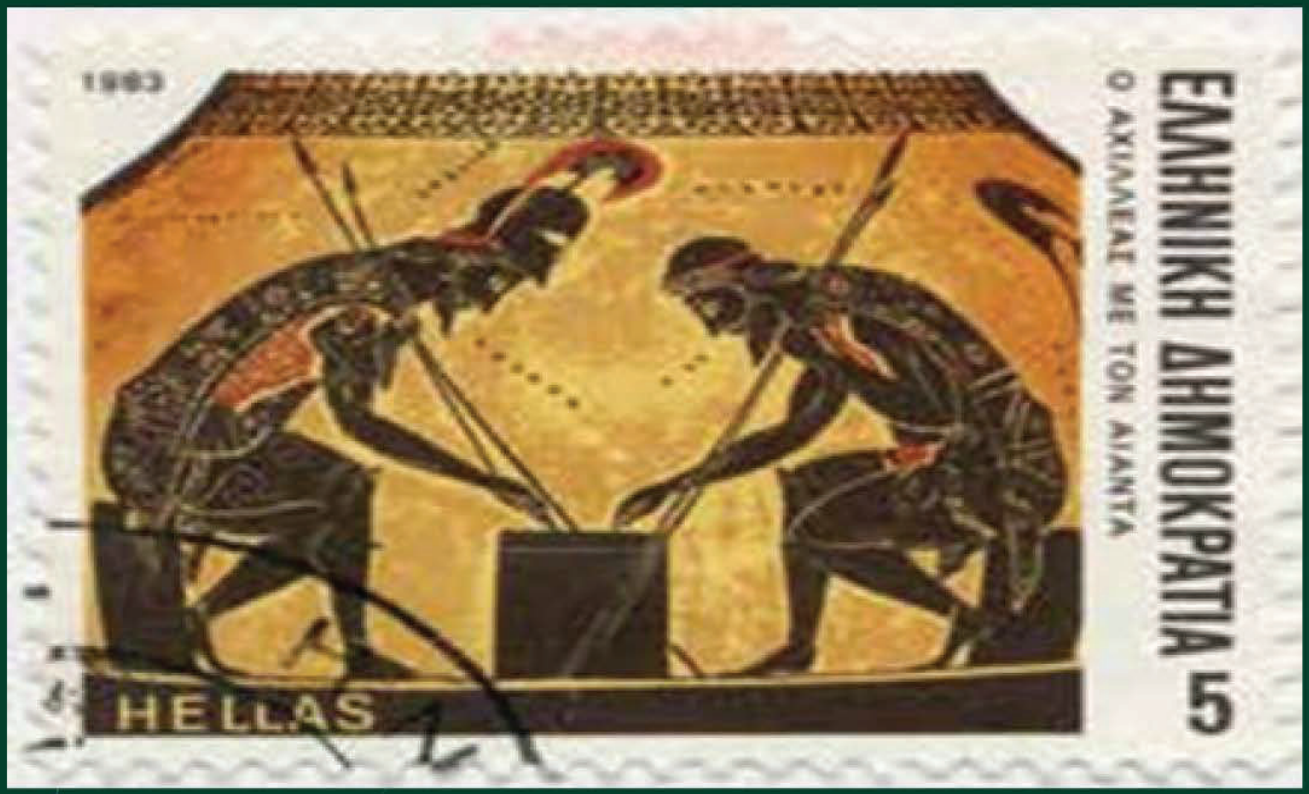
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GRIGORE T. POPA IAȘI

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FACULTY OF MEDICAL BIOENGINEERING

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1. Balneotherapy: definition, history; Spas - legal framework, terminology.

The use of water for medical treatment is probably as old as mankind. Until the middle of the last century, spa treatment, including hydrotherapy and balneotherapy, remained popular but went into decline especially in the Anglo-Saxon world with the development of effective analgesics. However, no analgesic, regardless of its potency, is capable of eliminating pain, and reports of life-threatening adverse reactions to the use of these drugs led to renewed interest in spa therapy.

Balneology or Medical Hydrology has been an important modality in the area of Medicine with a wide scope of interventions which include prevention, treatment, and rehabilitation of a large number of health conditions. Balneotherapy is the use, at their place of origin, of natural remedies such as natural mineral waters, peloids or gases, associated, when appropriate, with other therapies (climatotherapy, exercise, massages, physiotherapy, dietetics, psychotherapy, health education, complementary therapies, …) for treatment, rehabilitation, prevention and health promotion.

Balneology or, more completely, **balneo-creno-climatology** is the science that covers the study of natural sanogenic physical / chemical factors: mineral waters, lakes and therapeutic muds, therapeutic gases, as well as all the physical-chemical / climatic elements of the sea coast, and respectively the sanogenic factors of the main types of bioclimate (including the microclimate in salt mines and caves).

Climate is the totality of physical factors (cosmic, atmospheric, and terrestrial) and biological factors, specific to a given region, which act together on the human body.

Acclimatization is a puzzle of functional changes through which the body transposed into a new climate responds adaptively to the demands of spa factors. The rithm and intensity of changes depend on the specificity of the factors and the body's ability to respond.

Balneo-creno-climato-therapy (Balneotherapy) is the applicative component of balneo-climatology, which aims at the appropriate use of natural sanogenic factors in prophylactic, therapeutic and rehabilitation healthcare.

Spa / Balneotherapy / balneo-climatic treatment is a form of medical assistance that is applied in balneo-climatic resorts for defined periods of time for prophylactic, therapeutic and / or rehabilitation purposes and that uses mainly (but not exclusively) the natural sanogenic factors of the resort, applied according to a specific methodology.

Balneotherapy is stimulation-adaptation treatment applied in form of cure at certain periods of time with repeated and regular use in series in manner of bathing, packaging, drinking and inhaling thermal and/or mineral waters, healing clay and gasses at specific dosages and in specific methods. Balneotherapy is a complementary therapy that generally employs mineral and/or thermal waters from natural springs, peloids (mud), and other traditional remedies, for the treatment of different pathological conditions (dermatological, rheumatological, gastroenterological conditions, pulmonary diseases, cardiovascular, gynecological, metabolic, neurological, psychiatric, and endocrine disorders). Balneotherapy is the medical act performed in the spa / balneary resort. For the treatment of medical problems such as allergies, lung problems, gynecological, dermal, rheumatic and many others, but especially for the prevention of diseases and the maintenance of health, the use of natural therapeutic factors is the best solution.

Balneotherapy uses natural thermal mineral waters. The definitions of these waters is based on the sum of the cations of Na, K, Ca, and Mg and the anions of SO_4, Cl, and HCO_3 exceeding 1 g/l.

The amounts of NH3, NO, and NO2 must be negligible, and the waters must be bacteria-free. Some elements, such as iodine, require contents of 1 mg/l or more. It was presumed that most mineral ingredients would be absorbed through the skin, which is an active immune organ and may play an important role in the mechanism, but to date this has not been confirmed.

The adjective 'thermal' requires that the natural spring or welled water is 20°C or higher. Balneotherapy alone is difficult to study, since it is usually part of total spa therapy. However, it has been possible to compare the effects of balneotherapy with those of warm tap water in double-blind trials in osteoarthritis of the knees and in rheumatoid arthritis. In other controlled but not double-blind trials, ambulatory balneotherapy was tried in local patients for chronic low back pain and fibromyalgia. In this way, the effect of a 'spa atmosphere' was excluded.

The spa / balneo resort is the locality / area that has natural sanogenic physical / chemical factors (traditionally recognized and scientifically proven to be therapeutically effective), facilities suitable for their administration and which has the organization that allows the provision of spa and rehabilitation care, mainly, but not exclusively in the form of external (bathing) and / or internal (crenotherapy) treatments under appropriate conditions.

The climatic resort means the locality / area located in regions with beneficial climatic factors and which has conditions to ensure the maintenance and improvement of health or work capacity as well as rest and comfort.

By **balneo-climatic resort** is meant the locality / area that cumulatively meets both conditions from the above definitions.

The treatment methodology is represented by interventions to stimulate or inhibit neuro-endocrine reflexes specific to balneary medicine, associated with methods of influencing the pathophysiological mechanisms of the disease by the effects of physical-energetic vectors, respectively ions (substances) introduced in the body's metabolic circuits and generating anti-inflammatory, vasomotor, secretory, trophic, neuro-endocrine-vegetative, immuno-modulatory and regenerative, loco-regional or systemically extended regulatory and rebalancing effects.

The medicalization of the spa therapeutic sector is promoted as "health resort medicine", which uses elements specific to each resort: balneotherapy, climatotherapy, hydrokinetotherapy in thermo-mineral waters and crenotherapy, in the prevention, treatment and rehabilitation affecting health and / or or physical abilities, including fostering patients' social interaction abilities.

The opportunity of the international confirmation of the holistic aspect of balneology materializes through its coupling to the WHO concept "One health" launched in 2018, which is a multisectoral and transdisciplinary approach, local, regional, global in order to achieve optimal health, recognizing the connection between people, plants, animals and their environment.

Unique spa resources, such as hot springs, mineral springs, muds, mofettes as well as the bioclimate (sparing sedative, exciting seaside or plain, stimulating tonic), are successfully used in the field of spa/balneary medical services through which an action is pursued: preventive medicine, rehabilitation and wellness. At the beginning of this millennium, in many countries of the world there is interest and concern for limiting the negative effects that economic development has had on the health of the population. One of the effective ways to fight the diseases of modern civilization is offered by spa / balneary tourism. The international trend is that of returning to nature for treatment and recreation, and from this point of view the spas are obviously a suitable destination.

Every year, European spas generate a turnover of over 20 billion Euros. The direct employment of more than 500,000 people and the support of an additional 1.2 million jobs in related fields make the sector one of the largest employers in the EU in both healthcare and tourism.

The attention paid to this form of tourism worldwide is revealed by the declaration of 2000 as "World Year of Balneology" and organized scientific events, including: World Congress of Balneology in Rome, in 2000, on "Balneology in the Millennium three"; Congress of the International Society of Spa Technology at Levico Terme in Italy, since 2002, with the theme "Health tourism and medical treatment in spas".

New conceptions and guidelines in modern medicine, which address health as a fundamental human right, the introduction of health notions of quality of life, lifestyle, well-being among the criteria for assessing health has led to a reassessment of health care in spas, of balneology in general, as well as of traditional tourism. Between traditional balneology and traditional tourism, there is the wellness tourism, health tourism or prophylactic health cures, which are based on quality of life, closely intertwined with the defense of health and a valid psycho-physical relationship. The new evaluation criteria show the huge leap registered in the therapy with natural cure factors, from the crisis periods when it was reproached for the lack of a solid scientific foundation, the methodology used being mostly based on empiricism, to the multiple scientific studies and researches, that have proven the effectiveness of natural therapeutic factos.

The modern evaluation of health, well-being, quality of life, requires the continuation and development of scientific research, to establish the mechanisms of action and curative effects of natural therapeutic factors. Research on the methodology and effects of "health care", which is the most important field of primary prophylaxis of major diseases in lifestyle pathology, is considered a priority. In these conditions, reflecting the main elements of the spa in modern spas, the former president of the International Federation of Balneology and Climatology - Prof. Dr. H. Pratzel, defined the spa as "balneotherapy, diet, complex therapy, motivation for a healthy lifestyle, under the supervision of experienced and qualified medical experts, in a pleasant environment, accepted by the patient, close to nature and culture ".

1.1 The origin and history of balneotherapy

Balneotherapy (Latin: Balneum, bath) refers to the medical use of water, as opposed to its recreational use. It is difficult to identify the exact origin of the first spa and spa treatments. It was practiced by the ancient Greeks, Babylonians and Mesopotamians. Homer and other classical writers show that the Greeks bathed in a variety of social baths as early as 500 BC, including hot air baths known as "laconica,,.

Water therapy was an integral part of the therapeutic armamentarium of Aesculapius, Hippocrates, Galen, and Celsus. Patients admitted to the healing temples of Aesculapius first washed in a large pool before being admitted to the 'wards'. Floating on water and immersion were found useful in relaxing of muscles. Roman authors recognised several classes of thermal and medicinal waters not dissimilar to those of today: sulphur, alum, bitumen, alkaline, and acid. A host of different disorders was deemed appropriate for treatment, some of which are dealt with in modern spas, especially pain arising from musculoskeletal disorders.

Roman baths and spas were centres not only for cleansing, exercising, and medical treatment but also for relaxation and meeting friends and colleagues. This Roman heritage persisted not only in Britain and Europe but also in the United States of America until the first half of the last century.

According to a 19th century legend, the use of seawater for medical purposes is due to the Egyptians who observed a constipated ibis using its long beak, loaded with sea water. No writer other than Pliny the Elder (23–79) is supposed to be able to relate such a story.

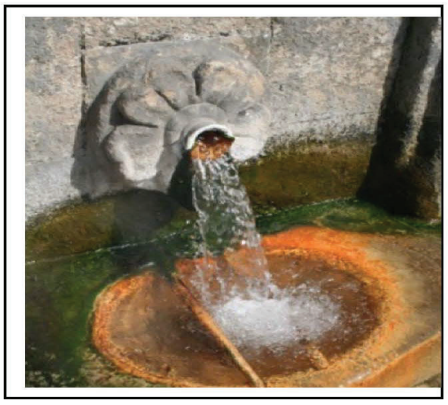


Figura 1.1. Burgas mineral water source (Ourense, Spain).

The Romans were responsible for the popularity and spread of balneotherapy in other parts of the world. Roman soldiers sought hot baths to recover from prolonged fighting. The baths were called "aquae". The concept of spa flourished with the continued use of major springs even after the decline of the Roman Empire.When we discuss the history of balneology, we do not really realize how much our Western culture owes to classical civilizations. It is undeniable that those medicinal spring waters, rich in minerals, with different sensory characteristics (smell, color, taste or temperature), have always been used empirically and recognized the health properties of these resources.



Figura 1.2. Balneoterapia în Imperiul Roman

When we discuss the history of balneology, we don't really realize how much our Western culture owes to classical civilizations. It is undeniable that those medicinal spring waters, rich in minerals, with different sensory characteristics (smell, color, taste or temperature), have always been used empirically and recognized the health properties of these resources. However, the spa phenomenon as we know it today was related "not only to medical concepts regarding the therapeutic use of medicinal mineral waters and their effectiveness, but also to a water philosophy or culture, a search for health, and health from a natural source', is deeply rooted in the classical and Roman eras.



Figura 1.3. Băile în epoca clasică și în epoca romană

It was precisely then when the use of these waters, whose health properties were usually ascertained through rituals and religion, came to have a more specific therapeutic role. This is not only evidenced by medical treatises and other written sources, but also by the many archeological remains found around these springs.

In this regard, although the notion of *spa* was frequent in many cultures and, most significantly, in Ancient Greece and Rome, a stark difference can be found during the Roman Empire between those facilities where common water was used for everyday hygiene and enjoyment, and those infrastructures and buildings which started to be built and developed around the main mineral springs, because thermal benefits of medicinal mineral waters were already well known. It seems to be proved that the uniqueness of these waters, their formulation and their health properties were considered in ancient medicine. However, only a few references to these waters are found in the Hippocratic school, usually suggesting mistrust of their use (possibly due to the religious connotation attributed to them), until later centuries, when Medicine was further developed and took a more open approach. It was not until the first and second centuries AD when authors such as Herodotus (Orib. X, 4– 5) or Caelius Aurelianus (*Chron.* I, 1–4) wrote enthusias-

tically about the health properties of mineral waters in detail and described how to better use the different treatments.

After the fall of the Western Roman Empire, there was a progressive extinction of thermal buildings, a general pat- tern due to the collapse of the urban model existing up to that time. Although the maintenance of hygienic infras- tructures declined and the use of these places was transformed—largely due, above all, to new moral imper- atives—medicinal mineral waters and their popular use for health treatments would survive to present times.

The decadence of the thermal model created in Roman times was not a result of mistrust of these waters, but rather of the understanding of their characteristics, the lack of a state or body protecting and utilizing them, and a zeal for controlling these resources, also from a moral perspective would lead to a dark period of ignorance, enlightened by rare exceptions.

Thus, the use of water as a treatment linked to health and body care survived in the territories which were gradually conquered by the Arab civilization, as the appreciation for spas (as opposed to Catholic moralistic criticism), essentially in their hygienic variety (al-hamma¯m: urban spas with common water and an organization similar to Roman *balnea*), would gain significance and a strong tradition, which continues to be true in Muslim countries today. Likewise, springs of medicinal mineral water—usually reusing the remains of Roman times around strategic springs—were also considered for their different health properties and monumentality, as evidenced, for instance, by the spas in Alhama de Granada or Alhama de Murcia in the Iberian Peninsula, among many others.

Within the European territory, however, the interest for these sources of natural health would determine the con- tinued utilization of some springs, both by monarchs investing in the recovery of some facilities (as early as in Charlemagne's court) and by individuals using these waters for their treatments, given the specialization of some of these springs. This would lead to the first researches, treatises and writings which, following classical tradition, aimed at being guides showing the health possibilities of these springs, providing rules for their adequate use.

However, it was not until the fourteenth and fifteenth centuries that a new interest for these waters became widespread when the principles of classical culture were studied in detail in the Renaissance. Scholars sought to understand the formulation of these waters and analyzed the specifics of the treatment which should be used in each of the hot springs. In this regard, medieval spas (called *balneis* "bathing places", as an essential practice of thermal therapy) are mentioned more and more often in written works as new facilities were built—par- ticularly early in territories with a stronger tradition, such as Italy or England, which welcomed a significant number of spa visitors even then.

The development of modern thermalism entered then its heyday with the creation of specific works on thermal resorts and the development of significant catalogs, which would be the foundation of subsequent studies allowing to resume the golden age of ancient times and to avow the wealth and abundance of these hot springs as sources of health. Thus, works on medicinal mineral waters would gain popularity essentially in the Italian territory, thanks to authors such as Savonarola (fourteenth to fifteenth cen- turies) or Andrea Bacius (sixteenth century), followed by more specific research studies by several authors on the water in each territory or city, which would become mainstream from the sixteenth century and, most notably, in the seventeenth century thanks also to the spur of the printing press.

In this regard, the search for potential solutions to common illnesses which found no remedy in other treat- ments, a spa culture was developed (more and more regulated by medical experts in the different kingdoms), which had its heyday in the nineteenth century and in the early twentieth century, rediscovering the cult of health and the body. Thus, the most renowned spas would become

the prime holiday destination for members of the bourgeoisie and nobility, thanks to the development of communica- tions, techniques and medical and analytical progress, and to the material improvement of spa facilities and accom- modation and leisure premises.

This second golden era of thermalism would be cut short and lead to the gradual neglect of many spa resorts which had been rocketed to fame in previous years due to (i) the political events which took place in the early and mid- twentieth century, essentially due to the wars which affected practically all European countries in one way or another; (ii) the growth of pharmacological therapy, which cheapened treatments and provided a more immediate cure to some illnesses or ailments; (iii) the creation of new leisure and tourism models, essentially geared towards sun and sand destinations.

Not until the end of the twentieth century were naturist practices and alternative medicine recalled (focused on prevention rather than on healing). Drugs were gradually replaced by new more natural and less aggressive treat- ments, fostering the resumption of modern thermalism (and to a great extent also ancient thermalism), based on social policies and the development of scientific knowledge on the properties of these waters according to the techniques and medical applications for each case.

As early as the second century AD, medical texts already identified healing spas—natural mineral water baths—(αὐτοφυῶν λουτρῶν) as opposed to common heated common water baths (λουτρόν)—without an adjective—or "artificial baths" (τῶν ἐξ ἐπιτεχνήσεως) (Antilus, in Orib. 10, 3). In this sense, in Roman times, the feminine plural word, *aquae* ("the waters"), was mainly used to refer to these medicinal mineral waters, as defined by Varro (*Ling.* 9, 41, 68–69); or, more specifically, *aquae calidae, fontes calidi* or *fontis medicati*.

These are mentioned, for instance, by several authors in the compilation made by physician Oribasius (fourth century AD, *Collectanae medicinalia*), or the well-known works of authors such as Vitruvius (8, 3, 1), Pliny the Elder (31, 1–5) or Seneca (*Nat*, 3, 20– 24), explicitly referring to the mineral formulation of these waters and not just to their temperature, which are linked to the health properties of these springs.

The Roman model, however, was pretty close to what we know today. If we examine the concept developed around thermal sites such as Baia (in the Gulf of Naples) or Bath (in South-West England), to name the most representative examples, we cannot find major differences from the image of a European spa around the nineteenth century.



Figura 1.4. Baie interioară Imperiul Roman

People have used geothermal water and mineral waters for bathing and their health for many thousand of years. Balneology, the practice of using natural mineral water for the treatment and cure of disease, also has a long history. Based on archeological finds in Asia, mineral water has been used for bathing since the Bronze Age, about 5000 years ago. Many hot springs have been used in connection with religious rites in Egypt and by the Jews of the Middle East. The Greeks, Turks and Romans were famous for their spa development and use from Persia to England.

The word "spa" traces its origin to a town near Liège in southern Belgium near the German border. Here a spring of ironbearing water was used by an iron master in 1326 to cure his ailments. He founded a health resort at the spring called Espa (meaning fountain in the Walloon language).

Espa became so popular that the word know in English as spa became the common designation for similar health resorts around the world (Lund, 1996).

Great spas have a long history, often stretching back to Roman times. Bath in England, for instance, was originally known as Aquae Sulis, Baden-Baden in Germany as Aquae Aureliae, and Aix-les Bains in France as Aquae Allobrogum (Rockel, 1986).

Today, especially in Europe and Japan, the use of medically supervised spas has long been accepted. They are used for both treatment and preventive therapy. The former Soviet Union had 3500 spas and some 5000 reconditioning centers all administered and run by the state. In the former Czechoslovakia, there are 52 mineral water health spas and more than 1900 mineral springs, which every year about 220,000 citizens are granted free spa treatment for three weeks, paid by the national health insurance program. The more famous ones are Karlbad in the present Czech Republic and Piestany in Slovakia. Many of these spas are being privatized today, and are dependent on income from visits by persons from outside the country.

The Indians of the Americas considered hot springs as sacred places and believed in the healing powers of the heat and mineral waters. Montezuma, the great Aztec leader, spent time at a spa, Aqua Hedionda, to recuperate from his strenuous duties; which was later developed into a fashionable spa by the Spaniards (Salgado-Pareja, 1988). Every major hot spring in the U.S. has some record of use by the Indians, some for over 10,000 years. These springs were also known as neutral ground, to which warriors could travel and rest unmolested by other tribes. Here they would recuperate from battle. Today, there are approximately 210 spas in the USA with 4.5 million persons attending a spa.

The word "spa" is also used as a Latin abbreviation for: S = salud, P = per, A = aqua, or "Health through Water." In Germany, they refer to the "Kur", which does not mean just a cure, but instead is a series of treatments over time including baths, taking (drinking) water, massage, exercise, mud baths, etc.

For the sophisticated European of the nineteenth century, a spa was much more than just a health resort. The famous spas of France, Germany and Britain were elegant social and cultural centers. Most who took the cure ["kur"] did not do so primarily for medical reasons, but to see and be seen by high society (Rockel, 1986).

Other definitions include (De Vierville, 1998):

"The spa is the social aspect of using water therapeutically."

"The spa is a natural space and place with a perspective on time."

"A spa is a space with a purpose, through a plan, by a purpose, for a period of time."

Spas today can have many forms and emphasize certain treatments. Sarnoff, (1989) classified American spas as follows:

Intensive fitness spas - where fitness buffs can trim and tone "to the max" in minimum time.

Rejuvenation spas - where you can take advantage of the latest beauty treatments for a younger-looking you.

Weight-loss spas - where you can vacation and shed those unwanted pounds at the same time.

Athletic camps - where excellent sports programs and exercise classes can be had at a very affordable price.

Mineral springs or "magic mud" resorts - where health-giving waters and the oldest, most aristocratic spa traditions await you.

New Age retreats - where you can renew your psychic and spiritual self as well as physical well-being.

Gustatory hideaways - where you can enjoy and learn about the best in healthful, nonfattening, gourmet fare.

In France, several public and or private scientific investigation organisms are involved in medical balneology scientific investigation (academic or university-linked institutes in Paris, Nancy, Bordeaux, Grenoble, Clermont-Ferrand; private organisations in Paris, Aix les Bains, Saujon). However, these last years, the important development in medical balneology investigation could be related to the French Association for Balneotherapy Research (AFRETH). The Afreth has been created in 2004 by the French Union of SPA Contractors, the Union of the mayors of spa resorts and the French branch of the FEMTEC. The AFRETH has agreed to provide every year a budget of 1.2 M€ for scientific investigation in balneology. The founders' representatives, who constitute the association's administrative committee, take the decision of supporting financially the scientifically validated projects. The scientific validity is pronounced by the scientific committee (12 independent and acknowledged doctors and scientists) on the basis of external independent experts' advices (methodological, clinical and biological sciences).

Alte țări, ca de exemplu Germania și Austria, au adoptat o legislație largă și au organizații profesionale care se ocupă de talasoterapie și termalism.

In Japan, health resort medicine dated back to Edo Era (17-18 century) as socalled "Touji (hot-spring cure)" that was occasionally prescribed by some Kampo (traditional Japanese medicine) doctors. The Japanese Society of Balneology, Climatology and Physical Medicine certifies the doctors as medical specialists who can perform balneotherapy. In some hospitals at hot spring regions, hot spring water is used for rehabilitation of orthopedic patients and those after cerebrovascular accidents by such as thermal therapy and/or underwater exercise. In these cases, medical insurance can be applied based on rehabilitation programs and /or physical medicine techniques. In Japan, there were 6 main national institutions (or hot spring hospitals) affiliated with national universities where many valuable researches were performed. Nowadays, five of them were closed (reorganized) and the last one became limited to the outpatient clinic only. Under this situation, research work trends toward to health promotion activity using health resort medicine including natural resources such as hot springs, forest environments, mountains, oceans and so on.

A



B



Health resort medicine or spa medicine has a great tradition in Turkey. Spa and balneotherapy forms differ according to the spa centre; they may be either stationary or ambulatory; and mono balneotherapy or complex spa therapy modalities. The main indication for spa therapy and balneotherapy in Turkey is rheumatic diseases. Unlike other

European countries, nearly 90% Turkish patients who undergo balneotherapy or spa therapy courses are suffering from rheumatic disorders, mostly degenerative joint diseases, often soft tissue and rarely inflammatory rheumatic diseases.



Figura 1.7. Dovezi istorice ale dezvoltării balneoterapiei

Balneology has a long standing tradition in the Italian territory. This old tradition stems from the natural spring locations and resorts that Italy has since centuries: the entire Italian history witnesses this remarkable journey. To foster a modern basic and clinical research activity in balneology, the Italian Federation since January 2003 has implemented FoRST (Foundation for the Spa Scientific Research) that collects and grants money for scientific and clinical research in balneology. The almost 380 spa centers in Italy allocate a percentage of their income directly to ForST which launches research calls on topics of medical spa therapy. The management of the scientific projects and the consequent money allocation is based on a rigorous international peer-reviewed system, that encompass all the required parameters of integrity and quality at the base of a reliable and solid scientific process. Overall, ForST granted between 2003 and 2011 almost 5 million euro to research activities, with 6 grant calls, 65 research projects implemented, 40 project co-financed. 25 projects have been concluded and publications have been generated in internationally peer-reviewed scientific journals. All the most important fields of interest in spa therapy are involved: Rheumatology, Otorhinolaryngology, Pneumology, Skin diseases, Gastroenterology, Urology, Cardiovascular diseases, Hygiene and Preventive Medicine, Rehabilitation, Health economics. This methodological approach - in common with the main research - granting agencies - is the scaffold for the indispensable spreading of a non-episodic strong scientific research production.

1.2 Planning and Developing Spa

A spa plan must have the following for a successful development: Vision, Mission, Goals, Objectives, Strategies (how to accomplish the plan). The categories and dimensions that are part of a spa and should, for the most, be incorporated into its development are:

Natural, environmental, ecological
Medical, psychological, therapeutic
Scientific, technical, research
Economical, financial, managerial
Planning, architectural, building
Social, fashionable, gastronomical
Artful, historical, literal
Spiritual, mystical, religious

Finally, the items necessary for a spa are:

1. Water
2. Food or nutrition
3. Exercise or movement
4. Massage or body work
5. Mind-body - physiological
6. Natural therapeutic agents (muds)
7. Environment - area, climate
8. Cultural aspects
9. Management and staff (marketing)
10. Life style patterns or rhythms (time).

