OZONIOTERAPIA EM ORTOPEDIA DE EQUINOS

Roberta Basile
Veterinary Academy

1

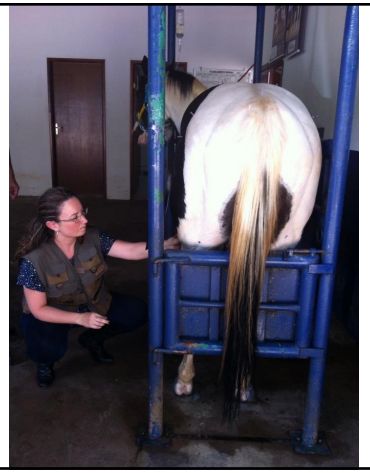
CONTEÚDO

2

01
Bases em Ozonioterapia

1. Breve histórico
2. Posicionamento da técnica no Mundo e no Brasil
3. Mecanismos de ação

3



2011

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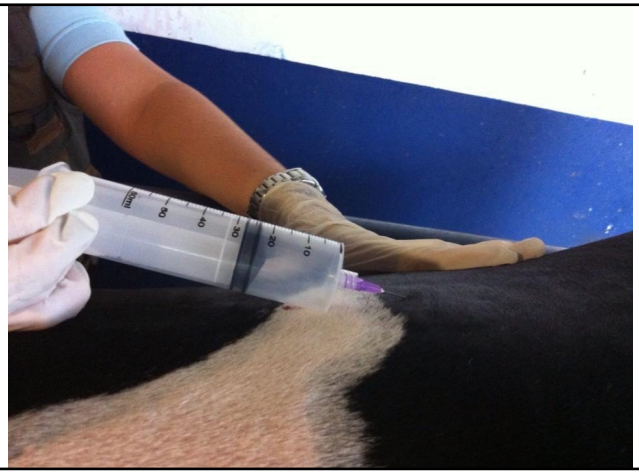

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Histórico

Descoberto em 1785

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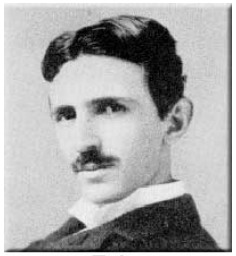
Nikola Tesla's Ozone Generator – 1896


Tesla

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the production of ozone or such gases as are
obtained by the action of high-tension elec-
trical discharges, although in the application
to such purposes of the apparatus heretofore
invented by me and designed for the produc-
tion of electric currents of high frequency and
potential I have made certain improvements
in such apparatus itself which are novel and
useful in other and more general applications
of the same. I have heretofore shown and de-
scribed, notably in Patents No. 462,418, dated
November 3, 1891, and No. 454,622, dated
June 23, 1891, an apparatus devised for the
purpose of converting and supplying elec-
trical energy in a form suited for the produc-
tion of certain novel electrical phenomena
which require currents of higher frequency
and potential than can readily or even possi-
bly be developed by generators of the ordi-
nary types or by such mechanical appliances
as were theretofore known. This apparatus
involved means for utilizing the intermittent
or oscillating discharge of the accumulated
electrical energy of a condenser or a circuit
possessing capacity in what may be desig-
nated
rents, such as the ordinary municipal incan-
descent-lighting circuits.
Let A B designate the terminals from any
given circuit of this character. In such cir-
cuit I connect up an electromagnetic motor
C in any of the usual ways. That is to say,
the coils of the field and armature may be in
series or derivation or wholly independent,
and either or both are connected up in the
circuit. In the present instance one termi-
nal, as B, is connected to one of the binding-
posts, from which the circuit is led through
one field-coil, D, the brushes and commutator
E, the other field-coil, F, and thence to a
brush G, which rests upon a circuit-controller
H, consisting in general of a conducting disk
or cylinder with insulating-sections in its pe-
riphery. The other terminal, as A, connects
with a second brush K, bearing on the con-
troller, so that the current which passes
through and operates the motor is period-
ically interrupted. For this reason the iron
cores of the motor should be laminated.
Around the controller is formed a circuit of
low self-induction, which includes a con-
denser L and the primary M of a transformer.
Tesla Ozone Company

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1a GUERRA MUNDIAL

10


OZÔNIO NO MUNDO
OZONE THERAPY MEDICAL SOCIETIES

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NO BRASIL
1975: Dr Heinz Konrad - SP

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OZONIOTERAPIA NO SUS

A Ozonioterapia foi reconhecida pelo Ministério da Saúde, por meio da Portaria n.702 de 21 de março de 2018, que alterou a Portaria de Consolidação n. 2/GM/MS de 28/09/17, para incluir novas práticas na Política Nacional de Práticas Integrativas e Complementares (PNPIC) do SUS.

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DIÁRIO OFICIAL DA UNIÃO
Publicado em: 23/10/2020
Edição: 204
Seção: 1 Página: 528
Órgão:
Entidades de Fiscalização do Exercício das Profissões Liberais/Conselho Federal de Medicina Veterinária

RESOLUÇÃO CFMV Nº 1.364, DE 22 DE OUTUBRO DE 2020

Define orientações para a ozonioterapia em animais.

O CONSELHO FEDERAL DE MEDICINA VETERINÁRIA (CFMV), no uso das atribuições que lhe confere a alínea 'f' do artigo 16 da Lei 5.517, de 23 de outubro de 1968; considerando competir ao CFMV orientar e disciplinar o exercício da medicina veterinária; considerando o disposto nas alíneas "a" e "c" do artigo 5º da Lei 5.517, de 23 de outubro de 1968; considerando o disposto considerando o disposto nas Resoluções CFMV nº 1138, de 25 de janeiro de 2016, nº 1236, de 26 de outubro de 2018 resolve:

Art. 1º A ozonioterapia em animais compreendida a indicação, a prescrição e a aplicação, é atividade clínica privativa do médico-veterinário e deve seguir as seguintes orientações:

I - contar com respaldo técnico que indique segurança e eficácia para o tratamento da doença ou agravo específico, na dose e via indicada, seja de forma isolada, adjuvante ou complementar;

II - o médico-veterinário é responsável pela utilização de equipamentos e materiais apropriados e devidamente registrados nos órgãos competentes.

III - ser autorizada expressamente pelo proprietário, responsável ou tutor do animal mediante Termo de Consentimento Livre e Esclarecido para o procedimento, conforme diretrizes contidas Resolução CFMV nº 1321, de 24 de abril de 2020, e outras que a complementem ou substituam.

Art. 2º Esta Resolução entra em vigor em 03 de novembro de 2020.

FRANCISCO CAVALCANTI DE ALMEIDA
Presidente do Conselho

HELIO BLUME
Secretário-Geral

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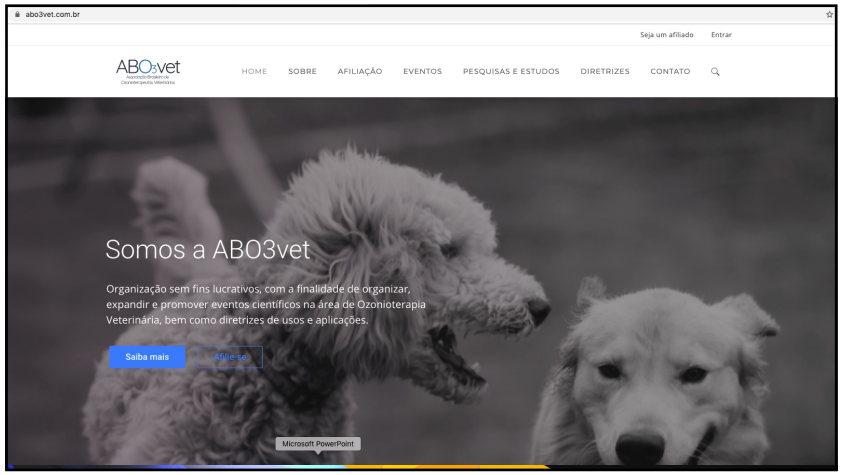
17



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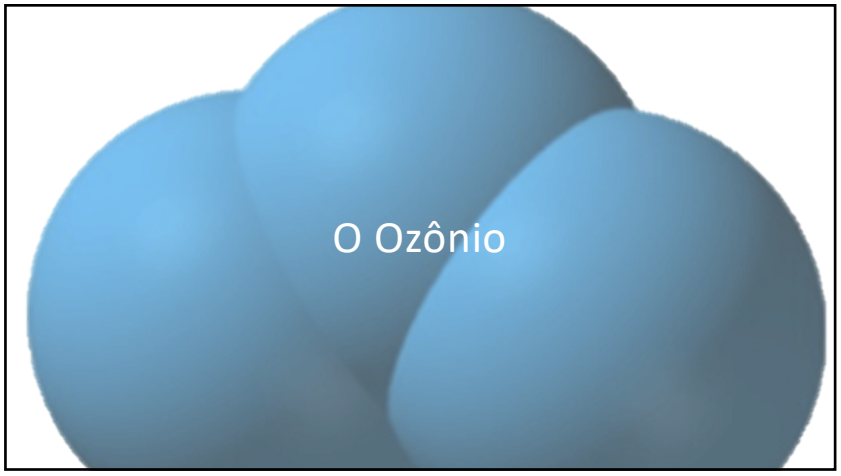

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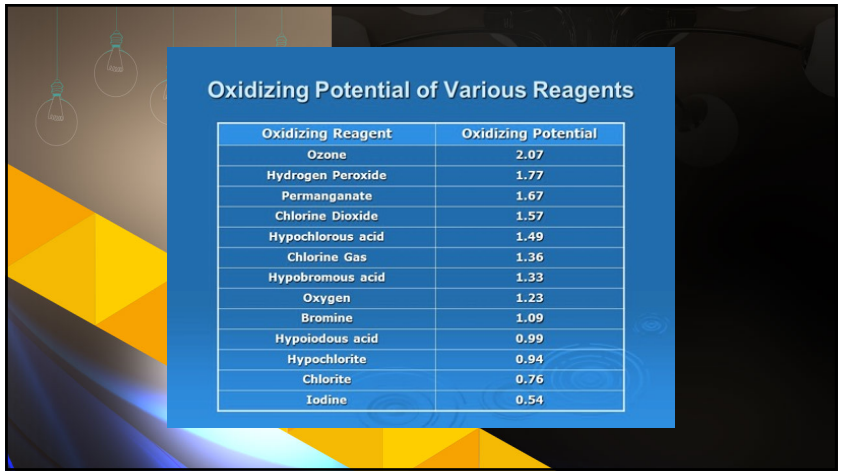

Oxidizing Reagent	Oxidizing Potential
Ozone	2.07
Hydrogen Peroxide	1.77
Permanganate	1.67
Chlorine Dioxide	1.57
Hypochlorous acid	1.49
Chlorine Gas	1.36
Hypobromous acid	1.33
Oxygen	1.23
Bromine	1.09
Hypoiodous acid	0.99
Hypochlorite	0.94
Chlorite	0.76
Iodine	0.54

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Ozonioterapia

Ozônio utilizado em Medicina

é uma

mistura de

oxigênio puro e ozônio puro.

0,05 % O_3 5 % O_3 (Vol.)

99,95 % O_2 95 % O_2

1 µg /ml O_3 100 µg/ml O_3

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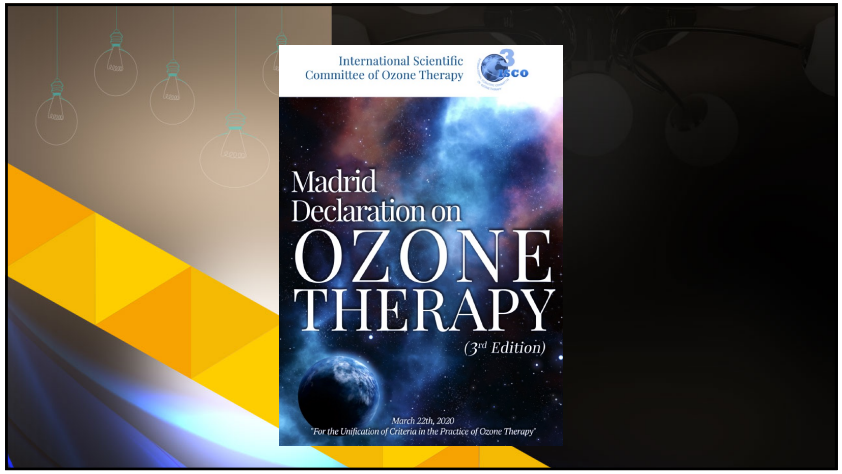

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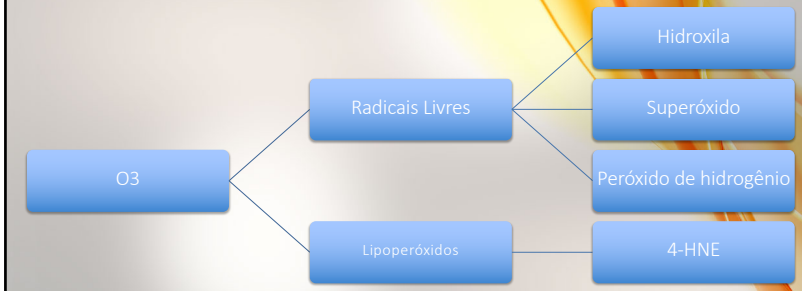
OZONIOTERAPIA



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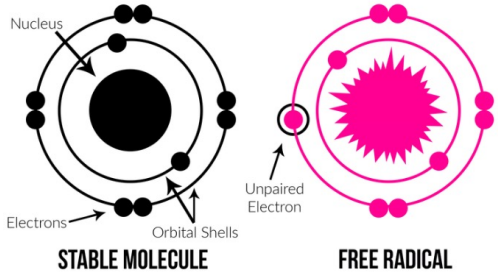
RADICAIS LIVRES



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ANTIOXIDANTES

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ESTRESSE OXIDATIVO

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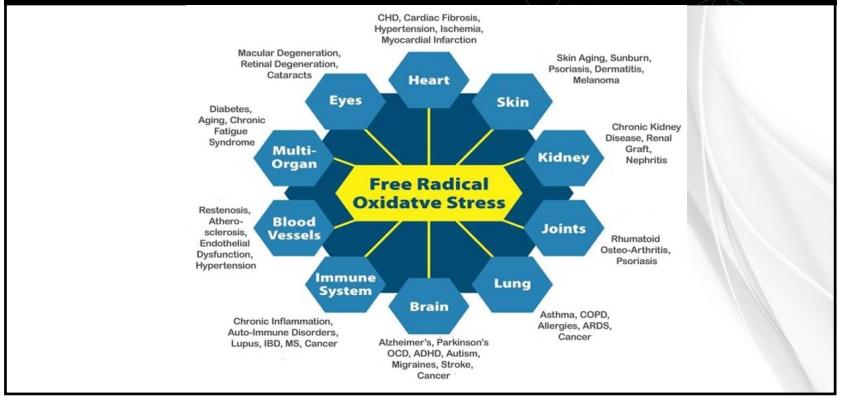
ESTRESSE OXIDATIVO



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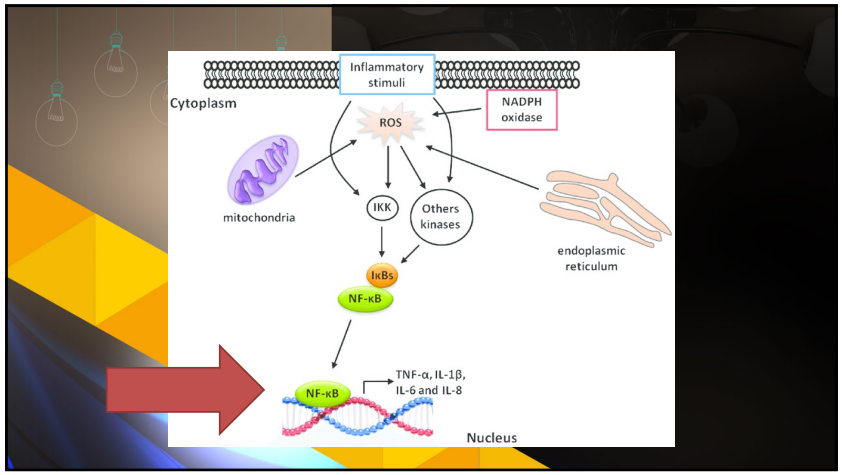

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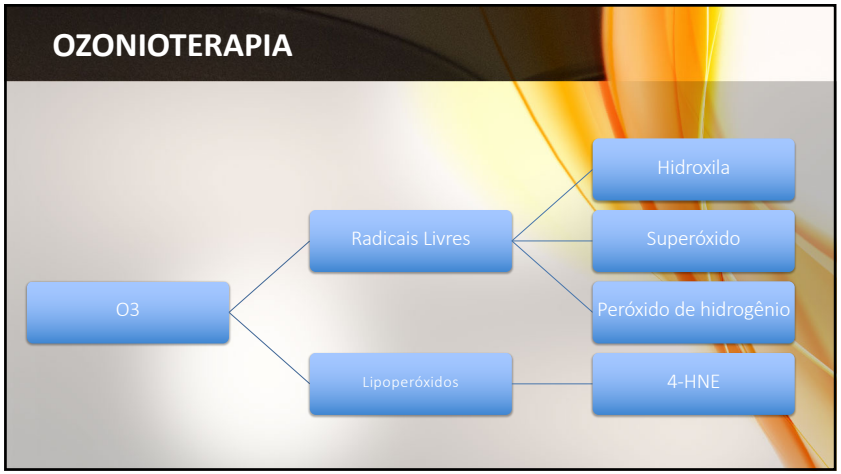
OZONIOTERAPIA



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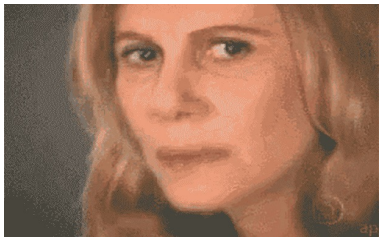
Pergunta:

Como tratar um paciente que está sob **estresse oxidativo** com uma **terapia oxidante**?????



