters of immunoreactivity.

Key words: atopic dermatitis, infantile form, ozone therapy, immunologic parameters.

Clinical aspects of ozone therapy

THE USE OF MEDICAL OZONE FOR PREVENTION OF POST-OPERATIVE HYPERSENSITIVITY DURING THE ESTHETIC PROSTHETICS WITH VENEER APPLICATION

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The study was aimed to evaluate the effectiveness of the use of medical ozone for prevention of postoperative tooth sensitivity in aesthetic prosthetics with veneer application

The study was conducted at the Dental Clinic of Odessa National Medical University in 2010-2012. The study involved 23 patients who underwent aesthetic prosthetics using veneers. For the prevention of postoperative hypersensitivity in 12 patients there was used an original method of prevention (I group), and in 11 patients - the traditional means of processing and surface preparation for porcelain veneer (II group).

At the time of the preparation of the tooth beneath the veneer on the treated teeth for 1-2 minutes wore a custom gouthière, which is fed with the ozone-oxygen mixture at a concentration of 15-30% active ozone. For medical ozone generation there was used BOZON-H (NPP "Ekonika", Ukraine). After removing the pattern for the veneer, handling the ozone-oxygen mixture was repeated after 10-15 minutes. Patients in both groups were examined using the apparatus for electroodontometry Digitest (Parkell USA). Statistical processing was performed using the software Statistica 7.0 (StatSoft Inc., USA).

In assessing the clinical effect of the application of veneers at follow-up visits (in a week, 1, 3, 6, 12 months) their aesthetic parameters (matching the color and surface roughness) were optimal for all veneers. We did not find a hypersensitivity of the teeth after the installation of porcelain veneers patients of the main group. Dental pulp irritation study occurred in two (6.7%) patients in group comparison. In another case, a 2-year follow-up found a dead tooth pulp, which had a considerable area of composite restorations and secondary caries. In all these cases, the root canal treatment was carried out. Cases of endodontic complications of teeth were absent in the main group.

The electrical excitability of the pulp of the teeth treated with ozone before fixing veneers differed little from those of intact teeth - sensitivity has leveled to $6,7 \pm 0,1$ mA. At the same time, there was a decrease electroexcitability pulp of teeth with veneers set up to $16,5 \pm 0,2$ mA in the Group II., which may indicate a disorders of local blood flow and the

risk of inflammatory processes in the pulp Indicators of electroodontometry correlated with subjective satisfaction with treatment ($r = -0,69$ $p < 0,05$).

Conclusions:

1. The use of medical ozone in the preparation of the surface of the teeth for veneers leads to the stabilization of the pulp, which is the prevention of endodontic complications
 2. The proposed method of prevention of endodontic complications with the use of medical ozone gives a high degree of satisfaction of patients with treatment and good functional and aesthetic results.
 3. After the treatment of dental surgery field with ozone the electrical excitability of the pulp does not differ from that of intact teeth.
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Key words: esthetic dentistry, prosthetics, veneers, ozone, prevention.

Clinical aspects of ozone therapy

OZONE THERAPY AS EFFECTIVE PHYSICAL METHOD OF TREATMENT AND REHABILITATION

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Up to date due to efforts of scholars and medical practitioners of our country and their foreign colleagues many mechanisms of therapeutic and revitalizing action of ozone, specific methods of ozone therapy were elaborated. All this enables to use actively these methods in the rehabilitation of patients with chronic disorders of cerebral hemodynamics, after ischemic cerebral affection, for persons with digestive organ pathology, in case of diabetes mellitus, female genital organ diseases and in many other lines of current clinical medicine. However, many questions of modern ozone therapy still require the detailed elaboration and clarification. It concerns first of all curative dosages because serious inconsistency on this matter disturb specialists' confidence to this method as well as the time and number of treatment courses, the possibility for combination with other physiotherapy methods especially with more or less similar mechanisms of curative effect (laser therapy, ultraviolet irradiation, nitrogen oxygen therapy, hyperbaric oxygenation etc.) and, certainly, drug therapy. The solution of these matters will enable to create pre-requisites for the more reasonable and methodically substantiated introduction of ozone as a really high-effective physical factor into program of treatment and medical rehabilitation of patients.

Key words: ozone therapy, current state, prospects.

Clinical aspects of ozone therapy

OZONE THERAPY AT GASTRIC PATHOLOGY AND NORMAL COLON MICROBIOTA STATE

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The purpose of the research is the study of intestinal microflora contents of patients during the ozone therapy of gastritis and gastric ulcer. The segregation of intestinal microflora organisms was performed by the method described by N.A. Glushanova and B.A. Shenderov. The cultivation of anaerobes segregated from patients' faeces were carried out on solid culture media with the aid of Anaerobic system Mark III - LE003 (Hi Media Laboratories Pvt. Ltd., Mumbai, India) with gas generating packages Hi Anaero Gas Packet. Escherichiae were cultivated on Endo agar. The total microorganism quantity in 1 g of faeces was determined in Goryaev's chamber and single microflora agents by inoculation of biomaterial suspension onto solid culture media and by counting grown colonies. The result of performed investigations is a recommendation, thereunder the correction and prevention of gastrointestinal microbiocenosis disorder of patients with gastrointestinal pathologies should be carried out by using up-to-date facilities and methods including a group of prebiotics with proved clinical efficiency in complex treatment in addition to ozone therapy.

