

# Training on evidence-based balneotherapy for medical students: The experience of the University of Parma

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**Abstract.** Understanding the scientifically proven properties of balneotherapy is a valuable element in the training of future medical doctors. This article describes the experience, since 2021, at the University of Parma, of teaching the benefits and limits of balneotherapy in the light of the scientific evidence. The Elective Teaching Activity (ETA), titled “Balneotherapy and Health: Scientific Evidence and Future Perspectives”, offers 1 university educational credit to students, and takes place over two consecutive days. The course contents are the following: an overview of the history of thermal baths, specific terminology and classification of water- and mud-based treatments, interpretation of scientific evidence, results of major studies on the topic, regulatory aspects and practical balneotherapy, a virtual tour of a health resort, bibliography, and contacts for further exploration of the subject. In 2023, students were asked to evaluate the course at the ETA’s end. On average, participants’ knowledge of balneotherapy increased by 42%, while their ability to critically evaluate scientific evidence increased by 20%. All students would recommend the course to their peers. This ETA not only enriches the academic training of medical students but also prepares them to consider balneotherapy as a valid and scientifically supported option in treating various pathologies. ([www.actabiomedica.it](http://www.actabiomedica.it))

**Key words:** balneotherapy, thermal baths, medical training; evidence-based medicine, health

## Introduction

The increase in chronic-recurrent diseases presents contemporary medicine with the challenge of strengthening the prevention of these diseases and their complications as much as possible, countering chronic conditions, and addressing multiple pathologies. Hospitals of the near future will necessarily be focused on acute patients, while a well-organized network of non-hospital medical centers, distributed across the territory, will need to ensure the necessary integrated approach to patients, from health promotion to functional recovery. Medical science is undergoing a period of significant expansion, fueled by molecular medicine, the main tool for personalising

therapy. Balneotherapy, thanks to the efforts of research foundations (in Italy, Fondazione per la Ricerca Scientifica Termale, FoRST), has made many recent advancements in demonstrating its effectiveness, foreseeably placing it in the unique position of relying on both a centuries-old medical tradition and a solid scientific foundation in the future (1).

Teaching the scientifically proven properties of balneotherapy is therefore a valuable element in the education of future medical doctors, providing them with an understanding of these treatments and their clinical applications. Starting in 2021, the University of Parma has included this topic among the Elective Teaching Activities (ETAs, optional teaching activities chosen by the student) in the Medicine and Surgery

degree program, with the aim of enriching the knowledge and skills of students, as well as better preparing them for their future professional activities.

This article describes the experience at the University of Parma in teaching the applicative potential and limitations of balneotherapy in light of the most recent scientific findings. It details the teaching methodologies, course contents, and benefits for students, who are thus introduced to an ancient yet ever-relevant medical practice.

### Why this course?

In Italy, mineral waters are community resources, often granted for use to private entities through mining concessions, but they always remain the property of the State (2). This aspect highlights the importance and public value of balneological resources, making them a precious asset for the community. Additionally, balneological treatments are currently provided under agreements -within precise prescription rules - with the National Health Service and social security entities such as INAIL (“Istituto Nazionale Assicurazione Infortuni sul Lavoro”), ensuring access to effective treatments for a wide range of the population. Balneotherapy is particularly aimed at patients with widespread and epidemiologically significant conditions, offering treatments that can reduce drug expenditure and improve the quality of life for people suffering from various chronic diseases (osteoarthritis, postural or post-traumatic low back pain, fibromyalgia, psoriasis, chronic inflammatory diseases of the respiratory tract, etc.) (3,4). This therapeutic approach alleviates symptoms and contributes to a more sustainable management of public health, reducing the economic burden on the healthcare system and improving patient well-being (5).

Therefore, having a future generation of doctors capable of prescribing balneological treatments in a scientifically appropriate manner - following updated indications and contraindications in light of the Evidence-Based Medicine (EBM) paradigm - constitutes a highly valuable asset.

### The course program

The Elective Teaching Activity, titled “Balneotherapy and Health: Scientific Evidence and Future Perspectives”, offers students 1 university educational credit and takes place over two consecutive days (Figure 1). The activity includes a total of 10 hours of training, comprising both lectures and individual study. The course contents are as follows:

- Historical overview: this part briefly describes the origins and evolution of thermal baths, from ancient civilizations to the present day. Understanding the historical roots of balneotherapy allows understanding of how current practices have been influenced by past knowledge and traditions. The final part of this review mentions current scientific organizations involved in research and dissemination in the field of balneotherapy.
- Specific terminology and classification of mineral water- and mud-based treatments: this section provides an overview of technical terms and the various types of balneological treatments available, with a particular focus on the categorization of mineral waters and muds based on their composition.
- Interpretation of scientific evidence: students learn to read and interpret scientific studies, developing critical skills necessary to evaluate the effectiveness of balneological treatments. This section provides tools to discern between methodologically sound studies and less reliable ones.
- Results of major relevant studies: this section analyzes the results of key studies in the field of balneotherapy, with a focus ranging from the “Naiade” study (6) to more recent research (3,7–12). This analysis highlights the clinical benefits and scientific evidence supporting the therapeutic use of balneological treatments, as well as potential adverse effects and evidence-based contraindications for treatments involving mineral waters and muds.