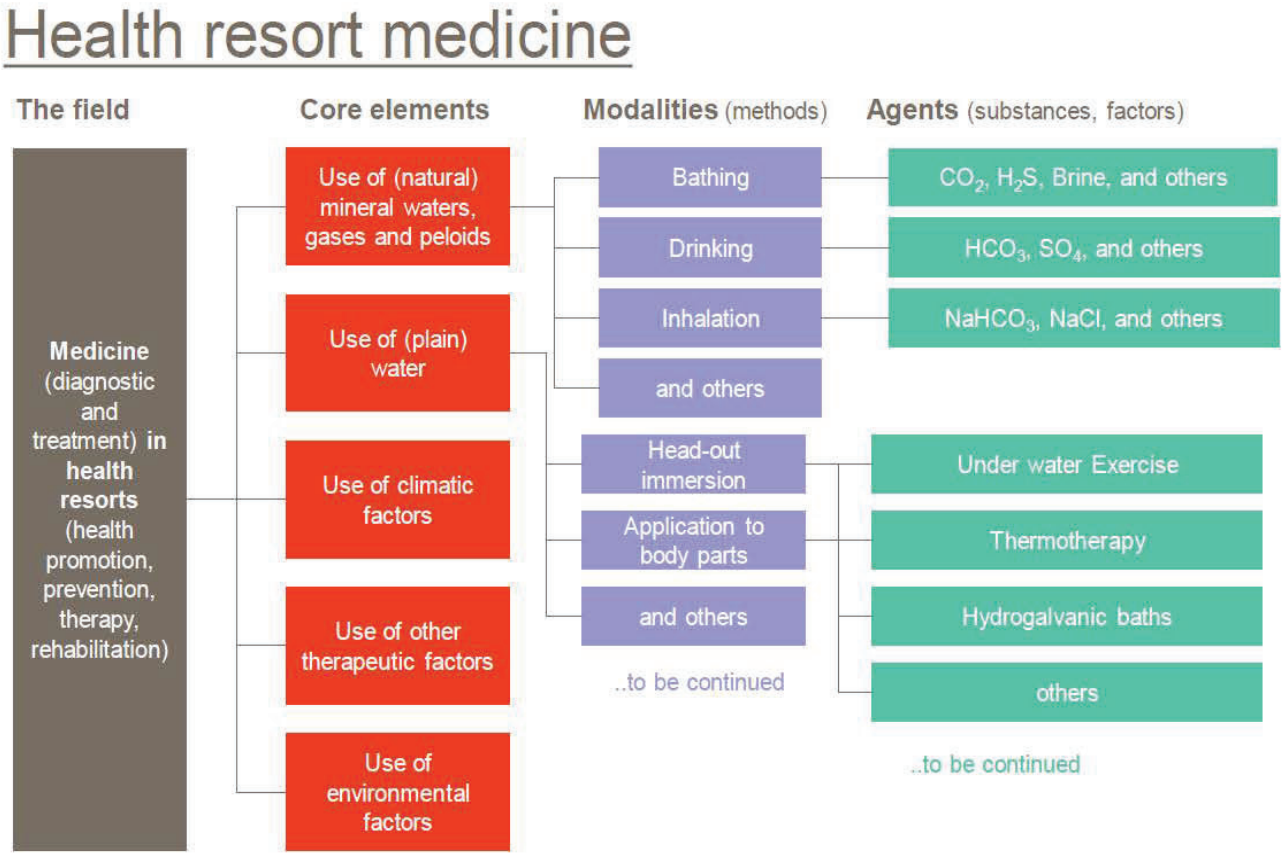


Water and Muds

A spa originates at a location mainly due to the water from a spring or well. The water, with certain mineral constituents and often warm gives the spa meaning from one or more of the following points of view (DeVierville, 1998):

1.3 Health Resort Medicine

Associated with most spas are the used of muds (peloids) which either are found at the site or are imported from special locations. As an example, at Piestany in Slovakia, there is a special laboratory that test muds or clays for their mineral content and their therapeutic benefits. The muds are stored in tanks and "cured" for maximum benefit.



2. Natural Therapeutic Factors - classification, general mode of action.

In recent decades it has become evident in many countries of the world that groundwater is one of the most important natural resources. As a source of water supply groundwater has a number of essential advantages when compared with surface water: as a rule it is of higher quality, better protected from possible pollution including infection, less subject to seasonal and perennial fluctuations, and much more uniformly spread over large regions than surface water. Very often groundwater is available in places where there is no surface water. Putting groundwater well fields into operation can be gradual in response to growing water demand while hydrotechnical facilities for surface water use often require considerable one time investments.

These advantages coupled with reduced groundwater vulnerability to pollution particularly have resulted in wide groundwater use for water supply. Groundwater is the only source of water supply for some countries in the world (Denmark, Malta, Saudi Arabia, etc.). It is the most important part of total water resources in the other countries. Groundwater in Tunisia is 95% of the countries total water resources, in Belgium it is 83%, in the Netherlands, Germany and Morocco it is 75%. In most European countries (Austria, Belgium, Denmark, Hungary, Romania and Switzerland) groundwater use exceeds 70% of the total water consumption.

The use of natural therapeutic factors (thermal water, mineral water with a variety of physical and chemical concentrations, carbogaseous water and mofettes, mineral water lakes and mud) started in ancient times, with more than three Millennia ago.

After the Roman conquest, they built many „Thermae" in Băile Herculane spa (Ad Mediam, the Roman camp, with its springs called „Ad aquas Herculi sacras"), Geoagiu (Thermae Dodone, in the Germisara camp), Mangalia (Callatis), Turda (Potaissa), etc. The Romans, „who had not known a treatment different than the thermal bath for 600 years", as *Plinius* stated, brought the ways of balneary treatment rational use into Dacia.

The Middle Age following after Roman Empire fall caused by barbarians' invasion was dominated by wars, migrations and infectious diseases with devastating consequences which, together with the obscurantism and religious fanaticism determined the interdiction of the thermae because of epidemic risks.

The first information about the thermae being used again dated from 1221, and it referred to the water of present Băile Felix; later, it came from Pope Innocent VII, in a letter dated 1405, which mentioned that the Roman-Catholic diocese, in Oradea, had used the water since 1374. The reconsideration of the mineral springs was a gradual process in the 16th and 17th centuries in the European countries, and in some regions of Romania, such as Transylvania, Banat and Bucovina of today, as part of the Austrian-Hungarian Empire at that time. There is also information with regard to the use of mineral water in some places like Băile Felix, Covasna, Buziaş and other places which later became balneary resorts.

In the 18th century, the sanitary reform initiated by Mary Theresa covered regulations and monographs regarding the analysis of the mineral springs from Transylvania and Banat, their therapeutic indications and use. Over the same period, there came information about the therapy in Băile Herculane, Băile Felix, Băile Homorod, Bazna, places visited by the Austrians as well as information about the export of Borsec mineral bottled in Wien, Budapest, in Moldavia and Wallachia.

In the 19th century, altogether with the development of balneology in many European countries as well as in Romania, they continued the research and capitalization of natural factor resources, by developing many balneary resorts, on account of some mineral waters systemic studies and classifications (worked out in many monographs and scientific papers). In Transylvania, Banat and Bucovina, regions with higher economic and social levels, such spas like Băile Felix evolved; Băile Herculane and Buziaş were internationally renowned, as members of the royal family of Wien had visited them several times; also, Covasna, Balvanyos, Tuşnad, Vatra Dornei and others were considered.

Quoting from the book of "Balneology and Thermal Spring and Spa Medicine" of Ph. D. M. Zeki Karagülle, president of International Society of Medical Hydrology and Climatology, use of hot springs and spas for purposes of health and treatment is a tradition going all the way for a thousand years and still continuing. In reality this tradition exists in almost all of the civilizations. Spa treatment in Romania has advanced to a high quality standard. Spa treatment tradition has also developed the spa tourism phenomenon.

Medical tourism, as practiced in Hungary, Thailand, and Tunisia and as practiced in Romania with the help of the treatments by Dr. Aslan, refers to medical or surgical procedures performed in specialized institutions and for which customers are motivated because of the lower price than in their home country.

Balneotherapy uses the natural therapeutic factor with recognized curative qualities (chemical, thermal and mechanical effects). General, balneotherapy is practiced in a particular natural environment, characterised by the absence of pollutants. Being an activity with a medical profile, it must follow strict health regulations on thermal waters (mineral water sources protection, administrative authorization for resource exploitation, compliance with bacteriological and physical-chemical quality of water and mud).

Seawater therapy uses seawater with recognized curative qualities (chemical and mechanical effects). Practiced on sea shores in a refreshing climate (the ocean more than the Mediterranean and Black Sea).

Balneotherapy is stimulation-adaptation treatment applied in form of cure at certain periods of time with repeated and regular use in series in manner of bathing, packaging, drinking and inhaling thermal and/or mineral waters, healing clay and gasses at specific dosages and in specific methods.

Natural therapeutic factors used in balneotherapy are underground sources of natural "therapeutic" waters, mud, seasonal agents and various microclimates (for speleotherapy). "Therapeutic waters", thermal and mineral waters in other words are the most widely used among natural healing agents. Natural peloides (mud) and gasses (CO2, radon and H2S) are also other agents used in spa treatment besides waters.

Natural "therapeutic" waters, which are the most widely used natural healing agents of Balneotherapy, are classified according to their physical and chemical qualities.

Therapeutic waters according to classification of generally and internationally recognized German Spa Union are:

- Thermal Waters: waters that have natural temperatures over 20 °C,
- Mineral Waters: waters containing over 1gr. of dissolved minerals in one liter of water,
- Thermo Mineral Waters: Waters that have both the natural temperatures over 20 °C and contain over 1gr of dissolved minerals in one liter of water.

Classification of Special Balneological Waters containing certain special minerals over specific threshold values is also in question. According to this, they are classified in:

- Carbon-dioxide containing waters: waters containing dissolved free carbon dioxide over 1 g/L,
- Sulfide containing Waters: waters containing sulfides in value of -2 over 1 mg/L,
- Radon containing waters: waters containing over 666 Bq/L of radon radiations
- Salt waters: waters containing over 14 g/L of sodium chloride,
- Iodine containing waters: waters containing over 1mg/L of iodine,
- Fluoride containing waters: waters containing over 1 mg/L of fluoride.
- Healing waters having total mineralization under 1g /L that doesn't belong under any one of the group in the above classification yet having natural temperatures above 20 ºC are referred to as Akrato Thermal Waters.

Peloides (therapeutic clay) used in peloidotheraphy that is one of the unique treatment methods of spa cure are organic or inorganic substances formed as result of geological and/or biological events. They are found in form of grains in nature or they can be turned into grains with certain preparation processes. They can naturally contain water or have no water at all in their structures. They come to appropriate thickness and temperature by adding adequate amount of thermal or regular water during use. They are used in forms of mud baths and mud packages in serious of diseases. Therapeutic effects in certain diseases over human organism must have been proven.

Main balneotherapy methods are as follow;

1. Baths: Thermo mineral water, peloid and gas baths and regional applications of these agents.
2. Drinking cures: drinking cures made with mineral waters or applied to living areas.
3. Inhalation applications: inhaling applications performed with thermo mineral water drops.
4. Peloidotherapy: applications in method of bathing in healing mud and clay, packaging and padding.
5. Applications of hydrotherapy: Taking shower, bathing, washing and these types of applications performed with thermo mineral waters.

Baths are classified as cold (hypothermal; under 34ºC of water temperatures, sea baths are included into this classification), warm (isothermal; indifferent; in 34-35 ºC of water temperatures), hot (thermal; in 36-38 ºC and 38-40 ºC of water temperatures). Duration of bathing is usually 20 minutes. While this time is reduced to 10 minutes in hyper thermal baths it can be extended to 25-30 minutes in isothermal baths. Bathing applications can be administered in forms of complete baths, half baths and bathing in sitting position and arm-leg bathing. Bathing is usually administered for the period of 2 to 4 weeks either as everyday bathing (only one day without bathing for week) or once every other day. Spa physician can readjust bathing frequency towards the end of cure.

Other than the carbon dioxide baths, patient must be in a position to be able to move freely especially in full baths. This condition is especially very important for patients who are suffering from rheumatoid arthritis, posttraumatic distress or orthopaedic discomfort and peripheral neurological disorders. In baths with carbon dioxide containing water; it is recommended for patient to remain immobile during the time of bathing in order not to place an additional load onto the heart and artery system of patient.

Healing mud and clay baths are used in forms of full, half body or arm-leg baths or mostly in forms of packages. Package form application is the method often used. In this method packages are applied to specific areas of the body.

After application the body gets freed of mud with the assistance of a warm shower (taken under the water in temperatures of 37-38 ºC). Following this body is freed from mud; patient gets dried of immediately and rests for half an hour to an hour. Afterwards patient either takes a light walk or receives a massage or is taken into a regional exercise program if necessary. Mud treatment is the best preparer for exercise since it brings tissues and muscles into soft and flexible condition.

Most often used method after baths with thermo mineral waters in balneotherapy is "drinking cures carried out by intake of waters containing natural minerals for certain period of time during the day at specific hours and in specific amounts". Direct effects over the digestive system organs and functions and indirect effects over the kidneys and urinary tracts occur in connection to the chemical compound of mineral water used here. Beside all that has been stated above a general positive effect develops over the organism with drinking mineral waters in specific amount and at specific times in manner of cure. This effect makes itself noticeable with series of positive and meditative changes in physiological and pathological courses.

Inhalation is a method of treatment administered with the inhalation of drops of mineral water. Goal in the inhalation applications is for drops of mineral water inhaled to reach to the desired area of respiratory system and have direct effect by means of separating from the gas that carries them and be dropped off into the environment. Lung functions are positively affected and blood gas levels becomes normal with the effects of natural inhalation solutions.

Spa treatment is a method of treatment developed with intuitional use in treatment of various diseases by mainly the agency of bathing in spas, which are places where thermal and mineral ("Therapeutic") waters naturally come to surface on earth, and reached to present by becoming a tradition. Modern spa cure, especially in European countries, is in the condition of a complex treatment opportunity where some other treatment methods and applications are practiced beside balneotherapy. Methods such as medical and physical treatment are among these and they are especially widespread in Europe.

Supplementary and alternative treatments in spa treatment on the other hand, more accurately in spa cure (since it is administered with application of certain treatment methods, for certain period of time in a series in form of a cure) are also used in many countries. Especially exercise and massage mainly; acupuncture, herbal treatments and aromatherapies are found among these methods. Finally series of supporting methods are also allowed in spa cure programs in some countries again. For example, health education and social medical preventions are also being added to spa cure in Germany. Other support methods such as regulation of diet and daily living and psychological support may also be used.

Patient coming to spa rests for certain period of time. Following that receives a check-up from the specialist here. Certain additional laboratory analyses get performed if it is considered necessary for diagnosis and treatment. Consequently, Spa and cure medical specialist organizes (prescribes) a cure program to patient. Balneotherapy and other treatments in a spa cure are organized and arranged according to the condition and ailment of patient and according to the natural treatment resources unique to that spa and are modified and changed during cure according to responds they provide to treatment.

Factors effective in spa treatment can be listed as treatment methods applied change of environment, climatic agents, placebo effect, psychological agents, irregularities in daily life, not having any negative environmental agents and supportive methods.

In addition to all of these various organizations towards patient's body and position education and information can also take place in thermal spring, spa, and cure centres. In illnesses where posture and movement of the body is important especially in terms of quality and quantity (for

example, chronic back pain, diabetes mellitus) in order for the correction of function and function disorders by the patients it is a prerequisite for patients feel them knowingly and consciously. A patient suffering from an intervertebral disc disorder will not be able to correct this as long as he/she is unaware of faulty or wrong positioning of his/her body in his daily life. Practices of feeling and understanding the body administered by a specialist who is competent on the subject that he/she teaches form an important portion of patient education programs used in many illnesses at modern cure centres in European countries.

Underwater exercises are intense muscle and circulation system works targeting on minimizing the load of muscle and skeleton belonging especially to back and lower extremities and parallel to this on minimizing the neural load at these areas. In other words, long lasting endurance exercises of limbs and organs having difficulty during exercises performed outside of water due to gravity and lower extremities and lumbar portion of spine before everything else can be performed in an intense and effective manner in water. Affects of underwater exercises are also being benefited from with purpose of treating neurological illnesses.

These exercises may be practiced much more intensely in a meaningful fashion than exercises performed outside of water and they are especially indicated for patients who are disabled to walk. In addition, it can be used as a unique treatment method in multimorbidity through benefiting from mutual interaction of water environment with active movements.

As a rule, waters inside the exercising pools must be in the same quality of drinking water. By means of cooling the hyperthermal waters or warming the cold mineral waters, pool water temperatures are kept rather near thermo neutral (34-35°C) temperatures.

Existence of additional effects is in question here according to exercises performed outside of water due to physical agents such as water pressure, buoyancy of water and water viscosity. Buoyancy of water is more in waters containing salt and minerals. For that reason, such additional factors in exercise baths can provide significant therapy in the extremities and joints in spine. This on the other hand means that there are special indications for muscle and skeleton system ailments.

In reality, existence of physical treatment and rehabilitation units in spa facilities is in rather optional quality than a prerequisite. Physical treatment measures in spas must be arranged special to the individual and in cases when it is medically necessary and not to fill-up a cure program. Physical treatment methods have began being practiced mostly in European spas as an addition to balneotherapy methods. Certain European cure centres today have earned a special place for themselves in treatment and rehabilitation of ailments primarily associated with rheumatism, orthopaedics, neurological, cardiovascular and geriatrics followed by chronic illnesses that receive spa indication.

Finally in connection with the equipments of spas; hydrotherapy means such as Jacuzzis, jet showers, whirlpools, underwater pressured massages, filiform showers, walking tracks, steam showers and baths etc. from the other treatment methods performed with natural therapeutic agents in spa centres must be listed as equipments towards the methods.

Speleotherapy is a relatively new method in medicine, although is well known and appreciated by isolated tribes in caves and salt caves. During the years of 50 and 60 of the XX Century speleotherapy was practiced only sporadically in Germany and later Klutert repeated the method in Poland, in the Wieliczka salt mine, when the first positive effects of salt mine micro-environment were mentioned on respiratory illness (B. Yang, G. Schubert, 1962; M.Skulimowski, 1968).

Effective curative results of salt mines and caves on respiratory diseases aroused interest, especially in Europe, where as noted, chronic inflammatory airway diseases and allergies are

growing. Around the years 1870 –1875 has been practiced for therapy of patients with rheumatic diseases in Grotta Guisti Monsumano Terme (Italy), the beneficial effect was confirmed years later in 1939-1942.

Several directions are necessary for balneary development:

1. Serious analysis to establish a national register of natural therapeutic factors, mineral substances reserves and their degree of usage
2. Complex research studies to establish the therapeutic potential of natural factors for specific diseases
3. Specific actions and optimal therapeutic indications as basis for the setting of the degree and the structure of material base development
4. Finding the best solutions for functional division and specific and general infrastructure development
5. Development of protective measures for natural environment preservation and protection.

The conceptions and the new orientations of the modern medicine that approach the health as a fundamental right of the human being, the introduction on the evaluation criteria of notions as the quality of life, lifestyle, welfare determined a re-evaluation of the medical assistance offered in balneary resorts, of balneology generally speaking, and of traditional tourism. Between the traditional balneology and traditional tourism appeared the welfare tourism, the health tourism and preventive health cures, which have as basis the quality of life, the health protection and a psycho - physical plan valid.

The new criteria of evaluation show the impressive leap registered on the therapy with natural cure factors, from the crisis periods when there were no solid scientific substantiation, the methodology used being based more likely on the empiricism, to the multiple studies and scientific examinations which proved the efficiency of therapeutic and rehabilitation cures for different groups of diseases, based on a complex methodology.

The modern evaluation of the health, the welfare, and the quality of life imposes the continuation and development of scientific study for the establishment of action mechanisms and curative effects of the natural therapeutic factors. There are considered as a priority the studies on the methodology and effects of "health cures", which represent the most important domain of the primary prophylaxis of the major diseases from the pathology related to the life style of civilization from the new millennium.

Due to these conditions and reflecting on the principal elements of the balneary cure in the modern health resorts, the president of the International Federation of Balneology and Climatology – Prof. Dr. H. Pratzel defined the balneary cure as being: "balneo-therapy, dietetic regimens, complex therapy, motivation for an healthy lifestyle under the supervision of experimented and qualified medical experts in a pleasant environment, accepted by the patient, closed to the nature and culture".

Due to the natural cure factors and the modern equipment from the treatment spas, the balneary resorts from Romania may offer the possibility of diverse disease treatment by the therapeutic and rehabilitation balneology and also solutions to prevent the disease and to maintain the health status through welfare balneology (health cures).

Natural therapeutic factors: mineral and thermal water, salty lakes, therapeutic mud and gases, salt-mines, climate, medicinal plants, represent the fundamental condition to conceive and develop the offers. So, to respond to competitive requirements they must have several characteristics regarding volume, quality, diversity and therapeutic efficiency.

The diversity of natural therapeutic factors is a fundamental condition in order to obtain as many products and to treat as many diseases as possible. These natural factors can be intensified by other natural factors, as a characteristic of a particular resort.

Another important factor is the quality and quantity of natural therapeutic factors that can be appreciated by several quantitative and qualitative criteria with great influence on therapeutic efficiency.

For mineral water qualitative criteria are: global mineralization, minimum contain of chemical elements, dissolved gases, emergency temperature, osmotic pressure, radioactivity, therapeutic indications, morbidity incidence; quantitative criteria are: homologated reserves. For therapeutic usage mineral water must be bacteriologic pure, to have scientific fundaments, and a regular debit to ensure the therapeutic usage method (internal and external administration, inhalations).

Therapeutic mud, used in different applications, can be evaluated with qualitative criteria: physical indicators: density, pH, rH, specific warmth, texture, slip resistance, organic material contain, peat decomposing grade, mineralization and ionic composition of imbibitions solution, and quantitative criteria: homologated reserves.

In vitro bioassays are valuable tools for screening environmental samples for the presence of bioactive (e.g. endocrine disrupting) compounds. They can be used to direct chemical analysis of active compounds in toxicity identification and evaluation.

Enzymes are the vital activators in life processes, likewise in the mud they are known to play a substantial role in maintaining soil health and its environment. The enzymatic activity in the mud is mainly of microbial origin, being derived from intracellular, cell-associated or free enzymes. A unique balance of chemical, physical, and biological (including microbial especially enzyme activities) components contributes to maintaining mud health. Evaluation of mud health therefore requires indicators of all these components.

The occurrence of estrogens in the aquatic environment attracts increasing attention because of their strong endocrine disrupting potency. Estrogenic hormones, also referred to as female steroid hormones, are steroidal molecules structurally based on the phenanthrene ring. They are produced from cholesterol primarily in the ovaries of females in response to signals from the brain or other organs and, albeit in lower quantities, in testes of males.

Therapeutic moffetarian gases can be appreciated by several criteria: CO_2 contain, H_2S contain, other gases contain, radioactivity.

Curative properties of therapeutic salt-mines are evaluated by thermo-hidro-baric indicators, (pressure, humidity, air flow), physical indicators for air quality (aeroionozation, aerosol particles concentration, radioactivity) chemical indicators (CO_2, H_2S, N_2, O_2, SO_2 concentrations, Na, Cl, K, Ca etc. concentrations, microbiology: greenhouse, fungus.

Therewith the high demands and high selectivity of the market influence the choice of consumers in choosing a balneary resort. At the basis of this choice is the proved therapeutic efficiency of natural factors and physical procedures, proved by clinical testing, internationally recognised by OMS.

The natural environment extremely beautiful surrounding the balneary resorts from mountains, hills or seaside is a powerful argument for balneary tourism. In these area the patients benefit also from all the natural factors: The effect of negative air ions or sea climate (air, water, sun, ozone) increase or are in addition to other natural therapeutic factors.

But all these factors can not be valued without a touristic arrangement of the resort, on scientific bases, with modern infrastructure, well developed and a highly trained staff.

Touristic arrangement of the resort on scientific bases, considering complex relations between environment and human and all the factors which influences these relations has an important part in tourism development and optimal exploitation of territory, in implementation of tourism in local economy and integration of development plans in social economic strategy.

In touristic arrangement of the resort several conditions are requested:

- Establishing profile and functional status of resorts on the basis of developmental directions;
- Choosing the right environment for balneary resorts
- Functional mapping of balneary resorts in order to ensure optimal exploitation of natural factors and environment protection,
- Establish the optimal dimension for resort related to resources quality, volume and diversity;
- The structure of equipments in a unitary conception to allow in the same time free spaces or therapeutic arrangements, parks, sport field, field cure area

Establishing profile and functional status of resorts is a decisive action for the market success of these offers.

Profiling and determining the functional statute of touristic spa resorts represents a decisive step for market success. While resorts' profile is defined by the nature of therapeutic factors, the functional statute – the specialization could have a major temporal flexibility according to market necessity. Based on these issues, be noted that a very good market research and a prediction of trends in volume and structure of demand are necessary, as well as using research to diversify cure factors, thus ensuring the flexibility of spa products.

Considering the actual global trends, there are two main categories for the profile and functional statute of spa resorts: modern and traditional/classic.

Regarding modern resorts, they have a new background concept about the global approach of health status, offering products which can mix/associate creatively balneary cures with therapeutic factors and a number of activities for regaining physical and mental balance of the patients.

In traditional/classics resorts the cures are mainly based on improved medical treatment and rehabilitation, which can exploit the rich tradition of our country in balneology. Functional rehabilitation programs are achieved in strictly specialised medical units.

For spatial perimeters establishments, the size of resorts and choosing the most efficient sites are of major importance. It implies a global valuation of natural therapeutic factors, total area as possible to arrange, establishing procedure for use of resources, internal and external cure and the necessary for every procedure: bathroom tub, packing, inhalations, buvete.

Another important aspect, which has left its mark on the therapeutic natural factors, is the quality of the environment as well as its protection and preservation. Therefore it is necessary to take action in this regard to not allow the contamination of therapeutic natural factors, chemicals, noxious wastes and pollutants. For instance, it is necessary to stimulate organic farming practice (without using chemicals), that would not affect the quality of spa resources and which is an asset for offering organic food. It is also required to avoid pollution by noxious wastes. There shouldn't be any polluting factories close to such resorts, and the flow of not ecological vehicles should be restricted. At the entrance of the resort there should be a special parking area.

3. Representative Spa Resorts of Romania

Turda is one of the six urban centres of the county of Cluj and, as municipality, the second in population number, which represents 8.3% of the county's total population and 14% of its urban population. Being situated along the most important Romanian traffic route – DN1 – E60 – E81 is a big advantage for Turda, for it ensures very good links with principal towns.

The area on which the town of Turda developed, from a geomorphologic point of view, in the contact plateau of Turda, a subdivision of the Transylvanian Plateau, below the root of the Apuseni Mountains. The very surface area of the plateau is shaped by the large riverside Arieş, west east oriented, which contains a well-defined range of terraces on the right.

From a geological point of view the area is situated at the juncture between the Jurassic facies limestones formations of Mount Petrid and the tertiary sedimentary rocks of the Transylvanian Plateau floor, here formed from marns, clay, greystone, and volcanic tuff strata.

Approaching Turda, the strata come bending towards the town, where they appear deformed, due to the salt grains that lifted them in a vault-like shape. Due to the erosion from the tributaries, the sediments' cover was washed off and the salts from these vaults rose to surface, allowing the exploitation. Because of these low-resistant deposits, there is frequent land sliding in the area. Water flooding into the former mines dissolved the salt, giving birth to salt lakes (the spas area). The actual antropossaline lakes were formed in the Middle Ages, up to 13th century. The petrographic structure of the neighbouring areas influenced the construction materials used from ancient times till the modern epoch.

The types of soil have a strong character of transition from the mountainous frame to the hilly Transylvanian plain. The hilly area of the plateau contains levigated cernosiums (specific to the bioclimatic conditions of steppe) and brownish forest soils.

The hydrographical network is subordinated to the river Aries, through its left-hand tributaries: Racilor, Sandul and Pardei. In droughty years, their level runs low, to sometimes dry in July and August, due to underground waters exhaustion, which rarely happens, though. These rivers freeze in the second half of November, ice formations disappear with the second half of February. In what regard river Aries, it has a subsequence character in the plateau, with a big tendency towards erosion in the left bank.

Due to the anthropogenic factor, we are in an area of antropic steppe and silvosteppe vegetation, which also includes natural meadows and islets on interfluvial waters as on the southern and eastern slopes: The xenophile plants from the secondary meadows account for the dryness of the climate. Here and there, on the western and northern slopes, there are oak-trees, elms, hornbeams, and ash-trees. Where the meadows are there appear graminae. In the Aries meadows we come across hydrophilic vegetation, due to the underground water supply. In the past one could see even beeches in the area.

The climatic factors didn't change very much in time in the curse of Turda's history with the exception of the changes due to the actual morphology of the town's surface and the ones engendered by the pollution. The characteristics of the local atmospheric circulation can be seen in the descendant movement of the air and the appearance of the breeze, which account for higher temperatures than those in the surrounding areas, as well as for nebula and poor rainfall. The average yearly temperature is given by the +8.5 isotherm. Freezing sometimes lasts eight months a

year, from October to May. Snows start in the third decade of November and last till the first half of March.

The deposit of salt formations from the Transylvanian plateau took place in middle Bandenian-Wielician. The absolute age attributed to the salt deposits from Transylvanian is 13,6-13.4 million years. The salt sedimentation took place in isolated marine basins, in a warm and wet climate, with vague tendencies towards dryness, on grounds of an active subsidence. The subsequent tectonic evolution of the basin determined the formation of long folds N-S orientated, lying in the West and, respectively East of the Transylvanian Plateau, on the axis of which the salt is concentrated in diamond-shaped seeds.

The existence of a salt deposit and the exploitation of this reserve over the centuries, created in the North-East of the town, at about 2 Km from the centre, a specific landscape. It is the Salty Spas micro-depression. The exploitation of salt, the process of carstification of the salt deposit, as well as the land slidings, contributed to the formation of numerous lakes, especially the antropossaline ones lying in the very surface area of a former salt mine, are used by the population to curing purposes or for entertainment.

The concentration of salt differs from one lake to another. The high content of salt and other elements confer to these lakes therapeutic properties. From this point of view the highest interest is directed to the Roman Lake where the town's swimming pool has been built; then there is Tarzan Lake, followed by the chain of lakes from Salty Valley, west of the Salty Spas micro-depression, the name of which is Durgau. The water in these lakes contains either chlorosodium, or bicarbonate, or calcium or magnesium and has a high therapeutic value for the muscular and the bone system, or the peripheral nervous system or for the gynaecologic ailments.

Another therapeutic factor of the zone is the medicinal mud. This type of mud lies at 0,5 –1m depth under the layer of deposit and it is used for cure, spread on the body followed by heliotherapy. The treatment is often applied in unorganised manner or in the existent balneal complex.

Sovata is renowned in Romania and surrounding countries for its treatment of infertility in woman, performed with salt water and mud. In addition, the effective results attract more and more women to seek Sovata's gynaecological treatment for the purpose of infertility prevention (especially in cases of those who are at risk of infertility) and for preparing the uterus prior to *in vitro* fertilization.

