ACQUA SULFUREA E SALSOBROMOIODICA DI SIRMIONE: BIBLIOGRAFIA IN RELAZIONE AD AZIONI ED EFFETTI SU FUNZIONI ED APPARATI

AZIONE SULLA CLEARANCE MUCOCILIARE (TRASPORTO MUCOCILIARE)

- Keller S, König V, Mösges R. **Thermal water applications in the treatment of upper respiratory tract diseases: a systematic review and meta-analysis.** J Allergy. 2014:Article ID 943824, 17 pages, http://dx,doi: 10.1155/2014/943824.

Abstract
Background. Thermal water inhalations and irrigations have a long tradition in the treatment of airway diseases. Currently there exists no systematic review or meta-analysis on the effectiveness of thermal water treatment in upper respiratory tract diseases. Methods. A systematic search in the databases of MEDLINE, EMBASE, CENTRAL, ISI Web of Science, and MedPilot was accomplished. Results. Eight evaluable outcome parameters from 13 prospective clinical studies were identified for 840 patients. Mucociliary clearance time improves significantly ($P < 0.01$) for the pooled thermal water subgroup and the sulphurous subgroup after 2 weeks (−6.69/minutes) and after 90 days (−8.33/minutes), not for isotonic sodium chloride solution (ISCS). Nasal resistance improved significantly after 2 weeks (Radon, ISCS, and placebo), after 30 days (sulphur and ISCS), and after 90 days (sulphur). Nasal flow improved significantly with the pooled thermal water, radon alone, and ISCS subgroups. For the IgE parameter only sulphurous thermal water ($P < 0.01$) and ISCS ($P > 0.01$) were analyzable. Adverse events of minor character were only reported for sulphurous treatment (19/370). Conclusion. Thermal water applications with radon or sulphur can be recommended as additional nonpharmacological treatment in upper airway diseases. Also in comparison to isotonic saline solution it shows significant improvements and should be investigated further.
Richiedi il testo completo: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4058810/

AZIONE ANTIOSSIDANTE E ANTINFIAMMATORIA

- Braga PC, Ceci C, Marabini L, Nappi G. **The antioxidant activity of sulphurous thermal water protects against oxidative DNA damage: a comet assay investigation.** Drug Res (Stuttg). 2013 Apr;63(4):198-202. doi: 10.1055/s-0033-1334894. Epub 2013 Feb 27

Abstract
Various studies have recently shown that sulphurous waters acts against the oxidants released during respiratory bursts of human neutrophils, and free radicals such as HO•, $O2^{-}$•, Tempol and Fremy's salt. However, there is still a lack of data concerning their direct protection of DNA. The aim of this study was to investigate the antigenotoxicity effects of sulphurous water, which has never been previously investigated for this purpose, using the alkaline single cell gel electrophoresis (SCGE) approach (comet assay). The comet assay is a sensitive method for assessing DNA fragmentation in individual cells in genotoxicity studies but can also be used to investigate the activity of agents that protect against DNA damage. The extent of migration was measured by means of SCGE, and DNA damage was expressed as tail moment. All of these assays were made using natural sulphurous water, degassed sulphurous water (no detectable HS), and reconstituted sulphurous water (degassed plus NaHS). DNA damages was significantly inhibited by natural water with HS concentrations of 5.0 and 2.5 µg/mL. The use of degassed water did not lead to any significant differences from baseline values, whereas the reconstituted water led to significant results overlapping those obtained using natural water. These findings confirm the importance of the presence of an HS group (reductive activity)

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and indicate that, in addition to their known mucolytic activity and trophic effects on respiratory mucosa, HS groups in sulphurous water also protect against oxidative DNA damage and contribute to the water's therapeutic effects on upper and lower airway inflammatory diseases
Richiedi il testo completo: https://www.ncbi.nlm.nih.gov/pubmed/23447143

- Braga PC, Dal Sasso M, Culici M, Spallino A, Marabini L, Bianchi T, Nappi G. **Effects of sulphurous water on human neutrophil elastase release.** Ther Adv Respir Dis. 2010 Dec;4(6):333-40.

