

Dear colleagues,

The year 2023 was a remarkable one for the **Romanian Association of Balneology**, marking significant progress both in terms of scientific research and in the promotion of spa tourism. Achieving 100% of last year's objectives, including the organization of the AMR 2023 Congress and the Timişoara Congress, the publication of numerous ISI articles, as well as obtaining the impact factor for the "**Balneo and PRM Research Journal**", have strengthened our position as leaders in the field balneology.

Reflecting on these achievements, we move with optimism and determination towards the goals for the year 2024:

- ✓ **ISMH Congress 2024**: A world-class event bringing together national and international experts in the field of balneology to discuss the latest discoveries and trends in the field.
- ✓ Research Publication and Dissemination: We aim to publish at least 15 articles in prestigious ISI journals, continuing to contribute to the development of balneology.
- ✓ Research Projects: Successful implementation of ongoing research projects and initiation of new projects, with emphasis on the study and exploitation of natural factors.
- ✓ **Strategic Collaborations**: Intensification of collaborations with universities, research institutes and other professional associations, to promote innovation and excellence in balneology.
- Expanding International Presence: Active participation in international conferences and symposia, to share our knowledge and experiences and learn from our colleagues around the world.
- Human Resource Development: Promoting the continuous training and professional development of our members to ensure a high level of expertise and innovation in our field.
- ✓ **Sustainability and Social Responsibility**: Integrating the principles of sustainability in all our activities, thus contributing to the protection of the environment and the promotion of responsible balneary tourism.

In closing, I want to thank you for the commitment and passion shown in your work. May health, harmony, and success guide us in all our endeavors in 2024.

Happy Holydays and Happy New Year!









ARB members in 2023

ARB members - legal entities

SC Biosafety SRL - București Representative: Munteanu Constantin

Representative: Iuliana Tasie, Director General, SC Ana Hotels SA - Eforie Nord

Dr. Mihaela Cucu, Director Medical

ARB members - individuals

In 2023, the Romanian Association of Balneology has 186 individual members, of which 85 are Doctors for whom the membership fee to Romanian Medical Association (AMR) will be paid.





The membership status of the Romanian Balneology Association is renewed annually. For the year 2024, membership status is granted to those who will complete the online registration form on the association's website http://bioclima.ro and pay the membership fee of 100 lei. Resident doctors, physiotherapists, medical assistants, scientific researchers, civil servants from local / central public authorities and members of other NGOs promoting tourism have a 50% reduction in the fee - for these categories, the fee amount is 50 lei. Payment of the membership fee of the Romanian Balneology Association includes 25 lei for the Subscription to the association's Balneo Research Journal, entered in the Nomenclature of Medical Publications of the Romanian College of Physicians.



Proiect in derulare 2024-Faza III

Titlul Proiectului: Metoda combinata bazata pe imagistică hiperspectrala și investigații biologice de evaluare a efectelor unor factori naturali terapeutici în afecțiuni din sfera patologiei Neuro-Mio-Artro-Kinetice



https://biohis.projects.umfiasi.ro/

Proiectul BIOHIS își propune să dezvolte, să testeze și să valideze o nouă metodă de bioinginerie, utilizând date corelate de imagistică hiperspectrală (HSI) și investigații biologice pentru evaluarea eficacității terapeutice a factorilor terapeutici naturali, cum ar fi namolul sau apele minerale sulfuroase naturale, în sfera de patologie Neuro-Mio-Artro-Kinetică.



concept do UDIManagor EVol

Proiectul European 101080875 - STRATIF-AI, finanțare aprobată, durata 48 luni



Gunnar CEDERSUND LINKOPINGS UNIVERSITET CAMPUS VALLA 581 83 LINKOPING SWEDEN

Subject: Horizon Europe (HORIZON)

Call: HORIZON-HLTH-2022-TOOL-12-two-stage
Project: 101080875 — STRAIIF-AI

GAP invitation letter

Dear Applicant,

I am writing in connection with your proposal for the above-mentioned call.

Having completed the evaluation, we are pleased to inform you that your proposal has passed this phase and that we would now like to start grant preparation.

Please find enclosed the evaluation summary report (ESR) for your proposal (for both stages of the evaluation).

Please be aware that there may be differences between the ESRs, since stage 1 evaluations are done on the outline of your proposal, while stage 2 evaluations cover the full proposal.

Invitation to grant preparation

Grant preparation will be based on the following:

1. Proje

Project number and name: 101080875 - STRATIF-AI

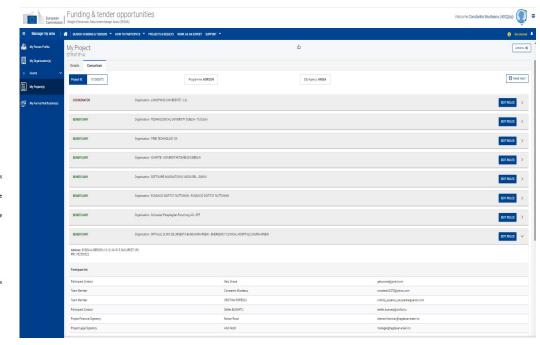
<u>Topic:</u> HORIZON-HLTH-2022-TOOL-12-01-two-stage — Computational models for new patient stratification strategies

Type of action: HORIZON Research and Innovation Actions

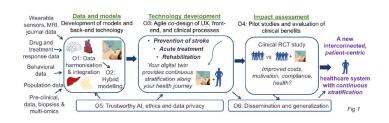
Requested grant amount (proposal): 5 969 100.00 EUR

Maximum grant amount (after evaluation): 5 969 100.00 EUR

Project duration: 48 months



Within STRATIF-AI, we will apply this methodology to stroke care. Stroke is a high prevalence disease with a huge societal burden where continuous stratification would greatly enhance disease management, making it an ideal use case for the application of modern computational techniques. During the dynamic trajectory of the disease, from acute stroke to rehabilitation and long-term disease management phases, stratification would enable personalised care as patients evolve. Despite considerable progress in understanding stroke risk factors and treatments, it is still extremely difficult to implement traditional knowledge-based decisions on what prevention measures and/or therapeutics to use for which patients. The availability of more effective preventive and therapeutic interventions tailored to the individual or groups of individuals with common phenotypes is still lacking. The most important identified causes are i) the lack of interdisciplinary research that takes advantage of data integration solutions and technologies (e.g. advanced statistical and/or Al/machine learning methods and/or digital twin technologies) ii) the absence of data integrative computational models from multiples stroke-relevant sources (structured and unstructured data) to be stored, exchanged and re-used taking advantage of a series of already available interoperability standards, and iii) the lack of optimised, robust, transparent, trustworthy and accurate computational models to guide stratification strategies aimed at stroke prevention and for improving patients' clinical outcomes as measured by standardized assessments



Relevant activities of the Romanian Balneology Association in 2023

Societatea Română de Medicină Fizică, de Recuperare și Balneoclimatologie (SRMFRB)









* U.E. M.S.