Sovata resort, located in Transylvania, at the edge of Gurghiu Mountains, was known by the period of Romans for salt mines. Since 1578, it was certified under the name Sovata. The soil, rich in salt, allowed salt lakes to appear, and these lakes were the start point for balneary activity. The first description of the therapeutic effects of the salt water was written in 1597. In 1884, Sovata was officially recognized as balneary resort.

In 1900, the baths from upper Sovata region (nowadays health resort) was opened, the research concerning the heliothermal effect of Ursu Lake has started and since 1929 the medically supervised balneary treatment was introduced. During 1975-1983 were built several hotels near Ursu Lake and the medical tourism as mass phenomenon has appeared. Since 2001, three of these hotels (Sovata, Bradet, Faget) were included in the private system of the European Danubius Hotels Group and have started the actions for according the balneary product to the European trends and quality control: natural treatment factors were evaluated periodically by the National Institute of Balneoclimatology, the resources and health spa resort activities were checked according to TUV Rheinland requirements.

Sovata resort has become famous due to the quality of natural resources gained from Ursu (English: Bear) Lake (the salt water and the sapropelic mud), the climate (fresh air, rich in negative ions) and the continuous improvement of the infrastructure.

Sovata resort is indicated for the treatment of gynaecological diseases (chronic inflammation, hormonal disorders, infertility), rheumatology – chronic inflammation, after orthopaedic surgery, respiratory diseases (infections, allergies, asthma), dermatological diseases, and also for prevention of some of these diseases, stress management and classical prevention (improvement of the effort level, detoxifying cures).

In Sovata is treated infertility caused by fallopian tubes stenosis or blockage, chronic pelvic inflammation, adherences (after pelvic surgery, peritonitis, inflammation), hypo function of ovaries (low estrogenic and progesterone levels, ovulation disorders), hypo-plastic uterus, endometriosis, polycystic ovaries, stress.

Salt water and mud are extracted from Heliothermal Ursu Lake and contain human-like estrogens and progesterone hormones liberated by *Artemia salina*, which improves significantly the hormonal status of the body. Human –like measured hormone levels are: in salt water oestrogen human-like 95 S.U % and progesterone human-like 0.7-0.8 mg%, in mud oestrogen human like 355 S.U.% and progesterone human like 2.5 mg%. On the other hand, the high amount of salt in water – 300 g/l and in mud – 95% of mineral fraction of mud relieves pelvic tissue fluids and stasis and decreases pelvic inflammation.

Both oestrogen and progesterone levels are important for embryo implantation. Oestrogen induces the development of progesterone receptors in uterus. The main role of progesterone is to prepare the uterus for implantation of the embryo, but progesterone has also an anti-abortive role, by modulation the mother's immune response. The loss of embryo after in vitro fertilization (IVF) caused by the mother's insufficient levels of oestrogen and progesterone could be avoided in some cases if the uterus is previously "prepared" for IVF using Sovata gynaecological treatment.

Prevention related to cases at risk of infertility is indicated for repeated anexitis, methroanexitis, other pelvic inflammations, genital infections (especially repeated, chronic Mycoplasma, Candida), hypo – and oligomenorrhea.

Sovata treatment is not recommended for the following cases:

- Ovarian cysts greater than 5 cm in diameter (sonography);
- Uterus fibroma greater than 2 cm (sonography);
- Recent Bethesda/Papanicolau smears at risk;
- Genital surgery (or abdominal surgery) conducted within the last three months (cervix conization, ovarian cyst removal, laparoscopy);
- Acute pelvic inflammation – anexitis, methroanexitis, etc (fever, need of antibiotics) more recent than three weeks;
- Malignant tumour anywhere in the body, treated within the last five years (i.e.: removal of the tumour, specific treatment and rigorous follow-up).

Discussion about possible infertility causes with treated patients at Sovata follows a detailed questionnaire and examination of previous medical records in order to screen other unexplored causes of infertility (as well as male infertility causes).

The climate of Sovata has a good relaxing effect, and pregnancy among those with idiopathic (no cause found) infertility after treatment in Sovata probably corresponds to a great number of stress-induced infertility cases. The climate of the Sovata resort has a relaxing effect on the nervous system, neutralising chronic stress (there are direct connections by nervous fibers between brain and

genital apparatus: thus brain stimulated by stress causes spasms of the tubes – blocking the ovule fecundation, and also uterine contractions that eliminate the recently implanted egg). About 20% of cases of female infertility have unknown mechanisms: some of them are surely caused by chronic stress.

The high temperature of the mud and salt water increases local circulation, implicitly the absorption of salt and hormones. Salt decreases local inflammation, heals genital lesions and dissolves adherences. Hormones, with almost the same chemical structure as the human ones, are received by ovaries, hypophysis and hypothalamus as their own, effectively stimulating and balancing the body's hormonal synthesis. Ovarian synthesis of oestrogen and progesterone increases, regulating menstruation, optimising vaginal pH and ovulation and prepare the uterus for egg implantation.

In this way Sovata treatment prevents repeated miscarriages, including miscarriages after IVF, caused by inadequate preparation of the uterus (low endogenous oestrogen and progesterone levels). Sovata's treatment consists now of salt-water irrigation, intra-vaginal mud pads, external mud pack, electrotherapy, and salt water baths. The required period of treatment is at least one week, with optimal effects following two-three weeks of treatment.

Pregnancy after gynaecological treatment in Sovata is achieved in 15% of cases, according to ten years non-rigorous statistics, taking also in account that the total number of women included gynaecological problems besides infertility, like menstrual disorders, chronic pelvic inflammation etc., and the pregnancy cases registered were only those reported directly by mothers by phone – in other words, cases were not followed up individually.

Internationally, scientific data on peloidotherapy and mineral water treatment used in various medical conditions are relatively few and have a very general view on biological mechanisms. Our searches through the literature have shown that in other European countries the situation is similar in terms of scientific reasoning regarding therapeutic use of natural factors in spas. This leads us to believe that the accumulation of experience in this scientific field opens new perspective for international collaboration.

Periodic certification of the quality of natural therapeutic factors used in spa resorts represents a way of assessing the preservation of environment, directly reflected in therapeutic efficiency. Thus, the development of the researching capacity of National Institute of Rehabilitation, Physical Medicine and Balneoclimatology has also the argument of improving the environment by monitoring balneary resorts.

The Détente Consultants Company made the Master Balneary Tourism Development Plan available to the Institute and to the Ministry of Regional Development and Tourism, as beneficiary, plan completed in 2009-2010. This public document is very useful for our balneary sector.

Romanian Association of Balneology has set as its main objective the promotion of scientific research in the Balneary sector.

Balneo and PRM Research Journal (http://bioclima.ro/Journal.htm), published by the Romanian Association of Balneology in English provides a platform to disseminate scientific knowledge to researchers, physicians and other authors interested in publishing scientific articles in the field of medical recovery and balneology, in a multidisciplinary scientific journal with peer-review group, open-access, which presents many aspects of daily spa research, medicine, medical tourism and natural therapeutic factors.

4. *Therapeutic mineral waters – definition, classification, indications and contraindications*

Therapeutic mineral waters are waters that come from a natural source - spring, lake or borehole and meet at least one of the following conditions:

a) mineralization or content of dissolved mineral salts above 1 g/l;

b) the presence of chemical elements with known pharmacological action, in minimum necessary proportions;

c) content of dissolved gases with biological effects, - 1000 mg CO_2/l, 1 mg H2S/l;

d) temperatures above 20°C, regardless of the mineral content, which gives them the characteristic of thermal waters;

e) the existence of a scientifically recognized therapeutic action, a situation that gives these therapeutic mineral waters the status of medicine, being prohibited any modification or processing by adding or extracting substances other than carbon dioxide.

Thermal waters are classified according to temperature into:

a) hypothermal waters = 20° - 31° C

b) thermal waters = 32° - 38° C

c) hyperthermal waters = peste 38° C.

According to the level of mineralization, therapeutic mineral waters are classified into:

a) mineral waters with mineralization of more than 1 g/l dissolved solids, subdivided into: mineral waters with average mineralization of 1 - 15 g/l, concentrated mineral waters with mineralization of 15 - 35 g/l, highly concentrated mineral waters with mineralization of 35 - 150 g/l and highly concentrated mineral waters with mineralization of over 150 g/l;

b) mineral waters with mineralization below 1 g/l dissolved solids - trace minerals, which have biologically active components that give them their specific character, and which are subdivided into: sulphurous trace mineral waters, ferruginous trace mineral waters, carbonated mineral waters.

According to the physico-chemical composition, therapeutic mineral waters are classified into:

a) oligometallic - acratic;

b) alkaline and alkaline-earth - bicarbonate, sodium, calcium, magnesium;

c) chlorinated-sodium - salty;

d) iodides;

e) brominated;

f) sulfated;

g) ferruginous;

h) arsenical;

i) sulphurous;

j) carbon dioxide;

k) radioactive.

Depending on the type of mineral substances and their concentration, they can be used as follows:

- in regular, daily consumption, for variable periods, in bottled form, helping to preserve the state of health and the prophylaxis of the state of illness - drinking mineral waters
- for therapeutic purposes, for the treatment of some conditions or for secondary prophylaxis, at the indication of specialist doctors and following standardized administration protocols - therapeutic mineral waters.

Depending on the chemical composition and concentration of mineral substances, therapeutic mineral waters are used in the following ways:

a) internal cure for drinking - crenotherapy, aerosols and inhalations;

b) parenteral administration in injectable form; 16

c) external treatment in the form of baths in individual cases, in spa pools, in physiotherapy pools, in swimming pools and solariums, as well as in the form of medicinal irrigations;

d) for extracting salts or gases for treatment or for industrialization.

The most widespread and, as a result, more frequently used, therapeutic mineral waters come from the precipitation infiltrated into the soil, which thus takes mineral substances useful to the human body. Romania benefits from countless such sources of health, which, however, must be used with caution, like any other remedy.

The main types and sources of mineral waters that can always help our health, as well as the conditions they can treat:

Chloride-sodium or salty waters. Very numerous, they are used in internal medicine, if they have a concentration of up to 15 g per liter, in digestive diseases (hypoacid gastritis, etc.), in chronic bronchitis, chronic rhinitis; in the external cure, when their concentration exceeds 15 g per thousand (it can reach up to 250 g), they are indicated in rheumatic diseases.

Sulphurous waters (1 mg per thousand H2S). Sulfur is an element with important roles in the body. It is included in the composition of amino acids, indispensable for the body (cysteine, arginine, etc.). Hence the importance of sulphurous waters in chronic lesions of the mucous membranes (bronchitis, chronic rhinitis). Then, sulfur is the element that enters into the constitution of connective tissue. Rheumatic disease, being considered a collagenosis, is one of the major indications of sulphurous waters. Sulfur enters the constitution of insulin – hence the indication of sulphurous waters in diabetes. Finally, sulfur also has a desensitizing, anti-allergic role, having indications in bronchial asthma and some dermatoses.

Carbo-gaseous waters (1 g per thousand CO2) are indicated both in internal cure (digestive, chronic diseases, with gastric hyposecretion) and in external cure (in cardio-vascular diseases and arterial hypertension, arteritis, Raynaud's disease, acrocyanosis, postphlebitic sequelae, venous insufficiency, etc.).

Alkaline waters (1 g per thousand bicarbonate) in pure form do not exist in our country; they are found in the form of combinations (alkaline-earth waters with Mg, Ca), alkaline, chloride-sodium, carbon-gaseous, sulfurous, sulfated, ferruginous. They are used in internal cure, especially in digestive, hepato-biliary diseases. In the external cure, they are used in inhalations and sprays (in respiratory conditions). As for drinking water, it is good to do it by sipping or with a straw, to warm it in the mouth. Start with about 50 ml at each meal and, depending on tolerance, increase the doses.

Alkaline-earth and earthy waters (1 g per thousand) contain bicarbonate linked to Ca or Mg and are mainly indicated for digestive ailments (gastritis, colitis, ulcer disease, chronic enterocolitis, rickets, allergies, etc.).

Sulfated waters (1 g per thousand sulfates). They are sodium sulfate or Glauberian, magnesian or bitter, calcic or gypsum and vitriolic (with Fe and Al); they are used only in internal cure, in digestive diseases (intestinal, hepato-biliary). They are drunk in the morning, on an empty stomach, in chronic constipation, cholecystitis, obesity, etc.

Iodized waters (1 mg per thousand iodine). Iodine, whose metabolism is controlled by the thyroid gland, has been used for a long time in the treatment of chronic rheumatism, atherosclerosis, hypertension, etc. These waters are used in internal and external cures.

Ferruginous waters (10 g per thousand iron). They are always carbonated, but they can also be salty, alkaline, calcium, etc. Iron plays an important role in the body. Ferruginous waters are administered, in the internal cure, only from the spring, during meals, because otherwise the iron in contact with the air becomes inactive. Only bivalent iron is active, being resorbed in the presence of HC1 and vitamin C. Indications for ferruginous waters are iron deficiency anemia, gastric achilles, operated stomach, etc.

Oligometallic waters (1 g per thousand) are poorly mineralized waters and can be thermal or cold. They contain Na, I, S, Ra (Geoagiu, Felix, with a temperature of 40-45°C) and are used in diseases of the locomotor system. The cold ones are used in the drinking cure (they are bottled and available commercially), used in digestive or urinary diseases.

Litiniferous waters are waters containing more than 3 mg of lithium per liter, being used in the treatment of manic-depression. Lithium salts have proven effective in the treatment of bipolar disorder, formally known as manic-depressive illness. As the name suggests, people suffering from bipolar disorder go through severe emotional swings, from extreme happiness to extreme depression. Between 0.4 and 1.6% of the population suffers from this psychiatric condition.

Radioactive waters are waters that contain radioactive elements that emit a (alpha), b (beta), g (gamma) radiation: (radium, uranium, thorium). The most important is radium, which emits radiation called radon. A water, to be radioactive, must have at least 80 u/1.

Water covers almost 71% of the globe's surface. The hydrosphere itself is composed of: seas and oceans 97.2%, continental waters 2.15%, surface waters 0.3%, glaciers 0.38%, vapors in the atmosphere 0.01%.

The role of water in the body is important, first of all, through its proportion in the human body: plasma contains 90% water, bone tissue, 25-30%, fat tissue, 20% water.

Water is also the essential element for the development of all physiological processes: absorption, diffusion, excretion. At the same time, it contributes to the maintenance of the body's homeostasis, i.e. to the maintenance of the body's basic constants: isotonicity (balanced maintenance of osmotic pressure), isothermy (the ability of the body to maintain its internal temperature constant), acid-base balance, metabolism.

Water and salts are indispensable in all vital chemical and physical processes. Any disturbance or deviation of +/- 10% of the water, the salts, each individual electrolyte, the ratio of various anions or cations, leads to serious disorders and ultimately death.

Health improvement and prophylactic action represent the major objective of the therapeutic uses of natural factors in spas and various spa or medical recovery centers.

Hydromineral therapy by ingestion - crenotherapy - is especially aimed at metabolic and urinary tract disorders. Indications and treatment methodology are based on the pharmacodynamic effects in the pre-resorptive stage and after resorption of water in the digestive tract.

In the chemical definition of a mineral water, the anions and then the significant cations (over 20mEq%) will be mentioned. The gases present in the water will also be recorded, if necessary. Finally, the degree of osmolarity of the mineral water (hypo-, iso- or hyperosmotic) and possibly the degree of thermality (if it exceeds 20 0C in natural conditions from the spring or well) will be indicated. A formula designed as a fraction (Kurlow formula) draws attention to the most important elements in the mineral water, while also including the amounts of the different elements.

For example, the characterization of Borsec water according to this formula looks like this:

$$CO_2\ 2{,}6\ ;\ M\ 5{,}14\ \frac{HCO_3\ 97}{Ca\ 60\ ;\ Mg23\ ;\ Na\ 13}\ t\ 8{,}5^0$$

Almost all known chemical elements were found in the mineral waters. Among them, chlorine, bromine, fluorine, arsenic, as well as bicarbonate, sulfate and phosphate ions behave as anions (negative electrical charges).

Chlorine (Cl-), extremely widespread in mineral waters, with its origin in sedimentary rocks rich in salt, in lagoon deposits and in the residual salinity of some rocks, is very soluble in the form of chlorides of alkaline or alkaline-earth metals.

Bromine (Br-) originates in marine sedimentary rocks, because it is concentrated in marine organisms (corals, sponges, gastropods, etc.) in the form of organic compounds with a biological role. Bromine in fossil waters associated with oil deposits is also of biogenic origin. In mineral waters it is found in the form of bromides, in concentrations of at least 5 mg/l. Bromine concentrations below 15 mg/l are often found in areas with salt masses and in reservoir waters, but there are also waters very rich in bromine.

Iodine (I-) comes from organogenic sedimentary rocks, with algae and diatoms very rich in iodine. The iodine present in fossil waters is also of biogenic origin. Iodized mineral waters must contain at least 1 mg/l of iodine. Most of the internal cure springs contain less than 10 mg/l of iodine, but in the mineral waters for balneation we can encounter concentrations of over 40 mg/l.

Fluorine (F-) appears in mineral waters from phosphate rocks. Mineral waters containing 5 mg/l fluoride can produce tooth enamel; cures have no prophylactic value against tooth decay.

The bicarbonate ion (CO3H-) has its origin in the carbonated sedimentary rocks and together with the carbon dioxide dissolved in the mineral water ensures the acid-base balance that conditions the presence of the other electrolytes in the water. In Romanian mineral waters, the bicarbonate ion concentration varies from 500 to 7000 mg/l. The minimum concentration of 726 mg/l bicarbonate anion is mandatory for such water to be classified as bicarbonate water. Usually, carbonated waters are chemically mixed waters.

The sulfate ion (SO4-) comes from gypsum deposits. Sedimentary rocks contain sulfates of sodium, calcium, magnesium, etc. In sulfated mineral waters, the sulfate anion concentration must exceed 20% of the total anions. Bacteria can transform the oxidized form of sulfur into more reduced ones such as sulphides, thiosulphates, so that such reduced forms and even hydrogen sulphide appear in sulphated waters.

The phosphate ion (PO4-) comes from phosphatic sedimentary rocks (phosphatic limestones, phosphatic clays), calcium phosphate (apatite) being the main source of phosphorus in the body and in sediments. In the chemical classifications of mineral waters, waters with a higher phosphate content are not defined. Among the other elements present in mineral waters are cations (positive electrical charges) sodium, potassium, calcium, magnesium and iron.

Sodium (Na+), present in all mineral waters, but predominating in salty, sodium bicarbonate and sodium sulfate, has its origin in the residual salinity of sedimentary rocks; sodium chloride is washed from the marine sediments and returned by the circulating waters to the marine hydrosphere. Fossil waters and those that infiltrate salt masses also contain sodium chloride. If the mineral water has its origin in volcanic rocks, it contains a little sodium extracted from sodium or sodium-potassium feldspars present in these rocks. Sodium appeared later in the primitive ocean water and is not capable of making organic combinations. In the body, although it tends to enter the cells, it is constantly pumped by them through a metabolic mechanism, called the sodium pump.

Potassium (K+), with a higher concentration in mineral waters because it is retained in clay rocks, comes from feldspar and mica rocks, as well as from the residual salinity of the sediments. Unlike sodium, which "runs away" to ocean basins, potassium is retained in sediments (clay/mud). The Na/K ratio in mineral waters is 10-20.

Present in the water of the primitive ocean where life appeared, potassium is the essential ion of cellular protoplasm and participates in all its metabolic reactions. The sodium pump mentioned above is coupled with a potassium pump, in the sense that the metabolic expulsion of sodium from the cell occurs in exchange for the attraction of potassium into the cell.

Calcium. (Ca2+), present in many mineral waters, especially in the group of alkaline-earth or sulfated calcium, comes from the geological layers (calcareous sedimentary rocks and gypsum) in which the mineral water, extracting the cation, is biogenic. Living organisms fix soluble calcium from seawater, incorporating it into their hard structures. Calcium has a special functional role in cellular metabolic activity. Biotic energy retains calcium in the hydrosphere.

Magnesium (Mg++) is present in mineral waters usually together with calcium, alkaline-earth waters contain both calcium and magnesium, in bitter waters the latter is found in the form of magnesium sulfate. The great wealth of magnesium and potassium in the primordial ocean water explains the participation of those anions in numerous enzymatic and cellular metabolic reactions (for example, chlorophyll assimilation, a process that is the basis of life on earth, takes place only in the presence of magnesium). The origin of magnesium in mineral waters can be found in dolomite rocks (double carbonates of calcium and magnesium). The mineral waters used in the internal cure are considered magnesium when its concentration reaches, in general, 70-300 mg/l. In the concentrated salty waters used, usually, in the external cure, magnesium can reach concentrations of up to 6,000 mg/l (Probe 1 from Bălțești).

Iron (Fe++), originating in eruptive minerals, in basic magmatites, but also in sedimentary deposits, is present in some mineral waters, called ferruginous only if its concentration exceeds 10 mg/l. In fresh spring water, iron is found in its reduced form (Fe++), but in contact with air, the water oxidizes quickly, the reduced bivalent iron passing into the form of colloidal ferric hydroxide (Fe+++). Iron bicarbonate is the chemical form in which iron is usually found in mineral water. The loss of carbon dioxide present in the water contributes to the precipitation of iron, a phenomenon that must be taken into account in the bottling technology of ferruginous mineral waters. Among the Romanian mineral waters, those from the Unirea spring in Vatra Dornei (49.7 mg/l) and from Băile Usturoi ("Garlic") in Maramureș county (313 mg/l) contain the highest amounts of iron. Bottled mineral waters used as table water are pre-ferred.

Along with the above-mentioned ions present in mineral water in concentrations that allow its chemical classification according to the quantitative importance of the respective ion, other chemical elements from the *trace minerals* group are also found in mineral waters, in an ionized state, in extremely low concentrations. Their biological action, very important, resembles the activity of vitamins, catalyzing, like them, certain enzymatic reactions.

Since the list of trace elements is very large, we will list only those identified in mineral waters and which have a biological and therapeutic value related to hydromineral cures.

Manganese (Mn++) has the same origin as iron and is associated with it in mineral waters. Internal spa mineral waters contain up to 2 mg/l Mn. Like iron, manganese is oxidized in stagnant water, but after ingestion it is reduced again in the intestine. The most significant biological role of manganese consists in the synthesis of mucopolysaccharides, in the activity of arginase in the liver. Manganese has a hypoglycemic effect and also acts as a lipotropic factor.

Lithium (Li), spread in mineral waters, is retained in its underground circulation, like potassium, in clay banks. Mineral waters with a concentration of more than 3 mg/l Li are considered lithiniferous waters. Thermal waters readily solubilize lithium and, biologically, lithium has been shown to activate Na/K and Mg/Ca pumps in cell membranes. In older spa indications lithine waters were used in the treatment of gout.

Aluminum (Al3+) in the composition of the silicate rocks that form the Earth's crust is found in small quantities in mineral waters in the form of colloidal suspensions. Among the Romanian mineral waters, the highest concentrations of aluminum have the so-called "stomach" spring from Harghita (12.9 mg/l) and the 1 bis well from Biborțeni (5.5 mg/l).

Zinc (Zn2+) originates in sedimentary rocks, mineral waters in Romania contain up to 4 mg/l Zn. In the body, zinc participates in numerous metabolic processes (for example, protein synthesis). Insulin also contains zinc, and carbonic anhydrase, an enzyme that contributes to the formation of hydrochloric acid in the gastric mucosa, is zinc-dependent.

Copper (Cu2+) originates in clay rocks and appears in low concentrations in mineral waters (for example, in France, at Neris, mineral water with a content of 1.5 mg/l Cu is considered copper water). In the body, copper is stored in the liver, being used in the mitochondria for cytoeromoxidase synthesis. Manganese, zinc and copper protect the pancreatic islet apparatus and have therapeutic efficiency in diabetes.

Molybdenum (Mo) is also present in mineral waters. The treatment with sulfated mineral waters tends to deplete the body of molybdenum, by increasing its elimination. Xanthine oxidase, an enzyme involved in purine metabolism, is molybdenum-dependent. Molybdenum also contributes to maintaining the elasticity of arterial walls.

Vanadium (V), very biologically active, also appears in mineral waters (the highest amount of vanadium, 9 mg/l, found so far in mineral waters is found in Reichenhall). The main biological effect of vanadium consists in the activation of vitamin B1 coenzyme. We mention that vanadium is contraindicated in arteriosclerosis prophylaxis.

Silicon (Si), present in the silicate rocks that make up the earth's crust, soluble in thermal or alkaline mineral waters, is very poorly represented in mineral waters. Because the silicic acid molecule associates in macromolecular forms, the silicon in the mineral water passes extremely easily into the state of colloidal soil (alkaline-earth silicates). The silicon in the mineral water has its origin in clayey sedimentary rocks. Concentrations of 10-120 mg/l Si are common in our mineral waters. Although a direct biological effect of silicon in atherosclerosis has not been demonstrated, a decrease in silicon in the arterial wall has been found in the elderly and in atherosclerosis.

Boron (B) has its origin in connection with the volcanic activity of the respective area and dosed as metaboric acid (HBO2) is present in mineral waters in concentrations that can sometimes have toxic effects, its upper-admitted limit for drinking water being 0.5 mg/l. Mineral waters with a concentration of more than 5 mg/l B are considered boric waters.

Some gases present in natural mineral waters have proven pharmacodynamic effects, used for therapeutic purposes. Gases in nature come either from chemical reactions generated by the metamorphism of igneous rocks (carbon dioxide, hydrogen sulphide, hydrogen, methane), or from the metabolic processes of organic substances that produce methane, hydrogen, carbon dioxide and sulfuric acid. Some gases, such as radon, originate in radioactive processes.

Carbon dioxide (CO2) in carbonated waters is linked to volcanic phenomena. The mofetic aureole of the Călimani-Harghita volcanic chain supplies carbon dioxide to all the "borviz" in the area. The gas maintains the hydro-electrolytic balance of the fresh mineral water.

Mineral waters as a therapeutic factor - they are used most frequently in internal cure (crenotherapy) but, depending on the content, also in external cure, for baths, through inhalations, irrigations, etc. Although the mineral water cure can use varied and individualized techniques, depending on the type and stage of the disease, as well as the patient's reactivity, there is a general scheme for conducting the treatment.

Internal cure is the basic treatment for digestive, metabolic and urinary ailments.

In the resort, the mineral water must be drunk at the spring. Only when the patient is immobilized in bed, the cure can be done in the room or on the terrace, using freshly collected water from the spring. Cure in clinostatic position helps the evacuation of the stomach and is useful in gastric ptosis. The prescribed dose of water will be drunk in small sips, repeated at a rate of 2-3/minute. This rhythm increases gastric tolerance to mineral water. Waters are usually administered at their natural temperature. Pre-warming in the sea bath is indicated in digestive and biliary spastic forms; atonic constipations and diuresis belts benefit from cold water. The dose administration schedule is correlated with that of meals, in general, using three intakes per day.

The amount per 24 hours should be approximated to the patient's weight. According to the Nievre (Vichy) formula, the amount of water prescribed in ml per 24 hours results from the patient's weight in kg multiplied by 10. (example: 70 kg x 10 = 700 ml of mineral water /24 hours). Vishnevski recommends 3.3 ml/kg body weight per dose (example 70 kg x 3.3 = 221 ml per dose).

In diuresis cures, the amount of mineral water is much increased over the usual dose, it can even be tripled. Although the total daily amount is usually divided into three portions, there are special goals that can multiply the number of portions, as well as the amount of water per dose. Larger doses (400-500 ml) will be ingested in fractions, during 30-40 minutes.

We note that when a longer contact of mineral water with the mucosa of the lower esophagus is intended, small intakes of water will be recommended. The beginning of a hydromineral cure is done with smaller doses (1/4 or 1/2 glass), then the amount increases progressively every day depending on the patient's tolerance. In case of gastric intolerance or pyloric spasm, the starting dose will be administered twice or even once a day. Small doses are also recommended in the case of prescribing more concentrated mineral waters.

The duration of an internal cure is 18-21 days, but often this period of time is totally insufficient. It should not be overlooked that the therapeutic effect is due to the training of the homeostasis mechanisms and that this training is varied over time according to the quality of the water and the patient's reactivity.

The external cure is the basic treatment for diseases of the locomotor system, the nervous system, the genital system and the skin. The treatment is applied in valves or pools fed with mineral water. The thermality of the bath water is corrected either by heating or cooling as needed. In the mineral bath, in addition to the thermal effect, a mechanical effect is exerted, which consists in the lifting power of the body in the water. A subject weighing 70 kg will weigh only 7.9 kg in the bath, and in a bath with concentrated salt water his relative weight will be only 2.8 kg. In this situation, active movements are facilitated, as well as passive mobilization of body segments. Another effect is due to the hydrostatic pressure of the water in the bath, which is exerted on the soft parts of the body: abdomen, peripheral veins.

By summing up the thermal, mechanical and chemical effects on the skin, metabolism and hemodynamics are especially stimulated. In bathtub baths, the patient must avoid unnecessary movements, if the bath is carbonated or sulphurous, the gases are lost by stirring the water. A bath generally lasts 15-30 minutes, after its performance a rest is recommended, longer in the case of asthenics or hot baths. A mineral bath cure consists of a series of 18-20 baths.

3.1. Sulfurous waters

Sulfurous waters contain at least 1 mg of H2S, HS, S or thiosulphates per liter or colloidal sulphurous complexes, present in the form of simple or mixed sulphurous waters (alkaline-terous, carbonated, sodium chlorinated). In sulfurous waters, sulfur is found in several forms (free hydrogen sulfide, hydrogen sulfide groups, polyhydrogen sulfide acids). The yellowing, the opalescence and the deposition of a whitish precipitate on the bottom of the bottle with the sulphurous water on the way to oxidation indicate the intensity of the water's oxidative process by the oxygen in the air. Sulfurous waters are indicated both for crenotherapy and in external cure in the form of baths, inhalations and vaginal irrigations, due to the effects of H_2S, which is reabsorbed through the skin and through the mucous membranes of the stomach, upper airways and bronchopulmonary and vaginal tracts.