Key words: gastric diseases, ozone therapy, normal microflora, disbacteriosis, correction.

Clinical aspects of ozone therapy

EFFECT OF INTRAPORTAL OZONE THERAPY ON LIVER FUNCTIONAL STATE IN COMPLEX TREATMENT OF OBSTRUCTIVE CHOLESTASIS

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The results of treatment of 69 patients with obstructive jaundice were studied, for whom intravenous (the 1st group of 36 patients) and intraportal (the 2nd group of 33 patients) ozone therapy was applied in the pre- and postsurgical period in addition to traditional therapy. Ozonated saline solution (OSS) was produced by barbotage of 0.9% of sodium chloride solution with ozone-oxygen mixture. The ozone concentration in ozone-oxygen mixture at the resonator output was 2500 mg/l, the barbotage time was 10 min. For patients of the first group with total bilirubin of over 200 µmol/L the intravenous ozone therapy was carried out within three days in the pre-surgical period and within 5 days after operation. For patients of the second group intraportal infusions were made by means of intraoperative catheterization of umbilical vein at the rate of 30-40 drops per minute within 5-7 days. Indicators of the liver functional state, endogene intoxication, lipid peroxidation (LPO) products were determined in venous blood plasma of patients in the both groups by conventional methods. It was found that the hepatocyte function normalization occurred within shorter time under intraportal ozone therapy than in patients of the first group. It was associated with the more marked activation of the antioxidant system of the liver.

Key words: obstructive cholestasis, intraportal ozone therapy, lipoperoxidation, functional state of the liver.

Clinical aspects of ozone therapy

USE OF OZONIZED SALINE SOLUTION FOR IRRIGATION OF MAXILLARY SINUSES IN CASE OF PURULENT SINUSITIS

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The purpose of this paper is to study the ozonized saline solution efficiency for the irrigation of maxillary sinuses during punctures. The investigation involved 29 patients. In 43% of them unilateral maxillitis and in 57% bilateral maxillitis were diagnosed. All patients were treated with antibacterial agents within 10 days. In the first group of 14 persons) a maxillary sinus was washed by antiseptic (Miramistin) in dilution 1:1 with 0.9% saline solution. In the second group (of 15 persons) a maxillary sinus was washed by ozonated solution. 0.9% saline solution ozonation was performed by Medozons-BM with the ozone concentration of 6 mg/ l at the output. A course of maxillary sinus irrigation consisted of 4 procedures within 10 days for the both groups. The treatment efficiency was assessed as per dynamics of clinical symptoms and maxillary sinus sonography by Sinuscan device. Clinical observations confirm the therapeutic effectiveness of ozone therapy in complex treatment of acute and chronic sinusitis, which is preconditioned not only by the direct bactericidal action of ozone but also by its anti-inflammatory anti-edema effect.

Key words: purulent sinusitis, ozone therapy, irrigation of maxillary sinuses.

Clinical aspects of ozone therapy

THE APPLICATION OF LOW-FREQUENCY ULTRASOUND AND OZONATED OIL IN THE TREATMENT OF PATIENTS WITH LONGLY HEALED FOUL DISEASES OF SOFT TISSUES

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One of the most typical problems in modern surgery is the purulent infection. Despite on the success of managing the surgical patients, there is more and more people with the chronicity of the inflammatory process, burdened with atherosclerotic vascular and diabetes [1]. Significantly improve the possibilities of surgical treatment of wounds allow the low-frequency ultrasound and local ozone therapy [2, 3]. In our work for local ozone therapy, the ozonated oil was used [4].

The objective of our research was the study of effectiveness of combining the use of low-frequency ultrasound and ozonated oil in the treatment of long-term healing wounds.

The comparison group consisted of 40 people, which had the traditional treatment on each stage. The other group, made up of approximately 30 people, beside a traditional therapy, had an ultrasonic treatment of the affected area twice a day, during 3-4 min with resonance frequency of 26-28 k/Hz.

For the medium of conducting waves, the ozonated oil was used. The patients were comparable by gender, age and the severeness of course of disease in all the clinical groups.

Comparative evaluation of the results of treatment of studying and control groups was performed on the basis of received clinical, laboratory and bacteriological data.

In the comparison group, more than 70% of the patients marked declining, and after 10-15 minutes almost the total disappearance of the pain symptom during and after a session of low-frequency ultrasound processing through the ozonated oil. The given effect had a persistent action, and continued up to 12-30 hours in patients with localized, and also with the common longly healing foul processes of the soft tissues.

On the general background, the pain relief in the studying group occurred in average on $3,7 \pm 0,5$ days, whereas in the group of comparison on $8,5 \pm 1,2$ days. The reduction of swelling, occurred in average on $4,8 \pm 0,7$ days, in the comparison group on $8,3 \pm 1,5$ days. Hyperemia was marked until $3,1 \pm 0,5$ days in studying group and until $5,6 \pm 1,3$ days in the group of comparison. Termination of exudation occurred on average to $7,8 \pm 0,7$ days from the beginning of the treatment of the studying group and to $13,6 \pm 1,6$ days in the controlled group.