Congresul Național de Medicină Fizică, de Recuperare și Balneologie











cu participare internaționala



http://srmfrb.ro

Timișoara, 1 – 5 Septembrie 2023



http://bioclima.ro

Asociația Română de Balneologie (ARB)

Asociația Medicală Română (AMR)















Congresul Asociației Medicale Române

București, 8 - 11 Iunie 2023

SEDIILE LUCRĂRILOR:

- prima zi 8 IUNIE Aula Mare a Academiei Române
- următoarele 9, 10 și 11 IUNIE Cercul Militar National

Societatea Română de Medicină Fizică, de Recuperare și Balneoclimatologie (SRMFRB)











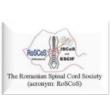


Conferința Zilele Academice ale Centrului Național Clinic de Recuperare Neuropsihomotorie Copii "Dr. N. Robănescu"



CNCRNC "Dr. N. Robanescu, Bucuresti, 14 – 15 Septembrie 2023







Centrul Național Clinic de Recuperare Neuropsihomotorie Copii Doctor Nicolae Robănescu



http://srmfrb.ro

http://bioclima.ro

Asociația Română de Balneologie (ARB)



Balkan countries have a very strong common tradition and culture of spas and health resorts. On the other hand, they have always been tightly connected politically and geographically. So, starting from these points and sharing the idea with our Balkan colleagues, the Balkan-Spa Summit has appeared as a need and necessity. And we all believed from the start that the Balkan-Spa Summit can play an important role in the development of Balkan spa industry in general.









CERTIFICATE OF ATTENDANCE

Constantin Munteanu

27TH ASIAN PACIFIC SOCIETY OF CARDIOLOGY CONGRESS
13 - 15TH JULY 2023, SINGAPORE

Yeo Tee Joo Organising Chairman APSC 2023

ASIAN PACIFIC SOCIETY OF CARDIOLOGY

Colin Yeo

Colin Yeo
Organising Co-Chairmar
APSC 2023



Hydrogen sulfide (H2S) - therapeutic relevance in

Diabetes and Obesity

Diabetes/Obesity/Lipid (basic)

SICEM2023 PF0098

Constantin Munteanu

Department of Biomedical Sciences, Faculty of Medical Bioengineering,

University of Medicine and Pharmacy Grigore T. Popa, Iasi Romania

Objectives

Diabetes and obesity are complex metabolic disorders associated with various vascular complications. This study investigates the therapeutic potential of hydrogen sulfide (H2S) in mitigating diabetic vascular complications, with a particular focus on diabetesaccelerated atherosclerosis. The objective is to explore the effects of H2S on diabetic endothelial dysfunction. nephropathy, retinopathy, and cardiomyopathy and to elucidate its cytoprotective role during myocardial ischemia-reperfusion injury in the context of diabetes.

The research design involves in vitro experiments using fibroblast cultures exposed to diabetic conditions and treated with H2S mineral waters. Markers of oxidative stress, inflammation, and cellular viability have been

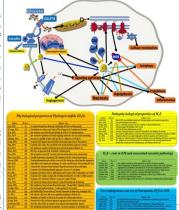
Results

Several pathological mechanisms have been proposed for diabetic vascular complications, including diabetesaccelerated atherosclerosis, such as increased polyol pathway flux, increased advanced glycation end product formation, and activation of protein kinase C. all of these in association with hyperglycemia-induced ROS accumulation. Hydrogen sulfide (H2S) plays an important role in physiology and pathophysiology in several biological systems. Emerging data suggest that H2S improves diabetic endothelial dysfunction, nephropathy, retinopathy, and cardiomyopathy. Some recent studies indicate that H2S is cytoprotective during myocardial ischemia-reperfusion injury in the setting of diabetes by alleviating oxidative stress and the ability of H2S to upregulate cellular antioxidants in the heart in an Nrf2-dependent manner.

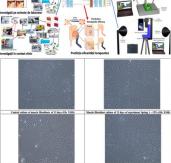
H2S may therefore play an important role in diabetesaccelerated atherosclerosis, and the effects of H2S may be mediated via the activation of Nrf2.

Conclusion

This study highlights the therapeutic relevance of hydrogen sulfide (H2S) in mitigating diabetic vascular complications, diabetes-accelerated including atherosclerosis.









EnMand Metabolism

The 11th Seoul International Congress of Endocrinology and Metabolism in conjunction with the 42rd Annual Scientific Meeting of Korean Endocrine Society

October 26Thu - 28Sat, 2023 Lotte Hotel World, Seoul, Republic of Korea



The 11th Secul International Congress of Endocrinology and Metabolism in conjunction with the 42rd Annual Scientific Meeting of Korean Endocrine Society

PE2-22

Diabetes/Obesity/Lipid (basic)

Hydrogen sulfide (H2S) - therapeutic relevance in Diabetes and Obesity

Department of Biomedical Sciences, Faculty of Medical Bioengineering, University of Medicine and Pharmacy Grigore T. Popa, Iasi, Romania

Objectives: Diabetes and obesity are complex metabolic disorders associated with various vascular complications. This study investigates the therapeutic potential of hydrogen valide (H2S) in mitigating diabetic vascular complications, with a particular focus on diabetes-accelerated atherosclerosis. The objective is to explore the effects of H2S on diabetic endothelial dyafunction, nephropathy, retinopathy, and cardiomyopathy, and to elucidate its cytomotective role during myocardial ischemia-reperfusion injury in the content of diabetes

Methods & Materials: The research design involves in vitro experiments using fibroblast cultures exposed to diabetic conditions and treated with H2S mineral waters. Markers of oxidative stress, inflammation, and cellular viability have been assessed.

Results: Several pathological mechanisms have been proposed for diabetic vascular complications, including diabetes accelerated atherosclerosis, such as increased polyol pathway flux, increased advanced glycation end product formation, and activation of protein kinase C, all of these in association with hyperglycemia-induced ROS accumulation. Hydrogen sulfide (H2S) plays an important role in physiology and pathophysiology in several biological systems. Emerging data suggest that H2S improves diabetic endothelial dysfunction, nephropathy, retinopathy, and cardiomyopathy. Some recent studies indicate that H2S is cytoprotective during myocardial ischemia-reperfusion injury in the setting of diabetes by alleviating oxidative stress, and the ability of H2S to unregulate cellular antioxidants in the heart in a Nrf2-dependent manner. H2S may therefore play an important role in diabetes-accelerated atherosclerosis, and the effects of H2S may be mediated via activation of Nrf2.