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Avaliando o estresse oxidativo e Calculando a Dose!!!!!!!

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Ozonioterapia

Oxidação de membranas

Decomposição em segundos!

Radicais livres

Degranulação plaquetária

Diminuem o pH local

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Ozonioterapia

Oxidação de membranas

Decomposição em segundos!

Radicais livres

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Diminuem o pH local

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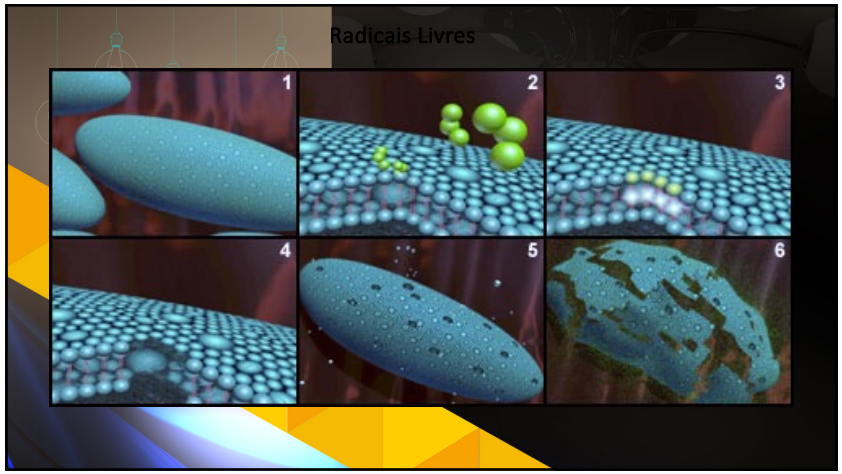

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Fontes *et al. BMC Infectious Diseases* 2012, **12**:358
http://www.biomedcentral.com/1471-2334/12/358

BMC Infectious Diseases

RESEARCH ARTICLE Open Access

Effect of low-dose gaseous ozone on pathogenic bacteria

Belchor Fontes[1], Ana Maria Cattani Heimbecker[2], Glacus de Souza Brito[3], Silvia F Costa[4], Inneke M van der Heijden[5], Anna S Levin[6*] and Samir Rasslan[7]

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Table 2 Bacterial *in vitro* growth, at 24 hours and 48 hours, of isolates submitted to an O_3/O_2 gaseous mixture (O_3 group), to 100% O_2 (O_2 group) and not submitted to gas treatment (Baseline group)

Bacterial strains	Culture duration	CFU / dish											
		O_3 Group				O_2 Group				Baseline Group			
		Plates (P)				Plates (P)				Plates (P)			
		P1	P2	P3	P4	P1	P2	P3	P4	P1	P2	P3	P4
1= *Escherichia coli* – ATCC:25922	24 h	0	0	0	0	83	68	59	73	58	66	65	76
	48 h	0	0	0	0	78	69	58	61	57	68	62	80
2= *Staphylococcus aureus* resistant to oxacillin –ATCC:29213	24 h	0	0	0	0	94	81	80	55	98	83	104	95
	48 h	0	0	0	0	88	74	85	49	75	89	104	90
3= *Staphylococcus aureus* susceptible to oxacillin – ATCC:25923	24 h	0	0	0	0	72	45	82	68	65	44	91	76
	48 h	0	0	0	0	70	47	75	69	66	39	94	73
4= *Enterococcus faecalis* resistant to vancomycin – ATCC: 51299	24 h	0	0	0	0	69	64	201	75	73	100	105	71
	48 h	0	0	0	0	79	78	207	82	68	97	106	57
5= ESBL producing *Klebsiella pneumoniae* susceptible only to carbapenems –clinical isolate from a patient.	24 h	0	0	0	0	65	75	153	71	87	113	117	80
	48 h	0	0	0	0	68	81	135	69	96	88	108	80
6= *Acinetobacter baumannii* resistant to carbapenem – clinical isolate from a patient.	24 h	0	0	0	0	226	205	201	162	158	165	159	206
	48 h	0	0	0	0	214	196	171	137	135	162	130	185
7= *Acinetobacter baumannii* susceptible only to carbapenem – ATCC:19606	24 h	0	0	0	0	70	60	58	70	63	65	63	67
	48 h	0	0	0	0	69	61	52	63	65	69	62	64
8= *Pseudomonas aeruginosa* susceptible to imipenem and meropenem-ATCC:27853	24 h	0	0	0	0	155	68	138	94	82	85	88	65
	48 h	0	0	0	0	110	79	97	94	83	72	66	69

ESBL: Extended-spectrum beta-lactamase; CFU: Colony-forming units; each experiment was repeated 4 times (Plates: P1 to P4).

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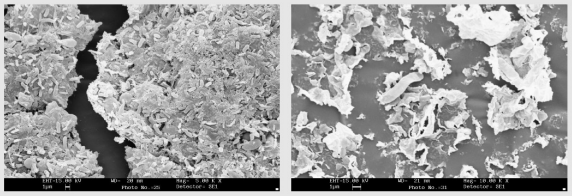
Remoção de Biofilme com Ozônio



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Aplicabilidade

Infecções tópicas ou cavitárias

Requer contato direto do gás com o patógeno

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Ozonioterapia

Oxidação de membranas

Decomposição em segundos!

Radicais livres

Degranulação plaquetária

Diminuem o pH local

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Efeito dos RL´S

- Plaquetas
  - Degranulação de fatores de crescimento
  - Autacoides

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Research Paper

Mediators of Inflammation, 8, 205–209 (1999)

Studies on the biological effects of ozone: 10. Release of factors from ozonated human platelets

G. Valacchi and Velio Bocci[CA]

Institute of General Physiology, University of Siena, 53100 Siena Italy

[CA]Corresponding Author
Tel: (+39) 577 234217
Fax: (+39) 39 577 234219
Email: fisgen@unisi.it

In a previous work we have shown that heparin, in the presence of ozone (O_3), promotes a dose-dependent platelet aggregation, while after Ca^{2+} chelation with citrate, platelet aggregation is almost negligible. These results led us to think that aggregation may enhance the release of platelet components. We have here shown that indeed significantly higher amount of platelet-derived growth factor (PDGF), transforming growth factor β1 (TGF-β1) and interleukin-8(IL-8) are released in a dose-dependent manner after ozonation of heparinised platelet-rich plasma samples. These findings may explain the enhanced healing of torpid ulcers in patients with chronic limb ischemia treated with O_3 autohaemoterapy (O_3-AHT).

Key words: ozone, platelets, aggregation, growth factors, inteleukin-8

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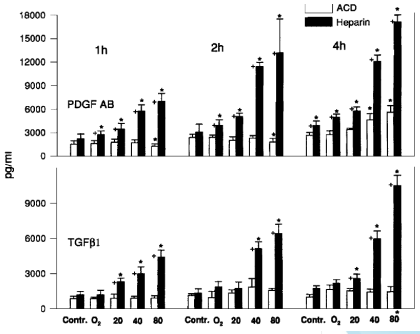
DEGRANULAÇÃO



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Ozonioterapia

Oxidação de membranas

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Radicais livres

Degranulação plaquetária

Diminuem o pH local

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J Biol Regul Homeost Agents. Jul-Sep 1998;12(3):67-75.

Studies on the biological effects of ozone: 7. Generation of reactive oxygen species (ROS) after exposure of human blood to ozone

V Bocci [1], G Valacchi, F Corradeschi, C Aldinucci, S Silvestri, E Paccagnini, R Gerli

Affiliations + expand

PMID: 9795834

pH=2.5

Abstract

The acceptance of any complementary medical approach is conditioned by the results obtained after the same scientific scrutiny applied in orthodox medicine. Otherwise any claim of efficacy remains in the realm of fiction. In the case of ozone therapy, the mechanisms of action have remained nebulous and in a series of publications we are trying to present the biochemical, immunological and morphological evidence in favour or against ozone therapy. We have now shown that ozone (O3) dissolved in the water of either plasma or serum or physiological saline generates reactive oxygen species (ROS), of which hydrogen peroxide (H2O2) can be unequivocally demonstrated by using specific methods for its detection. Lipids present in plasma preferentially those present in lipoproteins, undergo peroxidation that is somewhat O3-dose dependent and can be observed by the measurement of thiobarbituric acid reactive substances (TBARS). While the generation of H2O2 is crucial in activating both biochemical (hexose monophosphate shunt) and immunological (via the transcription factor NF-kB) mechanisms, the role of lipid oxidation products (LOP) remains to be investigated. We have shown here that there is a small but consistent induction of some cytokines (TNF-alpha, IFN-gamma and IL-2) when human blood is directly exposed to O3 concentrations up to 100 micrograms/ml per g of blood. On the other hand, isolated blood mononuclear cells (PBMC) in tissue culture medium are far more sensitive to the oxidant action of O3 as shown by a progressive reduction of the proliferation index with comparatively far lower O3, concentrations. On the whole, these results support the concept that much of the O3 toxicity is neutralized by the powerful antioxidant system of blood. The minimal hemolysis supports this idea but as far as platelets are concerned, we must mention that they tend to aggregate in heparinized blood, even when it is exposed to an O3 concentration of 40 micrograms/ml. In spite of the lack of side-effects after autohemotherapy, this drawback must be kept in mind and avoided in clinical practice.

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ATIVIDADE FAGOCÍTICA

Bulletin of Experimental Biology and Medicine, Vol. 146, No. 5, November, 2008 559

GENERAL PATHOLOGY AND PATHOPHYSIOLOGY

Modulation of Phagocytic Activity of Blood Polynuclear Leukocytes with Ozonized Physiological Saline

N. B. Volkhovskaya, S. B. Tkachenko, and A. A. Belopolsky

Translated from *Byulleten' Eksperimental'noi Biologii i Meditsiny*, Vol. 146, No. 11, pp. 492-494, November, 2008
Original article submitted June 24, 2008

We studied the effect of ozonized physiological saline on phagocytic properties of polymorphonuclear neutrophilic leukocytes from dog blood. Intravenous infusion of the examined doses of ozonized saline stimulated phagocytosis. Repeated intravenous infusion (48 h after) of the same dose was followed by a significant decrease in phagocytic capacity of polynuclears.

Key Words: *ozonized physiological saline; polymorphonuclear leukocytes; phagocytosis*

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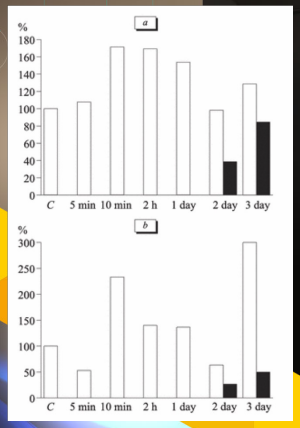

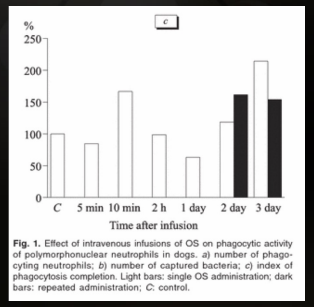

Fig. 1. Effect of intravenous infusions of OS on phagocytic activity of polymorphonuclear neutrophils in dogs. *a*) number of phagocyting neutrophils; *b*) number of captured bacteria; *c*) index of phagocytosis completion. Light bars: single OS administration; dark bars: repeated administration; *C*: control.

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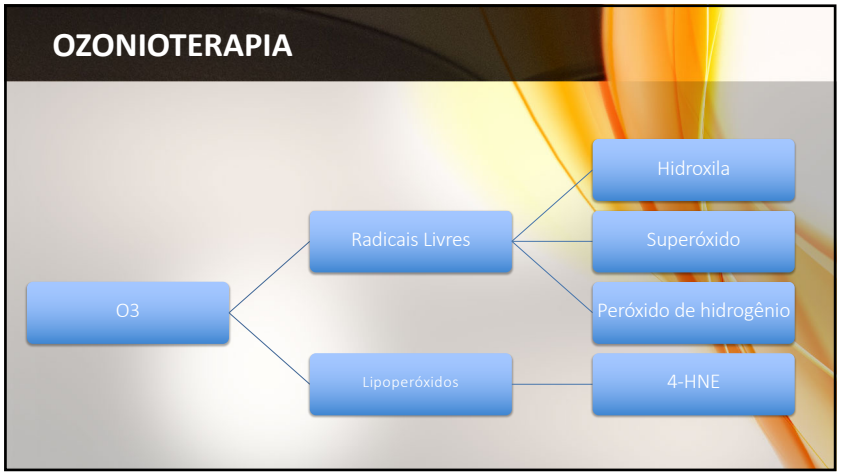
OZONIOTERAPIA



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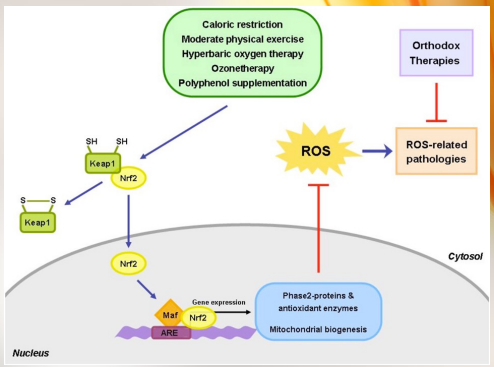
LIPOPERÓXIDOS



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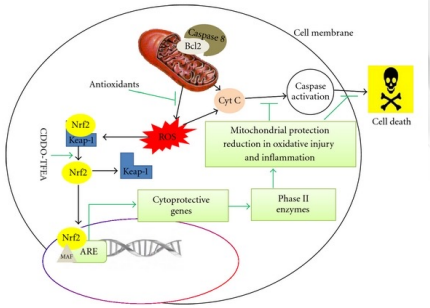
EXPRESSÃO DE NRF2



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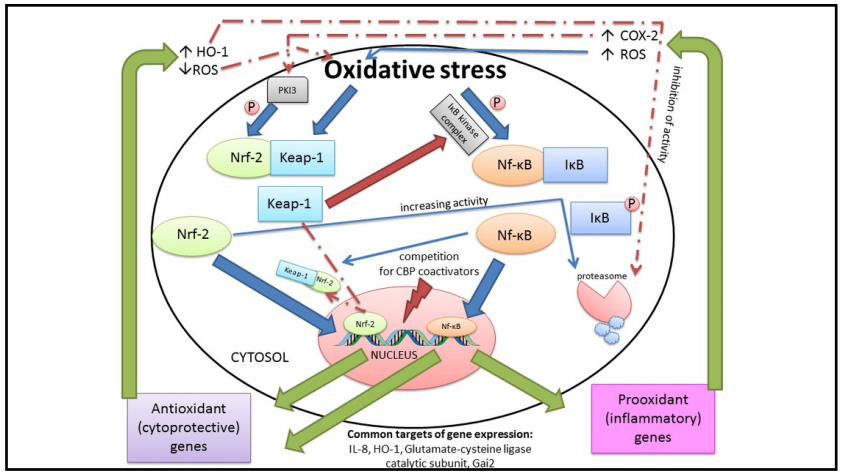

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European Journal of Pharmacology 742 (2014) 158–162

Contents lists available at ScienceDirect

European Journal of Pharmacology

journal homepage: www.elsevier.com/locate/ejphar

Molecular and cellular pharmacology

Is ozone pre-conditioning effect linked to Nrf2/EpRE activation pathway *in vivo*? A preliminary result

Lamberto Re [a,*], Gregorio Martínez-Sánchez [b], Marica Bordicchia [c], Giuseppe Malcangi [a], Antonella Pocognoli [c], Miguel Angel Morales-Segura [d], John Rothchild [e], Armando Rojas [f]

[a] Clinical Pharmacology & Toxicology Department, Medinat SAS, Via Fazioli 22, 60021 Camerano, Ancona, Italy
[b] Medical Center Beauty Benefit – San Biagio di Osimo, Via Mons. Oscar Romero, 31, 60027 Osimo, Ancona, Italy
[c] Department of Internal Medicine, University of Ancona, Politecnica delle Marche, 60131 Ancona, Italy
[d] Department of Pharmacology, Faculty of Medicine, University of Chile, Santiago de Chile, Chile
[e] Holistic Dentist Clinic, 175 Mercado Street, Suite 115, Durango, CO 81301, USA
[f] Biomedical Research Laboratories, Medicine Faculty, Catholic University of Maule, Talca, Chile

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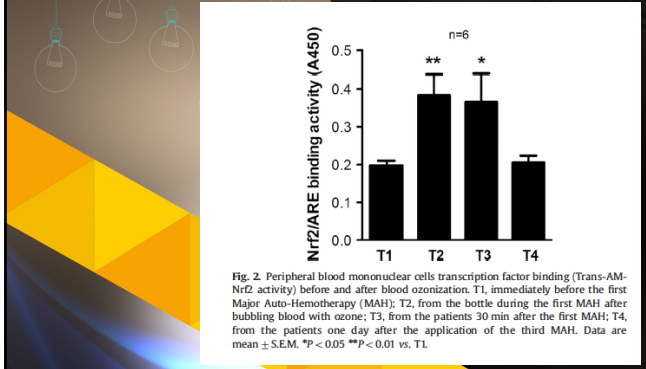

Fig. 2. Peripheral blood mononuclear cells transcription factor binding (Trans-AM-Nrf2 activity) before and after blood ozonization. T1, immediately before the first Major Auto-Hemotherapy (MAH); T2, from the bottle during the first MAH after bubbling blood with ozone; T3, from the patients 30 min after the first MAH; T4, from the patients one day after the application of the third MAH. Data are mean ± S.E.M. $^{*}P < 0.05$ $^{**}P < 0.01$ *vs.* T1.

