

Recent results about antioxidant and immunomodulatory effects of sulphurous water

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Abstract

The purpose of this study was to gather the most significant articles that highlight the antioxidant and immunomodulatory role of sulphurous mineral water (SMW), also validating scientifically its use in medical treatment.

The modern scientific researches confirm the effective utilization of sulphurous mineral water (SMW) as a therapeutic method and as a prevention of many respiratory pathologies. The positive effects of SMW were shown also on animal models, and sporadic adverse reactions were reported [1]. In Otorhinolaryngology (ORL) SMW is usually used in the treatment of upper respiratory tract of adults and children [2]. Examining the literature, in addition to the already known effects of SMW, remarkable antioxidant and immunomodulatory activities have been emphasized in recent studies [3]. The biological mechanism linked to the interactions of sulphur compounds is complex and controversial; anyway it is demonstrated that molecules containing sulphidrilic groups, such as glutathione, have a marked defensive activity against tissue and cell damage. The SMW utilisation as a therapeutic strategy is proved to be efficient in chronic inflammatory pathologies of the upper respiratory tract that didn't respond to the traditional therapy; therefore the thermal therapy is the first viable alternative to drug treatment [4].

In studies on immunomodulatory effects we have chosen the articles concerning the variation of some parameters such as: IgA, IgE, IgG, IgM, IgAs, eosinophils and albumin; in the antioxidant effect study we have selected some parameters such as: macrophages, neutrophils (PMNn), elastase release, L-type calcium channels, glutathione, protein oxidation products and total oxidant power. The first studies showed an immunomodulatory effect of SMW evaluated as secretion of nasal mucosa and serum Ig before and after a cycle of crenotherapy [5]. The obtained results on nasal secretion using a Beckmann ICS turbidimeter showed a statistically significant increase of IgAs [5]. The study of changes of the composition of nasal mucus before and after crenotherapy showed an increase of average total protein content of mucus and a statistically significant increase of IgAs amount expressed by an increase in

the secretory piece [3]. In patients with allergic rhinitis treated with SMW, after a 30-day cycle using nasal spray, a reduction of total IgE and an increase of serum IgA statistically significant compared to the control-case were demonstrated [6]. In 2008, the same authors analyze the same parameters in children with recurrent infections of upper respiratory tract treated with SMW inhalation; the data obtained agree with those previously reported. The same authors in 2010 published a study on adult patients with chronic rhinosinusitis [2]; again, the results showed an increase in the case sample and a statistically significant decrease of IgE and IgAs when compared to the control. A study on the possible modification of cell population before and after nasal irrigation with SMW was conducted through nasal mucosa biopsy: the comparison between the biopsies demonstrated a statistically significant decrease of eosinophils only in the control group; the SMW could limit the production of cytokine-mediated eosinophils, as well as the production of IgE [7]. A recent study, alongside an increase of IgAs concentration due to crenotherapy, showed an increase of albumin concentration in nasal mucus, suggesting a possible correlation between the increase of IgAs and albumin [8]; in the biological systems it is demonstrated that molecules with sulphidrilic groups, such as glutathione, have a defensive activity against marked cellular and tissue destruction and as a whole in the inflammatory process [8]. In the latter two processes the activation of epithelial cells and the emission of chemotactic signals by macrophages occur, as well as the recruitment of individual cells, in particular of PMNn, resulting in the release of free radicals and lytic enzymes, and damage of tissues by elastase action. Recent studies have tried to demonstrate the SMW antioxidant mechanism, therefore PMNn are incubated in increasing concentrations of sulphurous mineral water (SMW); the release of elastase promoted by N-formyl-methionyl-leucyl-phenylalanine was measured with spectrofluorometric methods, utilizing a fluorogenic substrate. Therefore, it was concluded that H₂S can exert an inhibitory activity on L-type calcium channels, which results in inhibition of intracellular Ca function, increase of membrane permeability and subsequent reduction of elastase release [9]. In patients with BPCO crenotherapy has been shown to lead to a reduction of radical oxidants such as hydrogen peroxide (H₂O₂). This effect appears to be related to increased GSH availability resulting in the use of SMW;

the same results were demonstrated with a treatment with sulphurous water. Following ingestion of SMW, the oxidation products of lipids and proteins in the plasma seems to decrease, and seems also to occur an increase in total antioxidant capacity of plasma and an increase of total plasma thiols levels. The increase of endogenous HS following ingestion of SMW can increase the level of intracellular GSH, which could be released from tissues in order to maintain the plasmatic thiols in the reduced form [10].

Conclusions

The examination of the literature demonstrates an important interaction between sulphurous water and biological systems, suggesting that SMW can be used as possible adjuvant therapy in various respiratory diseases, even if the interaction mechanism isn't yet fully understood.

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