



# Sulphurous thermal water inhalation impacts respiratory metabolic parameters in heavy smokers

Cecilia Carubbi<sup>1</sup> · Elena Masselli<sup>1</sup> · Elisa Calabrò<sup>2</sup> · Elisa Bonati<sup>1</sup> · Carlotta Galeone<sup>3</sup> · Roberta Andreoli<sup>1</sup> · Matteo Goldoni<sup>1</sup> · Massimo Corradi<sup>1</sup> · Nicola Sverzellati<sup>1</sup> · Giulia Pozzi<sup>1</sup> · Antonio Banchini<sup>1</sup> · Ugo Pastorino<sup>4</sup> · Marco Vitale<sup>1</sup>

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## Abstract

Sulphurous thermal water inhalations have been traditionally used in the treatment of airway diseases. In vivo and in vitro studies reported that they ameliorate mucus rheology, mucociliary clearance and reduce inflammation. Cigarette smoking induces an inflammatory damage, with consequent remodeling of respiratory airways, which in turn affect pulmonary functions. Despite the anti-inflammatory effects of H<sub>2</sub>S are clinically documented in several airway inflammatory diseases, data on the effects of sulphurous thermal water treatment on pulmonary function and biomarkers of airways inflammation in smokers are still scant. Therefore, we investigated whether a conventional cycle of sulphurous thermal water inhalation produced changes in markers of respiratory inflammation and function. A cohort of 504 heavy current and former smokers underwent 10-day cycles of sulphurous thermal water inhalation. Pulmonary function and metabolic analyses on exhaled breath condensate were then performed at day 0 and after the 10-day treatment. Spirometric data did not change after spa therapy, while exhaled breath condensate analysis revealed that a single 10-day cycle of sulphurous water inhalation was sufficient to induce a statistically significant increase of citrulline levels along with a decrease in ornithine levels, thus shifting arginine metabolism towards a reduced nitric oxide production, i.e. an anti-inflammatory profile. Overall, sulphurous thermal water inhalation impacts on arginine catabolic intermediates of airways cells, shifting their metabolic balance towards a reduction of the inflammatory activity, with potential benefits for smokers.

**Keywords** Thermal water therapy · Hydrogen sulphide · Pulmonary function · Exhaled breath condensate · Nitric oxide · Smoking habit

✉ Marco Vitale  
marco.vitale@unipr.it

Cecilia Carubbi  
cecilia.carubbi@unipr.it

Elena Masselli  
elena.masselli@unipr.it

Elisa Calabrò  
elisa.calabro@asst-fbf-sacco.it

Elisa Bonati  
elisa.bonati@ausl.re.it

Carlotta Galeone  
carlotta.galeone@unimi.it

Roberta Andreoli  
roberta.andreoli@unipr.it

Matteo Goldoni  
matteo.goldoni@unipr.it

Massimo Corradi  
massimo.corradi@unipr.it

Nicola Sverzellati  
nicola.sverzellati@unipr.it

Giulia Pozzi  
giulia.pozzi@unipr.it

Antonio Banchini  
antonio.banchini@gmail.com

Ugo Pastorino  
ugo.pastorino@istitutotumori.mi.it

<sup>1</sup> Department of Medicine and Surgery, University of Parma, via A. Gramsci 14, 43126 Parma, Italy

<sup>2</sup> Department of Internal Medicine, Ospedale Fatebenefratelli Sacco, Piazzale Principessa Clotilde 3, 20121 Milan, Italy

<sup>3</sup> Department of Clinical Sciences and Community Health, University of Milan, Via Commenda 19, 20122 Milan, Italy

<sup>4</sup> Section of Thoracic Surgery, Fondazione IRCCS Istituto Nazionale Tumori, via Venezian 1, 20133 Milan, Italy