Conclusion: This study highlights the therapeutic relevance of hydrogen sulfide (H2S) in mitigating diabetic vascular complications, including diabetes-accelerated atherosclerosis.



Certificate of Attendance

This is to certify that

Munteanu Constantin

has attended the 11th Seoul International Congress of Endocrinology and Metabolism in conjunction with the 42nd Annual Scientific Meeting of Korean Endocrine Society which is held in Lotte Hotel World, Seoul, Korea, from October 26 to 28, 2023.

Korean Endocrine Societ



Funding: "This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CCCDI - UEFISCDI, project number PN-III-P2-2.1-PED-2021-2146, within PNCDI III"

FAOPS 2023

Certificate of Presentation

This is to certify that

Constantin MUNTEANU (Grigore T. Popa University of Medicine and Pharmacy, Romania)

"Cellular stress investigations and homeostasis mechanisms on fibroblast cultures regarding Hydrogen sulfide (H2S) used as a natural therapeutic factor in the Neuro-Myo-Arthro-Kinetic (NMAK) pathology."

> at the 10th Federation of the Asian and Oceanian Physiological Societies Congress. held in Daegu, Korea, on November 1-4, 2023.

> > Organizing Committee of FAOPS 2023



The President of the Korean Physiological Society. and the President of FAOPS



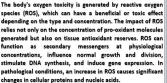
Cellular stress investigations and homeostasis mechanisms on fibroblast cultures regarding Hydrogen sulfide (H2S) used as a natural therapeutic factor in the Neuro-Myo-Arthro-Kinetic (NMAK) pathology.



Constantin Munteanu

Department of Biomedical Sciences, Faculty of Medical Bioengineering, University of Medicine and Pharmacy Grigore T. Popa, Iasi Romania





This study aims to investigate the cellular and molecular mechanisms underlying the therapeutic effects of natural therapeutic factors, specifically mud and sulfurous mineral waters. The investigation will be carried out by electrophoresis, ELISA, and Western blotting on primary fibroblast cultures obtained from Wistar rats. The two main physiological mechanisms investigated are inflammatory processes and the balance of oxidative stress, which are assumed to be influenced by mud and sulfurous natural

Previous scientific data show that different cell types, including fibroblasts, are recruited during the inflammatory process, which responds to different intercellular and microenvironmental signals. This leads to the regulated production of various pro-and anti-inflammatory mediators, including cytokines such as tumor necrosis factor (TNF)-α and interleukins (IL)-1β and IL-6, chemokines, and enzymes such as cyclooxygenase (COX)-2.

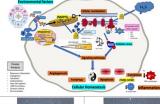
The concept of oxidative stress caused by free radicals argues for the consideration of biomarkers of oxidative stress. The oxidative and reductive activity of enzymes acting on glutathione, thioredoxin, and other substrates of interest in the oxidation-reduction process reflects not only the level.

The study also examines the protective effect of H2S on neurons expressed against oxidative stress by increasing the substrate for producing the antioxidant GSH, including the cystine/glutamate antiporter and intracellular Cvs concentrations. Furthermore, H2S has vasculoprotective properties in endothelial and vascular smooth muscle cells, such as triggering vasorelaxation and decreasing platelet aggregation. In addition, H2S possibly activates plasma membrane voltage-gated channels and mobilizes intracellular Ca2+ stores, providing neuroprotective effects.

In conclusion, this investigation sheds light on the cellular and molecular mechanisms underlying the therapeutic effects of natural therapeutic factors, specifically mud and sulfurous mineral waters, on inflammatory processes and oxidative stress. The findings of this study will serve as a scientific foundation for the therapeutic effects of these natural therapeutic factors.









Funding: "This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CCCDI - UEFISCDI, project number PN-III-P2-2.1-PED-2021-2146, within PNCDI III"



Vol 13, No. 1, March 2022





Balneo and PRM Research Journal

Website http://bioclima.ro/Journal.htm

E-mail: office@bioclima.ro

Publisher: Romanian Association of Balneology (Bucharest)

Asociatia Romana de Balneologie / Romanian Association of Balneology

Editura Balneara

Balneo and PRM Research Journal / Index name: BALNEO Indexare BDI science.thomsonreuters.com

Editor: Romanian Association of Balneology / Asociația Română de Balneologie

Dupa 13 ani, dupa 642 articole publicate, dupa eforturi susținute și prin prisma lectiilor învătate, Balneo and PRM Research Journal îsi mentine locul între revistele românesti indexate ISI, cu IF- 1,5 calculat pentru 2022.

În 2023 au fost publicate 110 de articole, evaluate de un grup de 20 de peerreview-eri, fiind emis un certificat în acest sens:



Indexare în EMERGING SOURCES CITATION INDEX (ESCI) - ISI Vă mulţumim pentru efortul comun de pană acum și vă invităm să continuăm acest demers pentru ca împreună să fim promotorii dezvoltării balneologiei și să oferim instrumente adecvate de promovare academică a fiecăruia dintre noi.



Reference: BPRMRJ/ART/564/14(2)/2023

Date: 23 June 2023



Certificate of publication

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(564) Cellular and Molecular Homeostatic Microenvironmental im-balances in Osteoarthritis and Rheumatoid Arthritis

- Constantin Munteanu, Gelu Onose, Marius-Alexandru Turnea, and Mariana Rotariu

Balneo and PRM Research Journal. 2023;14(2):564

DOI 10.12680/balneo.2023.564

- Website http://bioclima.ro/Journal.htm
- Editorial Board: http://bioclima.ro/Edit.php

Autorized signature: Constantin Munteanu

Digitally signed by Constantin Muntean

Editor-in-chief of Balneo and PRM Research Journal Romanian Association of Balneology

Balneo and PRM Research Journal

Print ISSN: 2734-844X Online ISSN: 2734-8458





Activity within the Working Group for Balneary Tourism 2023

Contracte de cercetare derulate în 2023

UAT SLÄNIC MOLDOVA STR. VASILE ALECSANDRI NR. 4. JUD. BACÂU; CIF 4278442; e-mail: primaria@primariaslaniemoldova.ro; web: www.primariaslanicasoldova.ro: tel: 0234/348119; fax: 0234/348829; RO-605500 EN ISO 9001:2015 EN ISO 14001:2015