Crenotherapy with sulphurous waters, usually mixed, has effects of stimulating gastric secretion (bicarbonated ones buffer this effect) as well as of intestinal peristalsis, choleretic and cholagogic effects on the liver and bile ducts, antitoxic effects and lowering blood sugar in diabetics. The mixed carbonated ones also have diuretic effects through the action of CO_2.

The indications for crenotherapy with low concentration sulphurous waters are: hepato-biliary disorders, especially biliary dyskinesias, gallstones and chronic cholecystitis, urinary tract infections, forms of diabetes and heavy metal poisoning.

Sulfurous water inhalation therapy is indicated in respiratory and ENT diseases for its anti-inflammatory, antiseptic and desensitizing effects on the upper airway and tracheo-bronchial mucosa, with the elimination of secretions. Individual or collective inhalations and sprays are indicated for patients with COPD, bronchial asthma, sinusitis, allergic rhinitis, ozone.

An original way of administering sulphurous waters is parenteral therapy, through injections of water from springs, indicated in the treatment of dermatological, digestive or respiratory allergic conditions, possibly associated with crenotherapy, external balneotherapy or inhalation therapy.

Due to the high sulfur concentration, which gives them an unpleasant taste, they cannot be used as table water, but only as medicinal waters. Used internally, these waters are indicated for constipation, colitis, hepatitis, diabetes and chronic heavy metal poisoning (mercury, lead, zinc). Sulfurous waters have a stimulating effect on the nervous system, therefore they can be used by asthenic and hyporeactive patients.

The sulphurous hydromineral cure also changes the endocrine secretions. The clinical and laboratory studies carried out on patients treated at the Herculane resort showed an increase in the secretion of hormones after the ingestion of sulphurous waters. Glucocorticoid hormones are secreted by the adrenal gland and have a strong anti-inflammatory and anti-algic effect.

Sulfurous waters have a bitter-astringent taste and a strong specific smell, sulphurous waters administered internally, in small doses of 50-100 ml per day, have laxative, diuretic and diaphoretic effects. If they are administered in larger doses (100-300 ml) they can generate a purgative effect. That is why they are indicated in constipation, especially when it is associated with hemorrhoids.

The internal cure with sulphurous waters is indicated in

- chronic gastritis with hyposecretion and hypopepsia
- enterocolitis and intestinal dyspepsia
- postoperative sequelae on the biliary tract, angiocolitis
- diabetes, hyperuricemia
- sequelae after nephropathy, urinary lithiasis

The external cure with sulphurous waters is widely used in balneo-climatic resorts, total or partial baths being particularly beneficial in the treatment of dermatological conditions. Sulfurous waters have the property of curing many diseases, due to the content of hydrogen sulphide, which is the only sulfur compound that is absorbed in the body through the skin, lungs and digestive tract, being eliminated through the skin, intestine and kidneys.

Sulfurous waters with an increased concentration of H2S are used, based on the following effects of H2S:

- cutaneous vasodilatory effect: increases peripheral cutaneous arterial circulation, decreases peripheral vascular resistance and lowers diastolic blood pressure
- metabolic effect: lowers blood sugar
- keratolytic effect: peels off the surfaces covered by keratosis and favors the elimination of scales
- effects on the articular cartilage: sulfur reaching the articular level induces vasodilation and thus decreases ischemia, activating the defense capacity and functional integration of the structures.

The heat of the bath activates the circulation at the level of the diseased tissues and helps their resorption and the stimulation of the skin, which produces the antibodies necessary to fight the infectious state and in the case of certain types of rheumatism. Sulfur assimilated by the body increases basal metabolism by 40%, causes vasodilation at the level of the central skin network, leading to a decrease in blood pressure values, is located in diseased joints and even in healthy ones, increases the number of red blood cells and the amount of hemoglobin.

Sulfurous mineral waters, due to the high concentration of sulfur that gives them an unpleasant taste, cannot be used as table water, but only as medicinal water. Sulfuric mineral waters act on digestive secretions not only on the basis of their chemical composition, but also due to hard-to-resorb ions, such as magnesium, calcium and sulfate ions. Thus, the waters from Calimanesti (spring 7), Olanesti (spring 24), Mangalia and Govora or Buzias stimulate the secretion and acidity of the stomach.

Sulfuous mineral waters have an exciting effect on the nervous system. For this reason, they can be used by asthenic and hyporeactive patients. By activating the parasympathetic nervous system, which coordinates part of the activity of the internal organs, there is a tendency to lower blood pressure and pulse, constriction of the bronchial tree, increased peristalsis and gastrointestinal secretions, dilation of vessels in certain regions of the skin with consequent redness.

In the external cure, from the skin, water and mineral salts are resorbed very slowly, so no acute counterregulation mechanisms occur, as happens after their ingestion and absorption from the intestine. As a result of skin contact with sulphurous waters, these baths find therapeutic indications in dermatological conditions. Due to the activation of the local circulation, the removal of the superficial layers of the skin, its desensitization, the rebalancing of the tone of the peripheral nervous system, very good results are obtained in the healing or improvement of allergodermas, neurodermas, eczema, non-specific itching of the skin, etc. In these conditions, important therapeutic successes were obtained by using the mineral waters from Călimanești and Olănești. Taking into account the similarity of the mechanisms that produce some digestive and skin conditions (eczema), at the Olănești Baths, the mineral waters for internal treatment from springs 5, 14, 24 are associated with the sulphurous baths. Obvious improvements in skin conditions were observed.

Apart from skin diseases, the internal cure with sulfur-containing mineral waters has its major indications in chronic rheumatic diseases. Special therapeutic results have been observed in the case of simple neuromyalgias, arthritic and pre-arthritis disease, chronic inflammatory rheumatic diseases, etc.

3.2. Carbonated mineral waters

Carbonated mineral waters are the result of the filtration of deep waters through volcanic soils, which contain CO2; the carbon dioxide, thus obtained, will promote the dissolution of other elements contained in the soil layers through which the water passes, such as calcium, magnesium, sodium, iron, chlorides, bromines, etc., so that, in the end, carbonated waters will have a complex composition and varied.

The action of carbonated waters used in the external cure

The therapeutic effects of carbonated mineral baths are based on the action of carbon dioxide and less on the pharmacodynamic action of the mineral salts in the composition of the mineral water.

The thermal factor, which in external cures is usually important, has a particular role in carbonated baths. This is due to the fact that the temperatures used in carbonated baths are below the values of 34°C, so below the thermoindifference temperature of water.

In the carbonated bath, an excitation is produced on the skin resulting from the simultaneous and continuously moving contrast between the aqueous or gaseous phase in the mineral bath. The surface of the skin is covered with small gas bubbles (extremely fine in the case of baths with carbonated natural water), which, reaching a certain size, break off, and in their place other bubbles are born (mechanical impact effect).

Water and carbon dioxide have different values of thermal conductivity, so in a bath of 28-32°C the areas of the skin that come into contact with the aqueous phase are below the thermoindifference point, while those in contact with the gas phase have past this point. In this way, simultaneous cold and hot stimuli are triggered, the contact surfaces with the thermoreceptors of the skin being constantly changed throughout the duration of the mineral bath.

As a result of the summation of excitations in space and time, evidenced by electrophysiological research, the carbonated bath reduces the sensitivity of receptors for cold (Krause) and increases that of receptors for heat (Ruffini).

The carbonated bath also increases arteriolar blood flow in the skin, as demonstrated with the fluvograph, the vasodilator effect being directly proportional to the concentration of carbon dioxide in the mineral bath. Carbon dioxide is absorbed through the skin even if it does not make gas bubbles.

All this explains the sensation of heat in the carbonated bath, although the water temperature is below the point of thermoindifference. As a result, a hypothermic effect is produced on the body, which explains some favorable effects on the circulatory system.

The effect of external cures with carbonated mineral baths, very complex, is based both on the mechanical and thermal action, as well as on the chemical qualities of carbon dioxide, its influence being either local or postresorptive.

The pharmacodynamic action of baths with these waters has been studied mainly in cardiovascular diseases.

In atherosclerosis with arterial hypertension or peripheral ischemia, the improvement of the peripheral circulation and the normalization of vascular hyper-reactivity, explored by the Hines test, the improvement of the collateral circulation and the claudication index, evaluated by radioisotopic and clinical methods, the reduction tensional values and the bradycardic tendency of the cures.

3.3. Chlorinated sodium water

In balneology, waters containing more than 1g/l NaCl (respectively 393 mg Na+ and 607 mg Cl-) are considered chlorinated-sodium waters. Mineral waters whose concentration in NaCl is higher than 14 g/l (hypertonic) are considered salty waters, their range being extremely wide. In general, hypotonic, isotonic or slightly hypertonic chlorinated-sodium mineral waters from mineral springs are usually mixed waters, which also contain other dissolved substances and gases (bicarbonate, sulfate, CO2, H2S, etc.), while concentrated salty waters from the waters of seas, salty lakes or from underground deposits of salt water or from underground or surface salt deposits (ocne) contain predominantly NaCl.

Given this very large variety of sources of concentrations, origins, associations with other ions and gases within the mixed waters, the therapeutic effects and their indications within the spa treatments will also be different, depending on the route and mode of administration . Chloride-sodium hypotonic, isotonic and slightly hypertonic waters (usually mixed mineral waters) are used in internal cure and inhalations, sprays, gargles. The salty ones, with very varied concentrations, are used for external treatment: baths in pools, lakes, in the bathtub, irrigation, possibly inhalations and sprays (the highly concentrated ones after a prior dilution).

At the forefront of therapeutic value are concentrated salt waters. The therapeutic effects of external bathing in heated salt water pools or tubs (there are also thermal salt waters, for example at Icoana, 570C, concentration 65 g/l); or in heliothermal lakes (Lacul Ursu de la Sovata, the heliotherms of Techirghiol, Gura Ocniței) cumulates the thermal effect on the one hand, the effect of the weight discharge of the body and the hydrostatic upward pushing force of the salt water, which is all the more accentuated the higher the concentration in the salt and which greatly facilitates kinetptherapy and therapeutic swimming, with the chemical effects of NaCl on the surface of the skin and in the body, after their resorption through the skin, proven by research with atoms labeled with Na and Cl.

The main effects of NaCl are manifested at the level of the skin, through osmolar changes, skin hyperemia, the excitation of skin receptors and, through them, the triggering of distant excitatory mechanisms. Reactive ergotropic effects after salt baths are described, the reduction of the electrical conductivity of the skin, the reduction of nervous hyperexcitability in case of neuralgic type disorders, the modification of peripheral skin thermoregulatory behavior, the balancing of neuro-vegetative disorders found in many conditions.

The main indications of external balneotherapy with salt water of different concentrations are:

a) post-traumatic, degenerative, abarticular and inflammatory rheumatic diseases of the locomotor system,

b) peripheral and central neurological conditions;

c) functional dyschronic and inflammatory gynecological conditions

Cold salt baths (in salt lakes, sea water pools, mineral water pools) are indicated in locomotor system conditions for practicing kinesitherapy and therapeutic swimming, as well as in peripheral veno-lymphatic circulatory conditions, for the effects of hydrostatic pressure and movement in water.

Crenotherapy with chlorinated-sodium waters can obviously only use waters with a low concentration. Hypotonic or isotonic waters are usually used, with concentrations between 3 and 10 g/l, or at most 15 g/l.

3.4. Alkaline waters

Alkaline waters contain at least 1g of salts per liter, with the predominance of the bicarbonate ion, linked to Na and K cations. Alaclino-terous waters have the bicarbonate ion predominantly linked to the heavy Ca and Mg cations. These waters are very rarely found pure, usually the bicarbonate of Na and K or Ca and Mg being associated with NaCl, with CO2, with sulfate ions, with H2S or Fe, in mixed alkaline or alkaline-earth, carbonaceous, sulphurous natural springs, chlorinated-sodium or sulfated, ferruginous, etc.

Therefore, their therapeutic indication and the selection of patients indicated for crenotherapy with a certain mineral water or another is done by the specialist doctor, as well as the establishment of the administration methodology, depending on which very different effects can be obtained.

Pure alkaline waters, without other associations and even with the removal of CO2 by heating or bubbling, shaking the water before use have broad indications in crenotherapy of digestive tube, hepatobiliary and some metabolic diseases. Their effects in this case are well known from the pharmacotherapy with alkaline substances used in the treatment of gastrointestinal disorders, as well as from the numerous pharmacodynamic, experimental and clinical-therapeutic studies.

Depending on the time of administration in relation to meals, alkaline waters have different effects: inhibition of gastric secretion when administered an hour and a half before meals; stimulation of gastric secretion when administered during meals or shortly before meals and biphasic effect, when administered after meals, with neutralization of gastric acidity in the first phase, but with subsequent stimulation of secretion, by NaCl and CO2 resulting from the combination NaHCO3 with HCl.

Alkaline waters also have the effects of fluidizing and eliminating mucus secretion from the stomach, accelerating the evacuation of the stomach, soothing pain. Hepatobiliary disorders are favorably influenced by the choleretic effect of alkaline waters. The alkalinizing effects of urine are also well known, with their favorable consequences on changes in urinary pH and inflammatory processes in the urinary tract, as well as on the composition of urine in metabolic disorders and kidney and urinary tract diseases in urinary stones acids.

Administration of alkaline substances in the form of crenotherapy with alkaline mineral waters in appropriate doses has even deeper influences on electrolyte metabolism. Alkaline-earth waters and especially mixed waters, to the extent that CO2 NaCl, H2S or sulfates predominate, change their effects compared to simple alkaline waters, in the sense that digestive excito-secretory effects, primarily gastric, determined by these mineral or gaseous substances from the mineral water. To a large extent, the effects also depend on the total mineralization of the mineral water, respectively on the global quantitative intake of salts, as well as on the ratio between different substances.

Hypotonic waters are very different in effect from iso-/hypertonic ones, so are their indications.

In the case of alkaline-earth and earthy waters, the known effects of Ca ions are added, both in inflammatory and allergic processes, as well as in phospho-calcium metabolic disorders. Hypotonic calcium waters also have diuretic effects, with indications in diuresis cures in urinary and metabolic diseases. Considering the effects of alkaline substances applied to different mucous membranes, therapy with alkaline and alkaline earth waters has broad indications also in the case of administration in the form of inhalations in ENT and bronchopulmonary conditions (sedative effects, fluidizing and elimination of secretions), in the form of vaginal irrigations in gynecological conditions with abundant secretions, as well as in the form of compresses or local or general baths in pruritic dermatological conditions (especially alkaline-earth and earthy waters, rich in Ca).

Modern physiology and pathophysiology data of electrolyte metabolism have imposed a series of reconsiderations regarding the role, the intake of Na and Cl ions in the daily diet in various conditions and therefore also in the crenotherapy with chlorinated-sodium waters. The effects of Na in combination with Cl in the regulation of the osmotic isotonicity of the extracellular fluid, in the occurrence of aqueous retention in case of excess of these ions, their role in diuresis mechanisms, in the regulation of water metabolism, acid-base balance, pituitary endocrine regulation mechanisms are well known. -adrenal cortex of the renal elimination of these ions, the pathophysiological mechanisms determined by the loss of Na and Cl in case of digestive disorders (vomiting, diarrhea) or in case of profuse sweating.

The effects of ingested chlorinated-sodium waters on the stomach and intestine depend on the concentration of the mineral water. In general, salt waters stimulate gastric secretion relative to concentration, as well as stomach motility. Those with high concentration inhibit the emptying of the stomach. The secretory and peristaltic stimulating effects are also determined at the level of the intestine.

Hypertonic saline waters have irritating effects on the intestinal mucosa, produce hyperperistalsis and purgative effects. These effects are enhanced or diversified, in the case of mixed waters, where the presence of CO2, bicarbonate or sulfate ions along with NaCl changes the effects on the digestive tract and biliary system. For the effects presented above, crenotherapy with chlorinated-sodium waters is indicated in gastro-duodenal and intestinal digestive disorders, in which the aim is to stimulate the secretory and motor functions of the digestive tube. However, as in the case of alkaline waters, the indications and dosage of crenotherapy with chlorinated-sodium waters must be well individualized, in order to avoid the negative effects of the increased intake of Na and Cl ions, in order not to disturb the body's electrolytic effect and to avoid the addition of a excess of these ions in patients with disorders of electrolyte metabolism.

Chlorinated-sodium waters applied to the mucous membranes have osmotic effects, with the appearance of hyperemia, intensification of secretion, secretolytic effects and removal of the secretion from the respective mucosa through mechanical effects in case of washing, as well as consequent sedative and anti-inflammatory effects. For these effects, chlorinated-sodium waters are also used and indicated in the form of gargles, inhalations, sprays (especially those with a concentration between 3-9 g/l and heated to a temperature of 34-380C) in ENT and bronchopulmonary conditions, such as and in the form of vaginal irrigations, in inflammatory gynecological conditions.

The main indications for external salt water cures are locomotor disorders of a rheumatic nature, degenerative such as spondylosis, arthrosis of the hands and feet, or inflammatory such as ankylosing spondylitis.

Among the diseases of the locomotor system indicated for salt water therapy are other diseases such as chronic lumbago due to lumbar discopathy, sequelae after operated disc herniation as well as various forms of abarticular rheumatism, tendinitis, fibrositis.

3.5. Ferruginous waters

The iron in these waters comes from the washing of eruptive or sedimentary rocks, through infiltration waters that always contain carbon dioxide (carbon-gaseous ferruginous waters).

The most numerous group of ferruginous waters is carbonated-bicarbonate-earthy waters. Usually, the presence of Fe is common in carbonated or mixed waters and represents a negative element, due to the unpleasant appearance and taste of these waters, which requires some technical measures to de-ferrize mineral waters that are bottled. Ferruginous waters are unstable due to the oxidation of Fe^{2+} ions into Fe^{3+} ions, which are difficult to absorb in the intestine.

The exclusive indication of carbonated ferruginous mineral waters is iron deficiency blood diseases due to insufficient exogenous intake of iron. In the conditions of the appearance of medicinal preparations improved by resorbable reduced Fe, the importance of crenotherapy with ferruginous waters has been greatly reduced.

Sometimes we find iron in mineral water, bound to the sulfate anion in the form of iron sulfate (vitriolic mineral waters).

Iron hydrocarbonate in mineral water is very labile, it oxidizes quickly in contact with air and precipitates the iron. The metabolic activity of ferruginous bacteria also contributes to the precipitation of iron from mineral water. For these reasons, the cure at the source is preferred, and the bottling must be correctly executed.

For the use of ferruginous waters as table water, prior differentiation of mineral water is usually done to ensure the stability of iron in the water.

Ferruginous waters are prescribed in the internal cure, their pharmacodynamic effect being based on the presence of bivalent iron (Fe^{++}), very easily assimilated and metabolically and enzymatically active, provided that the acidity of the gastric juice is normal. Cures with ferruginous mineral water are recommended in secondary anemia, covalescence, etc.

Given the congestive effect of iron on mucous membranes, such a hydro-mineral cure is contraindicated in gastroduodenitis with a tendency to hemorrhage (even microscopic).

The cure is also contraindicated in glomerulonephritis with hematuria.

3.6. Iodized waters

This category includes mineral waters that contain at least 1 mg of iodine per liter of water. There are no pure iodized waters in nature: iodine is found in some chlorinated sodium or bicarbonate waters; some sulphurous waters contain small amounts of iodine.

Iodine in water comes from sedimentary rocks or originates from the flora or fauna of ancient seas. In concentrated saline groundwater, iodine is found in high concentration (40-70 mg/l). Concentrated iodized salt mineral water is used only in the external cure.

Salt-iodide baths are indicated in degenerative rheumatic diseases, in abarticular rheumatism or in peripheral neurological diseases.

Chronic gynecological conditions, some skin diseases also benefit from the salt-iodized water treatment.

5. Pelotherapy - use, mode of action, indications, contraindications

According to the definition given by the "International Society of Medical Hydrology", muds (peloids) are "substances formed under natural conditions under the influence of geological processes and which, in a finely divided state and mixed with water, are used in medical practice in the form of baths or local procedures. Muds are earths or rocks of a pasty consistency, used as therapeutic remedies since ancient times. Some beneficial effects of muds are known empirically since ancient times, others have been described and studied relatively recently, some remain even today in the stage of summary explanation. Treatment with mud is also called pelotherapy. Pelotherapy should only be used when indicated and under the supervision of a doctor. The most widespread therapeutic muds are the silt deposits from the saline basins - the sulfurous black muds, which form at the bottom of marine estuaries, gulfs and continental salt lakes.

4.1. The history of the therapeutic uses of muds

Since ancient times, people have used mud, when available, for healing or beautification. Archaeological artifacts support such a hypothesis, and there are no problems in understanding this data, since the instinct to seek healing remedies also exists for the animal world. Even if images of the pig wallowing in mud for comfort seem legendary, or fairy-tale, we can only admit that such behavior is explicable in the equation of the adaptive benefit that the organism obtains in the direction of health.

The use of mud, especially spring mud, dates back to ancient times. In ancient Egypt, the sick anointed themselves with the mud brought by the Nile during its floods. According to Th. Valentiner, the Romans knew and used mud as a therapeutic agent. In one of his works, Plinius (23-79 AD) recommends the use of spring mud, a recommendation that Dioscorides (50 AD) also makes in his pharmacology and later Galenos (131 – 201 AD).

In antiquity, the behavior of Cleopatra, considered a beauty of her time, is historically emphasized, regarding body maintenance, an aspect directly correlated with the health of the skin. The beneficial effects of the mud and salt from the Dead Sea led her to ask Mark Antony to conquer this region in order to benefit from this remedy. Therefore, the use of the mud from the Dead Sea for therapeutic purposes dates back thousands of years, starting from the time of the Roman Empire and up to the present day, without anyone having complained of side effects or adverse effects.

We have more accurate data about the use of mud from the 14th century, in a treatise that talks about the use of therapeutic mud from Albano and Battaglia, and Fallopius describes in 1564 the technique of using mud. Later mud therapy (peloidotherapy) was used in France (17th century) and in Germany (18th century). In Russia, the cradle of peloidotherapy is the Crimean peninsula.

The Middle Ages only gradually rediscovered the therapeutic properties of mud. Between the 17th and 19th centuries, mud therapy became popular in Europe, as the recommendations for hot mud wraps for various chronic diseases were known. During this period, several attempts by the therapists of the time to establish the frequency, temperature and optimal duration of the cures are noted, but the explanation of the therapeutic qualities of the mud remains a mystery.

The modern period, now speaking of the 20th century, begins with a substantial utilization from a medical point of view, but also from a touristic point of view, of mud resources from all over the world, their therapeutic qualities being fully accepted.

In 1931, the Society of Medical Hydrology elaborates the directives of international use for the classification and use of muds and introduces the term "peloid" (from the Greek Pelos) which includes in its scope muds, peats and therapeutic earths. Today, talking about "Wellness" or "Spa" without considering the benefit of mud packs is almost nonsense. Associated with massage is the key to comforting the body in the ocean of daily stress.

Current scientific research seeks to gather as many explanations as possible of the therapeutic action of the mud and to obtain a maximum economic benefit through mud extracts that can then be incorporated into creams and lotions that can be used therapeutically or cosmetically. There are numerous scientific articles and patents dealing with one therapeutic mud or another, and this underlines the economic, medical and spa tourism importance of these resources.

4.2. Types of therapeutic mud

Therapeutic muds (peloids) are defined by the International Society of Medical Hydrology as substances that are formed in natural conditions under the influence of geological processes and which, in a state of fine division and mixed with water, are used in medical practice in the form of baths, local procedures, wraps, poultices or ointments.

Depending on the conditions of formation and chemical composition, therapeutic muds are classified into:

a) sapropelic, formed by underwater sedimentation of organic and mineral matter under the influence of biological, microbiological and physico-chemical processes, having a content of organic substances in dry mud of over 10% - continental lake, lagoon;

b) minerals, formed by sedimentation of organic and mineral matter under water under the influence of biological, microbiological and physico-chemical processes, having a content of organic substances in dry mud of over 10% - continental lake, lake on a salt massif;

c) peat, formed by the following methods:

d) natural formation through physico-chemical and microbiological processes at the contact of mineral water with the clayey bed, around natural emergents, resulting in a content of organic substances in dry mud below 10%;

e) directed formation through microbiological and physico-chemical processes at the contact of mineral water with the clay bed - artificial pools - resulting in a content of organic substances in dry mud below 10%;

f) incomplete transformation of the plant material in conditions of advanced humidity - swamps, resulting in a content of organic substances in dry mud of over 10%;

g) clays and salty marls, sedimented in arid land conditions - lagoons from the biological past;

h) calcareous tuffs, formed by chemical precipitation - around the emerging natural carbonates.

In terms of their origin and mode of formation, muds can be sapropelic, peat or mineral.

Sapropelic muds are represented by black deposits rich in colloidal iron hydrosulphide, they have a plastic and greasy appearance, they are found on the bottom of salty waters originating from the action of microorganisms on the flora and fauna of the water basin, which are also associated with mineral or inorganic substances which come from the soil of the lacustrine basin.

The flora consists of microphyte and macrophyte algae dominated by Cladophora vagabunda, Cladophora cristalina, algae that only grow in salt water. The aquatic fauna is represented by the species Artemia salina 10-12 mm, red in color. The corpses of Artemia salina, through bacterial decomposition, together with the algae Cladophora crystallina, form the sapropelic mud.

Examples:

• the sapropelic muds of harbors and coastal lakes (Techirghiol, Agigea, etc.)

• the sapropelic muds of continental lakes (Amara, Fundata)

• fossil sapropelic muds (Ocna Sibiului, etc.)

Peat muds were created by the decomposition of plant remains accumulated over time on the bottom of a swamp, under the action of microorganisms. Peats are rich in organic substances (over 10% of dry mud) and with high percentages of humic acids, bitumens, waxes, pectins, cellulose, protein substances. Peat muds are found at Mangalia Nord (marine peat), at Covasna, Borsec, Poiana Stampei.

Mineral muds arise from the emergence of sulphurous (Săcelu) or non-sulfurous (Sângiorz-Băi) springs, or are formed in artificial pools on clay beds or mineral muds from continental lakes and lakes formed on salt masses, in the same way as sapropelic muds (Turda, Sovata, Bazna, Câineni, Lacul Sarat). They have an organic matter content of less than 10% of the dry mud. Special types: siliceous iodized mud (Băile Govora), or ferruginous (Geoagiu Bai).

4.3. The physico-chemical characteristics of muds

The evaluation of the quality of peloids is done using different qualitative criteria such as: physical indicators: density, pH, rH, specific heat, texture, slip resistance, content in organic matter, degree of decomposition of peats, mineralization and ionic composition of the imbibition solution as well as through a series of quantitative criteria such as: approved reserves and balance sheet category reserves.

From a physico-chemical point of view, mud is a heterogeneous physico-chemical system made up of a liquid phase containing water and water-soluble mineral salts, a solid phase containing mineral and organic substances and a gaseous phase containing hydrogen sulphide, carbon dioxide, hydrocarbons, etc. The ionic balance of a mud is also reflected on its pH. In general, muds are alkaline, pH = 9-10. The therapeutic effect of muds is given by the combination of their physical and chemical properties.

- ✓ The solid phase mainly belongs to the ultramicroheterogeneous, colloidal-molecular domain of mixed and inorganic composition. Organic substances are represented by carbohydrates (cellulose, lignin), humic components (humic acids and humates), bituminous components (waxes, resins), lipid components and proteins and their breakdown products (amino acids). Mineral substances are made up of a series of water-insoluble salts, the most important of which are calcium sulfates and carbonates and silicates, and a clay structure made up of silicon dioxide and small amounts of oxides.
- ✓ The liquid phase is represented by the aqueous solution of soluble organic and inorganic substances and constitutes the structural aspect of the interstitial imbibition solution of solid particles. It comes from lake water in lake muds, from mineral water in mineral muds and some peats, and from rainwater. According to the amount of ions that predominate, the liquid phase of the mud can have a carbonated, sulfated or mixed character.
- ✓ The gaseous phase represents the result of biochemical and physico-chemical processes carried out during natural peloidogenesis and consists mainly of the fraction of H2S2, CO2, hydrocarbons, O2, H2.

The main quality indicators are represented by:

Macroscopic properties - especially those with references to color and physical consistency; The texture of the peloids, related to the state of dispersion of their solid phase, to the size and proportion of the particles that make up their composition, must contain a small percentage of particles larger than 0.25 mm, assessed as the degree of dirtiness of the mud;

- The humidity of peloids is dependent on their chemical composition and physico-chemical properties, primarily colloidal. The degree of hydration of the heterogeneous peloid sediment depending on the moisture content of the global composition:
    - poorly hydrated peloids < 37%
    - hydrated peloids 37 - 40 %
    - strongly hydrated peloids 40 - 70%
- The peloidogenetic stage of evolution as a therapeutic peloid corresponding to the degree of decomposition of organic substances, depending on the quantitative ratio between the main classes of organic substances (carbohydrates, humic substances, protein substances, organic carbon / organic nitrogen) and the level of biological oxygen consumption, CBO5:
    - peloids (sapropelic, organic, genetically evolved or with mineralization tendencies);
    - peats with different degrees of decomposition of the organic substance;
    - poorly decomposed peat;
    - early decomposed peat;
    - well decomposed peat. A well-decomposed peat presents a homogeneous mass with a high moisture content conditioned by the high amount of colloids and endowed at the same time with a good capacity to absorb and retain heat and plasticity. The degree of decomposition of organic plant residues must exceed 50%.
- The global content of organic substances in relation to dry matter differentiates mineral muds from organic muds according to whether their percentage is below or above the 10% limit. The quantitative differences between the main groups of organic substances leave their mark on the quality of the therapeutic mud.
- The mineralization and ionic composition of the peloid imbibition solution as factors of interaction with the human body at the integument level, follows the chemical characterization of mineral waters. However, it is customary to define the liquid phase primarily by the overall content of soluble salts, as follows:
    - a poorly mineralized, below 15g/l
    - a mineralized, 15-35 g/l
    - a strongly mineralized, 35-150 g/l
    - a saturated in salts, over 150 g/l
- The content of hydrogen sulphide and sulphides, especially iron sulphide, is another defining factor for the quality of peloids as follows:
    - non-sulfurized peloids, below 0.02 % FeS
    - slightly sulphurous peloids, 0.02 – 0.15 % FeS
    - sulfurous peloids, over 0.15 % FeS
- The pH of peloids is an indicator with a wide value range of variation, depending on the conditions of the formation environment, chemical and microbiological composition. From this point of view, peloids can be characterized in: acids (pH below 5), slightly acidic (pH between 5 and 7), slightly alkaline (pH between 7 and 8 and alkaline, with a pH above 8.

