

# Balneology research in Italy: facts and perspectives

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## Abstract

Italy presently promotes relevant scientific research of modern thermalism and significant collaboration with health care Authorities. Even in a evidence-based discipline such as balneology, we can monitor the effects of the active ingredients contained in a particular type of water and, at the same time foster a modern clinical research approach that assesses the true action of balneology on patients.

The Italian Granting Agency for Research in Balneotherapy (FoRST) periodically invites grant proposals in the Biomedical SPA basic and clinical research area. The selection process is based on the most acclaimed international criteria to evaluate scientific quality, appropriate money allocation, and overall feasibility of the project.

Together with other European health institutions, FoRST is actively involved to improve the overall knowledge in crenotherapy also at the educational level and in collaboration with WHO is working to define skills and intervention fields of thermal medicine as well as an in depth quality review of worldwide scientific spa literature.

**Key words:** Balneology Research, Crenotherapy Research, Italy

## Investigación Balneológica en Italia: hechos y perspectivas

### Resumen

En la actualidad Italia fomenta la investigación científica relevante del termalismo moderno en significativa colaboración con las Autoridades sanitarias. En una disciplina basada en la evidencia como la balneología, podemos controlar los efectos de los principios activos contenidos en un tipo particular de agua y, al mismo tiempo, fomentar un planteamiento moderno de investigación clínica que evalúa la verdadera acción de ésta en los pacientes.

La Fundación para la Investigación Científica Termal (FoRST) convoca periódicamente subvenciones para la presentación de propuestas en el ámbito de la investigación biomédica termal básica y clínica. El proceso de selección se basa en los criterios internacionales más reconocidos para evaluar la calidad científica, la asignación de dinero apropiado, y la viabilidad global del proyecto.

Junto con otras instituciones sanitarias europeas, FoRST participa activamente para mejorar el conocimiento general de la crenoterapia también en el ámbito educativo y en colaboración con la OMS está trabajando para definir las competencias y ámbitos de intervención de la medicina termal, así como una revisión en profundidad de la calidad científica mundial de las publicaciones termales.

**Palabras claves:** Investigación Balneológica, Investigación en Crenoterapia, Italia

#### REFERENCE STANDARD

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Within the term of balneology, the concept of spa medical therapy or, as we proposed, crenotherapy (Vaccarezza and Vitale<sup>1</sup>) is included. This is a series of practices that uses water with various mineral components and different physical properties to alleviate or to cure the symptoms of various pathologies, mainly of the respiratory, digestive and urinary tract, of the skin and middle ear, as well as rheumatologic diseases (Sukenic et al<sup>2</sup>; Bender et al<sup>3-4</sup>; Balint et al<sup>5</sup>; Falagas et al<sup>6</sup>; Fioravanti et al<sup>7</sup>).

The practice of crenotherapy originates from the Mediterranean sea region, where mineral water was used for hydrotherapy as witnessed by archaeological findings and numerous art pieces and literature (Routh et al<sup>8</sup>; Frosch<sup>9</sup>). Crenotherapy has reached our era as a medical discipline rarely regulated by scientific standards. Only in the last century the improved knowledge of chemistry and physics has added a rationale in classifying the different types of water based on their chemical and physical properties. The fact that in Europe, spas at the turn of the nineteenth century progressively became an élite fashion, together with the recent explosion of the modern concept of physical well-being, has hindered most of the scientific effort necessary to give to crenotherapy modern scientific foundations. One could say that crenotherapy would not have lasted 2.000 years or more if it was not effective. However, nobody would doubt that a long history cannot be taken per se as scientific proof of efficacy.

For this reason, Italy presently promotes relevant scientific research of modern thermalism and significant collaboration with health care Authorities. Even in a evidence-based discipline such as balneology, we can monitor the effects of the active ingredients contained in a particular type of water and, at the same time

foster a modern clinical research approach that assesses the true action of balneology on patients.