Terms of registration general clinical signs during the early process of the patients with limited forms longly healing diseases of soft tissues in the studying group and the comparison group distributed the following way: the stop of hyperemia was marked to $6,6 \pm 0,5$ и $12,5 \pm 0,9$ days, leukocytosis in peripheral blood reduced to the normal values to $5,7 \pm 2,1$ и $9,6 \pm 1,8$ days respectively. Normalization of the blood formula was observed to $6,7 \pm 1,7$ days in patients, that have received the ultrasound processing of the wound surface through the ozonated oil and to $9,9 \pm 1,5$ days without it. The maturation of granulation tissue on the whole surface of the wound was marked in the studying group on the average to $5,3 \pm 0,9$ days, while in the group of comparison to $11,9 \pm 1,7$ days, the appearance of epithelialisation of the wound edge were marked respectively to $7,2 \pm 1,5$ and $13,1 \pm 1,8$ days from the beginning of treatment.

This way, during the performing of the comparative analysis of the patients treatment effectiveness with longly healing foul wounds of the soft tissues it was determined, that local application of the low-frequency ultrasound and ozone therapy allow to significantly speed up the process of the healing the wounds, reduce the time being in the hospital, on the average of 20 per cent.

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Key words: wounds, low-frequency ultrasound, ozonated oil.

Clinical aspects of ozone therapy

ABOUT ANTIBACTERIAL, DETOXIC AND IMMUNOSTIMULATING EFFECT OF OZONE

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There were examined 65 patients with acute infective endocarditis, 90 patients with acute cholecistitis complicated by cholangitis and 60 patients with acute appendicitis complicated with diffuse peritonitis and infected pancreatic necrosis complicated with diffuse peritonitis. Different ozone therapy methods were used in treatment of a part of patients. Haematological, biochemical and immunologic parameters were studied in patients; endotoxemia indices were assessed after M.Y. Malakhova and S.V. Obolensky (1995); the contents of substances of low and mean molar weight (SLMMW) of packed red blood cells in hemacon were studied under the said methods before and after its treatment. Bacteriological test of bile taken from cystic duct remnant drainage was carried out by inoculation of Endo medium, blood agar, milk-salt agar and the Sabouraud agar. Thus, ozone therapy may and should supplement the intensive therapy of patients with infective endocarditis and purulent-inflammatory abdominal diseases.

Key words: ozone therapy, surgical pathology.

Clinical aspects of ozone therapy

OPTIMIZATION OF INTENSIVE THERAPY FOR PATIENTS WITH PURULENT AND INFLAMMATORY ABDOMINAL DISEASES BY DETOXICATION AND DISINTOXICATION TECHNOLOGIES

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The purpose of this paper is the prevention and treatment of post-operative complications in patients with purulent-inflammatory abdominal diseases by the combination of drug therapy and early application of detoxication and disintoxication methods. 360 patients were examined who suffered from purulent-inflammatory abdominal diseases (diffuse peritonitis, destructive pancreatitis, infective pancreonecrosis). Haematological, biochemical and immunologic blood values were analyzed and hemostasis was studied. Endotoxemy indices were assessed after M.Y. Malakhova and S.V. Obolensky methods (1995). The obtained results prove the need in the inclusion of detoxication and disintoxication methods in complex of intensive therapy for patients with purulent-inflammatory abdominal diseases.

Key words: purulent-inflammatory abdominal diseases, ozone therapy, detoxication, disintoxication.

Clinical aspects of ozone therapy

20-YEARS EXPERIENCE OF OZONE USAGE IN TREATMENT OF TRAUMA AND ORTHOPEDIC PATIENTS WITH PURULENT INFECTION

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Active surgical tactics are fundamental treatment for trauma and orthopedic patients with purulent infection focuses on operative actions. They include a complete surgical debridement of a purulent necrotic focus with the removal of metal constructions and fixers, non-fixed bone fragments, sequestrum, areas of osteonecrosis and non-viable soft tissues by opening purulent leakages and cavities. Mandatory condition is performing early and primary reconstructive operations: plasty of bone and soft tissues defects with subsequent active drainage of the wound and (or) residual bone and soft tissue cavities.

We have experience in treatment with ozone over four hundred patients with open fractures of long bones, complicated by wound infection, purulent wounds of various sites and areas, acute and chronic osteomyelitis of long bones, osteoarthritis of large joints, osteomyelitic and trophic ulcers.

The main method of treatment of these patients is operative one but ozone therapy plays a very important role in the treatment complex.

For preoperative coverlet preparation in patients with paratraumatic eczema and erysipelatos inflammation we used local open treatment with ozone-oxygen mixture in a concentration of 1.5-2.5 mg / l in the dressing room for half an hour every day up to acute inflammatory process calmed down.

In order to prevent post-operative complications at the surgical debridement of purulent and septic wounds in patients with open fractures of long bones we performed intraosseous lavage of the intramedullary canal with ozonized physiological solution in a concentration of 1-1.5 mg / L.