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frontiers in Pharmacology

REVIEW
published: 11 January 2019
doi: 10.3389/fphar.2018.01536

Contribution of Nrf2 Modulation to the Mechanism of Action of Analgesic and Anti-inflammatory Drugs in Pre-clinical and Clinical Stages

OPEN ACCESS

Edited by:
Carmen Gomez-Guerrero, Universidad Autónoma de Madrid, Spain

Reviewed by:
Khalid El Bairi,

Larissa Staurengo-Ferrari[1], Stephanie Badaro-Garcia[1], Miriam S. N. Hohmann[1], Marilia F. Manchope[1], Tiago H. Zanirelli[1], Rubia Casagrande[2] and Waldiceu A. Verri Jr.[1]†

[1] Departamento de Patologia, Centro de Ciências Biológicas, Universidade Estadual de Londrina, Londrina, Brazil,
[2] Departamento de Ciências Farmacêuticas, Centro de Ciências da Saúde, Universidade Estadual de Londrina, Londrina, Brazil

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- Imunomodulador
- Cicatrizante
- Produção antioxidante
- Oxigenação tecidual
- Analgésico

56

http://dx.doi.org/10.1590/1678-4162-11155

Arq. Bras. Med. Vet. Zootec., v.72, n.1, p.56-64, 2020

Effects of transrectal medicinal ozone in horses – clinical and laboratory aspects

[*Efeitos do ozônio medicinal transretal em cavalos – aspectos clínicos e laboratoriais*]

F.M. *Jaramillo*[1], C.P. *Vendruscolo*[1], *J. Fülber*[1], S.R.T. *Seide1*[1], A.P. *Barbosa*[2], R.Y.A. *Baccarin*[3*]

[1]Aluno de pós-graduação - Faculdade de Medicina Veterinária e Zootecnia - Universidade de São Paulo, SP
[2]Aluno de graduação - Faculdade de Medidina Veterinária e Zootecnia – Universidade de São Paulo, SP
[3]Faculdade de Medidina Veterinária e Zootecnia - Universidade de São Paulo - São Paulo, SP

F.M. Jaramillo:
https://orcid.org/0000-0001-7550-1895
C.P. Vendruscolo:
https://orcid.org/0000-0001-8377-5116
J. Fülber:
https://orcid.org/0000-0001-8989-6779
S.R.T. Seidel:
https://orcid.org/0000-0002-0808-6887
A.P. Barbosa:
https://orcid.org/0000-0002-1163-9884
R.Y.A. Baccarin:
https://orcid.org/0000-0001-9730-0840

ABSTRACT

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HEMÁCIAS E PLAQUETAS

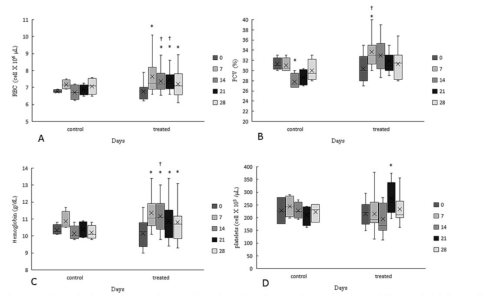

Figure 1. Quantitative data are given as box plots showing medians, means, and first and third quartiles for the O_3 treated and control groups. (A) Red Blood Cell Count (RBC) (cell x 10^6/µL); (B) Packet Cell Volume (PVC) (%); (C) Hemoglobin concentration (g/dL); (D) Platelet (cell x 10^3/µL). *Statistically significant differences compared to baseline values (P< 0.05). †Statistically significant differences compared to the control group (P< 0.05).

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IMUNOMODULAÇÃO

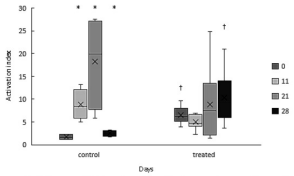

Figure 5. Neutrophil activation index values. Quantitative data are given as box plots showing medians, means, first and third quartiles for each experimental group. *Statistically significant differences compared to baseline values (P< 0.05). †Statistically significant differences compared to the control group.

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Arq. Bras. Med. Vet. Zootec., v.61, n.3, p.539-546, 2009

Comportamento de componentes bioquímicos do sangue em equinos submetidos à ozonioterapia

[*Profile of blood biochemistry components in horses treated with ozone therapy*]

M.A. *Haddad*[1], M.V. *Souza*[2*], J.J. *Hincapie*[3], J.I. *Ribeiro Junior*[2], J.D. *Ribeiro Filho*[2], L.A. *Benjamin*[2]

[1]Aluna de pós-graduação - UFV - Bolsista da CAPES
[2]Universidade Federal de Viçosa
Av. P.H. Rolfs, s/n
36570.000 – Viçosa, MG
[3]Departamento de Ciencia y Producción, Escuela Agrícola Panamericana, El Zamorano, Francisco Morazán – Honduras

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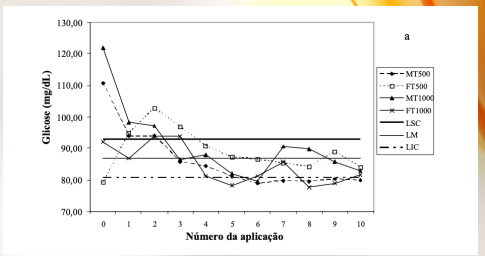
GLICEMIA



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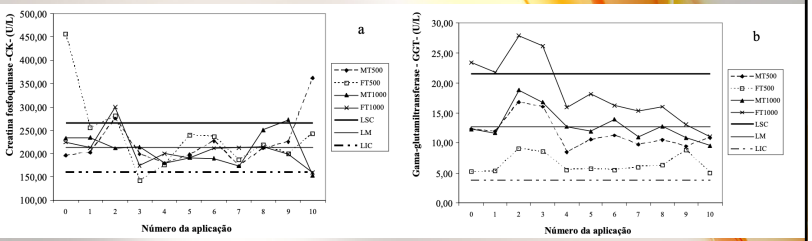
RINS E FÍGADO



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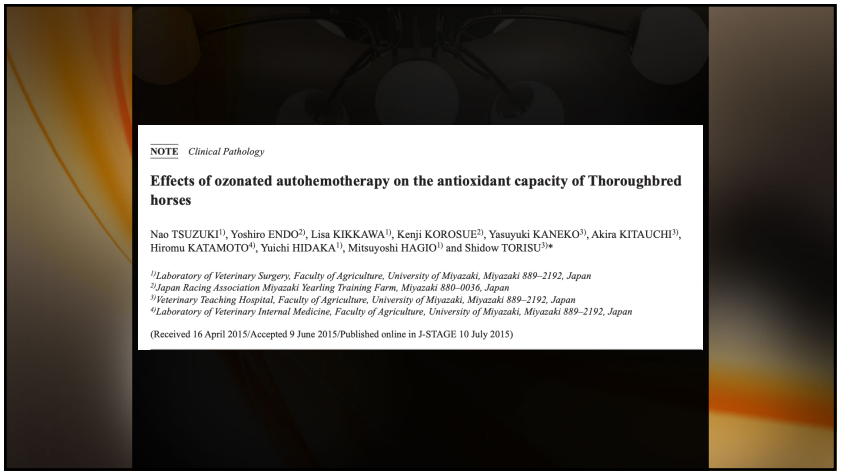

NOTE *Clinical Pathology*

Effects of ozonated autohemotherapy on the antioxidant capacity of Thoroughbred horses

Nao TSUZUKI[1)], Yoshiro ENDO[2)], Lisa KIKKAWA[1)], Kenji KOROSUE[2)], Yasuyuki KANEKO[3)], Akira KITAUCHI[3)], Hiromu KATAMOTO[4)], Yuichi HIDAKA[1)], Mitsuyoshi HAGIO[1)] and Shidow TORISU[3)]*

[1)]*Laboratory of Veterinary Surgery, Faculty of Agriculture, University of Miyazaki, Miyazaki 889–2192, Japan*
[2)]*Japan Racing Association Miyazaki Yearling Training Farm, Miyazaki 880–0036, Japan*
[3)]*Veterinary Teaching Hospital, Faculty of Agriculture, University of Miyazaki, Miyazaki 889–2192, Japan*
[4)]*Laboratory of Veterinary Internal Medicine, Faculty of Agriculture, University of Miyazaki, Miyazaki 889–2192, Japan*

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CAPACIDADE ANTIOXIDANTE

Table 2. d-ROMs values

		Pre	1 day	2 days	3 days	7 days	14 days
Control	Median	153	161	158.5	173	179	165.5
	Range	72–230	130–227	129–226	79–236	135–235	59–206
	Mean ± SD	153.3 ± 41.2	165.7 ± 26.7	160.8 ± 27.1	167.8 ± 45.6	181.2 ± 32.9	159.2 ± 42.6
OAHT	Median	149	146.5	151	152	145	137
	Range	126–187	123–185	115–184	125–203	120–206	120–232
	Mean ± SD	153.8 ± 20.7	151.7 ± 22.9	155.1 ± 24.4	157.4 ± 24.3	151.6 ± 25.8	149.8 ± 35.1

Unit: U.CARR.

Table 3. BAP values

		Pre	1 day	2 days	3 days	7 days	14 days
Control	Median	2,788	2,946.4	2,714.5	2,723.9	2,518.0	2,683.3
	Range	2,489.4–3,207.0	2,489.1–3,503.7	2,301.9–3,343.1	2,299.7–3,704.4	1,629.6–3,416.6	1,615.6–3,332.8
	Mean ± SD	2,797.0 ± 225.6	2,980.8 ± 399.2	2,758.4 ± 349.9	2,809.2 ± 394.4	2,518.3 ± 523.6	2,655.3 ± 438.3
OAHT	Median	2,735.0[a]	2,965.3[b]	3,029.6	3,272.4**[a,b]	3,097.7*	2,838.4[a]
	Range	2,663.3–3,053.1	1,949.3–3,184.2	2,663.3–3,659.2	2,911.4–4,540.5	2,502.2–3,926.9	2,648.2–3,113.8
	Mean ± SD	2,814.8 ± 141.0	2,772.7 ± 421.0	3,055.9 ± 289.0	3,437.7 ± 473.6	3,116.2 ± 450.8	2,849.7 ± 145.7

*Significant difference between the OAHT and control groups ($P<0.05$), **Significant difference between the OAHT and control groups ($P<0.01$), a) Values with the same letters are significantly different ($P<0.01$), b) Values with the same letters are significantly different ($P<0.05$), Unit: μmol/l.

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ESTRESSE OXIDATIVO

Table 4. OSI values

		Pre	1 day	2 days	3 days	7 days	14 days
Control	Median	5.4	5.3	5.6	6.0	7.8	6.3
	Range	2.6–8.2	4.7–7.2	4.8–8.6	2.6–9.7	5.2–11.2	2.3–8.8
	Mean ± SD	5.5 ± 1.5	5.6 ± 0.8	5.9 ± 1.1	6.2 ± 2.2	7.5 ± 2.1	6.1 ± 1.8
OAHT	Median	5.5	5.5	5.1	4.4 [a]	4.9 [b]	5.0
	Range	4.5–6.5	4.2–7.2	3.6–6.6	3.4–6.2	3.7–7.1	4.1–8.4
	Mean ± SD	5.5 ± 0.8	5.6 ± 1.0	5.1 ± 1.0	4.7 ± 0.9	4.9 ± 1.0	5.3 ± 1.3

a) Significant difference between the OAHT and control groups (P<0.05), b) Significant difference between the OAHT and control groups (P<0.01).

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Arq. Bras. Med. Vet. Zootec., v.56, n.4, p.433-437, 2004

Efeitos do ozônio nas lesões de reperfusão do jejuno em eqüinos

[*Effects of ozone in equine jejunum reperfusion injury*]

G.E.S. *Alves*[1], J.M.G. *Abreu*[2], J.D. *Ribeiro Filho*[3], L.A.L. *Muzzi*[4], H.P. *Oliveira*[1], R.J. *Tannus*[5], T. *Buchanan*[6]

[1]Escola de Veterinária – UFMG
Caixa Postal 567
30123-970 – Belo Horizonte, MG
[2]Universidade Estadual do Ceará – Fortaleza, CE
[3]Universidade Federal de Viçosa – Viçosa, MG
[4]Universidade Federal de Lavras – Lavras, MG
[5]Faculdade de Jaguariúna - SP
[6]Brazos Valley Equine Hospital Inc. - Texas (EUA)

RESUMO

Investigaram-se os efeitos do ozônio nas lesões de reperfusão intestinais de eqüinos. Induziu-se obstrução vascular (2h) seguida de reperfusão (12h) e os animais receberam os seguintes protocolos: não tratado (n=7, 500ml solução salina 0,9%) e tratado com ozônio (n=6, 50µgkg^{-1}). Amostras intestinais foram examinadas em 0, 1, 2h (obstrução) e 1, 2, 12h (reperfusão). Os seguintes escores histomorfológicos apresentaram-se significativamente atenuados: na região da mucosa - desprendimento epitelial, infiltrado de neutrófilos e hemorragia; na submucosa - infiltrado de neutrófilos e edema. Essas diferenças ocorreram na fase inicial da reperfusão, coincidindo com a geração de radicais livres derivados do oxigênio. Os efeitos conservadores observados podem estar associados à modulação de enzimas antioxidantes, ou à propriedades bioquímicas do ozônio, que interferiram com etapas bioquímicas da reperfusão, representando uma alternativa terapêutica para o tratamento de pacientes acometidos por abdome agudo.

Palavras-chave: eqüino, ozônio, reperfusão, jejuno

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INFLAMAÇÃO

Tabela 3. Escores medianos e médios de neutrófilos na mucosa nos grupos experimentais e segmentos intestinais

	SCONT										SOVEN										SOARV									
Tempo	**1OBS**		**2OBS**		**1REP**		**2REP**		**12REP**		**1OBS**		**2OBS**		**1REP**		**2REP**		**12REP**		**1OBS**		**2OBS**		**1REP**		**2REP**		**12REP**	
Grupo	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME
G-NTR	0	0	0	0	0	0	0	0	0	0	0,5	0,6	0,5	0,6	2,5	2,4	3,0	2,9	1,5	1,5	0	0,1	0,5	0,4	2,0	1,6	1,5	1,4	1,0	1,1
G-OZO	0	0	0	0	0	0	0	0	0	0	1,0	1,0	1,0	1,3	**1,0**	1,2	**1,0**	1,2	1,0	1,3	1,0	0,7	1,0	0,7	1,0	**0,7**	1,0	**0,8**	1,0	1,3

Números marcados em negrito representam diferença significativa (P<0,05); SCONT – segmento-controle; SOVEN - segmento submetido à obstrução venosa; SOARV- segmento submetido à obstrução artério-venosa. OBS - obstrução vascular; REP-reperfusão; MN - mediana; ME - média; G-NTR - grupo não tratado; G-OZO – grupo-ozônio.

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HEMORRAGIA

Tabela 2. Escores medianos e médios de hemorragia na mucosa nos grupos experimentais e segmentos intestinais

	SCONT										SOVEN										SOARV									
Tempo	**1OBS**		**2OBS**		**1REP**		**2REP**		**12REP**		**1OBS**		**2OBS**		**1REP**		**2REP**		**12REP**		**1OBS**		**2OBS**		**1REP**		**2REP**		**12REP**	
Grupo	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME	MN	ME
G-NTR	0	0	0	0	0	0	0	0	0	0	2,5	2,5	3,0	3,1	3,0	3,0	3,5	3,4	2,5	2,5	0	0	0	0	0,3	0	0,4	0	0,4	0	0,3
G-OZO	0	0	0	0	0	0	0	0	0	0,2	0,5	0,8	2,0	1,5	2,5	2,0	2,0	**1,8**	1,5	1,8	0,5	0,5	0	0,2	0	0,3	0	0,7	0	0,7

Números marcados em negrito representam diferença significativa (P<0,05); SCONT – segmento-controle; SOVEN - segmento submetido à obstrução venosa; SOARV- segmento submetido à obstrução artério-venosa. OBS - obstrução vascular; REP-reperfusão; MN - mediana; ME - média; G-NTR - grupo não tratado; G-OZO – grupo-ozônio.

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CONCLUSÃO

Concluiu-se que o O3 é eficaz na atenuação de lesão de reperfusão no jejuno de eqüinos submetidos à obstrução vascular. A proteção pode ter decorrido por efeitos hemorreológicos, hemodinâmicos sistêmicos ou modulatório sobre enzimas antioxidantes.