**Figure 1.** The first slide of the elective teaching activity “Balneotherapy and Health: Scientific Evidence and Future Perspectives”.

- Regulatory and practical aspects: the regulatory framework governing the balneotherapy sector is described, along with guidance on how to apply the knowledge acquired during the course in clinical practice. This includes a guided discussion of relevant clinical cases.
- A virtual tour of a health resort: photographs and descriptions help students better understand the organization of a health resort.
- Bibliography and contacts: at the end of the course, bibliographic references and contact information are provided to enable further exploration of the topic.

### Evaluation of the elective course by students

In 2023, students were asked to evaluate the didactic activity at the end of the Elective Teaching Activity (ETA). The questionnaire was administered

online and anonymously, fully respecting privacy regulations, and informing participants that the goal was to gather feedback to improve the course and better align it with the needs and expectations of the students. The evaluation results are summarized in Table 1; the sample consisted of 18 students (10 males and 8 females) aged between 22 and 29 years (median: 24 years), who were in their fourth (n=13), fifth (n=3), or sixth (n=2) year of the Medicine and Surgery degree program at the time of enrollment in the ETA. For each response, a score corresponding to the percentage of the average rating over the maximum possible score was calculated (Table 1).

The ETA largely met the students' expectations (score = 86%), was deemed useful for the training of future doctors (score = 88%), and all participants would highly recommend it to their peers (score = 100%). On average, participants' knowledge of balneotherapy increased by 42%, while their ability to critically evaluate scientific evidence improved by 20% (further details

**Table 1.** Results of the student evaluation questionnaire (n=18) on the elective teaching activity “Balneotherapy and Health: Scientific Evidence and Future Perspectives” (2023 edition).

Items	Evaluation* (n, %)				Score <sup>^</sup>
	1	2	3	4	
How well did the content of this course meet your expectations?	0 (0.0%)	1 (5.6%)	8 (44.4%)	9 (50.0%)	86%
How would you rate your knowledge in balneotherapy before attending this course?	7 (38.9%)	9 (50.0%)	2 (11.1%)	0 (0.0%)	43%
At the end of the course, how much do you think you have learned about the main topics in balneotherapy?	0 (0.0%)	0 (0.0%)	11 (61.1%)	7 (38.9%)	85%
How would you rate your knowledge regarding the critical evaluation of scientific evidence before attending this course?	2 (11.1%)	10 (55.6%)	6 (33.3%)	0 (0.0%)	56%
At the end of the course, how much do you think you have learned about the critical evaluation of scientific evidence?	0 (0.0%)	2 (11.1%)	13 (72.2%)	3 (16.7%)	76%
How useful do you consider the content of this course for your education?	0 (0.0%)	1 (5.6%)	7 (38.9%)	10 (55.6%)	88%
Would you recommend this course to your colleagues?	0 (0.0%)	0 (0.0%)	0 (0.0%)	18 (100.0%)	100%

\*1=Not at all; 2=Slightly; 3=Moderately; 4=Very much.

<sup>^</sup>=The score is calculated as the percentage of the average ratings (min: 1; max: 4) relative to the maximum possible score (4).

in Table 1). This underscores the usefulness of this course about balneotherapy, a topic that finds limited space in the “core curriculum” of the Medicine and Surgery degree programme.

## Conclusion

The results of the questionnaire revealed a positive evaluation of the proposed experience, with an increase in students’ knowledge about balneotherapy and the applicative potential of balneological treatments. The Elective Teaching Activity “Balneotherapy and Health: Scientific Evidence and Future Perspectives” not only enriches the academic training of medical students but also prepares them to consider balneotherapy, when appropriately prescribed, as a valid and scientifically supported option for the treatment and prevention of various health conditions. This integrated approach will contribute to the development of more informed physicians, capable of offering their patients a broader range of therapeutic options based on continuously updated scientific evidence. Other universities and training centers could use this model as inspiration to integrate evidence-based balneotherapy modules into their curricula.

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