For faster wound healing in postoperative period we performed active drainage of the residual bone and soft tissues cavities and vast operative wounds with ozonized antiseptic and physiological solutions bubbled with ozone-oxygen mixture in a concentration of 5 mg / L at room temperature for 30-40 min.

Open treatment of purulent wounds and trophic (osteomyelitic) ulcers with ozone-oxygen mixture in a concentration of 5-7 mg /L in a plastic container we performed taking into consideration the phase of wound healing process and had the purpose to prepare wound area for plastic replacement using any method, or the wound (ulcer) was cured with ozonized ointment bandage until healing by secondary intention type.

Parenteral introduction of ozonized solutions and autohemotherapy were prescribed to overall impact on the body and the microflora in patients with the most serious bones injuries and diseases, accompanied with purulent resorptive fever.

So, the use of ozone at different stages of the surgical treatment of trauma and orthopedic patients with purulent infection allowed to optimize the wound healing process, greatly reduce the number of repeated sanitizing operations and the period of hospitalization.

Key words: purulent diseases of bones and joints, ozone therapy.

Clinical aspects of ozone therapy

OZONE THERAPY OF PURULENT AND INFLAMMATORY DISEASES OF MAXILLOFACIAL REGION IN MIDDLE-AGE PATIENTS

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The purpose of the research is to study the effect of ozone therapy on the dynamics of wound healing time in middle-age patients with PID MFR. 72 middle-aged patients (31 men, 41 women) with odontogenic phlegmons of submaxillary region were under supervision. As per applied therapy the patients were randomized into the following two groups: a main group of 35 patients, whose complex treatment (operative aid, antibacterial, disintoxication therapy) included ozone therapy (intravenous infusions of 200 ml of ozonated (by using medical ozonator Medozone, N. Novgorod, Russia) 0.9% sodium chloride solution with the concentration of ozone-oxygen mixture 20 µg per 1 kg of the patient's weight, the local management of a purulent wound with ozonated distilled water (in the first phase of the wound process the ozone concentration in the ozone-oxygen gas mixture was 4000 µg/l, in the 2nd phase it was 1000 µg/l), and a comparison group of 37 patients in whose complex treatment no medical ozone was used. The complex treatment including ozone therapy promoted the positive dynamics of clinical implications, the normalization of indices in wound healing course, the change of cytogram types from degenerative-inflammatory to regenerative one within time determined by biological regularities of wound process. It resulted in the reduction of time to arrest the suppurative inflammation by 3.4±0.45 days as compared to conventional methods of treatment.

Key words: purulent and inflammatory diseases of maxillofacial region, ozone therapy, middle-aged patients.

Clinical aspects of ozone therapy

POSSIBILITIES OF OZONE THERAPY AT OPERATIVE TREATMENT IN MAXILLOFACIAL SURGERY

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The purpose of the study was to evaluate the efficacy of the combined use of ozone therapy and millimeter wave therapy in maxillary surgery in case of infection. This paper is based on the analysis of the results of examination and surgical treatment of 110 patients. The first group consisted of 30 patients with chronic inflammatory-destructive maxillary processes (chronic granulating and granulomatous periodontitis and gnathic cysts) in acute stages with roentgen destruction foci involving not more than 2 teeth. The patients were subjected to single-stage granule surgery or cystectomy. The second group was of 40 patients with periapical inflammatory-destructive maxillary processes in chronic stage, to which the tooth removal was followed by the immediate implantation into alveolar socket but with no direct load. The third group was represented by 40 patients with chronic maxillary sinusitis (diagnose was made on CT findings and ENT-doctor's impressions). We elaborated a method for prevention of post-operative complications after bone tissue surgery in the mouth cavity (Patent № 2476245 of 27.02.2013 was obtained). The performed study proved the high efficiency of applying the elaborated method for the combined use of ozone therapy and millimeter wave therapy in maxillary surgery in case of infection to be further confirmed by clinical-laboratory findings and X-ray examination data and reported in afterhistory.

Key words: maxillary surgery, ozone therapy, millimeter wave therapy

Clinical aspects of ozone therapy

EXPERIENCE OF OZONE THERAPY IN COMPLEX TREATMENT OF SOFT TISSUES INFECTION DISEASES

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The purpose of the study was to improve the results of treatment of patients with surgical infection of soft tissues (SIST) by using ozone therapy (OT) in the set of curative measures. The study was based on data of testing 310 male patients aged 19.6 ± 1.7 with SIST treated in the surgical infection unit of FSE 354 District Military Clinical Hospital of the RF MD. The efficiency of the OT usage in the combination SIST therapy was studied based on the study of clinical and laboratory data of system inflammatory response (SIR), microcirculation, wound change dynamics. In local OT the ozone-oxygen mixture was fed to a chamber by the flow-through method continually within 20 min at the rate of 1 l per min with concentration of 5 mg/l. The system OT included the infusion of 200 ml of ozonated saline solution with the ozone concentration 0.7 ± 0.063 mg/l. A course consisted of 4 infusions once a day. It was established that the use of OT in the set of curative measures in case of SIST interrupts the progression of system inflammatory response.