The physical properties of muds: plasticity, water capacity (hydroxypexy), specific gravity, their ability to withstand heat (thermopexy) and granulation are of particular importance in establishing therapeutic indications and in their use in different forms.

- Hydropexy - the ability to absorb and retain water; practical value - peloids with low hydropexity (mineral muds) are used only for packaging, those with medium (sapropelic muds) and high hydropexity (peat muds) can also be used for baths. The water capacity of peloids varies widely, from 100% in the case of mineral peloids to 200% in the case of organic ones.
- Plasticity - the property to change its shape under the action of an external force; it is given by the solid substances in their content; low (mineral silt), medium (peat) and high (sapropelic) plasticity. Plasticity defines the quality of the mud to spread and mold on the surface of the body.
- Dispersion - given by the size of the peloid granules; therapeutic value is directly proportional to the size of the granules.
- Density or specific gravity-is given by its components. The therapeutic value is inversely proportional to the density of the mud. The specific gravity reaches minimum values in peats and maximum values in highly mineralized muds.
- Thermopexy - the ability to absorb and retain heat. Peloids have a high capacity to retain heat, which explains why the indifference temperature of the mud bath is 20 degrees higher than that of plain water. It means that mud baths can be prescribed for thermotherapeutic purposes (to raise body temperature) at higher temperatures than plain water baths. Also, given their low thermal conductivity, they keep the temperature longer than plain water baths

Differences are also observed in terms of subjective arousals: in baths of the same temperature, which lead to the same peak of skin temperature, the water in the plain water bath gives a stronger sensation of heat than the mud bath. For this reason, from a thermotherapeutic point of view, it is important to note that, at the subjective limit of bath temperature tolerance, higher skin and tissue temperatures are obtained with mud baths than with plain water baths. It should be noted that thermopexy is more important with organic muds than with mineral ones.

Chemical properties of muds:

Water from peloid - is the most important component, directly proportional to the amount of colloids. Mineral substances – the amount of which depends on the structure of the rock and water in the basin. Mineral muds have the highest amount of mineral substances (50-70%), then sapropelic ones (20-40%) and peat ones (under 20%).

The organic substance appears almost entirely in colloidal form, being represented by several important groups such as: carbohydrates (cellulose), lignin (hemicellulose), humic components (humic acids and humates), bituminous components (waxes, resins), lipid components and proteins and their degradation products (amino acids).

Among the chemical components of the mud, particular therapeutic importance is given to humic substances, bituminous substances, colloidal iron hydrosulphide, calcium carbonate and zeolites. The humic substances, whose intimate structure has not yet been precisely specified, but whose properties, such as the high degree of swelling, the enzymatic braking action, the property of ion exchangers, are known and represent an important physico-chemical factor of the mud.

Zeolites have the same active participation in ion exchange (ad- and absorption).

Calcium carbonate is a good skin emollient.

The bituminous fraction is of interest due to the so-called estrogen-active substances it contains, highlighted by biological tests.

4.4. Biological factors of mud

Black mud is the product of very complex and long-term biochemical transformations of mineral and organic substances found in lakes and seas.

Enzymes are vital activators in body processes, also in mud they are known to play an important role in maintaining the health of the soil and its environment. These enzymes may include amylase, arylsulphatase, b-glucosidase, cellulase, chitinases, dehydrogenase, phosphatase, protease. Enzymatic activity in mud is mainly of microbial origin, being derived from intracellular, cell-associated or free enzymes. A unique balance of chemical, physical and biological components (including microbial activities) contributes to maintaining the health of the mud.

The occurrence of estrogens in the aquatic environment is attracting increased attention because of their strong endocrine disrupting potential. Estrogen hormones are nonsteroidal molecules structurally based on the phenanthrene ring. They are produced from cholesterol primarily in the ovaries in response to signals from the brain or other organs and, although in smaller amounts, in the testes of men. Chemical substances known to have the potential to bind and activate estrogen receptors are natural compounds such as phytoestrogens, mycoestrogens and synthetic estrogen analogues such as the powerful pharmaceutical 17α-ethynylestradiol (the active ingredient in birth control pills). Among the organic substances, flora and fauna play an important role in the formation of deposits on the bottom of lakes.

After identifying the phytoplankton species and determining their abundance, the following types can be considered to play an important role in the productivity of these lakes with peloidogenic potential:

- Filamentous algae: Cladophora crystallina, Enteromorpha clathrata, Spirogyra tenuissima, Ulotrix zonata, Rhizoclonium hieroglyphicum.
- Submerged macrophytes: Potomogeton pectinatus, Myriophylum spicatum;
- Emerging macrophytic vegetation: Phragmites communis, Typha augustifolia;
- Microalgae (Diatoms, Chlorophyceae, Dinophyceae, Euglenophyceae, Chrysophyceae, Cryptophyceae and Xantophyceae) contribute in a smaller but constant amount to the organic material of the peloidogenic process.



(sursa: http://www.hawaii.edu)



(sursa: http://www.naturephoto-cz.eu)

Figura 4.1. *Cladophora vagabunda* și indivizi de *Artemia salina.*

Artemia salina (L.) is a primitive aquatic arthropod (from salt lakes) of the Artemiidae family with an age of about 100 million years. It was discovered by Linné (1758) who named it Cáncer salinus, and 61 years later, Leach (1819) renamed it Artemia salina (Asem et al., 2010).

4.5. Methods of applying peloids

The mud is mainly applied in the form of baths, wraps, poultices or unctions.

Unction with cold mud - is the oldest method that involves applying cold mud to the patient's skin (after it has warmed up for 10-15 minutes) in a thin layer, on limited areas or the whole body. The patient must then expose himself to the sun, in a vertical position, until the mud dries, approximately 30-60 minutes, after which there is a 10-15 bath in sea or lake water accompanied by movement and a short shower with cold water and bed rest for at least one hour. It is a method of requesting thermoregulation mechanisms, neuroendocrine stimulation and adaptation processes by alternating hot - cold contrasting factors. The procedure has an important role in primary prophylaxis, tempering the body and preventing diseases, as well as in secondary prophylaxis of some diseases in their early stages.

Warm mud packs - consist of applying mud in a layer of 1-2 cm heated to 38-46ºC on a limited region or on the entire surface of the body for 20-40 minutes. The therapeutic value of hot mud packs in the complex spa treatment results from the improvement of circulatory and trophic disorders.

Poultices – mud applications at different temperatures on limited areas of the body.

Mud baths - in tubs with heated tap water in which 10-12 kg of mud are added, gradually increasing its concentration up to 10-25%. The mixture can be heated up to 44ºC. In the case of patients with cardiovascular diseases, the temperature should not exceed 37 ºC, and for those with inflammatory rheumatic diseases below 36 ºC. The duration of the bath is 20-40 minutes. The bath must be followed by a shower at 37-38ºC and rest for at least one hour. A cure consists of 12-15 daily baths.

Gynecological applications - in the form of vaginal tampons with mud at 39-40ºC for 2 hours or vaginal irrigations with mud dissolved in lye water and heated to 37ºC.

Mud massage - stretching and massaging with mud. Through the action of detoxification and exfoliation, the mud massage cleans and purifies the skin, restoring its brightness and softness. The mud massage is intended for people who complain of back pain, those who suffer from arthritis, osteoporosis or rheumatism, but also for those who simply want to relax.

4.6. Therapeutic indications and contraindications of muds

The main indications of peloidotherapy are diseases of the locomotor system of a rheumatic nature, degenerative such as spondylosis, arthrosis of the hands and feet, or inflammatory such as ankylosing spondylitis. Among the diseases of the locomotor system indicated for mud therapy are other diseases such as chronic lumbago due to lumbar discopathy, sequelae after operated disc herniation as well as various forms of abarticular rheumatism, tendinitis, fibrositis. An important place in mud therapy is also occupied by disorders of the locomotor apparatus of traumatic cause, various post-traumatic sequelae, as well as of neurological cause, especially neurological disorders of the peripheral nerves.

Chronic utero-anxiety gynecological conditions and sterility also occupy an important place in mud therapy, as do a number of endocrine diseases such as hypothyroidism, hypoparathyroidism or pituitary dwarfism and dermatological diseases such as psoriasis, eczema and chronic urticaria, etc.

Mud therapy is contraindicated if the patient suffers from asthma, diabetes, ulcer, any form of cancer or hepatitis, if he has kidney or cardiovascular diseases.

4.6.1. Applications of peloidotherapy in inflammatory rheumatic diseases

Therapeutic mud is among the factors used in the balneotherapy of inflammatory rheumatic conditions. The treatment applied can be prophylactic, curative or recuperative, depending on the variety of disease cases addressed.

The prophylactic treatment will be addressed to patients with persistent, but unsystematized, painful muscle-articular syndromes, which may be associated with angioneurotic or Raymond-type disorders installed on a hyperergically sensitized area or with disorders of the thermoregulation. The cure for therapeutic purposes can be applied to patients with rheumatoid polyarthritis in early stages, with present inflammatory phenomena, ankylosing spondylitis, psoriatic arthropathy and arthritis secondary to some gonococcal or genital infections.

The rehabilitative treatment is aimed at patients with rheumatoid arthritis in biologically stabilized stages II or III, but with functional deficits, forms of rheumatoid arthritis that have undergone orthopedic-surgical interventions and forms of ankylosing spondylitis, central or peripheral, without systemic complications, but with static disorders or with respiratory dysfunction. The goals of the cure are to reduce pain, combat muscle atrophy, increase joint mobility, increase the body's defense capacity, rebalance the neuro-vegetative field.

Special contraindications refer to valvular sequelae after acute articular rheumatism, febrile forms or those with systemic manifestations or with marked evolutionary potential of rheumatoid arthritis and also to febrile, disabling forms with marked kyphosis and advanced respiratory insufficiency, forms with systemic lesions or with losses high in weight from ankylosing spondylitis.

4.6.2. Applications of peloidotherapy in degenerative rheumatic diseases

Arthritis is a chronic, degenerative, slowly progressive arthropathies, generally related to premature joint wear and aging. Pain, swelling and sometimes joint deformities are the clinical expression of the lesions that intersect mainly the cartilage, the subchondral bone as well as the synovio-capsular insertion area. Destructive cartilaginous injuries result mainly from the imbalance between the importance of the mechanical stresses exerted in the joint and the very limited possibilities of restoration of the cartilaginous tissue. In fact, arthrosis represents the response that the modified organism gives to mechanical factors.

Hormonal, metabolic, vascular and nervous disorders modify the mechanical qualities of the connective tissue on the one hand, and on the other hand, through their effect on nutrition, muscle tonicity and nerve endings, they also intervene in the course of the disease.

Clinically, arthrosis is translated for a long time, especially in the pre-arthrosis phase, by almost exclusively dysfunctional symptomatology, i.e. by painful fatigue that mainly affects the lumbar region, the base of the head, the knees, the legs and which is frequently associated with an algic tendinous component as well as with a particular neuropsychic reaction (psycho-emotional and vegetative lability, sometimes depressive tendency).

The main localizations of arthrosis allow their classification into cervicarthrosis, dorsarthrosis, lumbar arthrosis, coxarthrosis, gonarthrosis (at the knee level), hand and foot arthrosis.

Among the natural therapeutic factors in degenerative rheumatism, an important place is occupied by therapeutic mud, through thermal, mechanical, chemical and psychological effects.

The objectives of peloidotherapy are to combat deviations, restore the harmony of muscle synergies, combat psycho-nervous tension states, prevent and combat overweight tendencies, general and circulatory toning.

4.6.3. Applications of peloidotherapy in abarticular rheumatic diseases

Abarticular rheumatism represents a group of sufferings of the periarticular soft parts, so-called rheumatic, relatively common, of non-unitary etiology and pathogenesis, which presents from an anatomo-clinical point of view in an inflammatory, degenerative and especially mixed form, with pain and dysfunction as a clinical expression mild or moderate functional.

The etiopathogenetic factors in the occurrence of abarticular rheumatic manifestations are generally common to arthrosis, speaking of spondylogenic and static factors at the spine level, microtraumas, overuse, vicious stresses at the level of the joints, infectious factors, environmental factors (moisture, cold, weather sensitivity), dysmetabolic, hormonal factors (obesity, hyperthyroidism, etc.), sedentary and professional factors, psychological and vegetative factors (neuroses), factors and sources of irritation at the level of internal organs.

According to the location of the pathological processes at the tissue level, we distinguish: tendinitis, tendinoses, tendoperiostosis, tenosynovitis, bursitis, tendomyositis, myositis and especially tendomyosis and miosis, myogelosis, myalgia, muscle contractures, fibrositis, panniculitis, panniculosis, etc. According to the topographical location, the most clinically defined entities are scapulo-humeral and hip periarthritis, epicondylitis, muscle contractures, tendomyoses and myogeloses around the belts, tenosynovitis and bursitis of the hand and foot.

The curative and recovery objectives will mainly aim at: suppressing areas and irritating factors, stimulating local circulation, relieving pain, combating muscle contractions and improving movement coordination, combating postural anomalies, general sedation and metabolic and psychic vegetative restructuring, avoiding functional overwork articular.

Special contraindications are acute tendinitis, tenosynovitis and bursitis, acute myositis, acute scapulo-humeral periarthritis.

4.6.4. Applications of peloidotherapy in posttraumatic sequelae

Spas present special possibilities for the therapeutic assistance of patients with post-traumatic sequelae, it being pointless to talk about prophylaxis in this case. From the basic methodology of therapy and recovery of post-traumatic sequelae, it is known that thermotherapy and hydro-kinetotherapy are two of the main physical directions used. The spa resort through the natural factors it possesses can perform them at a much increased degree of efficiency by using these factors. Thus, thermotherapy is performed very well by therapeutic mud wraps.

Sequelae can leave the traumas of the anatomical regions. Based on the usual classification, we speak of cranio-cerebral, thoracic, abdominal, limb and spine trauma.

Among the consequences of trauma on the integument and subcutaneous connective tissue, I raise the issue of physical therapy edema, graft wound - no earlier than 4 weeks after the graft, hypertrophic and atrophic scar, hyperchromic scar.

The typology of posttraumatic muscle sequelae refers to muscle rupture, muscle atrophy or hypotrophy, muscle retractions and contractures. All of these benefit from vascular and elasticity-enhancing effects. Joint instability, post-traumatic arthrosis, arthroplasties are post-traumatic joint sequelae, less septic ones, those with unconsolidated fractures, with intra-articular foreign bodies are treatable by peloidotherapy.

The involvement of the bone in the traumatic process determines an increased degree of severity and a specialized orthopedic assistance. In these cases, peloidotherapy is contraindicated.

Cases of bone infection, fractures without a tendency to consolidation, fractures on pathological bone are totally contraindicated.

4.6.5. Applications of peloidotherapy in neurological conditions

The entire pathology of the peripheral nervous system can be systematized into two major syndromes: the neuralgic syndrome and the neuropathic syndrome. Neuralgias are manifested by pain and paresthesias in the respective territory of distribution and refer to major syndromes such as cervical-branchial neuralgia, sciatic or crural neuralgia, scapulo-humeral neuralgic amyotrophy, thoraco-abdominal neuralgia, lumbar neuralgia, etc. The rehabilitation methodology is complex and also includes thermotherapy through applications of mud packs.

Neuropathy is a syndrome that is characterized by motor disorders associated with subjective and objective sensitivity disorders, trophic and vegetative. The etiology of neuropathies is varied, the identified causes being local (traumatic, compressive processes in the vicinity) or general: physical factors (cold, dampness, electric current), infectious, allergic, toxic, metabolic or vascular.

Anatomically and clinically, radiculopathies, plexulopathies, mononeuritis, polyneuropathies and polyradiculoneuropathies are differentiated. The central idea on which the entire process of functional recovery in peripheral motor neuron injuries is based is the possibility of peripheral nerve fiber regeneration.

Due to the denervation, there is a total or partial motor deficit in the affected territory, sensitivity and reflectivity disorders in the sense of their reduction, changes in neuromuscular excitability and vasculotrophic changes accompanied inconstantly by causal pain with a variable vegetative component depending on the affected nerve. Secondary to the denervation process, there are atrophies and fibrous transformations of the muscle fibers, as well as changes at the level of all articular, periarticular, capsuloligamentous and tendinous connective structures. If the causative factor disappears, or if the integrity of the nerve has been restored, the spontaneous process of reinnervation begins, which can be favorably influenced by peloidotherapy.

The methodology according to which the functional recovery program is carried out varies depending on the diagnosis and the evolutionary stage of the disease. In principle, during the denervation period, an appropriate postural treatment and a program of passive physical therapy are applied to the deficient segments with the aim of maintaining joint mobility, preserving myotendinoarticular kinesthetic information and avoiding muscle retraction.

Thermotherapy and loco-regional massage procedures are used to improve vascularization and implicitly local trophicity.

4.6.6. Applications of peloidotherapy in dermatological conditions

In dermatology, numerous studies and research on both the curative and prophylactic action of therapeutic mud have established that certain dermatoses can benefit from long-lasting improvements, by correcting certain visceral deficiencies, metabolic or endocrine-thyroid disorders, frequently associated neurotic states with skin diseases.

Through their properties, therapeutic muds manage to influence the body's deregulated mechanisms; in general, the therapeutic effects obtained in scaly dermatoses (especially in psoriasis, early stage ichthyosis, keratodermas and sometimes in parapsoriasis), in seborrheic syndrome (seborrheic dermatitis, polymorphous acne, rosacea acne), in allergodermas (eczema and chronic urticaria) are well known), diffuse and limited neurodermatitis, pruritus, prurigouri, occupational eczema and constitutional eczema (atopic dermatitis), peripheral irrigation disorders, scleroderma and others.

In the various dermatological conditions described above, therapeutic muds can be used in different forms of application;

a) Mud baths, at temperatures of 36-370, lasting 15-30 minutes, 2-3 times a day, indicated in psoriasis, chronic eczema, itching and prurigouri

b) Applications of cold mud (unctions with mud), associated with heliotherapy and lake baths (e.g. La Techirghiol), indicated in psoriasis, chronic eczema, itching and prurigouri

c) Wraps with warm mud, at a temperature of 46-480, lasting 15-30 minutes, indicated in extended neurodermatitis with lichenification, in forms of old psoriasis, rebellious to usual spa treatments.

General contraindications refer to disfiguring dermatoses (organizational contraindication) and acute inflammatory conditions of the skin, contagious dermatoses, dermatoses accompanied by light sensitivity (medical contraindications). Among them are: cutaneous mycoses (trichophytosis, microsporia, favus, blastomycosis, actinomycosis, mycetoma, scabies and other parasitic skin diseases of animal origin, pyodermas, leprosy, cutaneous tuberculosis (ulcer-hypertrophic form), malignant skin tumors, lupus erythematosus (acute, subacute and disseminated, as well as the discoid form, in the spring and summer season), bullous diseases (pemphigus and M. Duhring), hematodermas (leukemia, phugoid mycosis) and erythrodermas.

4.6.7. Applications of peloidotherapy in gynecological conditions

Within the complex treatment programs of diseases of the genital sphere in women, peloidotherapy, through the good results obtained in local lesions and in functional disorders, has emerged as an effective therapeutic modality in the following conditions:

- chronic inflammatory diseases of the pelvic organs and pelvic tissue in women;
- secondary female sterility;
- pain and other symptoms related to the genitals;
- pre- or post-operative conditions in the genital area.

Peloidotherapy applied for prophylactic purposes aims at: states of hypothalamic-pituitary functional imbalance, which can prevent the normal functioning of the gonads (due to stimulation defect) and cause menstrual disorders (amenorrhea, oligomenorrhea), dysmenorrhea, frigidity; as well as in the secondary prophylaxis of inflammatory conditions, by increasing the general and local non-specific resistance, by changing the body's receptivity to microbial agents, and by a more adequate adaptation to thermal factors.

Peloidotherapy also has a pronounced curative role through the resorption of chronic inflammatory exudates, stimulation of uterine growth and follicle maturation; effects of removing circulatory disorders in the genital sphere. In the complex therapy for the recovery of gynecological conditions, the application of peloidotherapy aims at general and local biotrophic effects, fibrolytic effects, improving the state of permeability of the cervical canal and possible normalization of tubal kinetics. In tubal and peritubal inflammatory sequelae from secondary sterility, as well as in functional disorders and postoperative adhesion syndromes, treatment should be continued for 2-3 years. Mud in general application (mud wraps) and local (poultices, vaginal tampons with warm mud) favors the increase in volume of the uterus and the resorption of chronic inflammatory processes. It is indicated in chronic inflammations, uterine hypoplasia, tubal sterility, pain in the lumbosacral region, postoperative adhesions. Ovarian secretory insufficiency due to estrogen and progesterone deficiency is eliminated as a result of the presence of estrogen and progesterone-like substances in the sapropelic therapeutic mud.

4.6.8. Applications of peloidotherapy in metabolic, nutritional and endocrine disorders

These diseases have an important place in the general morbidity and have an increasing dynamics in the conditions of modern civilization.

Mud baths improve the body's metabolism in general, stimulating the functioning of the endocrine glands. The main endocrine conditions for which peloidotherapy is a therapeutic adjunct are: hypothyroidism, hypoparathyroidism, pituitary dwarfism, obesity and rickets or weakness in children.

Remarkable advances in the knowledge of etiopathogenesis and pharmacological and dietary therapy of nutritional and metabolic diseases have determined substantial changes in the approach to balneo-climatic cures, with modern orientations towards the prophylaxis of the risk factors of these conditions and the recovery of the dysfunctions that determine their evolution and complications.

Obesity as a disease or as a risk factor, with complex and insufficiently known etiopathogenesis, with the involvement of endocrine-metabolic and nutritional mechanisms that ultimately lead to an unbalanced energy balance, with the accumulation of adipose tissue deposits, is the subject of numerous "methodologies " of treatment for excessive weight reduction, most without a rigorous scientific basis. The spa addresses this pathological segment in a functionally balancing manner, and peloidotherapy has scientifically proven beneficial effects in stimulating the body's energy.

4.6.9. Applications of peloidotherapy in respiratory diseases

Otorhinolaryngological (ENT) diseases, post-TB sequelae and allergic bronchial asthma stabilized by treatment are conditions on which hydromineral treatment, through the use of therapeutic muds, acts prophylactically, especially on complications and therapeutically.

Spa treatment in these diseases should not only be understood from the aspect of local treatment of the upper airways, but also aims at other equally important objectives. Thus, it is known that many ENT diseases are based on or evolve on a diabetic, hepatic, renal, endocrine-metabolic, etc. or are maintained in polluting and stressful conditions of the working and living environment. Sensitivity to cold, to sudden changes in temperature is a characteristic of these patients, and balneotherapy and peloidotherapy are useful therapeutic approaches in their treatment.

4.7. Contraindications of peloidotherapy

GENERAL CONTRAINDICATIONS

1. Acute febrile and chronic conditions in the course of acute exacerbation;
2. Infectious diseases during the period of contagiousness and convalescence;
3. Venereal diseases in the contagious stage (syphilis, gonorrhea);
4. Cachectic states, regardless of the cause.
5. Malignant tumors, regardless of shape, location or evolutionary stage.
6. Repeated and abundant hemorrhagic states of any nature.
7. Carriers of pathogenic germs or infested with parasites.
8. Pathological pregnancy in any month and normal pregnancy over 3 months.
9. Epilepsy.
10. Blood or system diseases with alteration of the general condition (anemias, leukemias, lymphomas).

11. Psychopaths with social behavior disorders.

12. Chronic alcoholism with neuropsychiatric disorders.

13. Drug addictions.

14. Decompensated diabetes, difficult to control through diet and drug treatment, especially insulin-dependent.

15. Manifest heart, liver or kidney failure.

SPECIAL CONTRAINDICATIONS

1. Valvular sequelae after acute articular rheumatism.

2. Rheumatoid polyarthritis: febrile, systemic, malignant, lupus forms,

3. Ankylosing spondylitis with advanced respiratory failure, systemic lesions.

4. Recent non-callus fractures and without sufficient internal contention; unstable spine fractures with potential secondary medullary injury; pathological bone fractures.

5. Polyneuropathies in the acute stage, paraneoplastic neuropathies, neuropathies from collagenoses.

6. Hemiplegia of infectious etiology, malignant tumor, those of hemorrhagic cause with blood pressure values difficult to control;

7. Painful ischemic heart disease with frequent crises, the painless one with severe rhythm and conduction disturbances, decompensated valvulopathies, decompensated heart failure, patients with embolic potential. Decompensated pulmonary cord.

8. Advanced cerebral atherosclerosis with social behavior disorders.

9. Active pulmonary tuberculosis. Pulmonary mycosis, bronchiectasis with severe hemoptoic forms, silicotuberculosis, manifest pulmonary insufficiency.

10. Dyspnea of degree IV and V regardless of the cause.

11. Bronchial asthma with frequent attacks or asthmatic ailments.

4.8. Scientific data on the therapeutic action of mud

Being a biological material used in human therapy, the analysis is carried out according to the methods indicated in the "Pharmacopoeia" with some additions taken from the working methods used for soil analysis. The obtained results are presented in the physical-chemical analysis bulletin.

From the research carried out so far, some milestones have been set that we call active factors of the mud and which include the two groups: physical factors (respectively mechanical action, thermophysical action and sorption capacity) and chemical and biological factors. The mechanical action is manifested in the mud bath by the high viscosity of the bath that provides a resting position to the body and by the high hydrostatic pressure that favors exhalation. The thermophysical action is ensured by the low thermal conductivity, by the high specific heat and by the absence of convection currents, which allows a constant and slow transfer of heat from the mud to the body.

When applying peloids, a series of processes take place at the level of the skin:

• the sensitive reception of the qualities/properties of the mud and their transmission to the upper levels of integration and control;

• exchange of energy and substance with the peloid environment;

• fulfillment of adaptive commands: circulatory (peripheral thermoregulation circulation), secretory (sweating), protective (keratinogenesis, melanogenesis, formation of the hydrolipidic film);

• integration of the skin effects of mud application into the body's general physiology: thermoregulation, vitamin D synthesis, optimization of homeostatic balances: immune, endocrine and neurovegetative of the body.

Applying the mud to the entire surface of the skin triggers local tissue and general functional reactions, inhibiting or activating some enzyme systems and intermediate metabolites. The spa treatment with mud produces favorable effects that persist for a long time by changing the adaptive response capacity to various stimuli. Peloids act on:

- ✓ cardio-vascular system - stimulation of cardio-vascular reactions with emphasis on hemodynamics through central and peripheral mechanisms. There is an immediate mobilization of blood deposits and their entrainment in the general circulation, inflammatory type processes;
- ✓ nervous system - sedative or excitatory effects on the CNS and SNV by sedating pain receptors. The mud spa cure increases the antimicrobial defense capacity by increasing the phagocytic power of leukocytes - highlighted by changes in the opsonocytophagic index;
- ✓ immunological systems - regulation of immunoglobulin values, increase of non-specific immunity, etc. Enzymatic and metabolic changes occurring in the endocrine glands after peloidotherapy differ according to the secretory specificity of the gland, according to the functional stage in which the gland is found.

Under the action of the mud, a harmonic stimulation is produced in all the glands in the sense of increasing the enzymatic and synthetic activity while preserving the specificity of each one. Correlated with the endocrine functional harmonization activity is also the stimulation of the activity of the hypothalamic-pituitary-adrenal axis translated by optimizing the plasma levels of: β-endorphins.

The endocrine mechanism is also involved in inducing the anti-inflammatory effects of pelotherapy by modulating the activity of the hypothalamic-pituitary-adrenal axis and by general balancing the endocrine balance, persistent and post-cure effects. Reactivity to chemical mediators - acetylcholine and adrenaline - as well as to ions correlated with vegetative activity - Ca, Mg, K - is increased after the external mud cure, and the vegetative tone shows a tendency towards regulation/normalization, which leads to remediation of vegetative stigmata.

Pharmacodynamic and clinical research come to confirm the experimental results on laboratory animals and show the favorable effects of mud applications in all its forms. Thus, authors such as Bellometti S., Evcik D., Suarez M., Gutenbrunner Ch., Tamas Bender, Cantista P., Karagulle Z and their collaborators, in recent studies, argue through scientific arguments that mud applications, alone or in combination with other balneotherapeutic methods have the effective ability to intervene therapeutically on painful arthritic processes. These authors emphasized the anti-inflammatory activity and influence of mud on the antioxidant system in patients with osteoarthritis. The antiseptic property and the exchange of substances are attributed (mainly) to the inorganic components of the mud. The effects of mud applications include: increased membrane electrical conductance, absorption phenomenon, hyperemia, enzymatic and hormonal activation, activation of hydropoietic glands.

Scientific studies by the above-mentioned authors have shown that peloidotherapy increases the peripheral temperature with an impact on the cardiovascular system, influences the hydro-electrolytic balance, neurotransmission (to the central nervous system, neuronal conductivity), the immune system, enzyme activity and metabolism.

6. Climatotherapy - definition, classification, indications and contraindications

The "climate" factor influences the functioning of living organisms through its various components, called climate parameters: solar radiation, atmospheric temperature, duration of sunshine, atmospheric pressure, air currents, average relative humidity. The relationship between the climate and the human body is reflected in the dynamics of homeostasis reactions on different levels of integration and regulation. The most convenient example is the homeostasis of thermoregulation.