It is possible to study *in vitro* and to reproduce *in vivo* the activity of spa therapy studying the effects of the active principles present in the various mineral waters. In the clinical field, we can quantify the evidence of the clinical effect of spa therapy in different medical disciplines.

The Italian Granting Agency for Research in Balneotherapy (FoRST) periodically invites grant proposals in the Biomedical SPA basic and clinical research area. The only criterion for eligibility is to be a scientist specializing in the area of spa research (regardless of nationality). Applicants must be from universities, hospitals, national and international, public or private research Institutions, local administrations, departments of health, Ministry of Health, Italian National Institute of Health. The grants are focused on basic and applied biomedical spa research as well as clinical research (as outlined above). The selection process is based on the most acclaimed international criteria to evaluate scientific quality, appropriate money allocation, and overall feasibility of the project. The proposal is also carefully monitored “*in itinere*” to secure the proper development and the appropriate time schedule for the selected project. Of note, only if the results are published in an international peer reviewed scientific journal, the applicant will be awarded the final part of the financing of the project.

As a demonstration of the efficacy of this approach to foster scientific spa research, in the past few years FoRST-related projects were able, just to mention few examples, to demonstrate the action of hydrogen sulphide (one of the active chemical compounds found in spa waters) on human lymphocytes and keratinocytes, highlighting its positive effects on psoriatic lesions (Rinaldi et al<sup>10</sup>; Mirandola et al<sup>11-12</sup>; Gobbi et al<sup>13</sup>), the possibility to use mud therapy as a delivery system (Tateo et al<sup>14</sup>), the antioxidant properties of several mineral waters (Benedetti et al<sup>15</sup>; Costantino et al<sup>16</sup>).

On a clinical stand point, FoRST has been involved in several projects such a prospective randomized studies on the effect of mineral waters on rhinosinusitis (Staffieri et al<sup>17</sup>; Ottaviano et al<sup>18</sup>), studies on the effect of mineral waters in pulmonary disease (Guarnieri et al<sup>19</sup>), on osteoarthritis (Fioravanti et al<sup>20</sup>), even studies on the vascular effects of active principles found in mineral waters (Bucci et al<sup>21</sup>).

Together with other European health institutions, FoRST is actively involved to improve the overall knowledge in crenotherapy also at the educational level and in collaboration with WHO is working to define skills and intervention fields of thermal medicine as well as an in depth quality review of worldwide scientific spa literature.

This multifaceted approach is paving the way to the rescue of balneotherapy on a national and, more importantly, international scale: a robust, scientifically sound clinical practice based on natural principles, that will be able to reduce public health

costs if selectively used for the appropriate indications and with the use of suitable methodologies.