Key words: surgical infection of soft tissues, systemic and local ozone therapy.

Clinical aspects of ozone therapy

THE PROSPECTS OF THE PRACTICAL USE OF OZONE IN PATIENTS WITH THE SYNDROME OF PROLONGED COMPRESSION

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The wound process dynamics were studied in different groups of patients: the main group, the ozone therapy group and the control group. For the purpose of additional blocking of toxemia and acidosis sources it was suggested to infiltrate an extremity with 200-300 ml of the ozone-oxygen mixture with the ozone concentration of 0.8-1.0 mg/l. At a distance from garrot by two injections an anterior or posterior fascial compartment of lower or upper extremity were filled with ozone. Temporary exposure till garrot removal creates the maximum ozone accumulation and prolongation of its action in affected segments of extremities. In case of non-applied garrot ozone is to be injected into soft tissues layer-by-layer, from several points throughout all over the extremity. Skin with hypoderm, subgaleal sheaths are soaked and saturated with ozone up to the bone. The proposed surgical manipulation as a local ozone therapy method is a boxy ozone block in itself. The infusion of 200 ml of ozonated saline solution with the ozone concentration 0.8 ± 1.0 mg/l is recommended into a venous bed, which should further the elimination of acidosis by urine "alkalization" along with 200 ml of 4% sodium carbonate.

Key words: ozone therapy, syndrome of prolonged conversion, leukocytic infiltration index, acidosis.

Clinical aspects of ozone therapy

THE EXPERIENCE OF APPLICATION OF ULTRASONIC CAVITATION IN THE TREATMENT OF PATIENTS WITH CHRONIC OSTEOMYELITIS

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The problem of the treatment of patients with chronic osteomyelitis remains relevant. Modern view of the pathogenesis of this inflammatory process is long confirms the need for integrated surgical treatment of this group of patients. Another important component is treatment of the focus of osteomyelitis with ultrasonic cavitator using a solution with high antibiotic. The research aimed to study the effectiveness of osteomyelitic cavity sanitation with ultrasonic cavitator as phases of the operation of surgical treatment of purulent focus. Qualitative and quantitative bacteriological analysis of wound perform as a control.

Key words: chronic osteomyelitis, ultrasonic cavitation.

Clinical aspects of ozone therapy

OZONE THERAPY IN SURGICAL TREATMENT OF PURULENT-NECROTIC COMPLICATIONS IN PATIENTS WITH INFECTED PANCREATIC NECROSIS

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The diagnostics and treatment of severe destructive forms of pancreatitis, which occupies the 3rd place (12%) among acute abdominal cavity diseases, remains one of the most actual problems of emergency abdominal surgery. Even the multicomponent therapy does not allow to stop the occurrence and development of pancreatic necrosis. Treatment of such patients is long term and expensive.

The object of research: to optimize the course of wound process on the basis of surgical sanitation of purulent-necrotic foci in total IPN.

We have the experience in triple lumen aspiration drainage with the help of ozonized physiological solution in treatment of purulent-necrotic complications of IPN in 22 patients. The patients under research were: 16 male and 6 female ranging 24-78 years.

The most severe complications in the form of parapancreatic phlegmons, left retroperitoneal space phlegmons were diagnosed in 7 patients. Pancreatogenic purulent cholangitis developed in 4 cases. Right necrotic mesoparacolic abscess formation in mesentery of large intestine ascending part and large intestine liver angle region in combination with large intestine wall necrosis and formation of large intestine fistulas was diagnosed in 3 patients.

We consider the following points as the key tasks in surgical treatment of purulent complications of acute pancreatitis:

the maximum effective removal of wound discharge out of parapancreatic and retroperitoneal spaces as the most possible ways of purulent complication development;

decontamination of the wound surface;

radical extraction of necrotized tissues;

maintenance of wet wound environment;

creation of conditions for maximum concentration of antiseptic in the focus of inflammation.

To realize the set tasks the patients were provided with the drainage system consisting of triple lumen polychlorine vinyl siliconized tubes of different diameters in parapancreatic and retroperitoneal spaces. Perfusion and aspiration (on the base of ЭЛЕМА-Н ППО I aspirator) was used starting from the moment of initial operative treatment as well as during progression of purulent-necrotic complications (in the period of up to 26 days from the date of admission to hospital). The average preoperative period in the group was 2,5 bed-day. Initial surgical treatment was performed in the following volume: laparotomy, omentobursotomy, pancreas mobilization, left lumbotomy, right lumbotomy, cholecystotomy, hemicolectomy.

Drainage by means of fresh ozonized physiological solution at 7 mg/l concentration got on the basis of ozone-oxygen mixture barbotaging started in the initial postoperative period. The change of triple lumen drainages together with omentobursostoma ozone sanitation was carried out in every 3-5 days without of anesthesia application (in average 5-7 times per course of treatment). The average term of hospitalization was $65 \pm 4,5$ days. The need for wound dressing with anesthesia application was reduced to minimum.

Application of the active drainage method promote the significant reduction of intertissue inflammatory edema and residual purulent cavities as well as development of system inflammatory reaction.