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GROWTH FACTORS
https://doi.org/10.1080/08977194.2019.1643339

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Effects of subcutaneous injection of ozone during wound healing in rats

Ciro D. Soares[a], Thayná M. L. Morais[a], Roberta M. F. G. Araújo[b], Patrícia F. Meyer[c], Eric A. F. Oliveira[c], Rodrigo M. V. Silva[d], Eneida M. Carreiro[e], Edvaldo P. Carreiro[e], Verônica G. Belloco[f], Bruno A. L. A. Mariz[a] and Jacks Jorge-Junior[a]

[a]Oral Pathology Section, Department of Oral Diagnosis, Piracicaba Dental School, University of Campinas (UNICAMP), Piracicaba, Brazil; [b]Medicine Department, Potiguar University, Natal, Brazil; [c]Physiotherapy Department, Potiguar University, Natal, Brazil; [d]Physiotherapy Department, Federal University of Rio Grande do Norte, Natal, Brazil; [e]Physiotherapy Department, University Center of Rio Grande do Norte, Natal, Brazil; [f]Physiotherapy Department, FisioKine Center, Buenos Aires, Argentina

ABSTRACT

Fibroblast growth factor 2 (FGF2) regulates the wound repair process and it is secreted by inflammatory and endothelial cells, and by myofibroblasts. This study aimed to establish the expression patterns of FGF2 and myofibroblastic differentiation during wound healing in rats treated with subcutaneous ozone injection. We created full-thickness excisional wounds in rats, and the healing process was analyzed through morphometric analyses and digital quantification of immunoreactivity of smooth muscle actin and FGF2. Ozone therapy-treated wounds presented granulation tissue with a reduced number of inflammatory cells and greater dermal cellularity, and intense collagen deposition. FGF2 immunoreactivity, microvessel density, and amount of myofibroblasts were significantly higher in treated wounds compared to controls. In conclusion, it was demonstrated that subcutaneous injections of ozone accelerate and ameliorate wound repairing process. Moreover, injectable ozone therapy's action mechanism may be associated with FGF2 overexpression.

ARTICLE HISTORY
Received 24 September 2018
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KEYWORDS
Wound healing; ozone; fibroblast growth factor 2; myofibroblasts

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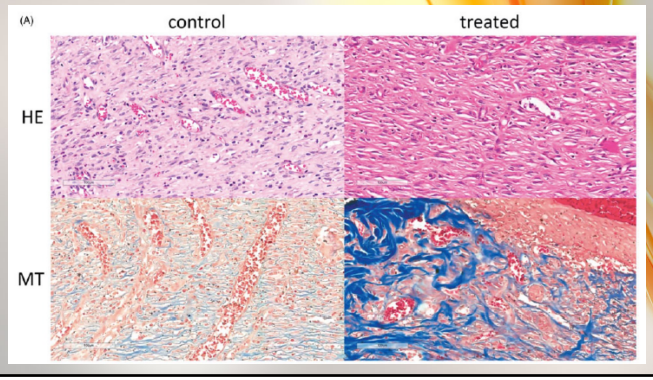
CICATRIZAÇÃO



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ELSEVIER

Neuroscience Letters
Volume 739, 20 November 2020, 135390

Research article

Ozone influences migration and proliferation of neural stem cells *in vitro*

Gerardo Tricarico [a], Jasmina Isakovic [b, c], Min Suk Song [d], Franco Rustichelli [e], Valter Travagli [f], Dinko Mitrecic [b, g]

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MIGRAÇÃO DE CÉLULAS TRONCO

Abstract

Ozone (O_3) is a short-lived molecule which can be produced in a controlled reaction when oxygen is exposed to electric discharge. In the last few decades, many publications dealing both with animals and humans reported beneficial effects of ozone administration linked to its immunomodulatory and protective role against cellular damage. This is the first work which brings insight into how ozone influences cells of neural lineage *in vitro* and hypothesizes the potential molecular and novel electromagnetic mechanisms behind its action. By using neural stem cells, we show that ozone, especially in concentrations of around 11 µg/mL, significantly increases the speed of neural cell migration. With much lower effects, it also increases cell proliferation and cytokine production. Results of this study, at least partly, explain the observed beneficial effects of ozone in diseases of the nervous system tested on animal models and in human clinical trials. Therefore, here described effects of ozone on cellular level represent a firm basis for further investigation of possible applications of ozone in regeneration of the nervous system.

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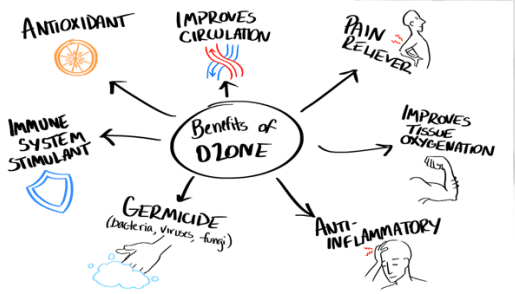
MECANISMOS DA OZONIOTERAPIA



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FÁRMACO MULTIMODAL

Dose
Concentração
Volume
Tempo
Duração
Frequência
Estresse oxidativo

75

ARS VETERINARIA, Jaboticabal, SP, v.38, n.4, 000-000, 2022. ISSN 2175-0106
DOI: http://dx.doi.org/10.15361/2175-0106.2022v38n4p00-00

OZONIOTERAPIA EM ANIMAIS DOMÉSTICOS: CONCEITOS BÁSICOS E DIRETRIZES

OZONE THERAPY IN DOMESTIC ANIMALS: BASIC CONCEPTS AND GUIDELINES

R. C. BASILE [1]*; R. Y. A. BACCARIN [2]

RESUMO

Ozonioterapia é uma técnica de tratamento de diversas doenças locais e sistêmicas por meio da administração de uma mistura oxigênio-ozônio. O gás pode ser aplicado diretamente no corpo do paciente ou ainda ser diluído em soro ou sangue, a chamada auto-hemoterapia ozonizada. Seus efeitos são mediados por mecanismos de oxidação direta ou indireta de células ou patógenos. Dentre os efeitos de oxidação direta, destaca-se a microporação na superfície de microorganismos incapazes de se protegerem por antioxidantes, resultando em destruição física de suas membranas e/ou paredes celulares, o conhecido efeito antisséptico ou desinfetante da ozonioterapia local, tópica ou cavitária. Ao entrar em contato com sangue ou outros fluidos biológicos, o gás ozônio imediatamente se combina com a água resultando em radicais livres e oxida lipideos, formando os lipoperóxidos. Os radicais livres e lipoperóxidos passam a ser os mediadores dos efeitos do ozônio em diversas células, como as hemácias, leucócitos, plaquetas, fibroblastos, entre outras. Como resultado, obtém-se os efeitos de melhora de perfusão e oxigenação tecidual, modulação da inflamação, analgesia, cicatrização e produção de antioxidantes enzimáticos. Porém, o planejamento terapêutico deve compreender a escolha das vias adequadas de tratamento, concentrações, doses de aplicações sistêmicas e frequência de aplicação para que os resultados sejam maximizados. Além disso, o profissional deve estar corretamente capacitado e conhecer todas as limitações e efeitos adversos possíveis da técnica.

PALAVRAS-CHAVE: Ozônio. Cães. Equinos. Ruminantes. Boas práticas.

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02
Indicações

1. Medicina interna
2. Ortopedia
3. Reprodução

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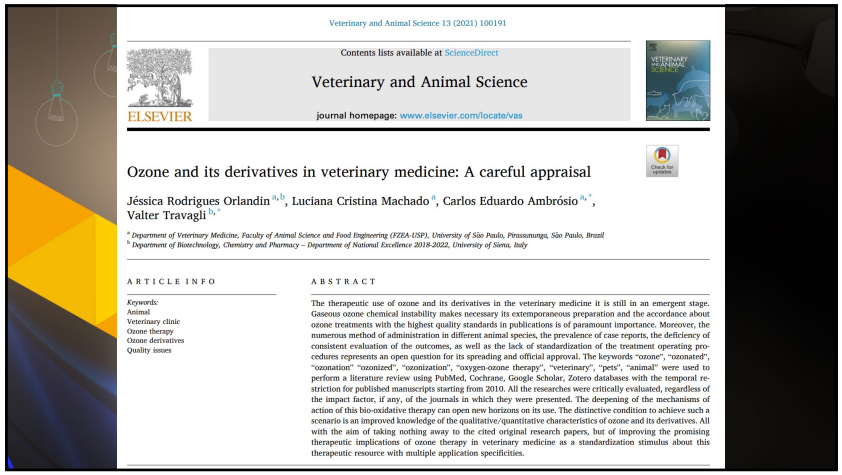

Veterinary and Animal Science 13 (2021) 100191

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Ozone and its derivatives in veterinary medicine: A careful appraisal

Jéssica Rodrigues Orlandin [a,b], Luciana Cristina Machado [a], Carlos Eduardo Ambrósio [a,*], Valter Travagli [b,*]

[a] Department of Veterinary Medicine, Faculty of Animal Science and Food Engineering (FZEA-USP), University of São Paulo, Pirassununga, São Paulo, Brazil
[b] Department of Biotechnology, Chemistry and Pharmacy – Department of National Excellence 2018-2022, University of Siena, Italy

ARTICLE INFO

Keywords:
Animal
Veterinary clinic
Ozone therapy
Ozone derivatives
Quality issues

ABSTRACT

The therapeutic use of ozone and its derivatives in the veterinary medicine it is still in an emergent stage. Gaseous ozone chemical instability makes necessary its extemporaneous preparation and the accordance about ozone treatments with the highest quality standards in publications is of paramount importance. Moreover, the numerous method of administration in different animal species, the prevalence of case reports, the deficiency of consistent evaluation of the outcomes, as well as the lack of standardization of the treatment operating procedures represents an open question for its spreading and official approval. The keywords "ozone", "ozonated", "ozonation" "ozonized", "ozonization", "oxygen-ozone therapy", "veterinary", "pets", "animal" were used to perform a literature review using PubMed, Cochrane, Google Scholar, Zotero databases with the temporal restriction for published manuscripts starting from 2010. All the researches were critically evaluated, regardless of the impact factor, if any, of the journals in which they were presented. The deepening of the mechanisms of action of this bio-oxidative therapy can open new horizons on its use. The distinctive condition to achieve such a scenario is an improved knowledge of the qualitative/quantitative characteristics of ozone and its derivatives. All with the aim of taking nothing away to the cited original research papers, but of improving the promising therapeutic implications of ozone therapy in veterinary medicine as a standardization stimulus about this therapeutic resource with multiple application specificities.

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MEDICINA INTERNA

ADJUVANTE NO TRATAMENTO DE:

- SÍNDROME CÓLICA
- HEMOPARASITAS
- DERMATOPATIAS
- HEPATOPATIAS E NEFROPATIAS
- NEUROPATIAS
- ABSCESSOS
- INFECÇÕES E INFLAMAÇÕES OCULARES
- INFEÇÕES E INFLAMAÇÕES ORAIS
- FERIDAS GRAVES

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ORTOPEDIA

ADJUVANTE NO TRATAMENTO DE:

- OSTEOARTRITES INFECCIOSAS E INFLAMATÓRIAS
- TENDINOPATIAS E DESMOPATIAS
- DOR E CLAUDICAÇÃO
- LAMINITE AGUDA E CRÔNICA
- LOMBALGIA E CERVICALGIA
- FISSURAS ÓSSEAS E FRATURAS MAL CONSOLIDADAS
- SÍNDROMES DE DEGENERAÇÃO ÓSSEA (NAVICULAR)

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REPRODUÇÃO

ADJUVANTE NO TRATAMENTO DE:

- METRITES
- VAGINITES
- MASTITES
- ACROPOSTITES
- FADIGA REPRODUTIVA

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03

Vias de aplicação

1. Aplicações sistêmicas
2. Aplicações locais
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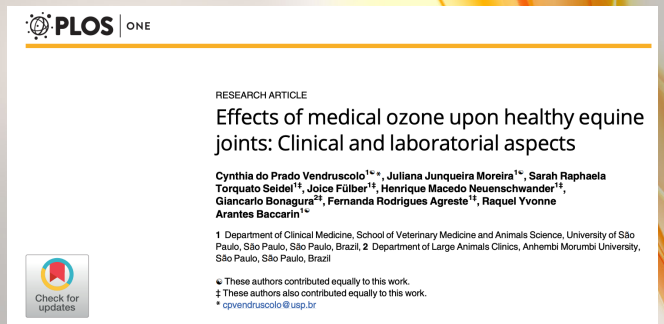

PLOS ONE

RESEARCH ARTICLE

Effects of medical ozone upon healthy equine joints: Clinical and laboratorial aspects

Cynthia do Prado Vendruscolo[1☯]*, Juliana Junqueira Moreira[1☯], Sarah Raphaela Torquato Seidel[1‡], Joice Fülber[1‡], Henrique Macedo Neuenschwander[1‡], Giancarlo Bonagura[2‡], Fernanda Rodrigues Agreste[1‡], Raquel Yvonne Arantes Baccarin[1☯]

1 Department of Clinical Medicine, School of Veterinary Medicine and Animals Science, University of São Paulo, São Paulo, São Paulo, Brazil, **2** Department of Large Animals Clinics, Anhembi Morumbi University, São Paulo, São Paulo, Brazil

☯ These authors contributed equally to this work.
‡ These authors also contributed equally to this work.
* cpvendruscolo@usp.br

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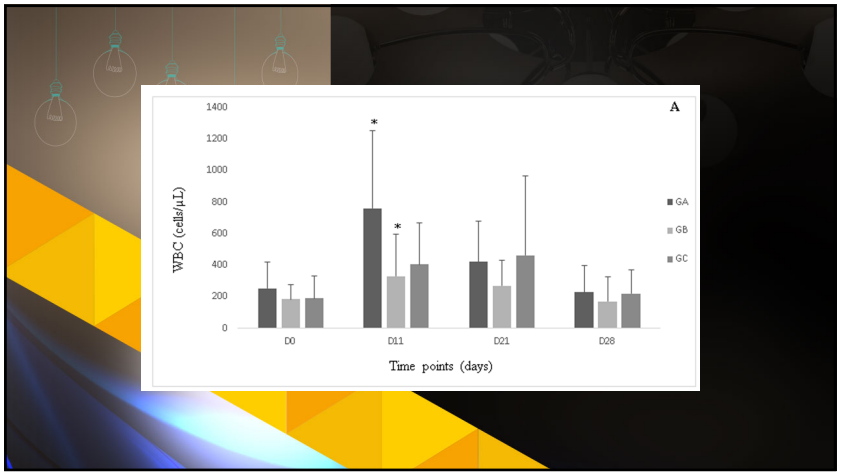
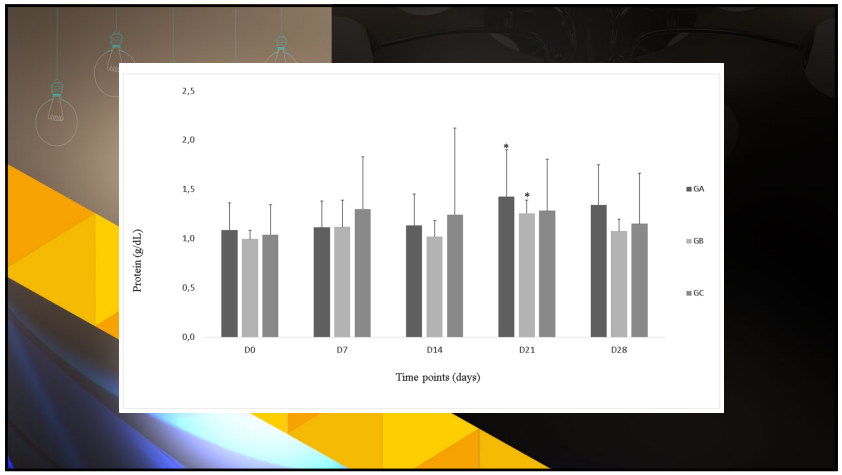
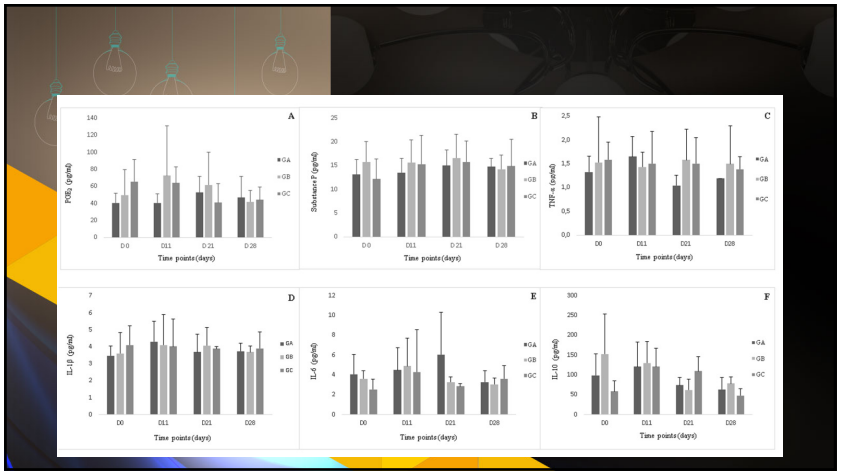

A
WBC (cells/μL)
1400
1200
1000
800
600
400
200
0
*
*
D0
D11
D21
D28
Time points (days)
GA
GB
GC

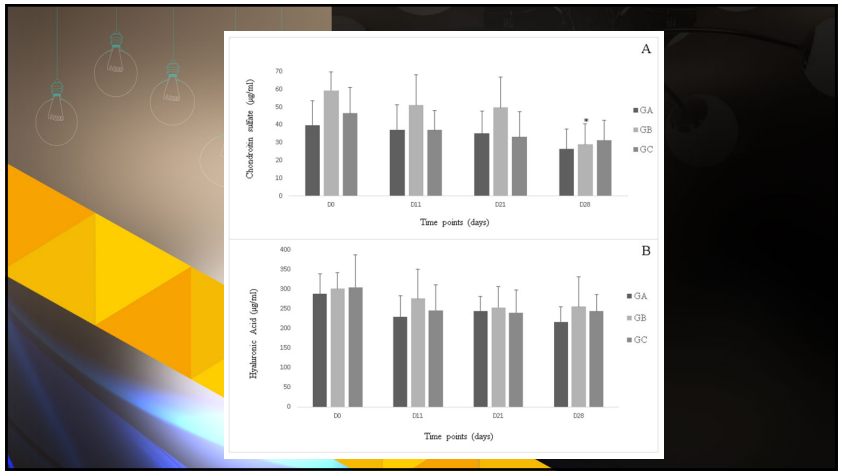
93


Protein (g/dL)
2,5
2,0
1,5
1,0
0,5
0,0
*
*
D0
D7
D14
D21
D28
Time points (days)
GA
GB
GC

94


A
B
C
D
E
F
Time points (days)
GA
GB
GC

95


A
Chondroitin sulfate (μg/mL)
Time points (days)
B
Hyaluronic Acid (μg/mL)
Time points (days)
GA
GB
GC

96

PLOS ONE

RESEARCH ARTICLE

Comparison between intra-articular ozone and placebo in the treatment of knee osteoarthritis: A randomized, double-blinded, placebo-controlled study

Carlos César Lopes de Jesus[1]*, Fânia Cristina dos Santos[2], Luciana Maria Oliveira Bueno de Jesus[3], Iara Monteiro[2], Maria Sonia Sousa Castro Sant'Ana[2], Virginia Fernandes Moça Trevisani[1]

1 Department of Evidence-Based Medicine, Paulista School of Medicine, Sao Paulo Federal University, Sao Paulo, Sao Paulo, Brazil, 2 Department of Geriatrics and Gerontology, Paulista School of Medicine, Sao Paulo Federal University, Sao Paulo, Sao Paulo, Brazil, 3 "Dante Pazzanese" Institute of Cardiology, Sao Paulo, Sao Paulo, Brazil

* caceloje@gmail.com

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Table 4. Results from WOMAC.