Nr. 7357/07.06.2022

CONTRACT PRESTĂRI SERVICII

1. În temeiul Legii nr. 98/19.05.2016 privind achizițiile publice, cu modificările Si completarile ulterioare, s-a încheiat prezentul contract de prestări servicii, între:

U.A.T. SLÄNIC MOLDOVA, cu sediul în or. Slănic Moldova, str. Vasile Alecsandri, nr. 4. județul Bacău, cod înregistrare fiscală 4278442, e-mail primaria@primariaslanicmoldova.ro, tel/fax: 0234.348119/0234348829, cont Trezoreria Mun. Onesti . reprezentată prin Primar - ec. BACIU GHEORGHE. în calitate de

ACHIZITOR, pe de o parte,

S.C. BIOSAFETY S.R.L., cu sediul in mun. Bucuresti , Str. Postavarul, nr. 3C, Sector 3, email: constantin2378@yahoo.com, office@ebiosafety.ro, tel:0723138339, înregistrată in Registrul Comertului sub nr. J40/3068/2011, CUI 28184450, cont, deschis la

Părțile au înteles să încheie azi,, prezentul contract în 2 (două) exemplare, câte unul pentru fiecare parte.

Achizitor, UAT ORASUL SLANIC MOLDOVA reprezentata prin Primar, ec. Baciu Gheorghe Viza Birou Economic, ec. Boaca Saulescu Genta

S.C. BIOSAFETY S.R.L. Bucuresti Administrator MUNICANU CONSTANTIN

Prestator,

Viza Compartiment Juridic, cons.jur. Forco\$ Petre

Intocmit - Achizitii Publice, cons. sup. Scurtu Mihaela Alina Viza Birou Urbanism Dr. Ing. Stamate Marius

Viza CFP, cons.asist. Moraru Mihaela Rozalia

1 PRIMÁRIA SLÁNIC MOLLIGIA



MINISTERUL SANAT ATII SANATORIUL BALNEAR SI DE RECUPERARE TECHIRGHIOL Str. Dr. Victor Climescu, nr.34-40 Tel.: 0241.481.711

Contract de prestari servicii

Nr. 7469 / 28.04.2017

În temeiul Legii nr.98/2016, privind atribuirea contractelor de achiziție publică, s-a încheiat prezentul contract de prestari servicii,

SANATORIUL BALNEAR SI DE RECUPERARE TECHIRGHIOL cu sediul in Techirghiol, str. Dr. Victor Climescu nr. 34 - 40, cod postal 906100, Judet Constanta, telefon/fax 02141/481.721 si 0241/735.705, cod fiscal nr. 4300868, cont RO51TREZ23F660606200109X deschis la Trezoreria Eforie, reprezentat legal prin Manager - Almasan Elena-Roxana, în calitate de achizitor, pe de o parte,

S.C BIOSAFETY S.R.L., cu sediul in Bucuresti, Sector 3, str. Postavarul nr. 3C, et.1, ap. 11, cod fiscal nr. 28184450, cont RO18INGB0000999904664056 deschis la ING Bank, reprezentatæ prin Presedinte - Munteanu Constantin, în calitate de prestator, pe de altă parte.

Părțile au înțeles să încheie azi, & 04. 2014, prezentul contract ale cărui clauze au fost discutate, negociate, înțelese și acceptate de părți în 2 (doua) exemplare, din care un exemplar la prestator și un exemplar la achizitor.

Prezentul contract contine un numar de 6 (sase) pagini.









SANATORIUL BALNEAR ȘI DE RECUPERARE TECHIRGHIOI

Bd. Dr. Victor Climescu, pr 34-40, Tel: 0241 481 711; Fax: 0241 735 705; Web: www.shtghiol.ro; E-mail: shtghiol@shtghiol.ru

Nr. 10035 / 07.07.2022

CONTRACT DE PRESTARE SERVICII

In temeiul Legii nr. 98/2016 privind achizitiile publice si a Hotararii Guvernului nr. 395/2016 pentru aprobarea Normelor metodologice de aplicare a prevederilor referitoare la atribuirea contractului de achizitie publica/acordului-cadru din Legea nr. 98/2016 privind achizitiile publice, s-a incheiat prezentul contract de prestare servicii.

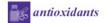
Intre:

SANATORIUL BALNEAR SI DE RECUPERARE TECHIRGHIOL cu sediul in oras Techirghiol, B-dul. Dr. Victor Climescu nr.34-40, cod postal 906100, judet Constanta, telefon 0241-481.711, fax 0241-735.705, Cod fiscal 4300868, cont IBAN RO48TREZ23F66060621000X deschis la Trezoreria Eforie, reprezentat legal prin manager - Elena-Roxana TUCMEANU, în calitate de BENEFICIAR, pe de o parte,

S.C BIOSAFETY S.R.L., cu sediul in Bucuresti, Sector 3, str. Postavarul nr. 3C, et.1, ap. 11, cod postal 032421, tel. 0723.138.339, e-mail: office@ebiosafetv.ro, cod fiscal nr. 28184450, nr. de inregistrarein Reg. Comertului - J40/3068/2011, cont RO18INGB0000999904664056 deschis la ING Bank, reprezentata prin Presedinte - MUNTEANU Constantin, în calitate de PRESTATOR, pe de

Părțile au înțeles să încheie prezentul contract, in 2 (doua) exemplare, cate un exemplar pentru fiecare parte contractanta, avand fiecare un numar de 8 (opt) pagini.

Beneficiar, SANATORIUL BALNEAR SI DE RECUPERARE TECHTRICHIOL	Prestator. S.C BIOSAFETY S.R.L
MANAGER Elena – Roxana TUCMEANU ECHICATOR ANNI SDIRECTOR FINANCIAR CONTABIL	PRESEDINTE MUNTEANU Constantin
VIZA C.F.P.P. Floring LUNGUE VIZA C.F.P.P. V	
COMPARTIMENT JURIDIC Joans CASANDRA	





Renien

Hydrogen Sulfide: An Emerging Regulator of Oxidative Stress and Cellular Homeostasis—A Comprehensive One-Year Review

Constantin Munteanu 1,2,50, Marius Alexandru Turnea 2,5 and Mariana Rotariu 2

- Teaching Emergency Hospital "Bagdasar-Arseni" (TEHBA), 041915 Bucharest, Romania
- Faculty of Medical Bioengineering, University of Medicine and Pharmacy "Grigore T. Popa" Iași, 700454 Iași, Romania; mariana.rotariu@umfiasi.ro
- * Correspondence: constantin munteanu.biolog@umfiasi.ro (C.M.); marius.turnea@umfiasi.ro (M.A.T.)