The bioclimate is a natural therapeutic factor dependent on the local relief conditions, altitude, climatic parameters and vegetation. Bioclimatic therapeutic factors can be associated with heliotherapy, hydrotherapy and crenotherapy.

Depending on the sanogenic effect, the bioclimate is classified into the following types:

a) **exciting and demanding bioclimate**, differentiated into maritime coastal bioclimate and lowland bioclimate;

b) **sedating bioclimate** - regardless or sparing, corresponding to hilly and hilly regions, with altitudes between 200 - 300 m and, respectively, between 700 - 800 m;

c) **tonic - stimulating bioclimate**, corresponding to mountain regions, with two variants depending on altitude: medium mountains, at an altitude of 800 - 1900 m and high mountains, at an altitude of over 2000 m.

Climatotherapy is a therapeutic means that uses the biological action of climatic factors in order to comfort and strengthen work capacity and health. Climatic factors with therapeutic action act complexly on the organism directly exposed to their action, obtaining a maximum therapeutic effect under the conditions in which climatotherapeutic procedures are applied dosed, progressively, in accordance with the indications of specialist doctors.

The climate in different parts of the globe is different. Since ancient times, scientists have divided the Earth into climatic zones, depending on the height of the Sun above the horizon and the length of the day. The very word "climate" translated from Greek means "inclination of the Sun". Indeed, the climatic differences on our planet are primarily due to the fact that solar radiation is unevenly distributed over the entire surface of the Earth. Also, the proximity of the sea, atmospheric circulation, precipitation regime and other so-called "climate-forming factors" have a great influence on climatic differences. These in turn are dependent on geographic conditions such as geographic latitude and altitude - height above sea level.

In ancient Greece, the place of origin and development of the entire European civilization, the great philosophers of different periods were also concerned in the field of meteorology, trying to establish certain relationships between the movement of the wind, the formation of clouds and the production of electrical phenomena in the atmosphere. Some instruments have even been built to determine wind direction and strength.

Among the scholars of the ancient Greek world, we will mention: Herodotus (484-425 BC), with the first very fine notes on some atmospheric phenomena observed during his geographical travels, describing, among other things, the climate of Scythia, of which he was a part and Dobrogea (information about the climate of this province also remains from the writings of the Latin poet Ovidiu, exiled between 9 and 17 AD), Plato (427-347 BC), Aristotle (384-322 BC) , the author of the first treatise on meteorology, in which he tried to explain the causes of various

meteorological and hydrological phenomena, as a consequence of the former (the water cycle in nature and the water balance of the Earth), Seneca (4 BC - 65 AD) , Ptolemy (90-168 AD), who was convinced that the reflection phenomenon of the atmosphere was due to the gaseous envelope of the planet.

In Greek antiquity, it was known that, depending on the inclination of the angle of incidence of the sun's rays with the earth's surface, the main climate zones are formed, and the scholar Empedocles established as early as the 5th century BC. BC the relationship between the atmosphere, solar radiation, the surface of the Earth, the presence of water surfaces and water in the atmosphere, considering that the four basic elements: air, water, fire and earth are at the origin of climates: hot, cold, wet and dry. The first climate descriptions were preserved from ancient China (11th century BC).

In the Middle Ages, during the period of the great geographical discoveries, an important contribution to the knowledge of atmospheric phenomena was made by daring navigators, who faced and described important winds such as trade winds and monsoons, but also tropical storms and other special atmospheric phenomena.

The end of the 16th century and the 17th century represent the era preceding the development of instrumental meteorology. We can mention the construction of the first instruments: the thermometer (Galileo Galilei, 1597), the mercury barometer (Torricelli, 1643), the aneroid barometer (Hooke, 1673), the thermometric scale (Huygens, 1665) with the two reference points - the freezing temperature and the of boiling water, the hair hygrometer (Saussure, 1783), the anemometer (Woltzmann, 1790), the psychrometer (R. August), the pyrheliometer (H. Poillet) - these are only a few more important examples.

The use of these instruments allowed obtaining concrete determinations of the values of meteorological elements, used by physicists in the elaboration of laws that constituted the theoretical foundation of subsequent climatology research. Also in the 17th century, in 1648, the French physicist Pascal mathematically demonstrated the weight of air and the decrease in pressure with altitude, laying the foundations of atmospheric air hydrostatics. Towards the end of the same century, the English astronomer Halley publishes his theory on the formation and permanence of the trade winds and monsoons, dominant winds in the intertropical areas, belonging to the great atmospheric circulation of the globe, generating specific types of climates and climates.

In 1735, the same author presented his theory on the relationship between the permanence, direction and intensity of these winds and the rotational movement of the Earth around its own axis, highlighting the deviation of the trade winds from the original north-south and south-north direction, within the two hemispheres of globe, to the real one, northeast-southwest and southeast-northwest, due to the permanent rotation of the planet around the axis of the poles. From this point of view, he can be considered a forerunner of the science of climatology.

At about the same time (1750), Benjamin Franklin published his famous discovery about the electricity of the atmosphere, and Lavoisier and Dalton, about the nature, physical state and chemical composition of the air. The 18th century also marked other milestones in the history of meteorology: the establishment of thermometric scales by the German physicist Fahrenheit in 1724, still used in the Anglo-Saxon countries, by the French physicist Reaumur in 1730, and by the Swedish Celsius , in 1742, widely used throughout the world.

In 1778, in Baden, Germany, the first meteorological institute in the world was established, and in 1780, the first meteorological society was founded, the "Palatine Meteorological Society", which had its headquarters in Mannheim - Germany.

6.1. The object and definition of bioclimatology.

Climate represents the **set of meteorological elements** averaged over a period of time as long as possible (geological, prehistoric, historical) and over a surface as large as possible (globe, hemispheres). In this case, the main genetic factor is the astronomical one (the sphericity of the planet, the movements of the Earth according to the degree of proximity or distance from the Sun, the inclination of the earth's axis on the plane of the ecliptic), which conditions the radiative one (different angles of incidence of the solar rays that determines the unequal distribution of radiant energy on the earth's surface, embodied by the geographical latitude on which the height of the Sun, the length of days and nights, therefore the radiative-caloric balance of the earth's surface, depends). Thus, in the latitudinal sense, according to the amount of heat received by the Earth from the Sun, one can speak of large climate zones: warm, temperate and cold. Within these climate macrozones, several types of climate are found, mainly determined by physical-geographical factors, but also by dynamic ones. The simultaneous and combined action of all generating and modifying factors of the climate determines the appearance on the surface of the Earth of several types of climate, at the regional level, with different characteristics, influenced by the nature of the active surface (dry and water), by the geographical position of the region respectively (within continents or near oceans and seas), by air circulation, by the presence of various major landforms. Climate types are: humid and dry tropical climate, Mediterranean climate, temperate oceanic climate, temperate steppe climate, permanent snow climate, etc.

Bioclimatology is a branch of climatology that studies the influence of climatic factors on organisms. In turn, bioclimatology is also a component of ecology, given that climatic factors are part of the living environment.

Climatotherapy (gr. therapeuein = to take care of) deals with the therapeutic use of the favorable action of climatic factors on the body.

Climatic resort - the locality or/and area located in areas with beneficial climatic factors and which has conditions for ensuring the maintenance and improvement of health and/or work capacity, as well as rest and comfort (definition according to Ord. 109/200)

Balneo-climatic resort - the locality or/and the area that has resources of mineral substances, scientifically proven and traditionally recognized as therapeutically effective, of specific installations for the cure and that has an organization that allows the provision of balneic medical assistance under appropriate conditions.

6.2. Cosmic and biological rhythms in the relationship of man with the climate

Human reactions to environmental conditions take place within cosmic rhythms, concordant or discordant with their own physiological rhythms. Adaptation to the natural environmental factors that present rhythmic variations at a certain interval is manifested, among other things, by a synchronization of the internal biological functions of man, with the external ones of the environment. The cosmic rhythmic phenomena of the nearby stars (especially the Sun and the Moon), the meteorological phenomena in the atmosphere (largely determined by the former, but also by the local geographical conditions), in turn influence the biorhythms of living beings, people, animals and plants. Some correlations are obvious, others are more difficult to establish due to their complexity, others go unnoticed or are considered without a correspondent, at least until now.

Examples of changes and adaptations:

- traveling by plane around the globe, from east to west or vice versa, through the rapid change of several time zones, disturbances in the wake-sleep rhythm;

- spending a longer time inside the earth, outside the day-night rhythm, also produces the disturbance of the wake-sleep rhythm and temporal disorientation.

Annual, semi-annual and diurnal phenomena are important for balneoclimatology.

The annual ones are expressed physically by the variation of the main meteorological and biological parameters, in the different functioning of some organs, in relation to the season (body temperature lower in winter and spring, higher in summer, heart rate faster in summer, slower in winter) and in frequency seasonal diseases.

The natural phenomena on Earth, which take place within the geospheres, including the climatosphere, cannot be conceived and understood without a prior foray into outer space, the galaxy and the Solar System of which it is a part, in which the Sun, the Moon, the distance and the position of the planet relative to them, the forces of attraction between them, the shape, movements, physical properties and structure of the earth's surface, condition the mutual energy flows and the existence of the geospheres. This huge system is the main generator of climate, which in turn is the essence of all physical, chemical and biological processes on the earth's surface.

The periodic one-day phenomena are related to the rotation period of the Earth around its axis, which determines the variation of numerous geophysical parameters (meteorological, atmospheric electric field and geomagnetic). They are also associated with two transits of the Moon at the meridian, with the sidereal rotation period of the planet Mars. These phenomena determine the circadian or nimeral biorhythm (lat. circa diem = approximately one day, respectively gr. nykt = night, hemere = day), very important for the human body in the wake-sleep rhythm, body temperature, pulse, blood composition, in the activity respiratory, cardiovascular, digestive system.

The annual phenomena are an expression of the revolution movement of the Earth, highlighting the 4 seasons in temperate latitudes. Variations during a year are due to uneven heating, air and soil temperatures, cloudiness, relative and absolute humidity, atmospheric pressure. It is appreciated that the moment of maximum daily functioning of an organ varies in relation to the season. Thus, the heart rate is faster in the summer and slower in the winter. Body temperature is higher in autumn and lower in winter and spring. The speed of hair growth is maximum in July and minimum in January, excretion of potassium, sodium and water is maximum between 8-12, in September, 16-20, March-April. At the same time, some infectious diseases have a seasonal maximum incidence.

6.3. The main genetic factors of climate and their bioclimatic importance

The climate of the globe, from the geological past of the planet, as it is currently perceived, but also its future evolution, as it is tried to be known through the elaboration of forecasts (climate scenarios) for the coming decades, is the result of the complex action of several categories of processes: cosmic, radiative, dynamic, physico-chemical, physico-geographic and anthropic, which take place permanently in outer space, the atmosphere and on the Earth's surface, conditioning and interpenetrating each other. The existence and geographical distribution of climate macrozones and climate types with their well-defined particularities are due to the presence of generating factors (climatogenic) and modifying factors of the initial (primary) features of the climate. Geological and physical-geographical factors.

Climatic zones are the result of all climate factors:

- cosmic: the inclination of the sun's rays on the Earth's surface,
- meteorological: the general atmospheric circulation characteristic at different latitudes
- geographic: spherical shape of the Earth, latitude.

The geomagnetic field. In general, the study of the geomagnetic index (Ci – directly measures terrestrial magnetism, takes into account the variation of force fields) is done in correlation with solar activity. The terrestrial magnetic field indirectly influences the human organism through a probable action on some climatic elements, for example barometric variations. Mortality is admitted to be higher on days with magnetic disturbances. Bacteria grow more rapidly during disturbances due to sunspots (eg, diphtheria bacteria, various viruses, relapsing typhus, plague).

Magnetic storms resulting from disturbances in the Earth's magnetic field cause disturbances in navigation equipment and radio communications.

Geological characteristics. The soils.

The nature of the rocks generally narrowly influences the geographical distribution of topoclimates. Given that it is mainly about the superficial constitution of the earth's crust, some features are more geographical aspects.

Soil and air radioactivity

Air contains radioactive elements: radon (around 1600 atoms/l of air) and thoron are found in the lower layers of the atmosphere and come from the decay of radium and thorium. The emergence of free radioactive gases near thermal sources is known.

The lower or greater richness of the soil in radioactive substances, their degree of appearance on the surface of the soil, the transport of gaseous radioactive elements by means of air currents, the proximity of the sea, the altitude, the meteorological conditions intervene in the evolution of the content of radioactive elements in the air which, at in turn, influence the ionization in the lower layers of the atmosphere.

Radiation exposure for the globe's population has generally been low over time. The interaction of nuclear radiation with living matter results in the appearance of complex physiological effects, which manifest themselves through morphological and functional changes in cells, tissues and organs. These effects are dependent on the radiation dose. There is therefore a limit dose of radiation, below which the irradiation does not irreversibly alter the biological balance of the tissues. On this basis, treatments with mineral waters and natural gases (mofettes) radioactive with radon (low half-life), with possibilities of rapid elimination from the body, were recommended.

Alpha therapy is recommended in rheumatic, vascular, allergic and skin diseases, hormonal and vegetative disorders, sequelae after paralysis, chronic inflammatory diseases (bronchitis and chronic adnexitis). WHO recommends minimizing the radiation dose to prevent pathological risks.

Geomorphological characteristics

The relief determines a pronounced differentiation of climates and bioclimates on the globe, especially in warm and temperate zones, both by altitude and relief form, positive or negative, and by the position of mountain slopes with respect to the meridian (cardinal points) and with respect to the general atmospheric circulation.

Altitude determines:

- temperature drop
- decrease in total and partial pressure of oxygen
- air dynamics are more active, more intense winds.

The essential element is the lowering of the atmospheric pressure, and especially the partial pressure of oxygen.

From about 3000 m the symptoms of altitude stress become clear, because the signs of lack of oxygen appear, which from 5000 m are predominant (75-90 mm O2 pressure, which means 10-12 %, compared to 21% as the amount of normal oxygen at sea level).

Normally at rest man needs 10 breaths/minute. The amount inhaled and exhaled with each breath is 0.5 l, so we need 7.5 l/min and 450 l/h.

In the case of physical work we need 20 l/min, up to 50 l/min for heavy work. With a deep breath, pulmonary ventilation can increase 8-20 times the normal value.

Only ¼ or 1/5 of the oxygen that participates in the respiratory process is used in the lung. Hentschel, 1978, shows that an external oxygen pressure of 30 mm is the extreme limit for sustaining life.

We must also mention a direct relationship between the drop in arterial oxygen pressure and the rise in arterial CO2 at altitude. C. S. Houston states the difficulty of the hyperventilated subject who suffers from lack of oxygen if he breathes too little and lack of carbon dioxide if he breathes too much.

Adapting to high altitude therefore means adapting to hyperventilation, to increase oxygenation, but also to the loss of carbon dioxide, and this causes a wide chest, an increase in the amount of hemoglobin in the blood and hyperglobulia (7-8 thousand red blood cells), an increase in blood pressure pulmonary, an alteration of kidney function.

The other characteristics of the high-altitude climate (low temperature, highly active air circulation, dryness of the air masses, but also relatively abundant precipitation) cause a bioclimatic stress, both at the level of the skin and the pulmonary mucous membranes, more pronounced on the mountain heights.

The medical treatment indications refer especially to convalescence, anemia, to increase work capacity, physical and intellectual.

Also, mountain resorts are indicated for all chronic bronchopulmonary diseases, for the treatment of asthma, persistent eczema in small children, pulmonary tuberculosis.

Contraindications: high altitude is borne with difficulty by patients with nervous instability, hypertension, tachycardia, also by rheumatism sensitive to sharp thermal changes.

Water surfaces. Oceanic and marine climate

The seaside or coastal climate presents differences in meteorological parameters depending on the geographical position, however, having lower thermal amplitudes than on the continent, higher humidity, but also sea and land breezes.

The clean air, free of large amounts of dust, but loaded with oxygen, aeroions and aerosols of salt and iodine, adds to the relatively high indices of skin and especially lung stress, determining an exciting and demanding bioclimate (Teleki et al. 1984), which stimulates all body functions, appetite, digestion, by activating metabolism, but also the central and autonomic nervous system.

The temperate maritime climate diminishes total demineralization, improves calcium metabolism, uric acid production, raises blood pressure, causes hyperglobulinemia, produces shortness of breath and improves respiratory capacity, facilitating exchanges in the lung.

Therapeutic indications refer to lymphitis, scrofulosis (a chronic tuberculous condition characterized by inflammation of the cervical, inguinal or axillary lymph nodes), pulmonary and extrapulmonary tuberculosis, nervous asthenia, convalescence, dermatoses, gynecological conditions, rickets, osteoporosis, bronchial asthma, rheumatism.

Contraindications refer to advanced cardiovascular diseases, chronic, evolving rheumatic diseases.

The climate of the lake and its shores is particularly reflected in the relaxing character of the lake landscape and the beneficial effects on the nervous system.

The biogeographical landscape. The forests. The deserts.

Forests introduce a special note in the distribution of climatic elements on the globe.

Protection of the atmosphere and climatic functions represent another aspect of the role played by the forest in maintaining the ecological balance.

The forest gathers on a relatively small surface a significant volume of plant biomass (trees, shrubs, herbaceous plants) engaged in the process of photosynthesis. Thus, it ensures the consumption of carbon dioxide resulting from its own "metabolism", but also from neighboring ecosystems or, more recently, due to pollution, releasing, at the same time, the necessary oxygen on the same scale.

This function justifies the name "green lung", forest ecosystems, especially tropical ones, being some of the most important producers of oxygen on a planetary level.

The "purifying" effect manifests itself for a wider spectrum of atmospheric pollutants - sedimentable dusts, sulfur dioxide, radioactive elements - mechanically retained or absorbed by the foliage. Although, in this sense, the role of the forest is significant, it must not be forgotten that the same pollutants can destroy the forest, the tolerance of plant species being limited. There is also a decrease in the microbial load, due to the presence of phytoncides, with up to 90% compared to the urban atmosphere. Forest air, on the other hand, is richer in negative ions, favorable to health.

The purifying effect of forest vegetation

One hectare of forest produces about 30 tons of oxygen annually, of which it consumes about 13 tons in the respiration process of its trees. The tree vegetation of the forest on the surface of one hectare consumes, in the process of photosynthesis, about 16 tons of carbon dioxide.

An air current polluted with sulfur dioxide in a concentration of 0.1 mg/m3 can be completely depolluted by its slow crossing over a hectare of forest. By mechanically reducing the wind speed, one hectare of forest can retain an amount of 60-70 t/year of dust, which is 6-7 times more than the amount retained by grassy vegetation. By emitting volatile phytoncides, in the amount of 5-30 kg/ha, the forest achieves a very efficient microbial purification, especially evident in the conifer forest. For example, while 570 thousand bacteria / m3 were recorded on the boulevards of Paris, and in some shops even 4-8 million bacteria / m3, in the nearby Fontainbleu forest, the microbial load was only 50-55 bacteria / m3 .

Since it significantly modifies the active surface, as a genetic factor of the climate, the presence of the forest ecosystem induces a specific topoclimate. It is determined by the influence exerted on solar radiation, the circulation of air masses and evaporation processes.

The forest topoclimate is differentiated by:

- moderation of temperature extremes,
- low intensity of solar radiation,
- increasing the relative humidity of the air,
- increase in the frequency of atmospheric calm and lower wind speeds,
- more uniform distribution of precipitation and increase in its quantity.

Recreation function

Among the functions of the forest, it occupies a special place due to its direct influence on human activity and health. In this context, some authors (Muja, 1994) considered this role a social function. Through the influence exerted on the climate and air quality, the forest allows the creation of an optimal environmental framework for human health. Adding to this the effect on the human

psyche, the forest becomes a refuge for the modern city dweller who, although largely dependent on a number of amenities of urban life, remains, like any living being, intimately connected to nature.

In these conditions, the bioclimatic indices indicate increased thermal and environmental comfort (except for the equatorial and tropical forest where high temperatures and excessive humidity create an uncomfortable feeling of suffocation), as well as reduced skin and lung stress.

The bioclimate is therefore relaxing, sedative.

It is appreciated:

- an improvement in metabolism during a longer stay in the middle of the forest,
- thermoregulatory adaptation reactions,
- increasing oxygen assimilation and CO2 elimination, by reducing the number of breaths per minute,
- lowering and stabilizing blood pressure and pulse.

Some psychological investigations, through projective personality tests, have indicated positive changes in behavior as prerequisites for relaxation and reorganization of mental activity and increased work capacity.

Deserts present particular aspects.

These, for the most part, are rocky or sandy surfaces, totally devoid of vegetation, where diurnal thermal amplitudes are maximum, so that minimum ground temperatures can drop to the freezing point in the middle of the desert, while during the day the ground temperature exceeds 80 degrees Celsius, and 450C in the air.

The humidity is extremely low, the amount of precipitation is a few mm per year, the wind is strong and there are quite frequent dust storms, with very low visibility and positive air ionization.

Predominant thermal discomfort through heating and wind during the day, through cooling at night. Skin and lung stress are high, the bioclimate is highly exciting, due to the high, almost permanent insolation (insolation fraction 80-100%). The air is generally quite pure, for sand being a heavy element is only lifted into the air by very violent winds, instead it is fixed to the ground by the night dew.

If the Mediterranean bioclimate at the edge of the Sahara desert can be discussed in terms of climatotherapy, the deserts themselves, practically uninhabited except by nomads, are totally inhospitable to ordinary life

Indoor climate. On the one hand, the increased acclimatization capacities through central heating, with temperatures that are sometimes too high, the dryness of the air, a uniform microclimate that does not respect the natural climatic variations and the balance they achieve, lead to physical and moral discomfort, an effect of excess comfort and sedentarism, a so-called "domestication syndrome" (Teodoreanu, 1984), in the conditions of society with a high material level. On the other hand, the absence of basic thermal and hygienic comfort, in societies with marked shortages in energy reserves, produces marked physical and mental stress, along with food shortages and other shortages.



Figura 6.3. Climatul interior

6.4. Meteorological elements and their influence on the body

The climatic study of an area involves the detailed analysis of the relevant climatic elements: actinometric elements (solar radiation), air and soil temperature, atmospheric pressure, wind, air humidity, cloudiness, atmospheric precipitation, potential evapotranspiration and meteorological phenomena such as snow cover, fog , hail, stormy phenomena or horizontal precipitation - mist, dew, drizzle.

6.4.1. Air temperature

Air temperature is a consequence of the solar radiative flux and to an extremely small extent of the telluric energy flux generated by the Earth's incandescent core (the insulating properties of the Earth's crust). In the absence of the Sun, the Earth's surface temperature would be close to 0°K.



Figura 6.5. Temperatura aerului

The main parameters that characterize the air temperature are:

- medium temperature
- extreme temperature (maximum, minimum)
- thermal amplitude
- the deviations of the annual thermal values from the multi-year average
- frequency of days with different temperature values
- the probability of production and degree of assurance of different temperature values
- the date the average daily temperature passed through different thresholds, the duration and the sum of the temperatures achieved in each interval: >0, >5, >10, >15, >18o C
- long-term variations in air temperature
- temperature indicators

Air temperature is the main meteorological element subject to an annual cycle, being a consequence of the interdependence relationship with solar radiant energy.

The variation of the radiative balance in the high mountain areas produces changes in the thermal regime of the air and the soil. The different orientation and lighting of the slopes leads to the appearance of large differences in the values of the heat balance and the temperature of the underlying surface on the slopes unevenly exposed to solar radiation. Thus, in the Northern Hemisphere, the southeastern, southern, and southwestern slopes receive a greater amount of heat and light than the northern ones.

This is reflected on the vegetation, in the sense that, in the spring, on the southern slopes, the resumption of vegetative processes (budding, leafing) is done much earlier than on the northern ones, where the snow persists longer, even during the summer. Also, on the slopes with southern exposure, located in regions with sufficient precipitation, the upper limit of the forest is higher than on the northern slopes.

6.4.2. Atmospheric pressure

Atmospheric pressure is defined as the force exerted by the atmospheric air on the surface unit and represents one of the fundamental parameters in meteorology.

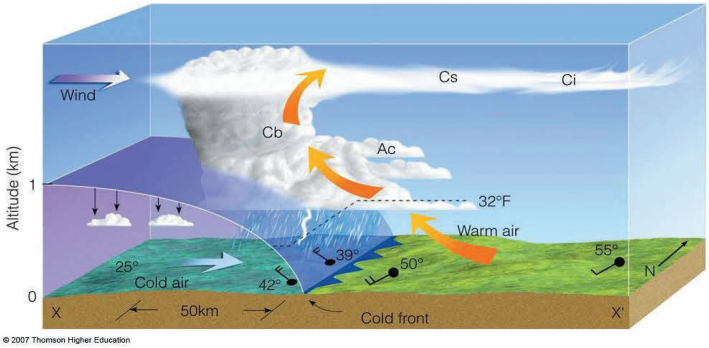


Figura 6.6. Presiunea atmosferică

Atmospheric pressure gradually decreases with increasing altitude from sea level as a result of the reduction in the thickness of the atmosphere and the decrease in air density. In the free atmosphere, the decrease in pressure with height is logarithmic. In the mountains, the distribution of air pressure is complicated due to the uneven relief, which causes baric gradients to appear between the different parts of the mountain massifs.

Above the mountainous regions, the isobaric surfaces undergo strong changes following the interaction processes that take place during the advection between the air mass and the slopes, but also under the influence of the air temperature variation.

Variability and extreme values show certain characteristics dictated by local conditions – active surface features, general atmospheric circulation. The monthly and annual absolute maximum was recorded in December, and the monthly minimum was recorded in August.

Rarefied air - appears on the plateaus and on the ridges of some mountainous massifs, such as those in Bucegi, Ceahlău, Făgăraș, Retezat, Piatra Craiului, etc. It is a powerful stimulant of the body. This high-altitude air increases heart and respiratory rate, increases blood pressure, and intensifies metabolism. It is an excellent remedy for hypotensive people, who suffer from mental or physical asthenia, as well as for those who are sedentary, provided they do not suffer from hypertension or chronic heart conditions. Also, the rarefied air from the mountain plateaus is an excellent remedy for losing weight, because it accelerates the metabolism and has a slight appetite-reducing effect. Its beneficial effects in the treatment of anemia are also worth mentioning.

Atmospheric pressure becomes a physiological stress factor only at high altitudes when its effect synergistically combines with that of other meteorological parameters, generating altitude sickness or "mountain sickness".

This meteorological condition includes a set of physiological reactions induced as a result of exposure to a hypobaric environment, characteristic of the high-altitude atmosphere. Their intensity is determined by the level of hypoxia (respiratory oxygen deficiency) which varies according to the value of the partial pressure of oxygen in the inspired air (pO2), which changes its qualities as the atmospheric pressure decreases with altitude. Thus, under conditions of progressive hypoxia at altitude, the components of the nervous system generate the first symptoms of physiological dysfunction that gradually affect the functional balance of the entire body.

In this regard, it was found that, at medium altitudes (2000 m), the central nervous system and the analyzers are in a state of hyperexcitability, both during the day and at night.

Altitude hypocapnia is a physiological phenomenon derived from hypoxia and is due to the decrease in the partial pressure of CO2 in the blood, in order to limit the effects of hyperventilation which would otherwise cause the excess removal of CO2 from the blood, seriously affecting the body's gas exchange coefficient.

6.4.3. Air humidity

Air humidity represents the amount of water vapor in the atmosphere and is influenced by the circulation of air masses, but also by the local characteristics of the active surface. The relative humidity of the air increases near bodies of water and in or near forests because they are sources of evaporation and evapotranspiration.

In the free atmosphere, the absolute humidity of the air decreases with height due to the distance from the source of evaporation represented by the underlying surface and the decrease in temperature. The same thing happens in the mountainous area, with the difference that the decrease is slower due to the surface of the mountains, which causes a higher air temperature and a surplus of water vapor.

The water vapor content of the air decreases rapidly with altitude in the first few kilometers from the base of the troposphere. According to observations made in the Alps, at an altitude of 2,000 m, the average absolute humidity represents about half the amount of water vapor at sea level (48%), compared to the free atmosphere at the same level (41%).

The absolute humidity of the air shows diurnal and annual variations, which depend on the following factors: temperature, air circulation in the form of breezes, altitude, the exposure of the slopes to the sun's rays and atmospheric currents, the configuration of the relief.

The relative humidity of the air shows a variation much more influenced by the orientation and inclination of the slopes and the altitude, which is similar to that of the lowland areas, with the production of a maximum in summer and a minimum in winter, in depressions and valleys. From a certain height, depending on the climatic zone, the maximum relative humidity occurs at the beginning of summer, after noon, due to the predominance of upward movements, and the minimum in winter and during the night, as an effect of downward air movements.

Relative humidity is, in principle, inversely proportional to air temperature. The highest value is recorded in December, immediately followed by January, a direct consequence of negative temperatures, the saturation level being reached faster in cold air. The lowest values are recorded, paradoxically, in the months of April and May, when, as previously recorded in the section dedicated to atmospheric pressure, the Atlantic cyclonic activity intensifies during that period. However, the phenomenon can be explained by the existence of downward air movements that cause an increase in temperature and implicitly a decrease in relative humidity - the foehn phenomenon.

Air humidity is characterized by a series of hygrometric quantities:

a The tension (elastic force) of water vapor, which is the part of water vapor in the total pressure of the atmosphere and is expressed in millimeters of mercury column or in millibars

b Absolute humidity is the amount of water vapor present in a cubic meter of air at a given time and is expressed in grams

c Relative humidity is the percentage ratio between the current tension e and the maximum tension E of water vapor existing in the atmosphere at a given temperature.

$$r = \frac{e}{E} \cdot 100$$

The value of relative humidity gives us precise indications about the state of humidity in the air, because it shows us in percentage terms how far the air is from saturation in water vapor at a given moment or over a period of time.