Variable	Time	Groups Median (min, max)		Median of Differences	CI 95% Median of differences		p value
		Placebo	Treatment		Lower	Upper	
Pain	Basal	50.0 (40, 70)	60.0 (42, 70)	0.000	-9.999	10.000	0.752
	4 weeks	20.0 (7, 37)	45.0 (25, 60)	15.000	5.000	25.000	<0.001
	8 weeks	10.0 (0, 30)	20.0 (10, 40)	9.999	0.000	15.000	0.019
	16 weeks	10.0 (0, 20)	25.0 (2, 52)	14.999	0.000	25.000	0.005
Stiffness	Basal	37.5 (25, 62)	37.5 (25, 62)	0.000	-12.499	12.499	0.5695
	4 weeks	0.0 (0.0, 12)	12.5 (0, 25)	0.000	0.000	12.500	0.0336
	8 weeks	0.0 (0.0, 12.5)	12.5 (0, 25)	12.499	0.000	12.500	<0.001
	16 weeks	0.0 (0, 0)	0.0 (0, 12)	0.000	0.000	0.000	0.1135
Functional deficit	Basal	44.1 (26, 68)	50.0 (40, 61)	5.879	-44.100	147.100	0.2973
	4 weeks	17.6 (9, 31)	33.8 (26, 51)	16.170	7.350	23.529	<0.001
	8 weeks	11.7 (3, 26)	27.9 (14, 35)	11.760	4.409	19.119	0.003
	16 weeks	11.8 (2, 24)	25.0 (7, 35)	7.350	1.469	16.180	0.016

Mann-Whitney's test, CI = confidence interval

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Original Article

The effect of medical ozone treatment on cartilage chondrocyte autophagy in a rat model of osteoarthritis

Weicheng Xu[1], Xu Zhao[2], Panpan Sun[3], Cong Zhang[3], Zhijian Fu[3], Dongsheng Zhou[1]

[1]Department of Orthopaedic, Shandong Provincial Hospital, Cheeloo College of Medicine, Shandong University, Jinan 250021, Shandong, China; [2]Department of Anesthesiology, Shandong Provincial Hospital Affiliated to Shandong First Medical University, Jinan 250021, Shandong, China; [3]Department of Pain Management, Shandong Provincial Hospital, Cheeloo College of Medicine, Shandong University, Jinan 250021, Shandong, China

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Abstract: Many studies have shown that ozone (O_3) can inhibit inflammation in osteoarthritis (OA) and regulate the metabolic balance of articular cartilage, but the mechanisms of this process are not well understood. Our study investigated the therapeutic mechanism of O_3 in OA. OA models were established, and the MWT and PWL were measured. HE staining and safranin O-fast green staining were used to observe cartilage degeneration. The levels of MMP-13, collagen-2, LC3II and P62 were measured by immunohistochemistry, and the levels of TNF-α and IL-6 were measured by ELISA. The results showed that intra-articular injection of O_3 can effectively alleviate pain and inhibit cartilage degeneration in OA rats. O_3 can also reduce the concentrations of TNF-α and IL-6, inhibit the expression of MMP-13 and the degradation of collagen-2, upregulate the autophagy-related protein LC3II and inhibit P62. This effect is associated with the upregulation of chondrocyte autophagy in OA.

Keywords: Medical ozone (O_3), osteoarthritis (OA), cartilage degeneration, autophagy, MMP-13, collagen-2

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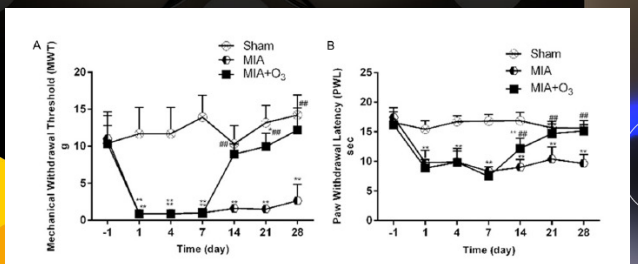

Figure 1. Effects of O_3 on the mechanical withdrawal threshold (MWT) and paw withdrawal latency (PWL) in osteoarthritic rats (n=8). A. O_3 increases the MWT in osteoarthritic rats. B. O_3 increases the PWL in osteoarthritic rats. *P<0.05, **P<0.01 vs. Sham; #P<0.05, ##P<0.01 vs. MIA.

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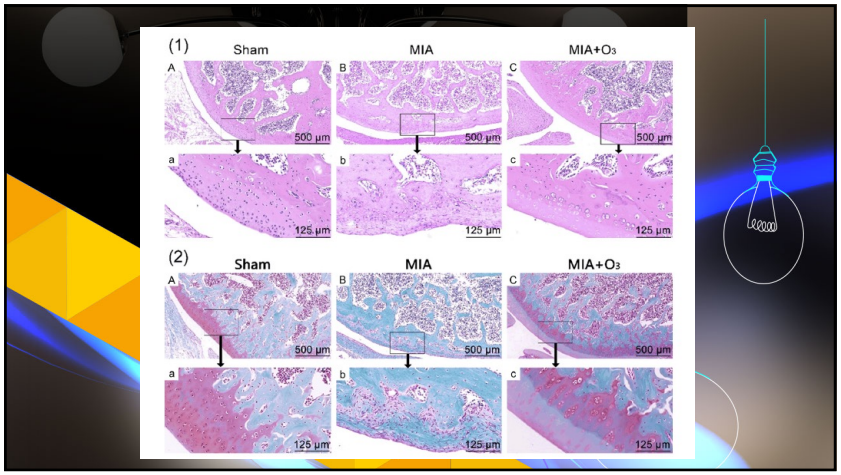

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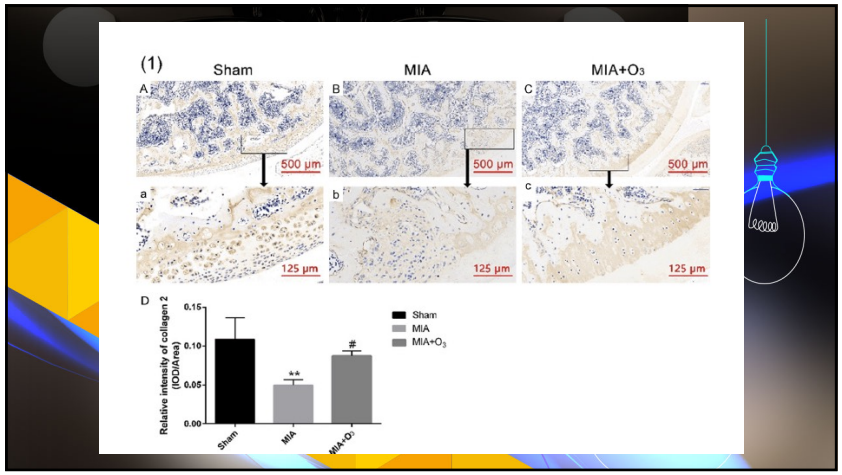

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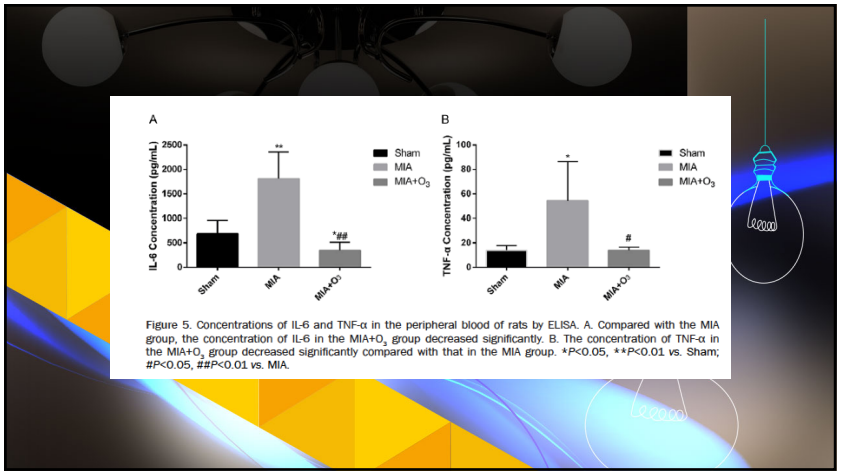

Figure 5. Concentrations of IL-6 and TNF-α in the peripheral blood of rats by ELISA. A. Compared with the MIA group, the concentration of IL-6 in the MIA+O_3 group decreased significantly. B. The concentration of TNF-α in the MIA+O_3 group decreased significantly compared with that in the MIA group. *P<0.05, **P<0.01 *vs.* Sham; #P<0.05, ##P<0.01 *vs.* MIA.

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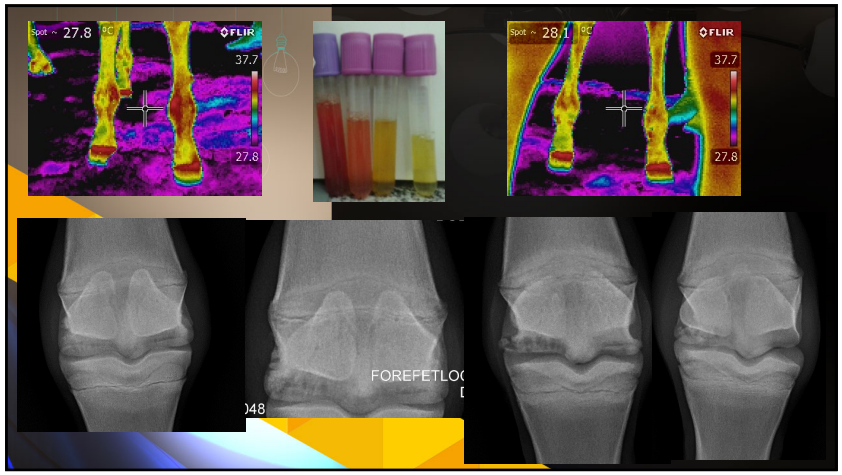

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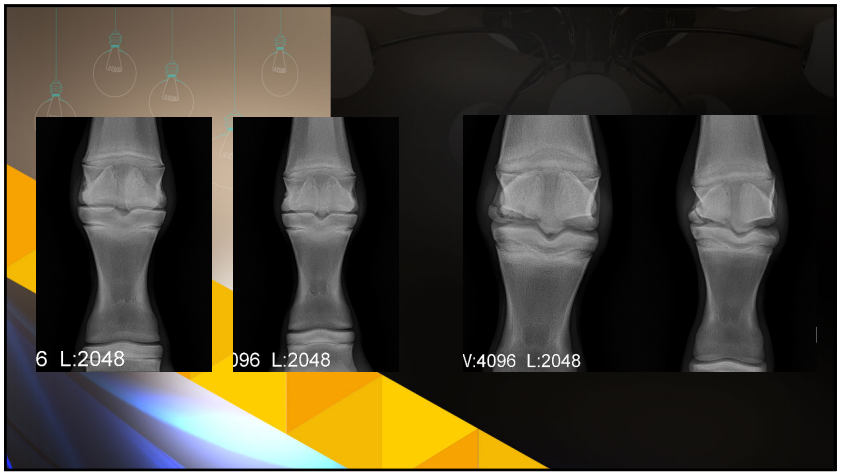

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https://doi.org/10.1186/s13018-021-02320-w

Journal of Orthopaedic Surgery and Research

RESEARCH ARTICLE Open Access

The effect of the platelet-rich plasma and ozone therapy on tendon-to-bone healing in the rabbit rotator cuff repair model

Murat Gurger[1], Gokhan Once[1*], Erhan Yilmaz[1], Sukru Demir[1], Ilknur Calik[2], Yakup Say[3], Ahmet Kavaki[4], Sefa Key[1], Mustafa Umit Gurbuz[1] and Onur Bingollu[1]

Abstract

Background: The aim of this study is to histologically and biomechanically investigate the effects of local PRP and ozone therapy (O_2O_3) on tendon-to-bone healing in a rabbit model of the supraspinatus tendon tear.

Methods: Four groups were formed to have seven rabbits in each group; repair, R; repair + PRP, RP; repair + ozone, RO; and repair + PRP + ozone, RPO. The supraspinatus tendon was detached by sharp dissection from the footprint and an acute tear pattern was created. Thereafter, tendon repair was performed with the transosseous technique. In the RP group, PRP, and in the RPO group, PRP + O2O3 mixture was injected to the tendon repair site. In the RO group, O_2O_3 gas mixture was injected into subacromial space three times a week for a total of 4 weeks. The study was ended at postoperative 6th week.

Results: When compared with the R group, a statistically significant increase was observed in the biomechanical strength of the RP and RPO groups. The highest increase in biomechanical strength was detected in the RPO group. The histology of the RO and RPO groups showed better collagen fiber continuity and orientation than the R and RP groups.

Conclusions: The results obtained from this study show that the ozonized PRP can be used as biological support to increase tendon-to-bone healing. However, these results need to be supported by clinical studies.

Keywords: Platelet-rich plasma, Ozone therapy, Tendon-to-bone healing, Rotator cuff

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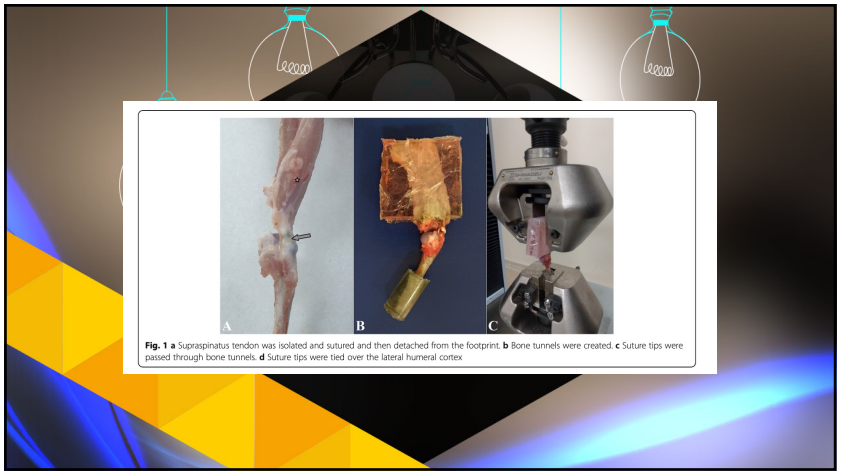

Fig. 1 **a** Supraspinatus tendon was isolated and sutured and then detached from the footprint. **b** Bone tunnels were created. **c** Suture tips were passed through bone tunnels. **d** Suture tips were tied over the lateral humeral cortex

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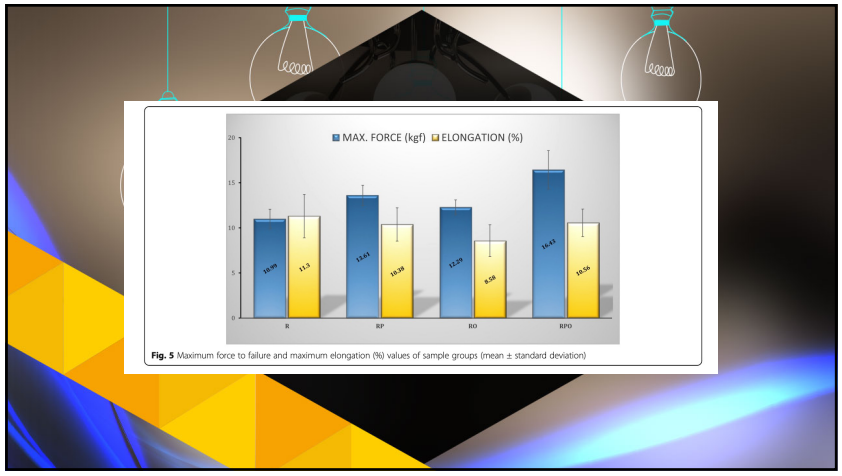

Fig. 5 Maximum force to failure and maximum elongation (%) values of sample groups (mean ± standard deviation)