Abstract Hydrogen sulfide (H₂S), traditionally recognized as a toxic gas, has emerged as a critical regulator in many biological processes, including oxidative stress and cellular homeostasis. This review presents an exhaustive overview of the current understanding of H₂S and its multifaceded role in mammalian cellular functioning and oxidative stress management. We delive into the biological sources and function of H₂S, mechanisms underlying oxidative stress and cellular homeostasis, and the intricals relationships between these process. We explore evidence from recent experimental and clinical studies, unraweling the intricate biochemical and molecular mechanisms dictating H₂S's roles in modulating oxidative stress responses and maintaining cellular homeostasis. The clinical implications and the rapeutic poetntal of H₂S is nonditions characterized by oxidative stress skysregulation and disrupted homeostasis are discussed, highlighting the emerging significance of H₂S in health and disease. Finally, this review underscores current challenges, controversies, and future directions in the field, emphasizing the need for further research to harness H₂S's potential as a therapeutic agent for diseases associated with oxidative stress and homeostatic imbalance. Through this review, we aim to emphasize H₂S's privotal role in cellular function, encouraging further exploration into this burgeoning area of research.

Keywords: hydrogen sulfide; oxidative stress; cellular homeostasis; biochemical mechanisms; therapeutic potential of H₂S

1. Introduction

A captivating theme in modem biology is the ability of simple molecules to orchestrate complex physiological functions [1]. Hydrogen sulfide (H₂S) [2], historically notorious merely as a hazardous, colorless, flammable gas with a characteristic rotten egg odor, is now understood to be a biological signaling molecule [3]. This shift in perception is due to the recognition of H₂S as a significant player in diverse physiological and pathological processes [4]. This small molecule, considered as the third gasotransmitter alongside nitric oxide (NO) and carbon monoxide (CO), exerts a plethora of effects in mammalian physiology, such as vasodilation [5], vascular tone [6], modulating the inflammatory response [7,8], neurotransmission [9], antioxidant properties [10], apoptosis [11] cellular survival [12], regulating cellular metabolism [13], or acting as a cytoprotectant [14]. As a multifaceted molecule [15,16] with profound biological implications, H₂S has increasingly been at the center of scientific scrutiny. This review aims to shed light on the emerging role of H₂S in regulating oxidative stress and maintaining cellular homeostasis, which is crucial for maintaining proper cellular functioning and ensuring the organism's survival [17].

It is essential to acknowledge that the intricate biological effects attributed to H_2S are not directly induced by the gas itself. Rather, H_2S triggers a complex array of oxidative modifications, prominently including persulfidation, disulfide formation, and polysulfide generation. These oxidative transformations operate as fundamental modulators of H_2S 's



M.A.; Rotariu, M. Hydrogen Sulfide An Emerging Regulator of Oxidative Stæss and Cellular Homeostasis—A Compathensive One-Year Review. Antioxidaets 2023, 12, 1737. https://doi.org/10.3390/antiox12091737

check for

update

Academic Editor: Kenneth R. Olson

Received: 12 August 2023 Revised: 27 August 2023 Accepted: 4 September 2023 Published: 7 September 2023



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Systematic Review

Exploring the Potential Benefits of Natural Calcium-Rich Mineral Waters for Health and Wellness: A Systematic Review

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Abstract This systematic review investigates the potential health and wellness benefits of natural calcium-rich mineral waters. It emphasizes the importance of dietary calcium sourced from natural mineral waters in promoting bone health, maintaining cardiovascular function, aiding in weight management, and enhancing overall well-being. The review process involved the comprehensive analysis of peer-reviewed articles, clinical trials, and experimental studies published within the last decade. Findings reveal that consuming calcium-rich mineral water can contribute significantly to daily calcium intake, particularly for those with lactose intolerance or individuals adhering to plant-based diets. The unique bioavailability of calcium from such waters also appears to enhance absorption, thus potentially offering an advantage over other calcium sources. The potential benefits extend to the cardiovascular system, with some studies indicating a reduction in blood pressure and the prevalence of cardiovascular diseases. Emerging evidence suggests that calcium-rich mineral water might have a role in body weight management, though further research is needed. The review identifies several areas requiring additional research, such as the potential interaction between calcium-rich mineral water and other dietary components, the effects on populations with specific health conditions, and the long-term effects of consumption. In conclusion, natural calcium-rich mineral waters show promise as a readily accessible and bioavailable sources of dietary calcium, potentially beneficial for a broad range of individuals. However, further investigation is required to fully understand its range of health impacts and define optimal intake levels.

Keywords: natural calcium-rich mineral waters; calcium intake; bioavailability; dietary calcium; calcium in drinking water

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Systematic Review

PRISMA Systematic Literature Review, including with Meta-Analysis vs. Chatbot/GPT (AI) regarding Current Scientific Data on the Main Effects of the Calf Blood Deproteinized Hemoderivative Medicine (Actovegin) in Ischemic Stroke

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Abstract: Background: Stroke is a significant public health problem and a leading cause of death and long-term disability worldwide. Several treatments for ischemic stroke have been developed, but these treatments have limited effectiveness. One potential treatment for this condition is Actovegin®/AODEJIN, a calf blood deproteinized hemodialysate/ultrafiltrate that has been shown to have pleiotropic/multifactorial and possibly multimodal effects. The actual actions of this medicine are thought to be mediated by its ability to reduce oxidative stress, inflammation, and apoptosis and to enhance neuronal survival and plasticity. Methods: To obtain the most up-to-date information on the effects of Actovegin[®]/AODEJIN in ischemic stroke, we systematically reviewed the literature published in the last two years. This review builds upon our previous systematic literature review published in 2020, which used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method to search for and select related articles over almost two decades, between 1 January 2001 and 31 December 2019. Additionally, we compared the results of our PRISMA search (human intelligence-based) with those obtained from an interrogation of a GPT-based chatbot (ChatGPT) in order to ensure comprehensive coverage of potentially relevant studies. Results: Our updated review found limited new evidence on the use of Actovegin®/AODEJIN in ischemic stroke, although the number of articles on this subject consistently increased compared to that from our initial systematic literature review. Specifically, we found five articles up to 2020 and eight more until December 2022. While these studies suggest that Actovegin®/AODEJIN may have neuroprotective effects in ischemic stroke, further clinical trials are needed to confirm these findings. Consequently, we performed a funnel analysis to evaluate the potential for publication bias. Discussion: Our funnel analysis showed no evidence of publication bias, suggesting that the limited number of studies identified was not due to publication bias but rather due to a lack of research in this area. However, there are limitations when using ChatGPT, particularly in distinguishing between truth and falsehood and determining the appropriateness of interpolation. Nevertheless, AI can provide valuable support in conducting PRISMA-type systematic literature reviews, including meta-analyses. Conclusions: The