Abstract
BACKGROUND:
Molecules bearing a sulphide (HS) group, such as glutathione, play a fundamental role in the defensive system of human airways, as shown by the fact that the lining fluid covering the epithelia of the respiratory tract contains very high concentrations of glutathione: the lungs and nose, respectively, contain about 140 and 40 times the concentrations found in plasma. Consequently, various low-weight soluble molecules bearing an HS group (including N-acetylcysteine, mesna and thiopronine, and prodrugs such as stepronine and erdosteine) have been used for therapeutic purposes. HS groups can also be therapeutically administered by means of sulphurous thermal water containing HS groups. The aim of this study was to investigate the direct activity of such water on the release of elastase by activated human neutrophils.
METHOD:
After the neutrophils were incubated with increasing amounts of sulphurous water or the HS/hydrogen sulphide donor sodium hydrosulphide (NaHS), elastase release was initiated by N-formyl-methionyl-leucyl-phenylalanine and measured by means of spectrofluorimetry using methylsuccinylalanylprolylvalyl-methylcoumarin amide as the fluorogenic substrate. To verify the presence of direct action on elastase we determined the diameter of the area of elastinolysis on elastine-agarose gel plates.
RESULTS:
The sulphurous water significantly inhibited elastase release at HS concentrations ranging from 4.5 to 18 µg/ml, as assayed using the iodometric method; in the case of NaHS, the inhibition was significant at HS concentrations ranging from 2.2 to 18 µg/ml. The concentration-effect regression lines of both were parallel and neither showed any direct elastolytic activity.
CONCLUSIONS:
Previous claims concerning the activity of sulphurous water have been based on the patients' subjective sense of wellbeing and on symptomatic (or general) clinical improvements that are not easy to define or quantify exactly. Our findings indicate that, in addition to its known mucolytic and antioxidant activity, sulphurous water also has an anti-elastase activity that may help to control the inflammatory processes of upper and lower airway diseases.
Richiedi il testo completo: https://www.ncbi.nlm.nih.gov/pubmed/20650977

EFFETTI CLINICI SULLA PATOLOGIA OTORINOLARINGOLOGICA

- Staffieri A, Marino F, Staffieri C, Giacomelli L, D'Alessandro E, Maria Ferraro S, Fedrazzoni U, Marioni G. **The effects of sulfurous-arsenical- ferruginous thermal water nasal irrigation in wound healing after functional endoscopic sinus surgery for chronic rhinosinusitis: a prospective randomized study.** Am J Otolaryngol. 2008 Jul- Aug;29(4):223-9.

Abstract
PURPOSE:
Although several publications reported the benefits of nasal irrigation in the management of chronic rhinosinusitis and in sinonasal postoperative care, the available data are poorly controlled. The aim of this prospective randomized study was to compare the effects of sulfurous-arsenical-ferruginous thermal water nasal irrigation vs isotonic sodium chloride solution nasal irrigation after functional endoscopic sinus surgery

(FESS) for chronic sinonasal disease considering the histomorphological characteristics of mucosal repair after sinus surgery.
MATERIALS AND METHODS:
Eighty patients who consecutively underwent FESS were randomly assigned (1:1) to postoperative nasal irrigation with sulfurous-arsenical-ferruginous thermal water or isotonic sodium chloride solution for 6 months. Intraoperative and postoperative (1, 3, and 6 months) mean counts of lymphocytes, neutrophils, eosinophils, plasma cells, histiocytes, and mast cells in ethmoid biopsies were blindly determined by a pathologist.
RESULTS:
Fifty-six patients underwent at least 2 postoperative biopsies. A statistically significant reduction of eosinophil count was disclosed 6 months postoperatively only after sulfurous-arsenical-ferruginous solution nasal irrigation (P = .04). After isotonic sodium chloride solution nasal irrigation, the mean eosinophil count in 6-month postoperative biopsies did not decrease. After both irrigation modalities, the mean mast cell counts in 6-month postoperative biopsies were significantly lower than in intraoperative biopsies (P < .05). Neutrophils, lymphocytes, histiocytes, and plasma cell counts were not significantly different between intraoperative vs 6-month postoperative biopsies independently from irrigation modality.
CONCLUSIONS:
Considering the important role of eosinophils in allergic response, we should suggest sulfurous-arsenical-ferruginous solution nasal irrigation in particular, which significantly reduces local eosinophil count, for allergic patients after FESS for chronic rhinosinusitis.
Richiedi il testo completo: https://www.ncbi.nlm.nih.gov/pubmed/18598831

- Califano L, Salafia F, Mazzone S, D'Ambrosio G, Malafronte L, Vassallo A. **A comparative randomized study on the efficacy of a systemic steroid therapy vs. a thermal therapy in Otitis media with effusion in children.** Minerva Pediatr. 2016; 68:241-9.