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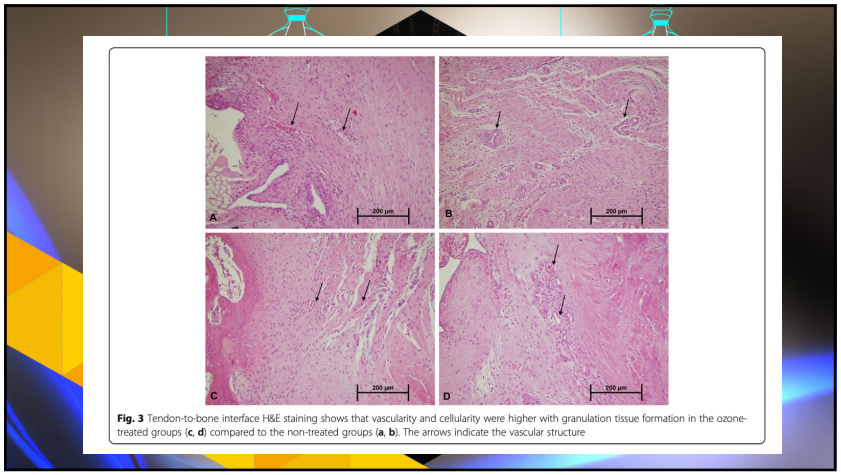

Fig. 3 Tendon-to-bone interface H&E staining shows that vascularity and cellularity were higher with granulation tissue formation in the ozone-treated groups (**c**, **d**) compared to the non-treated groups (**a**, **b**). The arrows indicate the vascular structure

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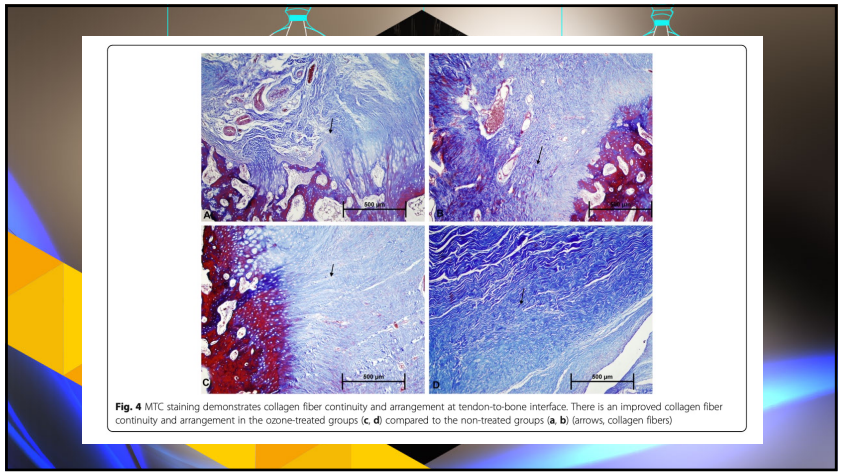

Fig. 4 MTC staining demonstrates collagen fiber continuity and arrangement at tendon-to-bone interface. There is an improved collagen fiber continuity and arrangement in the ozone-treated groups (**c**, **d**) compared to the non-treated groups (**a**, **b**) (arrows, collagen fibers)

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TENDINOSE DO TENDÃO FLEXOR DIGITAL SUPERFICIAL

- Macho, Quarto de Milha, 6a
- Tendinites recorrentes
- Tratamento com AINE's
- Claudicação grau 4

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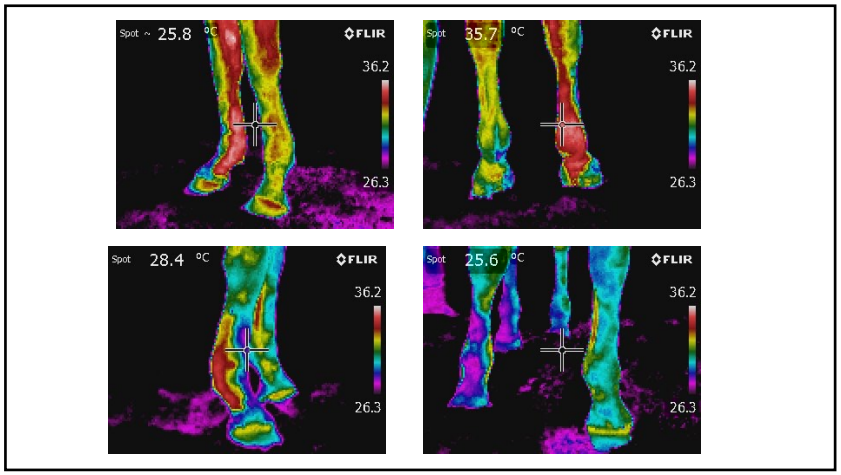

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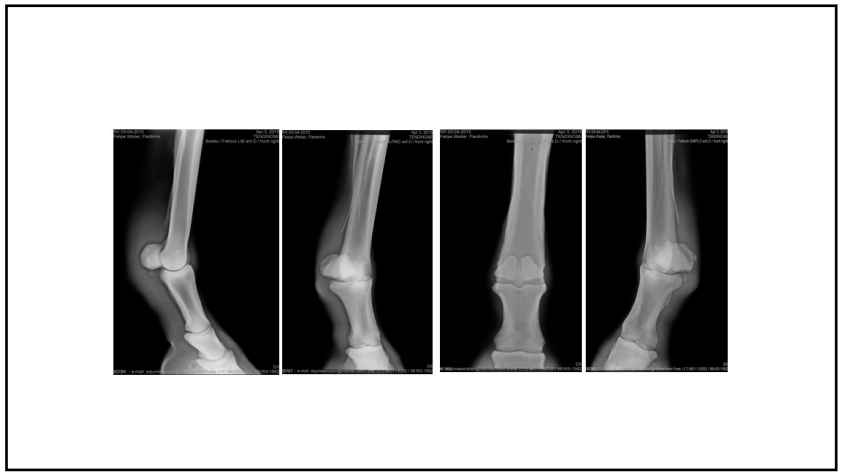

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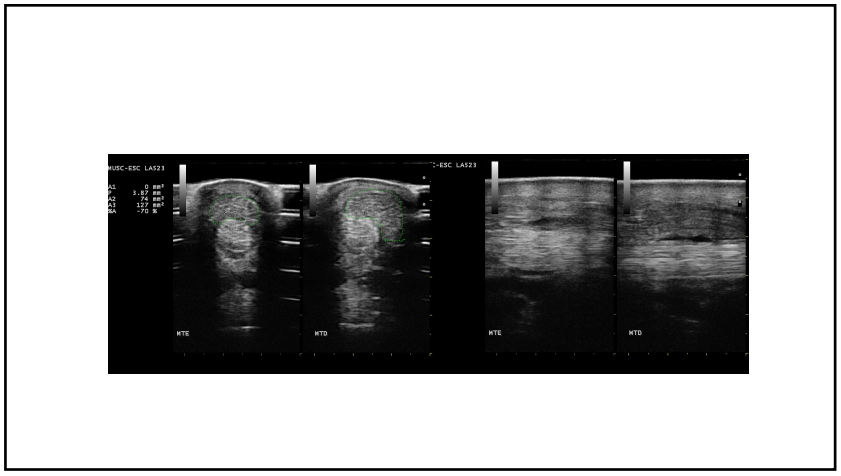

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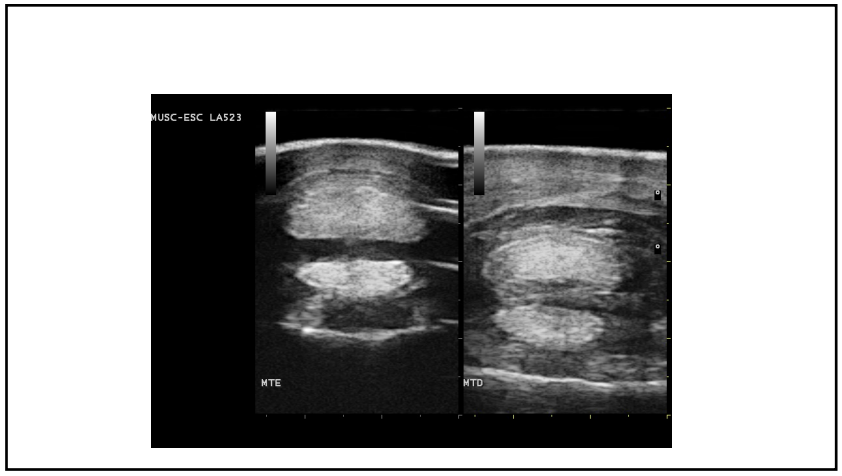

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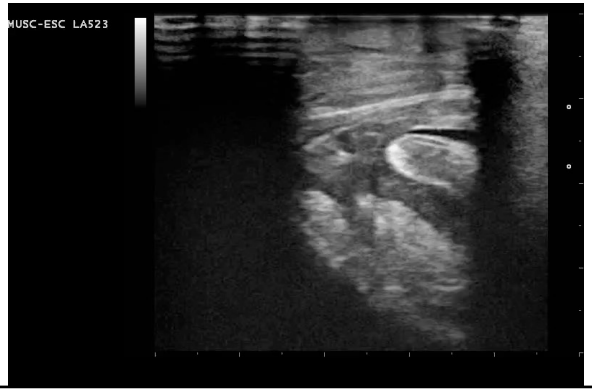

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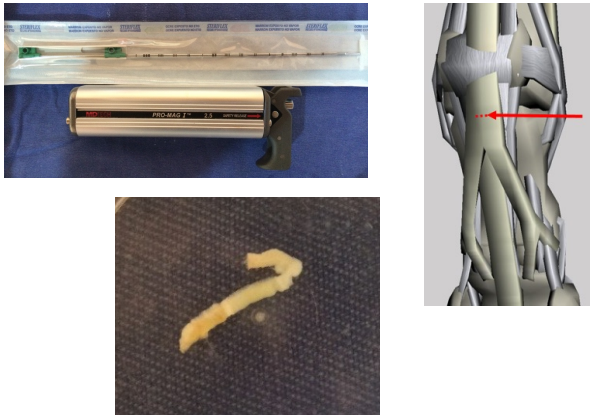

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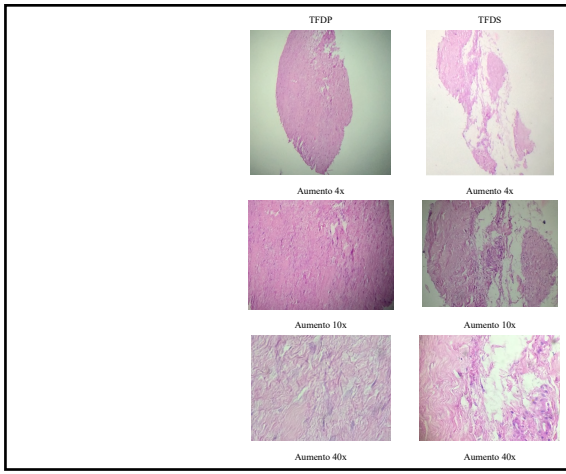

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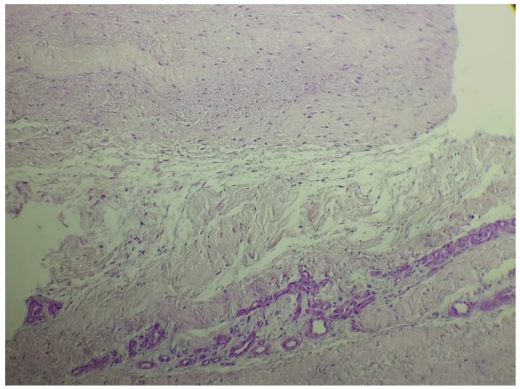

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TRATAMENTO

- 1 aplicação de PRP com Ozônio no local da
- lesão
- Insuflação com 20 ml de O_3 à 60 mcg/ml
- Repouso em piquete por 3 meses

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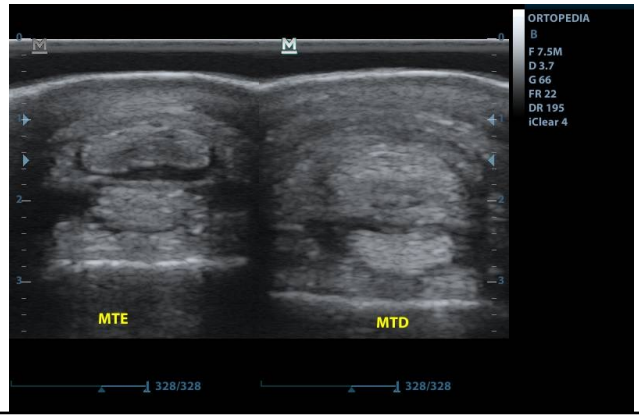

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DESMOSE DO LIGAMENTO SUSPENSOR DO BOLETO

- Fêmea, Mangalarga, 25a
- Degeneração bilateral dos LSB's dos MP's
- Tratamento com AINE's
- Claudicação grau 5

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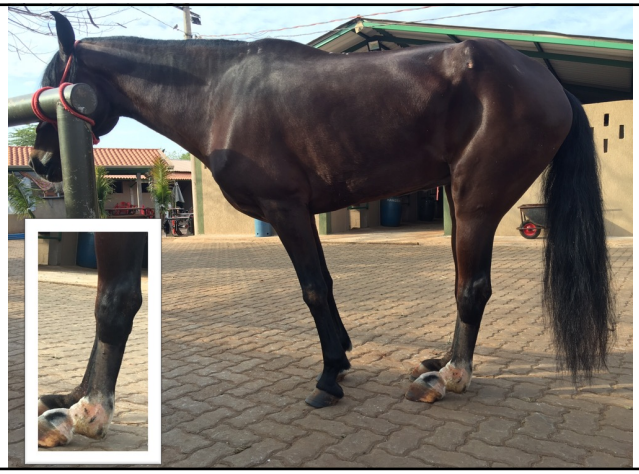

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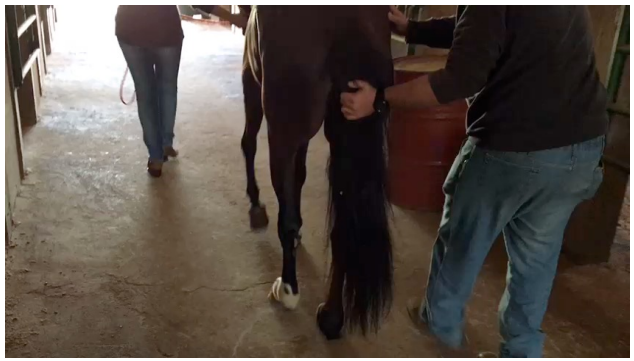

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TRATAMENTO

- 1 sessão de infiltração com Ozônio, 60 ml, 50 mcg/ml, massageando todo o ligamento
- Acupuntura
- Insuflação retal com 0,05 mg/kg de O_3 à 40 mcg/ml

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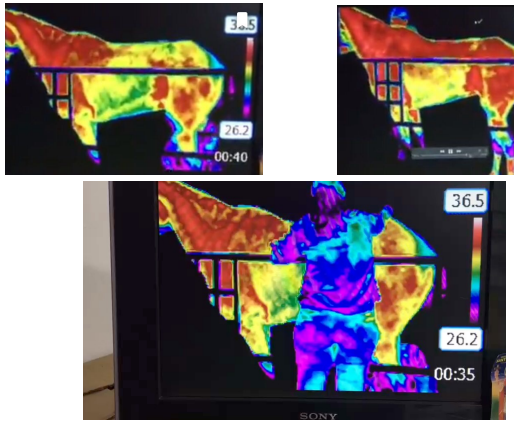

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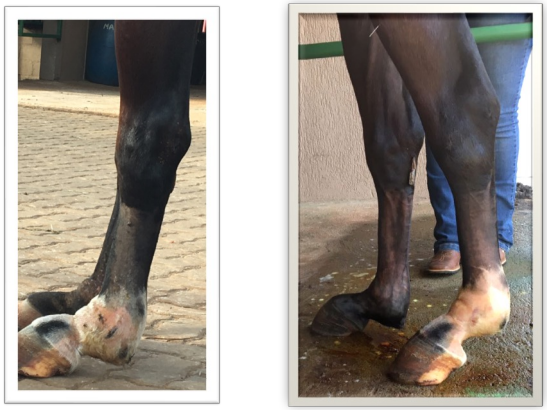

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CASE REPORT

Multimodal therapy for treatment of equine back pain: a report of 15 cases

Terapia multimodal para o tratamento da lombalgia em equinos: relato de 15 casos

Ubiratan Pereira de Melo[1] & Cintia Ferreira*[1]

[1]Veterinarian, DSc. Faculdade Maurício de Nassau (Uninassau). *Campus* Natal, RN, Brazil.

Abstract

Back pain and diseases of the spine are considered significant problems in equine sports and veterinary medicine. This article reports a multimodal approach to the treatment of equine back pain using ozonized platelet rich plasma (PRP), dynamic mobilization exercises, and therapeutic shoeing in 15 horses involved in the vaquejada discipline. Fifteen American Quarter Horses of both sexes engaged in vaquejada in the state of Rio Grande do Norte, Brazil, with a mean age of 8.61 ± 1.73 years were examined at a training center for lower performance diagnostics or back pain. A complete clinical examination was performed on all horses at rest to determine the general conformation and alterations in posture, symmetry, and curvature of the spine. The horses were examined while walking and trotting in straight lines and circles to determine the presence of lameness and/or gait asymmetry. Spinal abnormalities on clinical examination were classified on a scale of 0 to 5 based on the following parameters: degree of response to pain from back palpation, hypertonicity of the back muscles, stiffness of the thoracolumbar joint, and physical dysfunction. After physical examination, ultrasound was performed to identify the cause of the thoracolumbar pain. The therapeutic protocol consisted of the intralesional application of ozonized PRP combined with therapeutic ultrasound, dynamic mobilization exercises, and therapeutic shoeing. All treated animals returned to sports activities at a higher level of performance than at the beginning of the treatment. Six months after treatment, telephone contact was made with the owner or trainer to determine if the back pain had relapsed. None of the animals relapsed during this period, and they participated in vaquejada normally.