6.4.4. Cloud

Cloudiness, or the degree of sky coverage with clouds, is an important climatological element that influences the development of other atmospheric processes.

The main parameters calculated for cloudiness are:

- average daily, decadal, monthly and annual values
- the average frequency of days with different degrees of cloudiness
- frequency of cloud types
- the long-term variations of cloudiness

The regime of cloudiness (nefic) and fogs is very varied, as a result of the influence exerted by the landforms and the orientation of the slopes, compared to the direction of the prevailing winds, on these meteorological elements. In the mountains, the main characteristic of cloudiness is given by the predominance of convective movements (thermal and especially dynamic), following which cumuliform clouds are formed, with strong development, throughout the year.

In diurnal variation, the cloudiness has a maximum during the day, due to convection, and a minimum at night, due to the downward movements of the air, clear weather being much more frequent than in plain areas. This regime is also favored by the local air circulation, ascending during the day (valley breeze) and descending at night (mountain breeze).

The annual variation of cloudiness has a maximum in summer, when cloudy weather is very frequent, at the expense of clear weather, which is specific only to areas with an arid climate (eg: in the massifs of Central Asia) and a minimum in winter. Not only convection processes but also the high level of condensation of water vapor contribute to the increase in cloudiness during the summer.

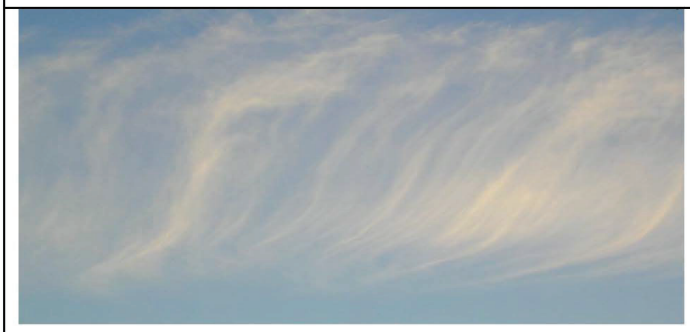
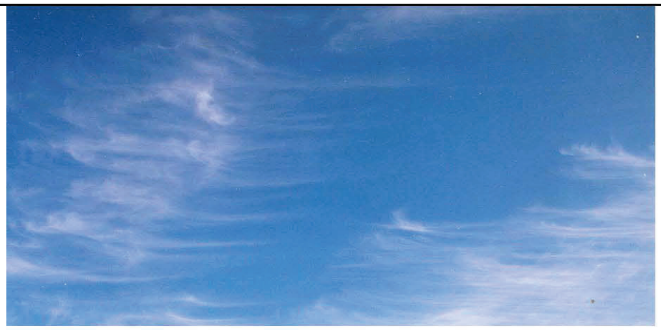
The annual regime of the fog phenomenon is similar to that of cloudiness, because the fog in the mountain region coincides with the clouds that are in permanent contact with the slopes or the bottom of the valleys. In general, mountainous regions are characterized by a large number of foggy days. In the highlands, fogs are less frequent during the day and summer, and in depressions and deep valleys, at night, and especially in winter, due to the accumulation of descending, cooled air on the tops and slopes. Condensation products more frequent in the cold period of the year explain the maximum in December in the conditions where the fog phenomena are particularly present.

Regarding the average monthly and annual frequency of cloud types, the analysis covers the lower clouds: Stratus (St), Stratocumulus (Sc), Nimbostratus (Ns), Cumulus (Cu) and Cumulonimbus (Cb).

Stratus clouds have the maximum frequency in the cold season, with December and January having a percentage of 14 and 12.9, respectively. Their frequency decreases with increasing altitude, being most often associated with thermal inversions. The frequency of Stratocumulus clouds reaches its maximum in December (30.3%) and its minimum in July (13.7%).

Nimbostratus clouds show the most attenuated differences in frequency from month to month (9%), with the highest frequency being a consequence of frontal activity. The frequency curve of Cumulus and Cumulonimbus clouds shows a similar course, with the maximum in June, a consequence of the intensification of convective movements of a thermal nature.

Cloudiness is an important climatic parameter in the development of tourism. Thus, the cloudiness directly determines the duration of the sun's shine, influencing the heliomarine cure in the coastal region or the excursions / hikes in the mountain area. Moreover, cloudiness influences the regime of all climatic elements, in turn, being influenced by the general circulation of air masses and relief.

Cirrus fibratus	Cirrus uncinus
	
Cirrus spissatus	**Cirrocumulus stratiformis undulatus**
	
Cirrostratus nebulosus	**Altocumulus stratiformis translucidus**
	
Altocumulus stratiformis undulatus	**Altocumulus lenticularis**
	
Altocumulus castellanus	**Altostratus translucidus**
	

Stratocumulus stratiformis opacus mamma	Stratus nebulosus opacus
	
Nimbostratus	**Cumulus humilis şi mediocris**
	
Cumulonimbus calvus	**Cumulus congestus**
	
Cumulonimbus capillatus incus	**Cumulus mediocris virga**
	

Figura 6.7. Genuri, specii şi varietăţi de nori

6.4.5. Atmospheric precipitation

Data on the regime and distribution of atmospheric precipitation are of particular theoretical and practical interest, especially in hydrotechnical constructions, in the zoning of agricultural crops, in tourism, etc., for which purpose the following parameters are calculated (Gaceu, 2001):

- average monthly, seasonal, half-yearly and annual quantity
- the lowest and highest monthly, seasonal and annual quantity
- the probability of production and the degree of assurance of different amounts of precipitation
- the deviation of annual amounts of precipitation from the multiannual average
- the frequency of days with different amounts of precipitation
- the maximum amount in 24, 48 and 72 hours
- torrential rains
- pluviometric indices
- long-term variations of atmospheric precipitation

Potential evapotranspiration (ETP), a notion introduced by the American climatologist Thornthwaite, is defined as the sum of water losses through evaporation and transpiration of a reference plant layer (generally lawn), which completely covers the land, having a uniform height of several centimeters, fed abundantly with water, in the stage of maximum plant development (Clima României, 2008).

Rain and snow wash and purify the chemically and microbially polluted atmosphere, but thus pollute the soil and drive infectious agents into the groundwater layer, springs, wells.

Rain and snow can cause uncomfortable mental states in sensitive patients.

However, snow is also an aesthetic-landscape tonic factor for the nervous system, and the snow layer, an ambient condition for training and thermal hardening, through winter sports or even only for aerotherapy, possibly associated with heliotherapy.

Rainfall amounts are higher in the city, which is otherwise considered a "rainfall island". The amounts of water falling in the urban perimeter vary depending on the type of neighborhood, residential or industrial, on the direction of the prevailing winds. Snow cover data are also conflicting. It appears that the number of days with snow is generally higher, but the number of days with snow is lower.

6.4.6. Snow layer

The interval with snow

Precipitation in solid form is recorded, as a rule, in the cold half of the year, between October and April, almost on the entire territory of Romania.

The occurrence of snowfall is imposed on the one hand by the general circulation of the atmosphere, and on the other hand by local conditions and especially altitude.

The average number of days with snow shows a maximum in January and progressively decreases towards the limits of the range for April.

Range with snow cover

The drop in air temperature, but also in the soil temperature, especially in the second part of autumn, allows the snow layer to appear.

6.4.7. The wind

The wind is a vector meteorological element, particularly variable in time and space, conditioned by the horizontal baric contrast created within the general circulation of the atmosphere. The movement of air currents from one place to another (wind regime) is mainly determined by the development of various baric systems and, first of all, by the activity of the main action centers.

Wind has two main characteristics, namely direction and speed. Apart from these main characteristics, the strength or intensity of the wind and its inclination or vertical component are also distinguished.

To indicate the direction of the wind in meteorology, 16 directions are used, corresponding to the 16 sectors of the wind rose and are noted with the initial letters of these sectors.

Tabel 6.1. The Beaufort scale representing the strength of the wind

Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects	
			On the Water	On Land
0	Less than 1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 ft taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 ft, whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Sea heaps up, waves 13-20 ft, white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (13-20 ft) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Whole trees in motion, resistance felt walking against wind
9	41-47	Strong Gale	High waves (20 ft), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Very high waves (20-30 ft) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	56-63	Violent Storm	Exceptionally high (30-45 ft) waves, foam patches cover sea, visibility more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 ft, sea completely white with driving spray, visibility greatly reduced	

During the summer, the central and southern part of Asia heats up excessively, the air temperature reaching 50 degrees Celsius. As a result of this fact, a vast depression area will be formed above these regions, towards which the moist, dense and cool air masses from the oceans that bathe the southern and southeastern shores of Asia converge. And thus the summer monsoon is born.

In the cold half of the year, the atmospheric situation undergoes radical changes compared to the warm season. This time in the central and northern part of Asia, an extended barometric maximum is born, as a result of the persistence of cold, dense and dry air, while a series of depression areas will form over the oceans.

6.5 The relationship between climate and organism: stress, adaptation, homeostasis

Stress. The action of the environment on humans can manifest itself through a stress of a variable nature. Stress (Eng. Stress = pressure, strain, tension) is a relatively new notion, meaning a strong demand on the body, a source of aggression, of demand on the body by countless and very different factors. All alarming states provoke the same defense reaction, regardless of the nature of the stressor. A general or local adaptation syndrome is thus achieved. The endocrine system (pituitary), nervous system and adrenal glands are called upon. A first stage is the "alarm reaction", followed, if the stress persists, by a stage of indifference, and then by a stage of exhaustion.



A **moderate stress**, followed by the restoration of the endocrine and nervous balance, is considered positive, stimulating, leading to adaptation and revitalization of the body.

Adaptation is a complex process by which an organism changes its form, structure and functions according to certain environmental conditions. There are three phases that the human body goes through.

The first phase is **accommodation**, which is reversible. An example of accommodation is the increase in the number of red blood cells and the percentage of hemoglobin in the blood, when moving to high altitude with a low oxygen pressure, used in the treatment of anemia and convalescence in mountain resorts. The immunity that certain infectious diseases give is also considered adaptation.

The second phase is acclimatization, which represents adaptation, through physiological changes, to new geographical conditions (especially climate). As an example is the adaptation of the European to the specific conditions in a warm country.

The third phase is naturalization, which means survival and reproduction, in changed conditions of existence, with physiological changes and in the offspring.

Homeostasis (Gr. Homoios = similar, stasis = state) is the property of living organisms, determined by neuroendocrine regulation, to maintain, within the limits of functional balance, different physicochemical, biochemical, physiological parameters constant. W. B. Cannon (1928), calls this property "the wisdom of the organism."

Homeothermy is important in balneoclimatology, within the thermoregulation mechanisms, which represents the constancy of the body's internal temperature, independent of the external temperature. This property is ensured by reflexive, antagonistic mechanisms, some of which produce internal heat, others release the accumulated heat to the outside. They are regulated by the cortical and hypothalamic nerve centers, based on the thermal excitations that the skin receives from the external environment.

Climatotherapy, carried out by travel and treatment in balneo-climatic resorts, includes the patient's reactions to the new living conditions.

6.6. Bioclimatic indices

Simple indices:

- for temperature can be used: the "thresholds" (limits) of monthly or annual average isotherms, also the variation of temperature from one day to another;
- for pressure: diurnal pressure variation and oxygen partial pressure variation;
- for wind, wind speed can be considered a bioclimatic index, and for humidity, water vapor tension is the basis of the pulmonary stress index.

Complex indexes:

- temperature - humidity: effective temperature (Missenard, 1933), domestic comfort nomogram (Givoni, 1978), humidity index (Henever, 1959 etc.), apparent temperature (Steadman, 1979), Hentschel nomogram (cf. Licht, 1964), Thom index, 1958 and Thom THI, 1959, Arakawa Index, 1960, ITU Index (recommended by ANM), domestic comfort nomogram (Givoni, 1978);
- temperature - wind: Wind chill index and cooling power, Steadman index (1998);
- temperature - humidity - wind.

Climate-tourism index

- the relationship between the duration of sunshine, in hours (S), the average monthly temperature, in 0C (T) and the duration of precipitation during the day, in hours (D), according to the formula : I = (S + T + 5D) / 5
- Uses hourly data from 5 parameters: the duration of the Sun's brightness (I), in hours; rainfall duration between 6 and 18 hours (D), in hours; maximum air temperature (Tx) in 0C; wind speed at noon (V), in m/s; water vapor pressure (U), in hPa;

Thermal comfort index

There is a narrow zone where a healthy, lightly clothed body at rest does not lose or gain heat, called the neutrality or thermal comfort zone, between 16.80 and 20.60 TEE (effective equivalent temperature - TEE).

Bioclimatic stress index

- It is a complex index, which can be calculated both in winter and in summer, in the form of hourly, daily, but also monthly and annual values, in this case being used especially for establishing a bioclimatic region. It is calculated in several steps, which can also be interpreted separately: the skin stress index, the lung stress index and the total bioclimatic index.

Skin climate stress index

- It refers to the sensations of heat and cold that the body feels at the level of the skin, in the process of thermoregulation and which depend on the air temperature and the speed of the air currents.

Pulmonary climatic stress index

- It is based on the respiratory exchanges, between the lung and the environment, respectively on the absorption of oxygen and the elimination of carbon dioxide, under the conditions of a certain amount of water vapor, best expressed in the values of water vapor tension, which show whether the air is it wet or dry.

Total climatic stress

- It was calculated by Teodoreanu et al. (1984) by summing the annual mean values of skin and lung stress and highlights the global stress of the climate on the human body attacked simultaneously at the level of the skin and the lungs.

7. Mofettes - types, mechanisms of action, methodology, indications

Moffets are gases resulting from post-volcanic emanations also existing in Romania, in the area of the curvature of the Carpathian arc, from which 95-98% of the existing carbon dioxide is used as a therapeutic factor.

The mofettes from Romania are among the few in Europe and the world. Along with carbon dioxide (CO2), the Mofetarian gas also contains other gases of volcanic emanation: ammonia, sulfur, as well as helium and radon in a small amount that exert a pulverization of CO2 molecules increasing its penetration power.

Carbon dioxide itself is not conducive to life, but used for therapeutic purposes (with its absorption at the integumentary level) it brings special benefits to blood circulation through peripheral and systemic vasodilatation.

The natural mofette has the effect of increasing blood flow through the penetration of CO2 through the skin both through the skin and at the muscle level.

The action is direct on the smooth muscles of blood vessels, especially on very small vessels (arterioles), an action that is considered superior to peripheral vasodilator drugs. It is usually performed in an orthostatic position, for the lower half of the body for 5 – 20 minutes progressively. Being heavier than air, carbon dioxide forms a blanket in the lower part of the mofette – the area occupied by the lower half of the trunk, where it exerts its beneficial action.

The much lower concentration of CO2 found in the upper layers of the mofetarian gases stimulates breathing, the transport of oxygen to the tissues and the brain, even leading to an increase in intellectual performance.

The seaside resorts where there are mofettes focus on two types of services:

- to recharge the body (wellness) through procedures that have as its objective its general relaxation, improving the general state of health, combating sedentarism, stimulating the practice of a sport, balancing the nervous system, eliminating the physical or mental discomfort generated by daily stress factors, restoring wake-sleep and rest-exercise biorhythms, training regulatory functions to combat stress. It is addressed to people of different ages, with symptoms of physical or mental discomfort, feeling of fatigue, irritability and with accusations of reduced professional performance, with demanding professions for the neuro-psychic system, with disturbances of the sleep-wake and rest-exertion biorhythms. In addition to the procedures performed, education regarding the harmful effect of smoking and alcohol consumption, compliance with a healthy diet, and outdoor exercise are considered.
- prevention and treatment of cardiovascular diseases, rheumatic, neurological, digestive, hepatobiliary, renal, respiratory, metabolic, endocrinological diseases.

Cardiovascular diseases are currently the main cause of death worldwide, with an extremely high mortality in Eastern Europe and in our country.

Therefore, special emphasis is currently also placed on cardiovascular recovery, especially in patients with ischemic heart disease, hypertension, chronic peripheral arteriopathy, after surgical interventions.

5.1. Defining the concept of Moffete.

One of the natural treasures that our country can be proud of is the mofette. Coming from the Latin term "mephitis", which means "stinking emanation", mofettes are gas emanations that can appear through cracks in the earth's crust in the final phases of volcanic activity, through drilling, through the degassing of mineral waters, or can be made artificially.

Although mofettes are also found in France, Italy, Java Island or Yellowstone National Park (USA), those in Romania are unique due to the emanations of dry gas very rich in carbon dioxide (95-98%), a therapeutic factor very efficient. Also, the mofettes in our country contain rare gases such as helium and radon, which complement the curative effect of the mofette therapy.

Mofettes are exhalations of natural gas at relatively low temperatures, usually found in post-volcanic areas. The main component of mofetic gas is carbon dioxide (CO2), which is found in high concentrations, other components present are methane, nitrogen, oxygen, helium, hydrogen, carbon monoxide, hydrogen sulfide and radon.

During wet seasons, mofettes are characterized by mud and bubble expulsions (Koch et al., 2000).

Mofettes can have a gas flow of more than 20,000 L/h, and the gas consists mainly of CO2 which can reach up to 99.8% by volume (Vaselli et al., 2002). Rainwater, snow or ice can close small cracks in the surface layer and/or increase the resistance to a free discharge rate, thus short-term flow disturbances can occur (Heinicke et al., 2006).

The geological periods that are associated with the mophetic zones are Pliocene-Quaternary, strongly related to volcanic activities (Vaselli et al., 2002; Heinicke et al., 2006). Mofettes are always associated with an active tectonics, gas emissions are found in intraplate regions, tectonic windows and the intersection of fault zones (Bissig et al., 2006; Somlai et al., 2007; Néda et al., 2008a and b) .

Following volcanic activity, large amounts of CO2 emissions reach the earth's surface, potentially carrying radioactive gases such as radon. Radons are continuously produced in the Earth's crust that migrate together towards the surface, mainly by diffusion and advection processes (Papp et al., 2010).

Geogenic radon can be useful in other problems such as earthquakes, the presence of faults or dating (Vasiliniuc et al., 2011). Depending on the local geology, following gases may appear at the surface, in the form of dry CO2 emanations (mofettes) or as carbonated mineral water, with CO2.

Natural sources of CO2 are used in countries such as Hungary or Romania in the treatment of cardiovascular and rheumatic conditions.

Although the curative effect is attributed to carbon dioxide, several studies have observed positive effects of radon on the health of people living in environments with high background radiation, demonstrating a potential effect on the immune system (Pratzel, 1997).

Through inhalation or transcutaneous absorption of radon dissolved in water, depending on the type of treatment, radon enters the body and is dissolved in body organs. Radon intake can be enhanced by concomitant heat or carbon dioxide.

The energy produced by the decay of radon and its short-lived daughters generates ionization with the production of oxidizing radicals that act at the cellular level (Pratzel, 1997).

În Europa, construcțiile specifice ale instalațiilor cu un tratament strict de baie uscată cu CO_2 natural pot fi găsite în Ungaria - Matraderecske (Lazar și colab., 2003; Kovacs și colab., 2003) și România (Néda și colab., 2008 a și b) .

In addition to CO2-rich gas (95-98%), high radon level (greater than 125 Bq • m-3) can cause potential health problems (Néda et al., 2008 a and b). Therefore, it is very important to know the level of radon in mofettes.

Natural therapeutic gases are Neogene post-volcanic emanations that are distinguished among natural therapeutic substances by their geochemical genesis, specific to the geological areas of Romania, and represent spontaneous natural emanations of carbon dioxide and/or gaseous compounds of sulfur, mainly hydrogen sulphide.

The character of mofetic gas is also attributed to the carbon dioxide resulting from the process of natural decarbonization of natural mineral waters - naturally carbonated during the extraction works of these waters.

A simple and accessible method to check the gas level is to use a lighted match, which will extinguish when it touches the interface between the air and the accumulation.

The therapeutic qualities of mofetic gas are determined by its chemical composition and the following climatic parameters:

a) temperature

b) humidity

c) pressure

d) air currents

e) contained in small therapeutic aeroions

From the point of view of carbon dioxide supply, mofettes differ in:

a) mofettes on the source, which use the gas coming directly from natural emergence;

b) fed mofettes, which use the gas transported from drilled sources or from other sources by means of storage and distribution tanks;

c) mofettes fed with bottled industrial carbon dioxide.

Solfatares are therapeutic gases that, in addition to carbon dioxide, contain hydrogen sulfide in a concentration of 0.1-0.56%, with important vasodilating effects.

We find them in the localities: Turia, Băile Sântimbru, Harghita-Băi, Harghita County

Mofeto-sulfatarian gases are natural mixed mixtures of carbonic and sulphurous gases resulting from simultaneous exhalative post-volcanic emanations.

The requirements and criteria for the application of the definition and classification of natural therapeutic gases must refer to the physical, physico-chemical and chemical characteristics differentiated according to the genetic premises of the area that cantons them, their quantitative proportions and the range of natural fluctuations of these ratios on levels of gravimetric sedimentation, within the limits of the natural spaces of exhalative manifestations - mockery.

The use of therapeutic gases requires rooms specially arranged in steps, in the shape of an amphitheater so that the carbon-gas bath can act on the lower part of the body.

The mofettes are gases resulting from the post-volcanic emanations existing in the area of curvature of the Carpathian arc, from which the existing carbon dioxide is used as a therapeutic factor in a proportion of 95-98%. Along with carbon dioxide, Mofetarian gas also contains other gases of volcanic emanation: ammonia, sulphur, as well as helium and radon in small quantity that exert a pulverization of CO2 molecules increasing its penetrating power.

The mofetary is a room arranged in steps, similar to a small amphitheater, created so that the respective gas accumulates in the lower part. Any mofette must be equipped with a gas level warning system, either automated or by direct observation.

The capacity of a party is a maximum of 30 - 50 people.

The patient must stand, it must be exposed only from the lower part of the trunk down, where the beneficial action is exerted and to avoid the production of intoxications.

The carbon dioxide level should be below the level of the heart.

Before the mofette treatment, it is recommended that the patient rest for 5-10 minutes. Talking should be avoided during the treatment because the patient risks inhaling the gas. Between the two daily treatments, where they are recommended by the doctor, there must be a break of 4-8 hours.

The clothing of the patients who are recommended mofetarian baths is made of rare cotton or woolen fabrics to allow the human body to be in contact with the mofetarian gases as completely as possible.

Duration of treatment

The duration of a session should not exceed 20 minutes and can only be done on the recommendation of the medical recovery and balneology doctor. It takes 10 to 28 days of treatment to have a lasting effect. At the beginning, the sessions are 5-10-15 minutes, up to a maximum of 20-30 minutes for an adequate therapeutic effect.

Effects of the mofette

In particular, cardiovascular diseases, dermatological, gynecological and endocrine diseases, as well as some diseases of the locomotor system - chronic degenerative rheumatism - can be treated with gas baths.

We also have other recommendations of the mofette for prophylactic purposes for people with cardiovascular risk, for those who suffer from hypertension, for those with high cholesterol levels, it is also indicated for smokers, people who have circulation problems as well as those who work in the cold. It is also known that mofetarian gas has beneficial effects on potency as well, being recognized as a very good natural aphrodisiac.

Very interesting to mention is the fact that in the upper layers of gases, the concentration of carbon dioxide is much lower, a fact that stimulates the transport of oxygen to the tissues of the body, including the brain, which leads to an increase in intellectual performance. It is known that many famous writers and painters came for the gas baths because they gave them real bursts of inspiration.

According to doctor Tatár Márta, from the Cardiology Hospital in Covasna, the "Covasna method", which combines several natural therapeutic factors, namely mineral waters, mofettes and strongly ozonated air, is successfully used in the treatment of over 10,000 patients annually and of the opinion that this should be much better popularized internationally.

The mechanism of action of mofettes consists, first of all, in peripheral vasodilatation, through the direct action of carbon dioxide on small vessels, which leads to heating of the skin, but also to systemic vasodilatation (muscular, cerebral), inhalation of a small parts of the carbon dioxide in the mofette.

So, mofettes - defined as emanations of carbon dioxide that appear in the final stages of volcanic activity, through drilling or through the degasification of mineral waters, mofettes are only found in a few places on earth and are considered true wonders of nature, due to the beneficial results that they have on the body. Among those already demonstrated, it has been found that mofette therapies help to detoxify the body, a benefit that is increasingly being exploited.

Mofette therapies are contraindicated for those suffering from acute conditions, infectious diseases, venereal diseases, malignant tumors (cancer of any type), some heart rhythm disorders and advanced cardiac decompensation.Dioxidul de carbon în sine nu este propice vieții, dar utilizat în scop terapeutic, absorbția lui la nivel tegumentar aduce beneficii deosebite circulației sanguine prin vasodilatația periferică și sistemică.

The natural mofette has the effect of increasing blood flow through the penetration of CO2 through the skin both through the skin and at the muscle level.

The action is direct on the smooth muscles of blood vessels, especially on very small vessels (arterioles), an action that is considered superior to peripheral vasodilator drugs. It is performed in an orthostatic position, for the lower half of the body for 5-20 minutes progressively.

Being heavier than air, carbon dioxide forms a blanket in the lower part of the mofette – the area occupied by the lower half of the trunk, where it exerts its beneficial action.

The carbonated mineral water bath combines the effect of the thermal factor with that of the chemical factor and the hydrostatic pressure of the water. CO2 is slowly released onto the skin forming a film of CO2 bubbles that exert active vasodilation through microtactile stimulation of the immersed skin.

Combining the same therapeutic factor CO2 in the form of a mofette and bath creates a cumulative effect of vasodilation. This means better nutrition of tissue and cells, faster uptake of normal or pathological metabolic waste and their transport to specialized organs to be processed and eliminated, thus reducing the inflammatory process and normalizing metabolic processes at the level of organs, tissues and cells.

Carbon dioxide CO2 is inhaled and dissolved in plasma, respectively it is absorbed through the skin and has the following experimentally proven effects on the body:

 on cerebral circulation: increases cerebral blood flow by 75%, which increases concentration power and intellectual performance

 on peripheral circulation: skin hyperemia by direct action on meta-arterioles, with an increase in skin temperature by 1.5 – 40C

 increase in muscle blood flow by 44% in the skeletal muscles

 role in the hemodynamics of the heart with arterial vasodilatation, decreasing the pre-ejection period, increasing the ejection period

 decrease in blood pressure

 decrease in catecholamines, decrease in blood lipids

Romania has the chance to have such reserves in a few spa resorts - Balvanyos, Băile Tuşnad, Buziaş, Covasna, Slănic Moldova, Sângiorz-Băi, Vatra Dornei - and we should consider ourselves privileged, because mofettes can only be found in very few places on earth.

Among them, France, Italy, the Island of Java and Yellowstone National Park in America, all the more so since, in our country, the emanations of dry gas very rich in carbon dioxide (up to 98%) make them particularly effective in various conditions.

"The mofettes in the Covasna area, for example, are unique in Europe due to the concentration of CO2 in the mofette gases. Mofette therapies are beneficial for circulation, supporting intellectual, renal, sexual function and keeping away cardiovascular diseases."

The most recent observations show that mofettes also help in detoxification belts. "Today, people accumulate many and more dangerous toxins in a day than their peers assimilated in a single life a few centuries ago. In addition to natural pollution caused by digestion, breathing, metabolism, our body is also polluted by an enormous amount of artificial pollutants, from air, food, detergents, toxins, cosmetics, household products, stress, as well as from consumption even and moderate alcohol and tobacco. The only way to deal with this toxin overload is to support the body's natural self-cleansing mechanisms through periodic detoxification programs and lifestyle adaptations, daily habits, so that purification always has a lead over pollution. Mofette therapies are very useful in such processes," says Dr. Anca Tene, Covasna.

5.2. Exploitation and use of therapeutic gases

The exploitation and use of therapeutic gases includes the following procedures and techniques: capture, storage - distribution, gas consumption, evacuation.

The capture of therapeutic gases is carried out by using a specific technology that allows the collection of natural emanations or from drilled wells, their storage in a buffer container and distribution by free fall or pumping to the consumer.

In the case of degasification of mineral waters, the carbon dioxide is stored in containers from where it can be led and used directly in the network of the therapeutic consumer or in bottling plants under pressure for use for industrial or therapeutic purposes.

Considering the presence in the composition of the Mofetarian gas, in addition to carbon dioxide in a concentration of over 90%, and other gases, mainly methane gas, in situations where the concentration of this substance is higher, a gas separator is installed.

The storage - prior distribution of therapeutic gases is not necessary in the case of mockeries set up in treatment bases in resorts, which use carbon dioxide collected directly from the emergency.

In the situation where the gas chambers are set up at a distance from the capture of therapeutic gases, a container-reservoir must be built in which the carbon dioxide can be stored with or without pressure depending on the flow rate of the source and the capacity of the respective gas chamber.

In the case of pressurized storage, carbon dioxide is directed into the mofetarium, with flows controlled by means of pressure regulating and reducing devices. The introduction of carbon dioxide into the muffetary is carried out through its lower part, the supply system must be provided with gas shut-off, adjustment and exhaust fittings in order to carry out the necessary maintenance work, the prevention of turbulence being achieved by reducing the speed of the gas below 0.1 m/sec.

The carbon dioxide distribution installations in the spas include the following components: a) channels and pipes for feeding and emptying the spa spaces, made of plastics, sheet metal protected with anti-corrosive paints, asbestos cement b) metal fittings; c) aggregates for the circulation of gases, in the case of storage and distribution under pressure;

In the case of using carbon dioxide stored in cylinders under high pressure, heating devices must be provided for the pressure reducer and the distribution nozzles in order to avoid their freezing.

The transport of therapeutic gases from natural sources can be carried out by gravity, except in situations where the relief of the land requires mechanized transport preferably by creating depressions of 0.1 - 0.2 atmospheres.

The materials used for gas transport are pipes with large diameters, between 90 and 220 mm, well sealed, made of PVC or galvanized sheet.

The evacuation of gases from the baths is carried out continuously, by overfilling, depending on the actual treatment process or for the periodic emptying of the spa spaces for technical interventions or for cleaning and sanitization.