Abstract
BACKGROUND:
The aim of this study was to compare the effectiveness of a systemic steroid therapy vs. a thermal therapy based on sulphurous water insufflation. The therapy was performed in Telese Terme Spa based on the Salimbani-Politzer technique on children suffering of otitis media with effusion (OME), using the variations of the tympanogram as objective outcome in a short time follow-up.
METHODS:
Eighty children suffering of monolateral or bilateral OME (44 male, 36 female, age 4-12 years, average age 7.2±2.83 ys.), enrolled in ENT or paediatrics offices, have been included in the study. Children were included in a randomization list in order to obtain two therapeutic groups, the first one to be treated through a systemic steroid therapy, the second one to be treated through sulphuruos water insufflation in Telese Spa. Children underwent otoscopic/otomicroscopic visit and tympanometry before the beginning of the therapy (T0), 7 days after the beginning of the therapy (T1), 7-10 days after the end of the therapy (T2), 30-35 days after the end of the therapy (T3). The variation of the type of tympanogram was considered the objective outcome. The shift either from a type B to a type C or o type A tympanogram and from a type C to a type A tympanogram was considered a positive outcome; the persistence either of the same type of tympanogram and the shift from a type C to a type B or from a type A to a type C or a type B were considered a negative outcome.
RESULTS:
Thermal therapy showed better outcomes at each time, with differences in improvement and healing often reaching the statistical significance. The most important prognostic indicator was the presence of an initial type B tympanogram, associated to a worst prognosis in both therapeutic groups and in each subgroup of OME.
CONCLUSIONS:
Sulphurous water insufflation therapy appeared a good therapeutic choose in the treatment of OME in a pediatric population.

Richiedi il testo completo: https://www.ncbi.nlm.nih.gov/pubmed/25393089

EFFETTI CLINICI SULLA PATOLOGIA RESPIRATORIA CRONICA (BPCO)

- Contoli M, Gnesini G, Forini G, Marku B, Pauletti A, Padovani A, Casolari P, Taurino L, Ferraro A, Chicca M, Ciaccia A, Papi A, Pinamonti S. **Reducing agents decrease the oxidative burst and improve clinical outcomes in COPD patients: a randomised controlled trial on the effects of sulphurous thermal water inhalation.** Scientific World Journal. 2013: Article ID 927835, 7 pages, http: http://doi.org./10.1155/2013/927835.

Abstract
BACKGROUND:
Inhalation of thermal water with antioxidant properties is empirically used for COPD.
AIMS:
To evaluate the effects of sulphurous thermal water (reducing agents) on airway oxidant stress and clinical outcomes in COPD.
METHODS:
Forty moderate-to-severe COPD patients were randomly assigned to receive 12-day inhalation with sulphurous thermal water or isotonic saline. Patients were assessed for superoxide anion (O2 (-)) production in the exhaled breath condensate and clinical outcomes at recruitment, the day after the conclusion of the 12-day inhalation treatment, and one month after the end of the inhalation treatment.
RESULTS:
Inhalation of reducing agents resulted in a significant reduction of O2 (-) production in exhaled breath condensate of COPD patients at the end of the inhalatory treatment and at followup compared to baseline. A significant improvement in the COPD assessment test (CAT) questionnaire was shown one month after the end of the inhalatory treatment only in patients receiving sulphurous water.
CONCLUSION:
Thermal water inhalation produced an in vivo antioxidant effect and improvement in health status in COPD patients. Larger studies are required in order to evaluate whether inhalation of thermal water is able to modify relevant clinical outcomes of the disease (the study was registered at clinicaltrial.gov-identifier: NCT01664767).
Richiedi il testo completo: https://www.ncbi.nlm.nih.gov/pubmed/24453924

AZIONI SUI VASI

- Mancini S Jr1, Piccinetti A, Nappi G, Mancini S, Caniato A, Coccheri S. **Clinical, functional and quality of life changes after balneokinesis with sulphurous water in patients with varicose veins.** Vasa. 2003 Feb;32(1):26-30.

Abstract
BACKGROUND:
Purpose of this study was to assess the effects of thermal hydrotherapy (balneokinesis) with a sulphurous water on clinical symptoms, quality of life and some functional parameters in patients with varicose veins.
PATIENTS AND METHODS:
70 patients with primary or secondary symptomatic varicosis were enrolled and submitted to elastic compression therapy. Patients were then randomized to receive (50 pts, group A) or not receive (20 pts, group B) balneokinetic treatment for 12 days "on top" of elastic compression. Clinical symptoms, quality of life and functional parameters obtained with light reflex plethysmography (PPG) and laser Doppler fluxmetry (LDF) were assessed after 3 and 6 months.