Keywords: dynamic mobilization exercises, ozone, platelet-rich plasma, shoeing, therapeutic ultrasound.

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***Correspondence**
Ubiratan Pereira de Melo
Faculdade Maurício de Nassau – Uninassau, Campus Natal
Rua Engenheiro Roberto Freire, 1514, Capim Macio
CEP 59080-400 - Natal (RN), Brasil
E-mail: ubiratan_melo@yahoo.com.br

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Table 1. Classification of equine back pain according to structural and functional abnormalities of the spinal cord at the time of initial clinical examination in 15 American Quarter Horses in the state of Rio Grande do Norte, Brazil.

Parameter	Abnormality score (grade)					
	0 (absence)	1 (mild)	2 (mild moderade)	3 (moderade)	4 (severe)	5 (incapacited)
Pain response	-	2 (13.33%)	4 (26.66%)	5 (33.33%)	4 (26.66%)	-
Muscle hipertonicity	-	-	4 (26.66%)	6(40.00%)	5 (33.33%)	-
Lameness	8	3 (20.00%)	2 (13.33%)	2 (13.33%)	-	-
Thoracolumbar joint stiffness	-	-	6 (40.00%)	9 (60.00%)	-	-
Physical dysfunction	3 (20.00%)	6 (40.00%)	6 (40.00%)	-	-	-

Table 2. Grading of equine back pain based on structural and functional spinal abnormalities 60 days after multimodal therapy in 15 American Quarter Horses in the state of Rio Grande do Norte, Brazil.

Parameter	Abnormality score (grade)					
	0 (absence)	1 (mild)	2 (mild moderade)	3 (moderade)	4 (severe)	5 (incapacited)
Pain response	15 (100%)	-	-	-	-	-
Muscle hipertonicity	15 (100%)	-	-	-	-	
Lameness	15 (100%)	-	-	-	-	-
Thoracolumbar joint stiffness	14	1			-	-
Physical dysfunction	3 (20.00%)	6 (40.00%)	6 (40.00%)	-	-	-

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LOMBALGIA POR POLIARTRITE FACETÁRIA

- Fêmea, PSI, 3a
- OA entre T10 e L6
- OA coxofemural esquerda
- Tratamento com AINE's
- Sensibilidade severa

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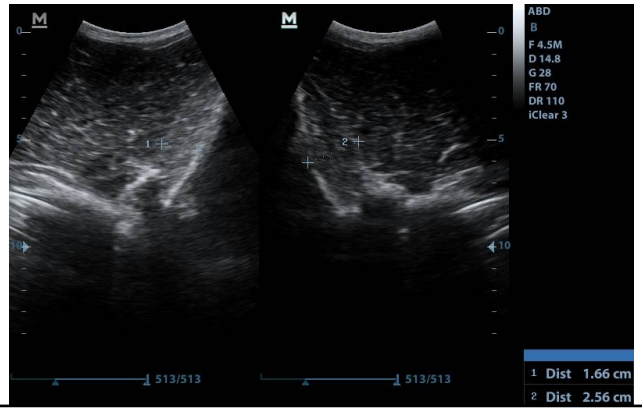

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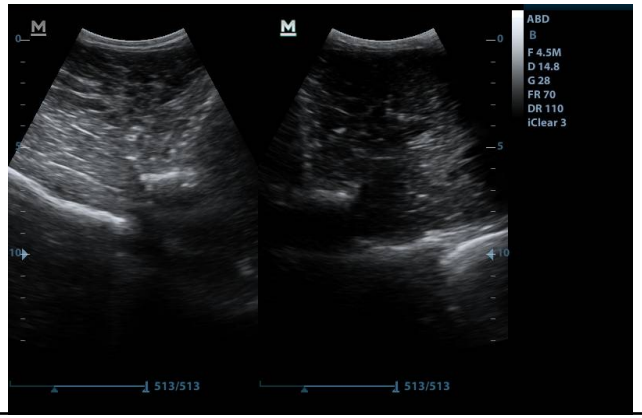

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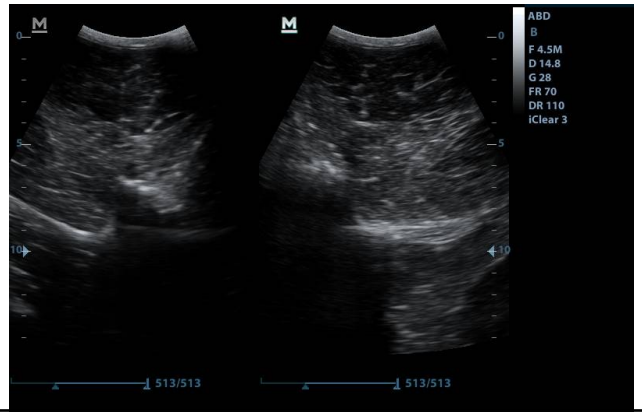

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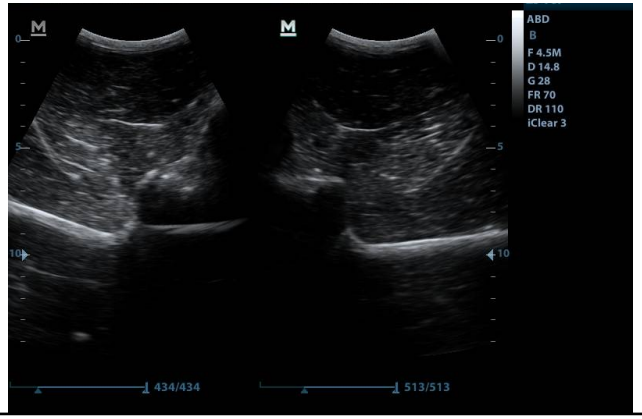

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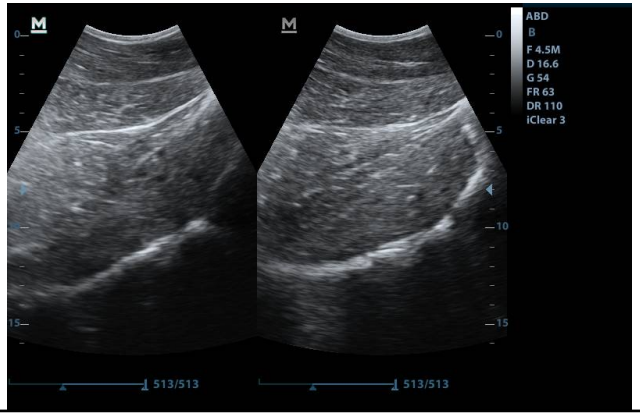

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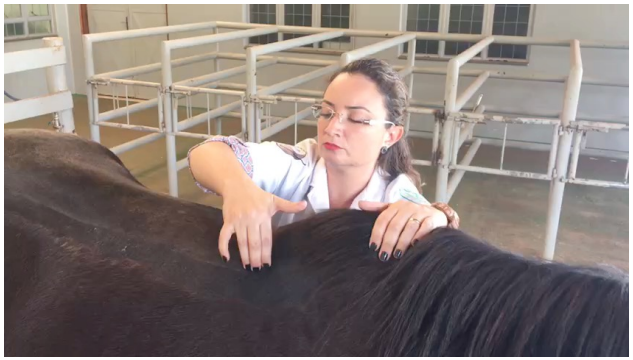

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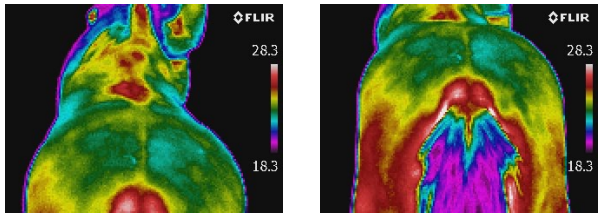

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TRATAMENTO

- 4 infiltrações com Ozônio, a cada 15 dias, ao longo de toda coluna, 40 mcg/ml
- 1 infiltração guiada na CXFe, 60 ml, 40 mcg/ml
- Ozonioterapia sistêmica retal 1x semana, por 8 semanas, 0,05 mg/kg, 40 mcg/ml
- 1 sessão de quiropraxia
- Previcox 15 dias iniciais
- Acupuntura semanal

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TRATAMENTO

- Cinesioterapia por 2 meses

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JO3T

CASE REPORT

Use of ozone therapy in chronic laminitis in a horse.

Clarisse S. Coelho*[1], Wherick Abreu Bernadi[1], Antonio M. Ginelli[2], Thassio Spagnol[3], Leandro S. Gardel[4], Vinicius R.C. Souza[5],

[1]Animal Science Master Program, Universidade Vila Velha (UVV), Brazil. [2]Hospital Veterinário Rancho Bela Vista, Serra, Espirito Santo, Brazil. [3]School of Veterinary Medicine, UVV-ES. [4]Department of Veterinary Clinics, ICBAS-University of Porto, Porto, Portugal. [5]Quality Especialidades Veterinárias. Vitória, Espírito Santo, Brazil.

ABSTRACT

A ten year-old mare, 320 kg, was referred with signs of lameness and reluctance to ambulate. On clinical examination, animal showed signs of shifting weight lameness on the forelimbs, presence of palpable supracoronary depressions and severe signs of pain with hoof test pressure over the sole on right forelimb. Digital pulses and temperature of the hoof were thought to be within normal limits. On inspection it was possible to observe a short extension of the toe and solar prolapse with hoof capsule distortion. Radiologic measurements showed displacement of the distal phalanx (30º). The animal was diagnosed with Obel grade IV chronic laminitis on the right foot. Therapeutic protocol established included exclusively corrective trimming and intramuscular, peritendinous and intrarectal administration of oxygen/ozone therapy as anti-inflammatory therapy. Oxygen/ozone therapy sessions were performed twice a week, for a total of 20 sessions. Six months after original presentation, the mare demonstrated clinical improvement with an improved body condition and better ambulation. Radiologic evaluation showed a normal relationship between the dorsal hoof wall and the distal phalanx.

Keywords: Lameness, Equine, Ozone

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USE OF OZONE THERAPY TO CONTROL CHRONIC PAIN IN EQUINE LAMINITIS

Fransael Franklyn Araújo da Silva[1]*, Eduardo Michelon do Nascimento[1], Liliane Aparecida Oliveira de Paula[1], Deborah Sandri[1], Geane Maciel Pagliosa[2], Erica Cristina Bueno do Prado Guirro[2], Maristela de Cássia Seudo Lopes[2].

[1]Veterinarian Resident of the Medical and Surgical Clinic for Large Animals Sector of the Veterinary Hospital of the Federal University of Paraná - Palotina Sector, Palotina, Paraná, Brazil. [2]Professor of the Department of Veterinary Sciences of the Federal University of Paraná - Palotina Sector, Palotina, Paraná, Brazil

* E-mail for correspondence: fransael20@gmail.com

ABSTRACT

Purpose. Laminitis is the inflammation of the dermal and epidermal blades of the hull. The use of ozone has already demonstrated promising effects in horses, through postoperative analgesia, antioxidant effect in athletic animals and even chronic laminitis. Thus, the objective of this article is to describe the use of ozone therapy in different methodologies (intramuscular points, acupoints and footbath) in the aid of pain control in an equine with chronic laminitis.

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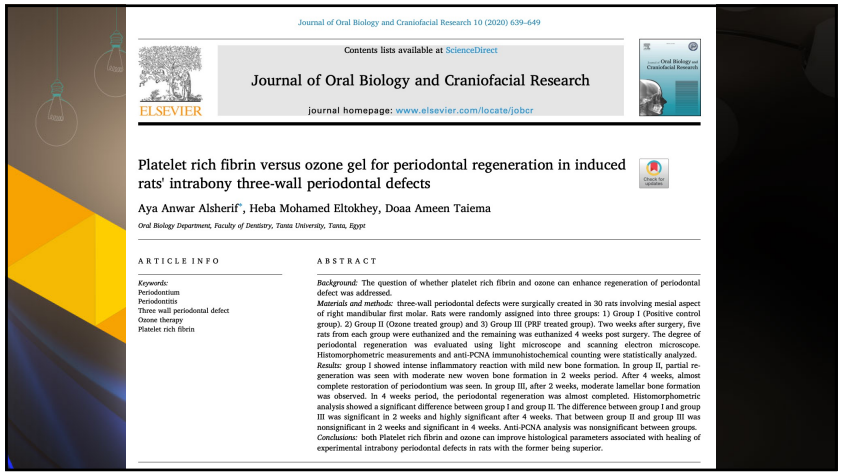

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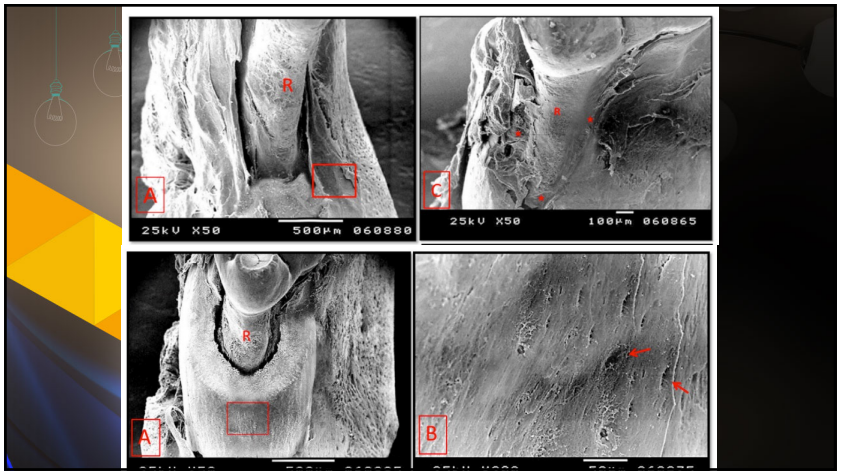

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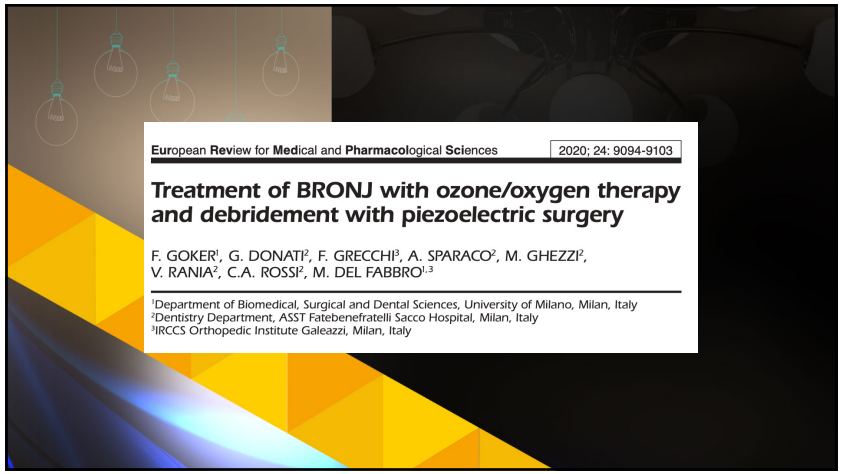

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Table IV. Comparison of patient characteristics.