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Molecular Aspects of Hypoxic Stress Effects in Chronic Ethanol Exposure of Neuronal Cells

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Abstract Experimental models of a clinical, pathophysiological context are used to understand molecular mechanisms and develop novel therapies. Previous studies revealed better outcomes for spinal cord injury chronic ethanol-consuming patients. This study evaluated cellular and molecular changes in a model mimicking spinal cord injury (hypoxic stress induced by treatment with deferoxamine or cobalt chloride) in chronic ethanol-consuming patients (ethanol-exposed neural cultures (SK-N-SH)) in order to explain the clinical paradigm of better outcomes for spinal cord injury chronic ethanol-consuming patients. The results show that long-term ethanol exposure has a cytotoxic effect, inducing apoptosis. At 24 h after the induction of hypoxic stress (by deferoxamine or cobalt chloride treatments), reduced ROS in long-term ethanol-exposed SK-N-SH cells was observed, which might be due to an adaptation to stressful conditions. In addition, the HIF-1α protein level was increased after hypoxic treatment of long-term ethanol-exposed cells, inducing fluctuations in its target metabolic enzymes proportionally with treatment intensity. The wound healing assay demonstrated that the cells recovered after stress conditions, showing that the ethanol-exposed cells that passed the acute step had the same proliferation profile as the cells unexposed to ethanol. Deferoxamine-treated cells displayed higher proliferative activity than the control cells in the proliferation-migration assay, emphasizing the neuroprotective effect. Cells have overcome the critical point of the alcohol-induced traumatic impact and adapted to ethanol (a chronic phenomenon), sustaining the regeneration process. However, further experiments are needed to ensure recovery efficiency is more effective in chronic ethanol exposure.

Keywords: hypoxic stress effect; chronic ethanol exposure; neuronal cells; neurorehabilitation



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Spinal cord injuries (SCI) comprise a particular category of trauma based on their severity and complex clinical management. The failure of SCI treatment and incomplete recovery is due to a poor understanding of their intricate characteristics. abundant inconsistencies, and complex pathophysiologic consequences post-SCI [1]. Post-traumatic SCI changes comprise the acute phase (up to 48 h post-SCI), the subacute phase (between 2 days and two weeks post-trauma), and the chronic one (following

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Hydrogen Sulfide and Oxygen Homeostasis in Atherosclerosis: A Systematic Review from Molecular Biology to Therapeutic Perspectives

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Abstract: Atherosclerosis is a complex pathological condition marked by the accumulation of lipids in the arterial wall, leading to the development of plaques that can eventually rupture and cause thrombotic events. In recent years, hydrogen sulfide (H₂S) has emerged as a key mediator of cardiovascular homeostasis, with potential therapeutic applications in atherosclerosis. This systematic review highlights the importance of understanding the complex interplay between H2S, oxygen homeostasis, and atherosclerosis and suggests that targeting H2S signaling pathways may offer new avenues for treating and preventing this condition. Oxygen homeostasis is a critical aspect of cardiovascular health, and disruption of this balance can contribute to the development and progression of atherosclerosis. Recent studies have demonstrated that H2S plays an important role in maintaining oxygen homeostasis by regulating the function of oxygen-sensing enzymes and transcription factors in vascular cells. H2S has been shown to modulate endothelial nitric oxide synthase (eNOS) activity, which plays a key role in regulating vascular tone and oxygen delivery to tissues. The comprehensive analysis of the current understanding of H2S in atherosclerosis can pave the way for future research and the development of new therapeutic strategies for this debilitating condition, PROSPERO ID: 417150.

Keywords: hydrogen sulfide; tissue oxygenation; hypoxia; atherosclerosis; homeostatic imbalances

1. Introduction

Atherosclerosis is a multifactorial disease involving various cellular and molecular processes, including lipid metabolism, inflammation [1], mitochondrial dysfunction, autophagy, apoptosis, and epigenetics [2]. These processes can induce oxidative stress, which is characterized by an imbalance between oxidants and antioxidants in the body [3], leading to the generation of reactive oxygen species (ROS), reactive nitrogen species (RNS), and other free radicals that can cause damage to cellular components, including proteins, lipids, and DNA [4]. Mitochondrial dysfunction plays a crucial role in atherosclerosis as mitochondria are the primary source of ROS production [5]. These mechanisms contribute to the development and progression of atherosclerosis, characterized by the accumulation of lipids, calcium, fibrin, and cellular waste products in the arteries' walls, leading to plaque formation [6]. Plaques can restrict blood flow and cause cardiovascular complications, such as heart attack, stroke, and peripheral artery disease. Atherosclerosis is a significant cause of morbidity and mortality worldwide, and multiple risk factors, including obesity, diabetes, smoking, high blood pressure, high cholesterol levels, and genetic predisposition, influence its development [7]. To fully understand the pathophysiological frame of atherosclerosis, it is necessary to consider the complex interplay of these cellular and molecular processes and how they contribute to the development and progression of this disease. Therefore, understanding the molecular mechanisms underlying atherosclerosis is critical for achieving effective preventive and therapeutic strategies [8].



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International Journal of Molecular Sciences



The Role of Hydrogen Sulfide (H2S) in Epigenetic Regulation of Neurodegenerative Diseases: A Systematic Review

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Abstract This review explores the emerging role of hydrogen sulfide (H2S) in modulating epigenetic mechanisms involved in neurodegenerative diseases. Accumulating evidence has begun to elucidate the multifaceted ways in which H2S influences the epigenetic landscape and, subsequently, the progression of various neurodegenerative disorders, including Alzheimer's, Parkinson's, and Huntington's disease. H2S can modulate key components of the epigenetic machinery, such as DNA methylation, histone modifications, and non-coding RNAs, impacting gene expression and cellular functions relevant to neuronal survival, inflammation, and synaptic plasticity. We synthesize recent research that positions H2S as an essential player within this intricate network, with the potential to open new therapeutic avenues for these currently incurable conditions. Despite significant progress, there remains a considerable gap in our understanding of the precise molecular mechanisms and the potential therapeutic implications of modulating H2S levels or its downstream targets. We conclude by identifying future directions for research aimed at exploiting the therapeutic potential of H2S in neurodegenerative diseases.