General and local complications specific to drainage methods were not observed. There were not the lethal outcomes in the patient group under research. These facts allow to speak carefully of lethality reduction.

The obtained results make it possible to conclude that the method of flow – aspiration tripple lumen drainage of parapancreatic and retroperitoneal spaces, as the main ways of possible development of purulent complications in IPN, by means of ozonized physiological solution at 5-7 mg/l concentration provide:

creation of conditions for radical extraction of necrotized tissues;

effective removal of wound discharge;

wound decontamination.

Key words: infected pancreonecrosis, ozone therapy, purulent focus sanitation

Clinical aspects of ozone therapy

CHRONIC INFLAMMATORY PROCESSES AND THE LOW-DOSE OZONE CONCEPT BASED ON THE INTERNATIONAL GUIDELINES OF MEDICAL OZONE: SIGNAL TRANSDUCTION AND BIOREGULATION THROUGH “OZONE PEROXIDES“ AS SECOND MESSENGER MOLECULES.

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Inflammatory processes as the classical indications for systemically administered medical ozone have one general phenomenon in common: oxidative dys-stress, mostly chronic oxidative dys-stress (chronic vascular inflammation, diabetes, pain syndrome, rheumoid arthritis, age related diseases, and - last but not least - cancer), initiated and maintained by an excess of oxygen radicals (superoxide radicals $\cdot O-O\cdot$, hydrogenperoxide H_2O_2 , $\cdot OH$ -radicals..).

As one of the consequences, the downregulated and/or insufficient cellular antioxidant system (superoxide dismutase (SOD), catalase (CAT) and others) supports chronic inflammations.

Ozone, being a strong oxidant itself, interrupts this vicious circle via formation of „ozone peroxides“, reduction by cysteine residues and/or glutathion (GSH), -bypassing SOD and CAT consumption- signal transduction and regulation through Nrf2 (antioxidants) and NFkB (immunoregulation). These seem to be the central mechanisms to understand pharmacological and therapeutical effects of ozone.

As a consequence pathological concentrations of stress-relevant parameters (H_2O_2 , MDA malone dialdehyde, TH total hydroperoxide...) decrease significantly following systemic ozone treatment (low-dose concept), cellular antioxidants are regulated as well as the cytokin production (such as IL-1, IL-6, TNF- α ...) in chronic inflammatory processes.

Key words: Inflammation, „ozone, peroxides“, oxygen radicals, oxidative stress, Nrf2, antioxidant regulation, NFkB, immunomodulation.

Clinical aspects of ozone therapy

THE EXPERIENCE OF APPLICATION OF THE COMPOSITION OF VEGETABLE OILS IN THE TREATMENT OF INFECTED WOUNDS COMBINED WITH URIC FISTULAS

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66 patients aged between 50 and 81 with infected wounds attended with urinary fistulas were studied. The main group of 35 patients was treated with ozone therapy. The comparison group of 31 patients was treated under conventional scheme with the use of ointment Levomecol. An ozonated composition of vegetable oils was applied in the main group. The said composition was ozonated by splashing of 100 mL of the composition with the ozone-oxygen mixture of the ozone concentration of 40 mg/L within 30 min on portable ozonator A-s-GOKS-505-OZON (Lepse JSC, Kirov, Russia). The bandaging for patients with application of such ozonated composition to infected wound surface was performed once a day. The wound process dynamics were assessed with the aid of clinical, bacteriological and morphometric methods of research. It was shown that the inclusion of oleozone therapy in the set of curative measures for treatment of infected wounds attended with external urinary fistulas enabled to accelerate the relief of local signs of infection-inflammatory process, had a good effect on the terms and rates of wound cleansing and healing, thus, reducing time of inpatient treatment and costs thereof.

Key words: oleozones, infected wound, urologic pathology.

Technical aspects of ozone therapy

OZONATOR FOR DRINKING WATER DECONTAMINATION

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The urgency and current state of the drinking water decontamination problem are disclosed as well as the technical justification of its ozone treatment for this goal attainment. A new ozonator for the water decontamination are described with its design and technical parameters. Its distinctions and advantages are given as compared to available analogs.

Key words: water decontamination, drinking water, ozone treatment.

Technical aspects of ozone therapy

NEW-GENERATION OF OZONATORS AND LOCAL WATER TREATMENT PLANTS BASED THEREON

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At FSUE RFNC-RRIEP an ozonator was designed with the ozone generation capacity 9 g/h and a local water treatment plant based thereon with the water treatment capacity 5 m³/h. Such ozonator may be used, if necessary, in the set of an ozone plant of modular construction with the ozone generation capacity 90 g/h, which is quite enough to treat 70 m³/h of water. The plant provides for water ozone treatment in compliance with state standard and sanitary norm requirements regulating the quality of drinking water and return water in swimming pools. A wide range of ozone concentrations in water obtained at such designed plant (from 0.47 mg/L to 3.35 mg/L) enables to use it not only in systems for drinking-water and swimming-pool water treatment but also at contamination and disinfection plants, which require large concentrations of dissolved ozone.