## REFERENCES

1. Vaccarezza M, Vitale M. Crenotherapy: a neglected resource for human health now re-emerging on sound scientific concepts. *Int J Biometeorol*. 2010 Sep;54(5):491-3.
2. Sukenik S, Flusser D, Abu-Shakra M. The role of spa therapy in various rheumatic diseases. *Rheum Dis Clin North Am*. 1999 Nov;25(4):883-97.
3. Bender T, Nagy G, Barna I, Tefner I, Kádas E, Géher P. The effect of physical therapy on beta-endorphin levels. *Eur J Appl Physiol*. 2007 Jul;100(4):371-82.
4. Bender T, Bariska J, Vághy R, Gomez R, Kovács I. Effect of balneotherapy on the antioxidant system--a controlled pilot study. *Arch Med Res*. 2007 Jan;38(1):86-9.
5. Bálint GP, Buchanan WW, Adám A, Ratkó I, Poór L, Bálint PV, et al. The effect of the thermal mineral water of Nagybaracska on patients with knee joint osteoarthritis--a double blind study. *Clin Rheumatol*. 2007 Jun;26(6):890-4.
6. Falagas ME, Zarkadoulia E, Rafailidis PI. The therapeutic effect of balneotherapy: evaluation of the evidence from randomised controlled trials. *Int J Clin Pract*. 2009 Jul;63(7):1068-84.
7. Fioravanti A, Cantarini L, Guidelli GM, Galeazzi M. Mechanisms of action of spa therapies in rheumatic diseases: what scientific evidence is there? *Rheumatol Int*. 2011 Jan;31(1):1-8.
8. Routh HB, Bhowmik KR, Parish LC, Witkowski JA. Balneology, mineral water, and spas in historical perspective. *Clin Dermatol*. 1996 Nov-Dec;14(6):551-4.
9. Frosch WA. "Taking the waters"--springs, wells, and spas. *FASEB J*. 2007 Jul;21(9):1948-50.
10. Rinaldi L, Gobbi G, Pambianco M, Micheloni C, Mirandola P, Vitale M. Hydrogen sulfide prevents apoptosis of human PMN via inhibition of p38 and caspase 3. *Lab Invest*. 2006 Apr;86(4):391-7.
11. Mirandola P, Gobbi G, Sponzilli I, Pambianco M, Malinverno C, Cacchioli A, et al. Exogenous hydrogen sulfide induces functional inhibition and cell death of cytotoxic lymphocytes subsets. *J Cell Physiol*. 2007 Dec;213(3):826-33.
12. Mirandola P, Gobbi G, Micheloni C, Vaccarezza M, Di Marcantonio D, Ruscitti F, et al. Hydrogen sulfide inhibits IL-8 expression in human keratinocytes via MAP kinase signaling. *Lab Invest*. 2011 Aug;91(8):1188-94.
13. Gobbi G, Ricci F, Malinverno C, Carubbi C, Pambianco M, Panfilis G, et al. Hydrogen sulfide impairs keratinocyte cell growth and adhesion inhibiting mi-

- togen-activated protein kinase signaling. *Lab Invest.* 2009 Sep;89(9):994-1006.
14. Tateo F, Ravaglioli A, Andreoli C, Bonina F, Coiro V, Degetto S, et al. The *in-vitro* percutaneous migration of chemical elements from a thermal mud for healing use. *Appl Clay Sci.* 2009 April;44(1-2):83-94.
  15. Benedetti S, Benvenuti F, Nappi G, Fortunati NA, Marino L, Aureli T, De Luca S, Pagliarani S, Canestrari F. Antioxidative effects of sulfurous mineral water: protection against lipid and protein oxidation. *Eur J Clin Nutr.* 2009 Jan;63(1):106-12.
  16. Costantino M, Giuberti G, Caraglia M, Lombardi A, Misso G, Abbruzzese A, et al. Possible antioxidant role of SPA therapy with chlorine-sulphur-bicarbonate mineral water. *Amino Acids.* 2009 Feb;36(2):161-5.
  17. Staffieri A, Marino F, Staffieri C, Giacomelli L, D'Alessandro E, Maria Ferraro S, et al. 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.
  18. Ottaviano G, Marioni G, Staffieri C, Giacomelli L, Marchese-Ragona R, Bertolin A, et al. Effects of sulfurous, salty, bromic, iodic thermal water nasal irrigations in nonallergic chronic rhinosinusitis: a prospective, randomized, double-blind, clinical, and cytological study. *Am J Otolaryngol.* 2011 May-Jun;32(3):235-9.
  19. Guarnieri G, Ferrazzoni S, Scarpa MC, Lalli A, Maestrelli P. Effects of inhalation of thermal water on exhaled breath condensate in chronic obstructive pulmonary disease. *Respiration.* 2010;79(3):216-21.
  20. Fioravanti A, Iacoponi F, Bellisai B, Cantarini L, Galeazzi M. Short- and long-term effects of spa therapy in knee osteoarthritis. *Am J Phys Med Rehabil.* 2010 Feb;89(2):125-32.
  21. Bucci M, Papapetropoulos A, Vellecco V, Zhou Z, Pyriochou A, Roussos C, et al. Hydrogen sulfide is an endogenous inhibitor of phosphodiesterase activity. *Arterioscler Thromb Vasc Biol.* 2010 Oct;30(10):1998-2004.