Keywords: hydrogen sulfide; epigenetic regulation; neurodegenerative diseases; DNA methylation; histone modifications; non-coding RNAs; Alzheimer's disease; Parkinson's disease; Huntington's

1. Introduction

Neurodegenerative diseases, including Alzheimer's, Parkinson's, and Huntington's, pose a formidable challenge to the modern medicine [1,2]. These conditions are characterized by the relentless and irreversible loss of neurons, leading to a gradual decline in cognitive and motor functions [3]. They have become a significant subset of non-communicable diseases, exacerbated by our longer human lifespan [4], impacting the lives of millions of individuals worldwide. Not only do these diseases cause emotional distress, but they also impose substantial economic burdens on society [5].

Delving into the biology of these complex conditions reveals an intricate web of causative factors involving a complex interplay of genetic, epigenetic, and environmental influences that collectively drive disease onset and progression [6-9]. Among these factors, epigenetic changes have emerged as critical determinants in the development and course of neurodegenerative diseases [10-14].

Epigenetic mechanisms play a fundamental role in gene regulation by facilitating dynamic changes in gene activity without altering the underlying DNA sequence [15-24]. Epigenetics includes DNA methylation, histone modification, and the non-coding RNAs [25-30].

Beyond their biological significance, epigenetic changes also offer an intriguing evolutionary perspective [31-33]. Modifying gene activity in response to environmental cues



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Review

Mechanistic Intimate Insights into the Role of Hydrogen Sulfide in Alzheimer's Disease: A Recent Systematic Review

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Abstract: In the rapidly evolving field of Alzheimer's Disease (AD) sesearch, the intricate role of Hydrogen Sulfide (H₂S) has garnesed critical attention for its diverse involvement in both pathological substrates and prospective the rapeutic paradigms. While conventional pathophysiological models of AD have primarily emphasized the significance of amyloid-beta (AB) deposition and tau protein hyperphosphorylation, this targeted systematic review meticulously aggregates and rigorously appraises seminal contributions from the past year elucidating the complex mechanisms of H₂S in AD pathogenesis. Current scholarly literature accentuates H₂S's dual role, delineating its regulatory functions in critical cellular processes—such as neurotransmission, inflammation, and oxidative stress homeostasis—while concurrently highlighting its disruptive impact on quintessential AD biomarkers. Moreover, this review illuminates the nuanced mechanistic intimate interactions of H₂S in erebrovascular and cardiovascular pathology associated with AD, thereby exploring avangated therapeutic modalities, including sulfurous mineral water inhalations and mud therapy. By emphasizing the potential for therapeutic modulation of H₂S via both donors and inhibitors, this review accentuates the imperative for future research endeavors to deepen our understanding, thereby open thalf and vancing movel diagnostics and therapeutic strategies in AD.

Keywords: Alzheimer's Disease; Hydrogen Sulfide (H₂S); amyloid-beta (Aβ) aggregation; tau hyperphosphorylation; cellular homeostasis; neuroinflammation; neuroprotection

1. Introduction

Alzheimer's Disease (AD), the predominant version of dementia, imposes a substantial public health burden [1], afflicting an estimated 50 million individuals globally [2]. While considerable strides have been made in understanding the pathological features of AD—namely, the accumulation of amyloid-beta (Aβ) peptides [3] and the hyperphosphory-lation of tau proteins [4,5]—these classical hallmarks only partially account for the disease's multifactorial etiology [6]. This has invigorated scholarly inquiries into the roles of other critical biochemical entities [7], among which Hydrogen Sulfide (H₂S) has emerged as a molecule of a significant role [8].

Alzheimer's Disease Assessment Scale (ADAS-Cog) is used to quantify cognitive dysfunction [9,10]. Data show a compelling correlation between higher ADAS-Cog scores and elevated levels of H₂S metabolites in plasma [11,12].



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Donion

Topical Cellular/Tissue and Molecular Aspects Regarding Nonpharmacological Interventions in Alzheimer's Disease—A Systematic Review

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Abstract One of the most complex and challenging developments at the beginning of the third millennium is the alarming increase in demographic aging, mainly—but not exclusively—affecting developed countries. This reality results in one of the harsh medical, social, and economic consequences: the continuously increasing number of people with dementia, including Alzheimer? disease (AD), which accounts for up to 80% of all such types of pathology. Its large and progressive disabling potential, which eventually leads to death, therefore represents an important public health matter, especially because there is no known cure for this disease. Consequently, periodic reappraisals of different therapeutic possibilities are necessary. For this purpose, we conducted this systematic literature review investigating nonpharmacological interventions for AD, including their currently known cellular and molecular action bases. This endeavor was based on the PRISMA method, by which we selected 116 eligible articles published during the last year. Because of the unfortunate lack of effective treatments for AD, it is necessary to enhance efforts toward identifying and improving various therapeutic and rehabilitative approaches, as well as related prophylactic measures.

Keywords: Alzheimer's disease; amyloid-beta (Aβ) aggregation; tau hyperphosphorylation; neuroinflammation; nonpharmacological interventions; neuroplasticity



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Renier

Epidemiology of Injuries in Men's Professional and Amateur Football (Part I)

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Abstract Background (1): Football is the most popular sport among men, associated with a certain risk of injury, which leads to short- and long-term health consequences. While the injury profile of professional footballers is known, little is known about the injury profile of amateur footballers; amateur football is a major and diverse area, the development of which should be a priority for football associations around the world and UEFA. The aim of this study was to perform a systematic review of epidemiological literature data on injuries in professional and amateur football players belonging to certain leagues. Methods (2): A systematic review according to the PRISMA guidelines was performed until June 2023 in the databases PubMed, Web of Science, Google Academic, Google Scholar, and Diva portal. Forty-six studies reporting injury incidence in professional and amateur men's football were selected and analyzed. Two reviewers independently extracted data and assessed study quality using an adapted version of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement and the Newcastle Ottawa Scale (NOS) to assess risk of bias for the quality of external validity. Results (3): The overall incidence of injuries in professional male football players was 7.75 ± 2.28, 95% confidence interval, injuries/1000 h of exposure and that of amateur football players was 7.98 ± 2.95, 95% confidence interval, injuries/1000 h of exposure. The incidence of match injuries (30.64 ± 10.28, 95% confidence interval, injuries/1000 exposure hours) was 7.71 times higher than the training injury incidence rate (3.97 \pm 1.35, 95% confidence interval, injuries/1000 h) in professional football players and 5.45 times higher in amateurs (17.56 \pm 6.15 vs. 3.22 \pm 1.4, 95% confidence interval, injuries/1000 h). Aggregate lower extremity injuries had the highest prevalence in both categories of footballers, being $83.32 \pm 4.85\%$ in professional footballers and $80.4 \pm 7.04\%$ in amateur footballers; thigh, ankle, and knee injuries predominated. Conclusions (4): Professional and amateur football players are at substantial risk of injury, especially during matches that require the highest level of performance. Injury rates have implications for players, coaches, and sports medicine practitioners. Therefore, information on football injuries can help develop personalized injury risk mitigation strategies that could make football safer for both categories of football players. The current findings have implications for the management, monitoring, and design of training, competition, injury prevention, especially severe injury, and education programs for amateur football players.