Key words: decontamination, water treatment, ozonation.

Technical aspects of ozone therapy

OZONIZATION DEVICE FOR DISINFECTION AND DEODORIZATION OF MEDICAL ROOMS

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An ozonization device was designed at the Vyatka State University for the generation of ozone-air mixture from air with specified ozone concentration (Ozone gun). The said device is a portable electrical apparatus comprising a high-frequency high-voltage power supply source and an electric-discharge reactor (ozonator) wherethrough ambient air is blown off with the aid of a fan. The distinguishing peculiarity of the developed ozonization device is the application of special-form electrodes made under RF Patent № 2326812 of November 24, 2006. The possibility for the generation of different ozone concentrations in ozone-air mixture at the device output enables to perform for influenza and ARVI prevention the express-disinfection and express-sterilization of ambient air in microbiological laboratory premises, in crowded rooms (at schools, universities, in sports halls, libraries, hotels, station buildings) as well as in premises of food industry, firms and poultry factories in agriculture etc.

Key words: ozone, disinfection, deodorization, ozone gun.

Technical aspects of ozone therapy

OPTIMIZATION OF TECHNOLOGIES FOR BONE IMPLANTS STERILIZATION AND PRESERVATION

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As the most frequently used methods of bone implant preservation in current practice there may be considered autoclaving (or high-temperature autoclave sterilization), sterilization by using special solutions, cryosterilization, gas (mainly by using ethylene oxide) and radiation (gamma-quanta and fast electrons) sterilization. The use of unique sterilizing properties of ozone-oxygen mixtures in appropriate concentrations and regimes should become an effective alternative to the above technologies. They are the ones that may ensure the adequate neutralization of pathogenic flora with the preservation of high osteoinductive capability of bone implants.

Key words: sterilization, preservation, bone implants, ozonation.

Technical aspects of ozone therapy

PRACTICAL ASPECTS OF OZONE THERAPY SUPPORT

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There are described devices for the local application of foam-producing oxygenated mixtures through a flexible catheter to an affected area of gastrointestinal tract (GIT), an upgraded device to supply oxygen to ozone therapy apparatuses at treatment and prevention institutions, physiotherapeutic pneumovacuum pulse device containing a source of pulse - periodic air pressure made as a membrane vacuum pump-compressor suggested by specialists of the Saratov State Medical University, the 5th City Clinical Hospital of Saratov city and the Public Health Committee of the Saratov City Administration.

Key words: ozone therapy, technical support.

Technical aspects of ozone therapy

NEW METHOD OF EXTRACORPORAL PROCESSING OF BLOOD LARGE VOLUME BY OZONE-OXYGEN MIXTURE (EBOO RU)

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The safe and low cost technique of extracorporeal blood processing large amounts of ozone-oxygen mixture was developed. Feature of the method is the use of a rotating glass rotary-film contactor. All parts of contactor are made only from the ozone resistant materials - glass and polypropylene. Contactor can be used to regulate the area of interaction between blood and ozone-oxygen mixture in the range 0.2-2 square meters per minute. The test method on human volunteers showed that the processing of large amounts of blood (6.7 liters) while maintaining the concentration of ozone-oxygen mixture in the range of 1 mg / l is not accompanied by an increase of the intensity of peroxide body processes.

Key words: extracorporeal blood processing, device.

Technical aspects of ozone therapy

USE OF BIOCHEMILUMINOMETER BHL-07 IN ESTIMATION OF OZONE THERAPY EFFECT

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15 patients with hypercholesteremia were examined and assigned a course of ozone therapy consisting of 8 infusions of 200 mL ozonated saline solution with concentration 200 µg/L. Their urine was analyzed before the first procedure and at the end of the course by using biochemiluminometer БХЛ. It has been established that ozone therapy is high-effective means for LPO-AOA normalization in patients with hypercholesteremia due to antioxidant activity enhancement.

Key words: hypercholesteremia, ozone therapy, urine, lipin peroxidation, antioxidant activity.

Reactive nitrogen species in biology and medicine

PLASMOCHEMICAL DEVICE FOR NO-THERAPY

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At Federal State Unitary Enterprise Russian Federal Nuclear Center – All-Russian Research Institute of Experimental Physics (FSUE RFNC-RRIEP) the technology was elaborated for nitrogen oxide generation in electrical discharge from ambient air directly at the place of carrying out therapy. A plazmochemical device was designed under this technology and its specifications were described. Peculiarities and advantages of that device were shown.

Key words: nitrogen oxide, generator, NO-therapy.