RESULTS:
Scores for subjective symptoms as pain, edema, and venous claudication were decreased after 6 months in both groups, but more evidently in group A submitted to balneokinesis. Some parameters related to quality of life evaluation as "bodily pain" and "emotional role" were improved only in patients undergoing balneokinesis. Regarding functional parameters, with PPG venous refilling time after foot exercise moderately increased in both groups. With LDF a significant improvement in the veno-arteriolar reflex was seen in the group treated with balneokinesis.
CONCLUSIONS:
These results show additional benefits of balneokinetic treatment in patients with symptomatic varices submitted to elastic compression. In fact, clinical and quality of life improvements were observed. The associated amelioration in the veno-arteriolar reflex may support these subjective benefits.
Richiedi il testo completo: https://www.ncbi.nlm.nih.gov/pubmed/12677762

AZIONI SULL'APPARATO MUSCOLO SCHELETRICO

- Kovács C, Pecze M, Tihanyi Á, Kovács L, Balogh S, Bender T. **The effect of sulphurous water in patients with osteoarthritis of hand. Double-blind, randomized, controlled follow-up study.** Clin Rheumatol. 2012 Oct;31(10):1437-42. doi: 10.1007/s10067-012-2026-0. Epub 2012 Jul 29.

Abstract
The aim of the study was to demonstrate the effectiveness of sulphurous water in patients with osteoarthritis of the hand. Forty-seven patients with osteoarthritis of the hand were enrolled into the double-blind, randomized, controlled study, satisfying ACR criteria. One group of the patients (n = 24) received balneotherapy, bathing in sulphurous thermal water for 20 min per occasion, 15 times in all during a period of 3 weeks. The control group (n = 21) had a bath exclusively in warm tap water. Assessments were carried out in both groups on four occasions: at the beginning and at the end of the treatment, and 3 and 6 months after the beginning of the treatment. The parameters studied were the following: pain in the hand, morning stiffness in the joints, grip strength of both hands, and Health Assessment Questionnaire Disability Index (HAQ) and AUSCAN Hand Osteoarthritis Index and EuroQol quality of life questionnaire. At the end of treatment, the improvement was more pronounced in the patient group treated with the sulphurous water. After 3 months, significant improvement could be detected in all parameters, except the morning stiffness and EQ5D. After 6 months, the values of pain, HAQ and AUSCAN continued to be significantly better in comparison with the baseline values. The improvement in quality of life was significant only at the end of the treatment, 6 months later not any longer. The difference between the two groups was significant after 3 months in point of pain and EQVAS. Balneotherapy and within this the sulphurous spa water alone may be effective for the attenuation of pain in patients with hand osteoarthrosis.
Richiedi il testo completo: https://www.ncbi.nlm.nih.gov/pubmed/22843170

- Sieghart D, Liszt M, Wanivenhaus A, Bröll H, Kiener H, Klösch B, Steiner G **Hydrogen sulphide decreases IL-1β-induced activation of fibroblast-like synoviocytes from patients with osteoarthritis**.. J Cell Mol Med. 2015 Jan;19(1):187-97

Abstract
Balneotherapy employing sulphurous thermal water is still applied to patients suffering from diseases of musculoskeletal system like osteoarthritis (OA) but evidence for its clinical effectiveness is scarce. Since the gasotransmitter hydrogen sulphide (H_2S) seems to affect cells involved in degenerative joint diseases, it was the objective of this study to investigate the effects of exogenous H_2S on fibroblast-like synoviocytes (FLS), which are key players in OA pathogenesis being capable of producing pro-inflammatory cytokines and matrix degrading enzymes. To address this issue primary FLS derived from OA patients were stimulated with IL-1β and treated with the H_2S donor NaHS. Cellular responses were analysed by ELISA, quantitative real-time PCR,

phospho-MAPkinase array and Western blotting. Treatment-induced effects on cellular structure and synovial architecture were investigated in three-dimensional extracellular matrix micromasses. NaHS treatment reduced both spontaneous and IL-1β-induced secretion of IL-6, IL-8 and RANTES in different experimental settings. In addition, NaHS treatment reduced the expression of matrix metallo-proteinases MMP-2 and MMP-14. IL-1β induced the phosphorylation of several MAPkinases. NaHS treatment partially reduced IL-1β-induced activation of several MAPK whereas it increased phosphorylation of pro-survival factor Akt1/2. When cultured in spherical micromasses, FLS intentionally established a synovial lining layer-like structure; stimulation with IL-1β altered the architecture of micromasses leading to hyperplasia of the lining layer which was completely inhibited by concomitant exposure to NaHS. These data suggest that H2S partially antagonizes IL-1β stimulation via selective manipulation of the MAPkinase and the PI3K/Akt pathways which may encourage development of novel drugs for treatment of OA.

Richiedi il testo completo: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4288362/