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Epidemiology of Injuries in Professional and Amateur Football Men (Part II)

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Copyright © 2023 by the authors. Licensee MDPL Baset, Switzerland. This article is an open access article distributed under the terms and conditions of the Cavative Commons Attribution (CC BY) license (https:// cavative.commons.og/licenses/by/ 4.0/). Abstract Background (1): Men's football is a physically demanding contact sport that involves intermittent bouts of sprinting, jogging, walking, jumping and changes of direction. The physical demands of the game vary by level of play (amateur club, sub-elite and open club or international), but injury rates at all levels of the men's football game remain the highest of all sports. Objective: The aim of this study is to conduct a systematic review of data from the epidemiological literature regarding the profile, severity and mechanisms of injuries and the frequency of recurrent injuries in professional and amateur football players. Methods (2): A systematic review, according to PRISMA guidelines, was performed up to June 2023 in the databases of PubMed, Web of Science, Google academic, Google scholar and the Diva portal. Twenty-seven studies that reported data on the type, severity, recurrence and mechanisms of injury in professional and amateur men's football were selected and analyzed. Two reviewers independently audited data and assessed the study quality using the additional and adapted version of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement and the Newcastle Ottawa Scale (NOS) to assess risk of bias for the quality of external validity. Results (3): In professional male football players, the mean prevalence of muscle/tendon injuries was 39.78%, followed by joint and ligament injuries—21.13%, contusions-17.86%, and fractures-3.27%, and for amateur football players, the prevalence's were 44.56% (muscle/tendon injuries), 27.62% (joint and ligament injuries), 15.0% (contusions) and 3.05% (fracture), respectively. The frequency of traumatic injuries was higher in amateur football players (76.88%) compared to professional football players (64.16%), the situation being reversed in the case of overuse injuries: 27.62% in professional football players and 21.13% in amateur football players. Most contact injuries were found in professional footballers (50.70%), with non-contact injuries predominating in amateur footballers (54.04%). The analysis of the severity of injuries showed that moderate injuries dominated in the two categories of footballers; the severe injuries in amateur footballers exceeded the severe injuries recorded in professional footballers by 9.60%. Recurrence proportions showed an inverse relationship with the level of play, being higher in amateur footballers (16.66%) compared to professional footballers (15.25%). Conclusions (4): Football-related injuries have a significant impact on professional and amateur football players and their short- and long-term health status. Knowing the frequency of severe diagnoses, such as strains, tears and cramps of the

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The effects of Mineral Waters from Slanic Moldova's Spring 1 and Spring 1 bis on Fibroblast activity: An In Vitro Study

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Abstract: Primary fibroblast cultures obtained from Wistar rats were investigated with a focus on two vital physiological mechanisms: inflammatory processes and oxidative stress balance. These are believed to be affected by mud and sulfurous natural mineral waters, forming the fundamental biological basis for understanding the therapeutic effects of these substances. Existing scientific research highlights that various cell types, including fibroblasts, are recruited during inflammation. These cells respond to a wide array of intercellular and microenvironmental signals, leading to a regulated production of both pro- and anti-inflammatory mediators. Examples include cytokines such as tumor necrosis factor (TNF)-α, interleukin (IL)-1β, and IL-6, as well as chemokines and enzymes like cyclooxygenase (COX)-2. Together, these play vital roles in modulating the

Keywords: Fibroblasts, Sulphurous Mineral Waters, Cytokines, Tumor Necrosis Factor (TNF)-α,

Research Journal stays neutral with 1. Introduction

Research data show that different types of cells are recruited during the inflammatory which play critical roles in controlling the inflammatory process (2,3).

The concept of oxidative stress caused by free radicals argues for the consideration of biomarkers of oxidative stress (4-8). The oxidative and reductive activity of enzymes that act on glutathione, thioredoxin, and other substrates of interest in the oxidation-reduction process reflect the level of antioxidant protection and are also relevant biomarkers for rheumatic degenerative diseases (9-11).

In the case of natural sulfurous mineral waters, the protective effect of H2S on neurons is

inflammatory response.

Interleukins (IL)-1\beta and IL-6, Chemokines, Cyclooxygenase (COX)-2



process, including fibroblasts, which respond to different intercellular and microenvironmental signals (1). This leads to the regulated production of various pro- and antiinflammatory mediators, including cytokines such as tumor necrosis factor (TNF)-α and interleukin (IL)-1β and IL-6, chemokines and enzymes such as cyclooxygenase (COX)-2,

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Research article

Mineral waters from Spring 1 and Spring 1 bis from Slanic Moldova - molecular mechanisms responsible for triggering the prophylactic and therapeutic effects

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Abstract: In this study, we investigated mineral water's therapeutic and prophylactic effects from springs 1 and 1 bis in Slanic Moldova, focusing on identifying the molecular mechanisms responsible for these effects. We collected water samples from these springs and analyzed their chemical composition using various analytical techniques. In addition, we tested the effects of water on cell viability using primary fibroblasts in culture and performed MTT assays to assess the metabolic activity of the cells. Our results indicate that water from both springs has beneficial properties on cells, including improving cell viability and stimulating metabolic activity. This suggests that the mineral water from springs 1 and 1 bis could have therapeutic and prophylactic potential due to its unique chemical composition. Our study could contribute to developing new mineral water-based therapies for various health conditions.

Keywords: fibroblaste, ape minerale sulfuroase, citokine, factorul de necroză tumorală (TNF)-α si inter-leukine (IL)-1β și IL-6, chemokine, ciclooxigenaza (COX)-2

1. Introduction

Biological investigations conducted at the cellular and molecular levels provide insights that support existing concepts regarding the action mechanisms of natural therapeutic factors (1-5). These studies will be carried out through electrophoresis, ELISA, and Western blotting on primary fibroblast cultures derived from Wistar rats. Specifically, these investigations target two primary physiological mechanisms: inflammatory processes and oxidative stress balance (6-9). These are hypothesized to be influenced by therapeutic mud and natural sulfurous mineral waters, constituting the fundamental biological level from which scientific reasoning can be built for the therapeutic effects of mud therapy and sulfurous mineral waters (10-16).

Mineral water is a valuable natural resource, renowned for its healing properties for centuries (17-19). Furthermore, the mineral water from Slanic Moldova has been



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