Reactive nitrogen species in biology and medicine

THE FIRST EXPERIENCE IN THE USE OF NITROGEN OXIDE AND OZONE IN COMPLEX TREATMENT OF WIDESPREAD PERITONITIS

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The purpose of this paper is to study the efficiency of the use of nitrogen oxide (NO) and ozone therapy methods in complex treatment of extensive purulent peritonitis. The treatment of 29 patients aged between 18 and 83 was studied. The main group of 12 patients was treated by intra-abdominal injection of gas air mixture containing nitrogen oxide and by ozone therapy methods. In treatment of the control group of 17 patients furaciline solution was used for intra-operation and post-operative abdominal sanitation. The treatment efficiency was assessed as per clinical characteristics of the disease, the neutralizing endogenous intoxication syndrome, time of organ dysfunction relief, the reducing bacterial contamination of peritoneal extraction and intestinal contents as well as according to Mannheim peritonitis index and the dynamics of organ failure assessments score indices. For intra-operation peritoneal sanitation in the main group up to 2000 ml of ozonated saline solution was used with the concentration of 6-8 mg O₃/l. Ozonated saline solution was produced by ozone therapeutic system YOTA-60-01 Medozone. For intra-operation peritoneal sanitation the gas air mixture containing nitrogen oxide (NO) was also used. Air-plasma flows were generated by air-plasma scalpel-coagulator-stimulator ККCBП/NO-01 Plazon. The introduction of the said physical and chemical methods to the set of curative measures in acute extended purulent peritonitis enabled to reduce the number of sanative relaparotomies by 1.8 times, postoperative purulent complications by 21.6% and lethality by 11.2%.

Key words: nitrogen oxide, plazon, purulent peritonitis, ozone therapy.

Reactive nitrogen species in biology and medicine

ESTIMATION OF DINITROSYL IRON COMPLEXES ACTION ON SOME PHYSICAL AND CHEMICAL BLOOD PARAMETERS IN VITRO

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The aim of this work is investigation of dinitrosyl iron complexes (DNIC) effect to some physical and chemical parameters of human whole blood in vitro. Water solution of DNIC (3 mM) was injected in blood samples (5 ml). DNIC were synthesised by method of A.F. Vanin et al. (2005). In blood samples we estimated pH, gases partial pressure, main ions concentration and parameters of acid-base balance. We fixed clear positive action of DNIC on blood pH and gases partial pressure (decreasing of carbon dioxide level with elevation of oxygen level).

Key words: dinitrosyl iron complexes, blood, pH, gases, acid-base balance.

Reactive nitrogen species in biology and medicine

NITRIC OXIDE AND GORDOX IN TREATMENT OF CONJUNCTIVA BURN ISCHEMIA (BIOCHEMICAL INVESTIGATIONS)

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The purpose of this paper was to determine the relationship between the NO-therapy effect on an eye and the change of proteinase-inhibition balance in tear in case of conjunctiva ischemia and its change under influence of the combined action of nitric oxide and Gordox used for treatment of eye burns. The third-degree alkali burn of a controlled area and depth was simulated in animals. After burn the eyes of animals from the 1st experimental group (of 4 rabbits) were subjected to NO-therapy with the concentration of 300 ppm, the exposure of 15 s, the 2nd experimental group (of 4 rabbits) was treated with Gordox (Gedeon Richter, Hungary) by ampule solution instillation (100 000 KIU in 10 ml) 4 times a day within 14 days. To determine the NO-therapy-Gordox relationship, in the 3rd experimental group (of 4 rabbits) the treatment was carried out simultaneously by the said two methods. In the 4th control group (of 4 rabbits) no treatment was carried out in the post-operation period. The 5th control group (of 3 rabbits) was intact to study a tear. As a source of NO-therapy Plazon, a medical air-plasma device, (Moscow) was used. In eluate the activity of trypsin-like serine proteinases, α_2 - macroglobulin proteinase inhibitor and total antitryptic activity was tested. The testing was performed by an enzyme method with using synthetic substrate N-benzoyl-DL-Arginin-p-nitroanilide (BAPNA). The protein concentration in tear fluid was determined by Lowry's method. Biochemical data obtained enable to draw a conclusion that the treatment of alkali burn of the eyes by using NO-therapy and Gordox is reasonable to perform as follows: within the first three days after injury NO-therapy should be used under well-proven scheme and further within 10-14 days the treatment with Gordox is to be carried out.

Key words: nitric oxide, NO-therapy, Gordox, burn ischemia of conjunctiva.

Reactive nitrogen species in biology and medicine

NITRIC OXIDE AND EMOXIPINE AT TREATMENT OF BURN'S ISHEMY OF CONJUNCTIVA (CLINICAL RESEARCHES).

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Purpose: to carry out comparative research of influence of Nitric oxide in gas flow (NO-GF) and emoxipine, and also their joint action on clinical displays and biochemical processes in a plaintive liquid at treatment of burn's ishemy of conjunctiva.

Methods: At 22 rabbits (44 eyes) simulated an alkaline burn III. The medical air-plasma device "Plason" was used as a source of a NO-containing gas flow (NO-GF). Biochemical research of a tear's liquid were performed.

Results: By comparison of the received results of antioxidizing activity of a plaintive liquid to the data of clinical researches, it is possible to speak about advantages of NO - treatment and combined treatment (NO + emoxipine).

Conclusion: simultaneous application of Nitric oxide in gas flow (NO-GF) with an exposition 15 seconds and emoxipine promotes faster reduction of an inflammation, reduction of edema, faster conjunctiva restoration in a zone of a burn and regional of limbal vessels, restoration of a transparency of a cornea and smaller vascularization.

Key words: nitric oxide, emoxipine, conjunctiva burn.