Patient	Characteristics	Healed/Total no of sites	Success %	*p*-value
Gender	Male	2/3	66.6	0.49
	Female	8/12	66.6	
Arch	Maxilla	2/5	40.0	0.15
	Mandible	8/10	80.0	
Reason for BP therapy	Oncology	5/9	55.5	1.00
	Osteoporosis	4/4	100	
	Rheumatoid Arthritis	1/2	50.0	
Age	< 70	3/6	50.0	0.24
	≥ 70	7/9	77.7	
Total patients		9/14	64.2	
Total sites		10/15	66.6	

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FRATURA VERTEBRAL

- Macho, BH, 3a
- Fraturou o axis com 6 meses
- Diagnóstico aos 3 anos
- Tratamento com AINE's sem resposta
- Sensibilidade severa

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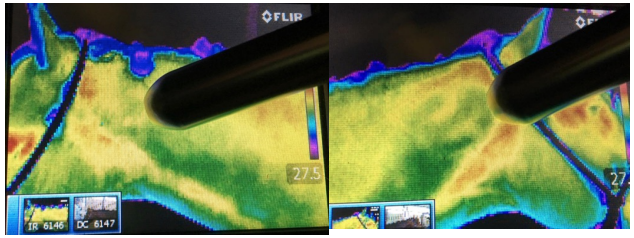

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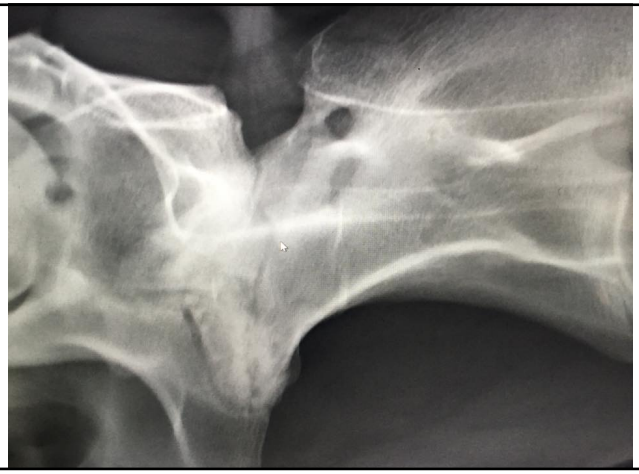

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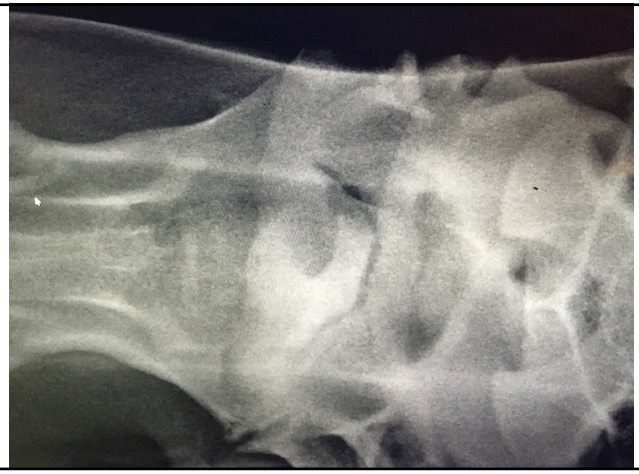

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TRATAMENTO

- 5 infiltrações locais quinzenais com 60 ml de ozônio à 60 mcg/ml
- Ozonioterapia sistêmica, 0,05 mg/kg, 40 mcg/ml, semanais
- 1 sessão de shockwave

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Disfunção sacroiliaca

- Quarto de Milha
- Apartação
- 4 anos, fêmea
- Artroscopia talus MPE em dez/15
- Ferimento quartela MPE >>> sem apoio por 2 semanas
- Claudicação MPD grau 3
- Assimetria de garupa

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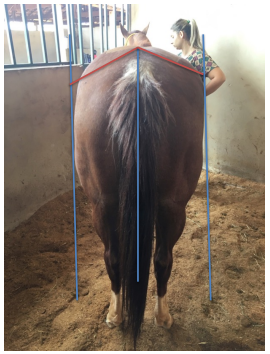
Inspeção estática



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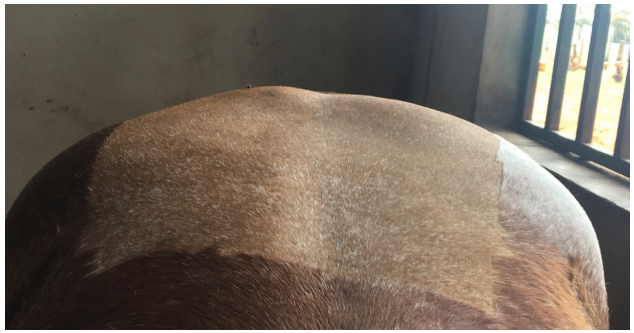

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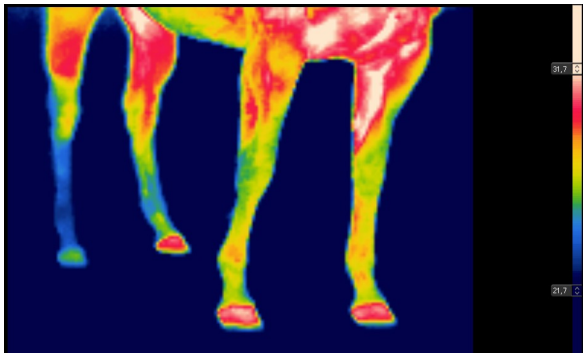
Termografia



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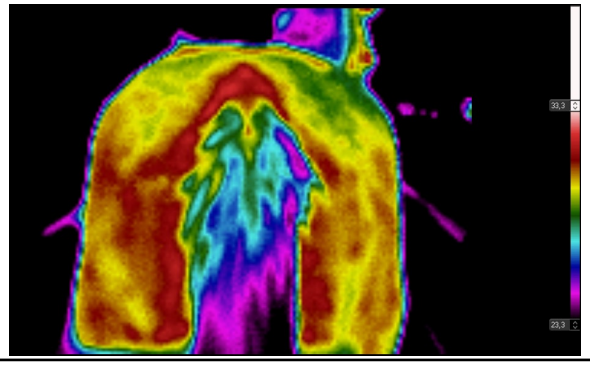
Termografia



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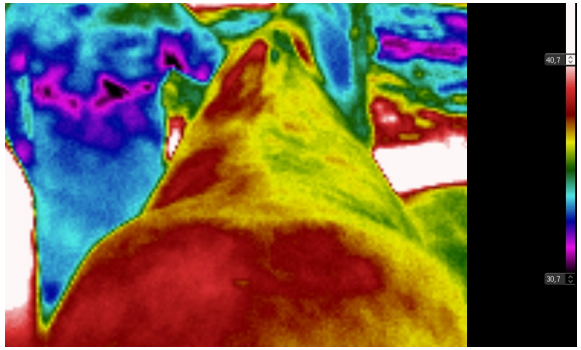

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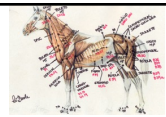
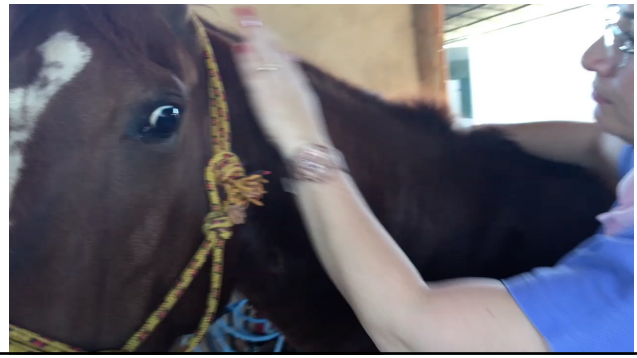
Palpação diagnóstica





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Inspeção dinâmica

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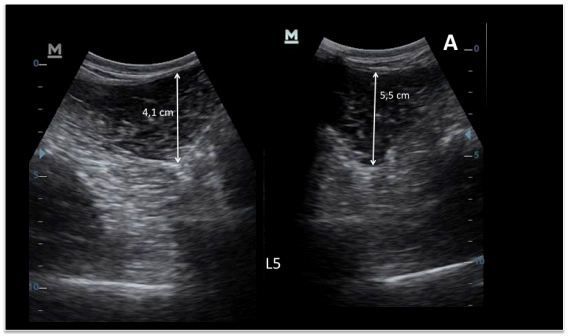
Ultrassom



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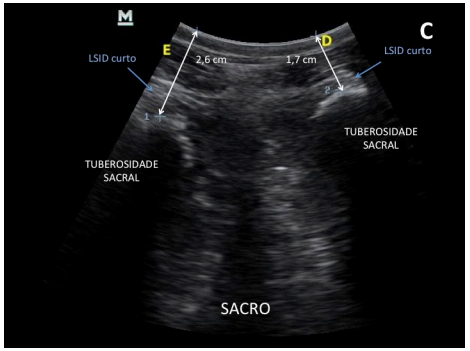
Ultrassom



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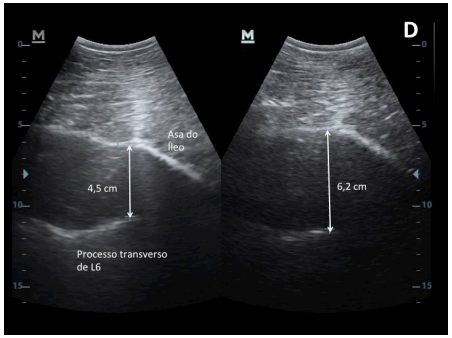

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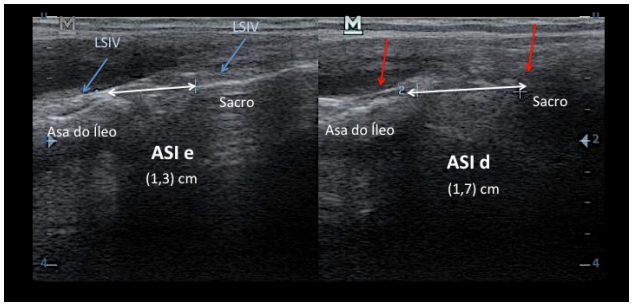

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Biomecânica

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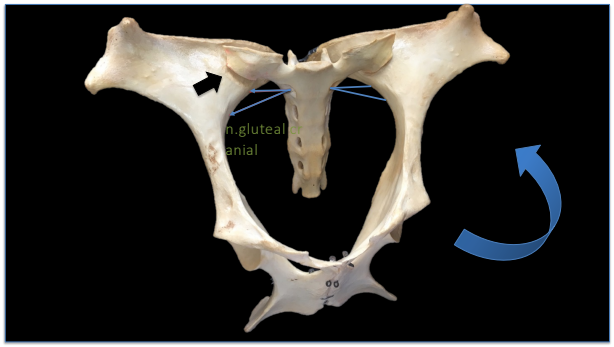
Biomecânica



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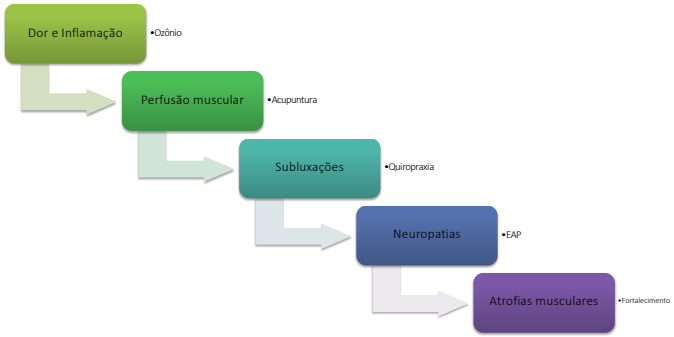
Diagnóstico

- Disfunção sacroilíaca: subluxação direita
- Desmoenteseopatia do ligamento sacroilíaco ventral direito
- Neuropatia do n.gluteal cranial direito
  - Atrofia cranial do m. glúteo superficial direito

184

Estratégia de tratamento: 60 dias



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Dor e inflamação

Ozônio

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Ozonioterapia local

O_3 → ROS LOP's → Leucócitos → Antioxidantes Citocinas → Analgesia Controle da inflamação

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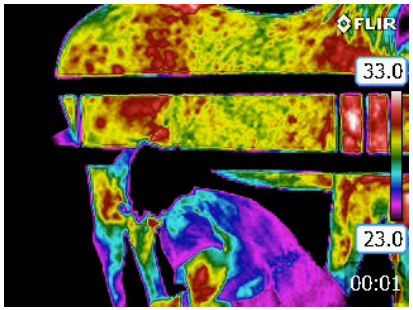
Perfusão muscular



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Subluxações vertebrais

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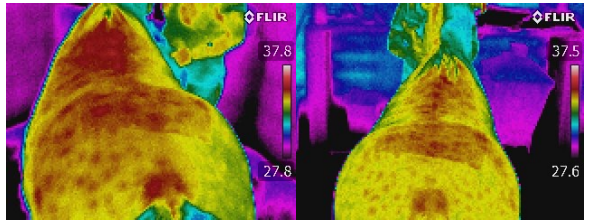
Subluxações vertebrais



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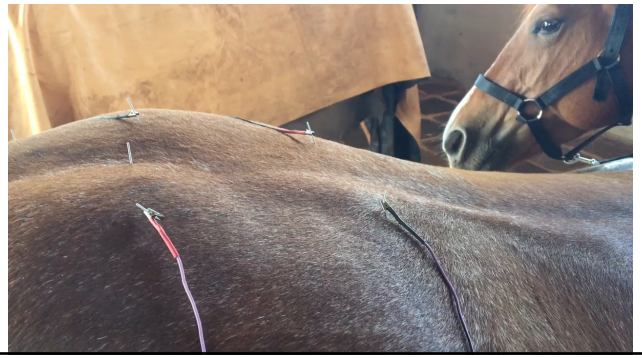
Neuropatia



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Atrofias musculares

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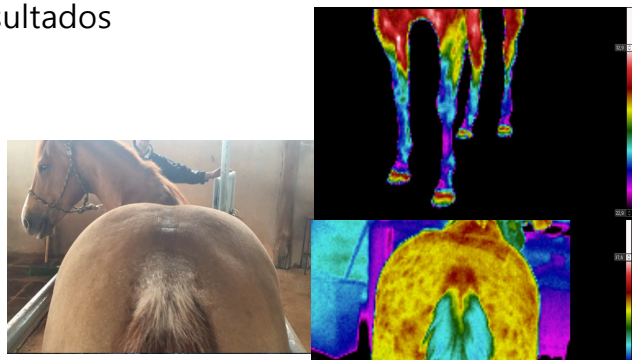
Resultados



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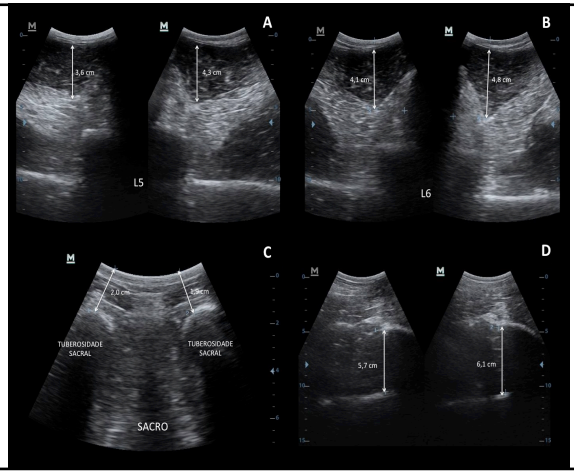

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Resultados

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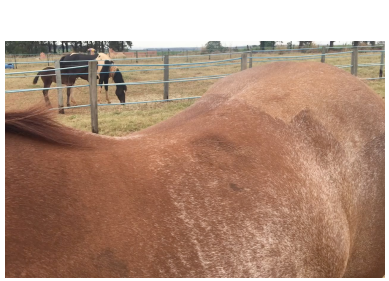
Resultados



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06

Status científico

1. Publicações
2. Qualidade

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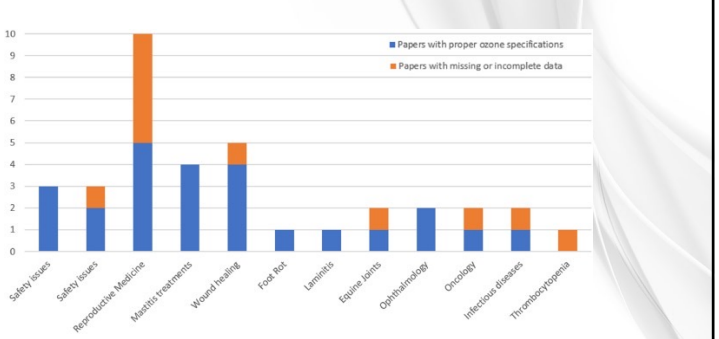
QUANTIDADE DE PUBLICAÇÕES

198

QUALIDADE DAS PUBLICAÇÕES



FONTE: Ozone and its derivatives in veterinary medicine: A careful appraisal

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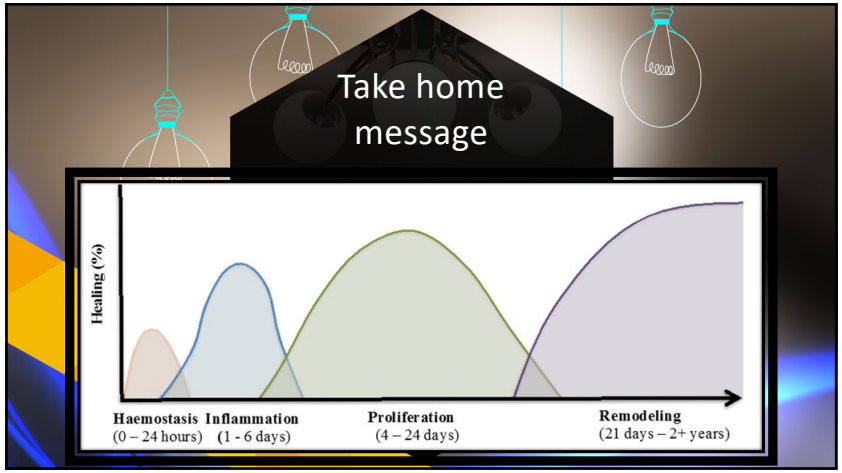

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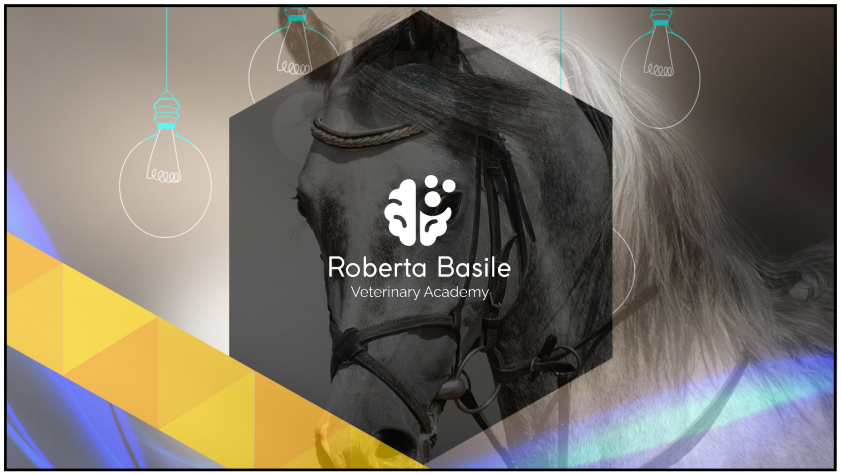

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