Overfill vents should not be vented to the outside in the direction of prevailing winds. The total emptying of the spa spaces is carried out through the floor siphon, through which the water and gases are evacuated.

Moffetarias are technical installations in the shape of an amphitheater, with a polygonal, square, oval or round outline, with a varied number of steps - degrees, which allow a comfortable position of the patient during the treatment.

By gradual descent, controlled gas "baths" can be made. The exhaust of gases from the mofette is carried out continuously through exhaust holes that must not be in the direction of the prevailing winds.

Mofetarias installed directly on the source, wet or dry, as the case may be, are built from concrete, stone, brick, wood and must be provided with internal steps for different heights.

The spas must be equipped with gas level warning systems in the bathing areas, automated or through direct observations and maneuvers.

The spas supplied with gas from a distance are built with spa places arranged for several people at the same time or individually, the existence of a dispatcher being necessary that organizes and supervises both the spa series of patients as well as the supply, warning, and evacuation facilities.

Any mofette must be provided with a gas level warning system, whether this is through an automated system or direct observation.

A simple method and accessible to anyone to check the level (to what level you have "dived" into the gas mixture) is to use a lighted match, which will go out when it touches the interface between the air and the accumulation.

The constructive structure and plan component of the rooms is specific to the respective therapeutic factor - therapeutic gases, such a structure can be set up in isolation as a stand-alone pavilion or be included in a complex treatment base.

The capacity of a mofetarium is a maximum of 30 - 50 people simultaneously, considering that the duration of a procedure is 20-25 - 30 minutes and that it is not followed by another associated procedure.

The ventilation of the spa spaces is achieved in a combination of two ways: open surfaces equipped with adjustable blinds and absorption holes with air intakes at the floor level, respectively at the gas level in the muffetarium.

In order to favor natural ventilation, the development of a thick blanket of vegetation must not be allowed in the spaces in the vicinity of the shacks.

The lighting of the storage rooms is carried out with fluorescent, watertight lighting fixtures, with actuation from the dispatch point. The heating of the spa spaces inside the spas is done by electric radiants, the rest of the spaces being heated by regular central systems.

In the case of heating the kitchens with stoves, the fireplaces must be handled from the outside, ensuring the air intake.

Among the natural gases, carbon dioxide (CO_2) has been recognized as useful and used since Antiquity for its therapeutic effects. The property of carbonic acid to produce vasodilatation quickly, intensely and throughout the arterial vasculature makes it a valuable "medicine" for those with poor arterial circulation.

CO_2 emissions (mofettes) are found around volcanic mountains, often associated with mineral and carbonated water springs (wet mofettes).

The gas has no color, smell, or taste and is felt only by the body, through its vasodilatory effect. The skin reddens, there is a feeling of pleasant warmth, but carbonic acid poisoning can also set in quite quickly, manifested by headaches, dizziness, nausea.

Natural mofettes can be found in Covasna, Băile Tuşnad, Borsec, Buziaş, Vatra Dornei, Balvanyos, Balnaş, Harghita Băi, Sângeorz-Băi, Slănic Moldova.

5.3. Therapeutic indications of mofettes. Contraindications

Indication of mofettes: arterial hypertension, chronic peripheral circulatory disorders (arteritis, endarteritis, sequelae after thrombophlebitis, varicose veins, varicose ulcers, atonic wounds). They are beneficial in diabetic microangiopathy, neuralgia, neuritis, multiple sclerosis, paralysis, neurosis, chronic rheumatic diseases, hypothyroidism.

Cardiovascular diseases:

Arteriopathy:

• chronic obliterating arteriopathy of the lower limbs in stage I, II and III. Those with a clear surgical indication are excluded

• Bűrger trombangitis

Chronic ischemic heart disease:

sequelae after myocardial infarction at least 6 months after the acute episode, without rhythm disturbances, without unstable angina, hemodynamically balanced

stable angina pectoris, exertional angina (under medical treatment)

Arterial hypertension stage 1 and 2 - under medical control without associated diseases that would contraindicate treatment with natural factors

Venous diseases: sequelae after superficial or deep thrombophlebitis, at least 6 months after the acute episode

• Valvulopathies: rheumatic valvulopathies without clinical hemodynamic disorders, operated valvulopathies without clinical and hemodynamic disorders after 3-6 months after the operation, with the opinion of the cardiologist

Neurological conditions

- sequelae after cerebrovascular accidents in neurologically and cardiovascularly balanced patients

- diseases of the peripheral nervous system: radiculopathy, polyneuritis, post-traumatic sequelae of the peripheral nerves

Rheumatic conditions:

- articular and abarticular diseases of degenerative type arthrosis, chronic stage
- chronic degenerative diseases of the spine - spondylosis
- chronic inflammatory joint diseases, with normal biological samples
- rheumatism of outbreak (after clearing the outbreak)
- osteoporosis

Other conditions: endocrine diseases, generally hypofunctional, nutritional diseases: compensated diabetes, obesity, gout, dermatological conditions (psoriasis, chronic eczema)

Mofettes have long been used in the treatment of several conditions: diseases of the arterial system, heart and cardiovascular diseases, high blood pressure, various types of rheumatic diseases, certain chronic gynecological diseases, infertility and impotence problems. CO2 gas has a dilating effect on peripheral blood vessels, thus increasing blood circulation in muscles and connective tissues.

In addition to the beneficial effect of CO2, the effect of radon on the patient's health should also be considered. It has been shown that radon therapy at low level radiation can have a positive effect on health, induce or activate DNA repair functions, immune responses.

Previous studies conducted in Covasna models indicate that the exposure due to radon is lower than the recommended values and that these values do not represent a health problem for patients.

In these studies, a monitoring is indicated to measure the radon levels in some mofettes in Covasna county, but also to determine the doses received by the patients (during a treatment).

Studies say that through these vasodilatory effects, blood pressure decreases, heart activity improves, peripheral and systemic circulation increases, exercise capacity and quality of life are improved, and the ability to concentrate increases.

Contraindications of mofetic treatment:

Mofette is contraindicated in neoplastic diseases, advanced atherosclerosis, decompensated heart failure, pulmonary tuberculosis.

- general contraindications: acute febrile conditions, infectious diseases, venereal diseases in the contagious stage, carriers of pathogenic germs, cachectic states, malignant or benign tumors with known malignancy potential, hemorrhages of any kind, pregnancy, epilepsy, systemic diseases, psychopaths manifest chronic diseases, dermatological diseases with the potential for contagion, manifest cardiac, renal or hepatic failure.

- specific contraindications: myocardial infarction with severe evolution in the acute phase, ischemic heart diseases with frequent crises, painless heart diseases with major rhythm or conduction disorders, valvulopathies with heart failure phenomena or recent thrombotic accidents, arterial hypertension in stage 3 or HTN with complications, cerebral atherosclerosis with mental and behavioral disorders, cerebral thrombotic accidents with important neurological sequelae.

Spa valorization of the mofette. Spas recommended for mofetotherapy

Covasna Spa Resort

The town of Covasna, known as the "City of 1000 Springs", has traditional public mofettes, such as the Bardócz, Bene and Banu mofettes. It is home to one of the largest mofettes in the world

One of the largest natural mofettes in the region is Peştera Puturosu from Báile Bálványos, from where more than 3000 cubic meters of sulphurous gas are released daily into the atmosphere, hence the name "puturosu".

Covasna is first and foremost a balneo-climatic resort with a variety of mineral water sources, numerous mofettes (CO_2 emissions) and a picturesque natural setting, ideal for a relaxing and restorative stay.

Located in the center of the country, one hour away from Brasov and 3.5 hours from Bucharest, this spa resort is very accessible, being quite easy to get here from Moldova, Muntenia and, obviously, Transylvania.

In the resort of Covasna, there are many mofettes in the treatment centers of the hotels, as well as two traditional mofettes - Bardócz and Bene - located in the center of the town, where the carbon dioxide content can reach a concentration of 98%. The higher the concentration of carbon dioxide, the more effective the mofette treatment (mofetotherapy) is in treating various ailments, but also in increasing sports performance.

Among the spa resorts in Romania, but also in Europe, Covasna is part of the resorts with a unique character, due to its wealth of natural resources that are used in the prevention and treatment of diseases of the cardiovascular system. Mineral water springs are used in balneotherapy, along with mofetotherapy, being considered an excellent remedy for health.

Mofetotherapy has a refreshing effect, it can also be beneficial in increasing sports and even sexual performance, but currently there are no clinical studies in this regard.



Figura 5.1. Mofetă Covasna

Mofeta of the Covasna Cardiology Hospital

The Cardiology Hospital in Covasna is a unique hospital in the country for its cardiology and cardiovascular recovery profile, serving the entire country.

In 2010, the 50th anniversary of the establishment of the institution was celebrated, since then the hospital bears the name of Dr. Benedek Géza, the founder of the institution and for 26 years its director, with essential, determining contributions in the development of the hospital.

The largest mofette in Covasna and one of the largest in the world is the one at the Cardiology Hospital, which occupies an area of 100 square meters and can serve up to 100 people at the same time.

The mofette hospital is recognized as one of the most frequented in the world because here, at the hospital, up to 500 treatment procedures are performed daily.

"The Covasna Method"

Covasna is the ideal destination for those interested in treating cardiovascular, digestive, metabolic, neuropsychiatric, rheumatic or gynecological diseases.

The method works by eliminating the main risk factors in various conditions, with a role in reducing blood pressure, blood lipid levels and body weight, smoking cessation. This treatment is not indicated in the case of infectious diseases, malignant tumors, cardiac decompensation, heart rhythm disorders.

This method combines drug treatment, in the case of cardiovascular diseases, with the specific elements of the city of Covasna (mofettes, mineral water cure, specific air) and was developed by Dr. Benedek Géza, the former director of the Cardiology Hospital in the locality. Through this method, an orderly lifestyle, a healthy diet and daily exercise are the basis of treating cardiovascular diseases

Indications for treatment in the spa resort of Covasna

Cardiovascular diseases: painful and painless chronic ischemic heart disease, sequelae after myocardial infarction, at least 3 months after hospital discharge, compensated mitral and aortic insufficiency, valvulopathies operated at least 6 months after surgery

Diseases of the digestive tract: chronic hyperacid gastritis, gastroduodenal ulcer, biliary dyskinesia, chronic lithiasis and non-lithiasis cholecystitis, conditions after liver surgery, chronic pancreatitis

Metabolic disorders: compensated diabetes

Diseases of the neuropsychic system: neuroses

Rheumatic conditions: chronic degenerative and inflammatory rheumatism in chronic stages

Gynecological conditions: chronic metronexitis

Contraindications to treatment in the spa resort of Covasna

Diseases in the acute stage, infectious diseases, venereal diseases, malignant tumors (cancer of any type), some heart rhythm disorders, advanced cardiac decompensation.

The spa treatments at Covasna have exceptional results in the recovery of cardiovascular diseases.

The seat of the county with the same name is a tourist resort of national interest, launched on the international market, recognized as the "heart" resort or the "City of 1,000 springs".



Figura 5.2. Mofeta Covasna

The quality of the useful mineral resources available to Covasna is unique, both in Romania and in the rest of Europe, and they have been the subject of complex studies and research, benefiting from a modern investigation methodology with radioactive isotopes.

Also, the air in Covasna is loaded with resinous aerosols and negative ions, beneficial to health.

The mineral waters in the resort have a very varied physico-chemical composition: carbonated, bicarbonated, chloride-sodium, iodized, ferruginous and slightly sulphurous, with a total mineralization of 3.2-22.4 g/l.

Baths with carbonated mineral waters and mofettes represent a very good therapeutic factor in the treatment of high blood pressure. The vasodilator effect that ensures the reduction of blood pressure is beneficial, both for the heart and for the peripheral circulation. The mofettes have come to be called "health laboratories", and together with carbonated mineral waters they offer uniqueness to the offer.

The indications of the mofette from Covasna

Mofeta de la Covasna is indicated in the treatment of cardiovascular diseases, namely chronic peripheral vascular diseases, stable hypertension, chronic ischemic heart disease as well as in the treatment of chronic locomotor system diseases, in chronic rheumatic diseases.

Mofette treatment can only be done on a doctor's recommendation and the duration of a session is 20 minutes. To have a lasting effect, 10 to even 28 days of treatment are needed.

Contraindications of the mofette from Covasna

This procedure is prohibited for people suffering from ischemic heart disease, with heart rhythm disorders, or those who have suffered a recent myocardial infarction. Also, the mofette is contraindicated in II and III degree hypertension, in heart failure, in cerebral atherosclerosis.

The gas bath also has beneficial effects on potency, being recognized as a very good natural aphrodisiac as it boosts sexual potency in men through the process of vasodilation. It is known that many famous writers and painters came for the gas baths because they gave them real bursts of inspiration.

Băile Tușnad Balneoclimate Resort

The Băile Tușnad spa resort is also called the "Pearl of Transylvania", it is located in the southern part of the Ciuc Depression, at an altitude of 650 m, between the Harghita and Bodoc Mountains, in a beautiful Olt gorge. The average annual temperature is 8°C (July 17.5°C, January -7°C), with cold winters and low cloudiness.

Mineral water springs with curative effects in the Băile Tușnad resort area have been mentioned since the 18th century. The resort was destroyed during the revolution of 1849, later being rebuilt, so that in 1861 it was known as Băile Tușnad, and in 1968, by the Decision of the Council of Ministers, Băile Tușnad became a city.

The mofeta from Băile Tușnad is technically arranged in a square shape, with a number of steps, which allows a comfortable position of the patient during the treatment. The carbon dioxide level should be in the lower part of the body.

Carbon dioxide used for therapeutic purposes, through its absorption at the integumentary level, brings special benefits to blood circulation through peripheral and systemic vasodilatation. By tradition, here too, the gas level is set with the match, where it goes out is considered as the place where the carbon dioxide level rises.

The main indication of mofettes: secondary prophylaxis and recovery in cardiovascular diseases, chronic rheumatic conditions.



Figura 5.3. Mofeta Băile Tușnad

Some authors believe that carbon dioxide (CO2) baths can be an effective therapeutic method for the recovery of coronary heart disease, myocardial infarction, stroke, for the treatment of chronic venous insufficiency, inflammatory diseases. functional (Irie et al., 2005, Toriyama et al., 2002).

The therapeutic effects of carbonated mineral baths are based on the action of carbon dioxide and less on the pharmacodynamic action of the mineral salts in the composition of the mineral water.

In a full bath, between 10 and over 80 ml/min/m² of CO2 are absorbed through the skin surface, on average 30ml/min/m² of CO2 (equivalent to 1.8-4.5 l/h), depending on the concentration , measurement method and temperature. CO2 is absorbed by the body 100 times more strongly than water (Pratzel, 1984).

A wide variety of indications for carbonated mineral water baths are mentioned in the literature, while clear evidence from controlled trials exists only for a minority of them, mainly for chronic circulatory disorders based on atherosclerotic diseases such as peripheral arterial disease occlusive disease, trophic ulcers, microangiopathies of various origins, and mild hypertension (Resch KL, Just U., 1994).

According to clinical observations, the effects of CO2 baths on human subjects are:

- bradycardia;

-slight changes in blood pressure;

-increasing the temperature of the exposed skin

A study of the molecular mechanism showed that CO2-induced vasodilation in peripheral blood vessels is related to a decrease in oxygen-hemoglobin concentrations, an increase in the partial pressure of oxygen, and a decrease in peripheral tissue pH.

The absorption of carbon dioxide at the integument level brings with it a series of benefits for blood circulation, stimulating peripheral and systemic vasodilatation. Due to these special therapeutic properties, mofettes become one of the most effective remedies for the heart.

Worldwide, stroke is one of the leading causes of morbidity and mortality, as it annually "kills" five million people and causes severe disabilities in approximately the same number of patients.

Prospective studies show that this condition is increasing year by year, both in incidence and prevalence, with World Health Organization experts estimating that strokes will become the main cause of mortality by 2030.

In 2013, according to a statistic of the American Heart Association, Romania ranked third in the world for women and fourth for men in terms of cardiovascular mortality.

Rehabilitation in cardiovascular conditions (myocardial infarction, chronic peripheral arterial and venous pathology, post-surgery for heart disease) should consist of a combination of health-related measures, starting with physical exercise and ending with stress reduction .

The goal of cardiac rehabilitation is to help patients regain their previous fitness, prevent subsequent strokes, and increase the quality of life and the chance of survival for patients.

The beneficial effects of mofettes and carbonated mineral waters in the treatment of cardiovascular diseases is recognized by clinical observations, but further clinical studies are needed.

In changing the lifestyle of patients with cardiovascular diseases, an important role is played by balneoclimatic resorts with a cardiovascular profile: Covasna, Băile Tușnad, Buziaș, Vatra Dornei.

Here, natural therapeutic factors are used in spa treatments, i.e. carbonated mineral waters, mofettes, climate, along with diet therapy, physical exercise training, electroanalgesia, rhythmicity of sleep and eating, elimination or reduction of excess food, tobacco consumption.

The effects of physical training can be multiple:

• increasing work tolerance - effort tolerance being the main measure for assessing a patient's work capacity

• increasing resistance to effort and stress

• adaptation of the cardiovascular system to effort

• increased tolerance to hypoxia and hypercapnia

Mofettes have an important role in the recovery from cardiovascular diseases or as a preventive measure in the case of patients predisposed to develop arterial hypertension, in those with cardiovascular diseases with limited functional reserves, or with chronic obliterating arteriopathy.

7. Aerosol therapy - application technique, indications, contraindications.

Climatotherapy means "climate therapy". In other words, certain climatic regions or zones are indicated for certain disease states, which have become climatic resorts over time, through the care and diligence of man. Air, an indispensable element of life, has become polluted and sometimes unbreathable for the inhabitants of big cities. Clean air has become a rarity that must be sought far away, in the hills and mountains. An effort full of health benefits. Under the phrase "clean air" hides, however, a multitude of types of air, each with its therapeutic effects.

Air rich in oxygen

We find it in extensive fir, oak, acacia or beech forests, especially in August, when the foliage is mature, and the activity of these huge oxygen generators that are the trees is at its maximum. The air in the forest is most oxygenated in the afternoon, between 2 and 7 p.m., when brisk walking, jogging or physical exercises are recommended. Air rich in oxygen significantly increases physical strength, intensifies brain activity, increases the body's natural defense capacity. A 12-day cure with strongly oxygenated forest air helps to cure some chronic diseases, such as: respiratory infections, headache, migraine, indigestion, anemia, being an excellent adjuvant even against tumoral, benign or malignant conditions. Also, the oxygen-rich air strengthens immunity and makes us more resistant to infections (regardless of location), eliminates depression and asthenia, making the mind clear and clear.

The air is rich in carbon dioxide

In the evening, the trees of the forest stop their photosynthesis and, starting at 10 p.m., they become big consumers of oxygen, emanating, instead, carbon dioxide into the atmosphere. The effects of this fact on the human body are very interesting: the lungs tend to expand more, in order to take over the necessary oxygen, breathing becomes wider and more regular, becoming a spontaneous respiratory exercise. A walk or some deep breathing exercises, done in this air somewhat poorer in oxygen, will be an excellent means of re-educating it, considering that most of us breathe quickly and shallowly. Then, a slightly higher content of carbon dioxide in the air will cause a state of relaxation, even drowsiness, extremely pleasant for those who suffer from insomnia or who do not have enough restful sleep. The night air in the forest is, therefore, an excellent sedative and a gentle mental tranquilizer, useful for overworked people, exposed to a high level of mental stress, who suffer from mild neuroses, who frequently face states of irritation or anger.

Thin air

We find it on the plateaus and on the ridges of some mountainous massifs, such as those in Bucegi, Ceahlău, Făgăraș, Retezat, Piatra Craiului, etc. It is a powerful stimulant of the body. This high-altitude air increases heart and respiratory rate, increases blood pressure, and intensifies metabolism. It is an excellent remedy for hypotensive people, who suffer from mental or physical asthenia, as well as for those who are sedentary, provided they do not suffer from hypertension or chronic heart conditions. Also, the rarefied air from the mountain plateaus is an excellent remedy for losing weight, because it accelerates the metabolism and has a slight appetite-reducing effect. Its beneficial effects in the treatment of anemia are also worth mentioning.

The strongly negatively ionized air can be found in the upper area of the mountain slopes covered with forests, near the waterfalls and the cataracts formed on the rivers and mountain streams.

What are negative ions? They are oxygen molecules in the air, which have acquired a negative electrical charge. Several factors contribute to their natural production: ultraviolet radiation (very strong in the mountain area), rain and water falls, photosynthesis, cold winds that pass through the thickets of coniferous forests. The life of these ions is very short, only one minute, and they have been nicknamed the vitamins of the air, because they stimulate and harmonize most of the vital processes, but also those in the psychic and mental sphere. In the presence of these ions, the immune system is extremely active, assimilation regulates itself, blood circulation intensifies, while regeneration processes are stimulated. On the high mountain ridges, especially where there are fir forests, near the waterfalls and cataracts made by the mountain streams, the concentration of negative ions increases up to 4000/cubic centimeter, while in the University Square of Bucharest, their concentration is only 100/cubic centimeter. In the presence of negative ions, we tend to be in a good mood, more attentive, more vigilant, with an intense mental creativity. On the contrary, in the presence of positive ions (whose concentration is high in plain areas without vegetation and in mountain depressions), the power of concentration decreases, headaches, drowsiness appear.

Exposing the skin to negative ionized air is an extremely effective treatment against infectious eczema, against psoriasis, for the rapid healing of burns and various wounds. Inhaled daily for 1-2 hours, in courses of at least one week, the negative ionized air has a considerable effect against migraines, hypothyroidism, peripheral circulation disorders, for recovery after accidents and traumas, for treating depression, asthenia.

Forest aerosols

Perhaps you have ever noticed, on warm summer days, that emanation, that steam rising from the fir, pine or spruce forests. Those translucent vapors are actually aerosols that are released in impressive quantities into the atmosphere. Aerosols are small particles of volatile substances or pollen, surrounded by a thin film of water, particles that, reaching the lungs and the bronchial tree, quickly cross the superficial layers and penetrate a few centimeters deep. They are a real elixir for those who are very sensitive to colds and who during the cold season have permanent respiratory problems. Aerosols from the mountain area also have calming, invigorating effects, having an extremely beneficial action on stressed, intellectually overworked, tired people. Among the ailments, aerosols are extremely effective in treating bronchial asthma, chronic infectious bronchitis, recurrent pneumonia and tuberculosis, rhinitis, sinusitis, tonsillitis.

Marine aerosols

They occur near rocky cliffs and piers, where sea waves break, producing fine sprays of water. These tiny drops are rich in sea salt, as well as in various substances with therapeutic effects secreted by seaweed and certain species of shells. What are the indications of marine aerosols? First of all, respiratory diseases: infectious bronchitis, sinusitis, rhinitis, bronchial asthma. An exceptional quality of sea aerosols is that they reduce allergic sensitivity, which is why they are recommended for respiratory ailments that occur due to allergies. Other indications of marine aerosols are hypothyroidism, nervous asthenia, conditions with an allergic substrate.

The air specific to the sedative climate

We find it in high plains, hills and premontane areas, where there are extensive forests and where the degree of pollution is low. Its therapeutic properties are truly exceptional, acting in a regulatory sense, especially on the nervous system, the cardiovascular system and the psyche. Among its indications we mention: cardiac ischemia, cardiac arrhythmia and arterial hypertension; hyperthyroidism and related phenomena; physical and intellectual overwork; hypoacid gastritis, gastric ulcer, fermentation colitis; states of nervousness, anxiety, panic attacks, neuroses; insomnia or too little restful sleep.

8. Speleotherapy: definition, indications and contraindications

The salt air

It is formed in the underground where the salt deposits were exploited and where huge galleries remain, which are then arranged for therapeutic purposes. It is quite cold air (14-150C), which keeps its constant temperature, regardless of whether it is night or day, summer or winter. This air works wonders in treating respiratory diseases, especially bronchial asthma, tracheobronchitis, chronic and recurrent bronchitis, sinusitis and rhinitis. The physical effort made in this air strengthens the immunity (especially the respiratory system), favors the regulation of body weight, gives a state of vivacity and mental tone.

Specially arranged salt pans for therapeutic purposes can be found in Târgul Ocna, Cacica, Praid, Slanic Prahova (the largest salt pan in Europe). Climatotherapy is a form of treatment which, when well managed, presents fewer side effects than chemo-therapeutic treatment and has prolonged effects, given that the treatment method is as close as possible to a normal activity, in a relaxing environment. H. Vogt (1940) wrote: "the therapeutic climate is characterized by a very good mixture of ordinary environmental factors, aided by a pronounced lack of unfavorable weather conditions".

The climate cure methodology includes several mandatory or non-mandatory stages, and with different durations, according to the type of disease and the proposed goal:

- rest cure (in bed);
- fresh air, at first in the room, with the windows open, then on the balcony, terrace, outdoors;
- the actual air bath, usually an introduction to the other natural procedures; light bath, by exposure to the action of indirect solar radiation;
- the sun bath, to which hydro baths can be added

Aerotherapy. Field cure. Aeration index

The air bath is performed by partially or totally exposing the body, progressively, to the action of air (eliminating the influence of direct radiation).

Climate therapy techniques are different depending on the patient:

- relaxing sedatives, prudent for neurotonic, excitable patients, with pain, with heart or kidney failure, debilitated etc. and
- incentives for all those with slowed down, deviated organic reactions, for the desensitization of urban maladapted children, etc., through contrasting climatic demands.

They take place according to the local and general climatic conditions.

The air cure acts on thermal regulation, improves blood circulation in the skin, acts on nutrition. It can be active or passive, day or night, accompanied by various graded activities, under supervision, gymnastics, sports, with the preparation of medical records. This category also includes the field course, with various degrees of difficulty.

Aerotherapy is also a good prophylactic treatment, apart from the curative one, as well as for recovery. The geographical, relief and vegetation conditions must be taken into consideration, along with the climatic ones, to establish the stimulating, exciting or sedative character of the bioclimate.

For outlining medical indications related to weather characteristics, the analysis of weather types (of weather classes) according to Feodorov-Ciubukov is very useful.

Air pollution has a negative impact on human health and ecosystems. In the last decade, due to the therapeutic effect of the microclimatic factors in salt pans and caves, Speleotherapy is used for prophylaxis, therapy and recovery mainly of patients with bronchial asthma, chronic bronchitis, but also sinusitis, allergic dermatitis, psoriasis. The effectiveness of Speleotherapy for convalescents with burns is certain. Experimentally, Speleotherapy has also proven useful in the therapy of wounds, including infected and inflamed ones.

Salt pans are defined as excavations carried out for the purpose of exploiting salt masses, having various forms of galleries, alveoli and the like, delimited by walls and ceilings, connected to each other by shafts for vertical circulation or through ramp galleries for horizontal circulation to the actual mine. The curative properties of therapeutic salts are evaluated by a series of criteria such as thermo-hydro-baric indicators (pressure, humidity, air currents), physical air quality indicators: aeroionization, concentration of aerosol particles, radioactivity, chemical: content in gases: CO2, H2S, N2, O2, SO2, contained in chemical elements: Na, Cl, K, Ca, etc., microbiological: aeromicrogreens, fungi.

Speleotherapy is recognized as a method of complementary therapy for patients with bronchial asthma and other respiratory conditions, in the underground environment of some salt pans and caves possessing natural therapeutic factors.

The main parameters that contribute to the creation of a sanogenic environment in salt pans are:

a) constant microclimate - relatively comfortable temperature and humidity, lack of air currents, low level of lung and skin stress, slight hyperbarism;

b) moderate, slightly positive air ionization;

c) absent allergens and polluting agents;

d) microbiologically pure air;

e) increased amounts of sodium, potassium, calcium and magnesium aerosols.

The main therapeutic indication of therapeutic salts is represented by respiratory diseases, especially bronchial asthma.

Calcareous caves can be used for therapeutic purposes due to the presence of calcium aerosols.

The treatment spaces in the salines are included in the structure of the outdoor balneo-sanatorium units that ensure the reception of patients, food and some associated treatments. The accommodation capacity of the balneo-sanatorium units is also determined according to the capacity of the spaces organized underground.

The location of balneo-sanatorium units outside is usually established in areas as close as possible to the salt pans, the location can also be at a distance if the access roads and means of circulation necessary for the transport of patients are provided.

Both patients from balneo-sanatorium units and patients who are recommended for outpatient treatment can access the treatment spaces in the salines.

The spaces for cleaning facilities and others like them must be designed according to the existing underground situations, with the following ways of sharing:

a) layouts in large spaces that require different boundaries through constructive elements designed as such;

b) arrangements in alveoli and small galleries that require small structuring and finishing works.

The installations, annexes and equipment are similar in both types of spaces:

a) in the case of salt rooms with large spaces, the constructions intended for patient rest, serving meals, intellectual games and small entertainments, as well as medical offices are set up in

the form of rooms built from heat-insulating panels and equipped with lighting, heating and ventilation installations;

b) in the case of salt pans with alveolar spaces and galleries of low height, the partitions must be made only for insulation in thermal and acoustic comfort, especially in the places where the current activities of salt exploitation are continued;

The activity of sharing the therapeutic areas in the salt pans must take into account sectorization measures of separate spaces for adults and children. In the treatment spaces organized in salines, the following categories of functional flow are distinguished:

a) access circuit to the salt pan, ensured by circulation in the vertical direction via the elevator or, as the case may be, on the inclined ramp;

b) patient circuit;

c) the circuit of the medical staff and for services, ensured by the access ways of the patients, having a prior route on the surface through changing rooms with sanitary groups;

d) material circuit.

The principles of design and organization of treatment spaces in salines:

a) establishing functional links with the balneo-sanatorium units on the surface;

b) compliance with a specific program corresponding to the functions of the respective spaces;

c) stay in a rest environment: active rest, entertainment, meal service, small bar, buffet, day and night sleep;

d) stay in conditions of movement, underground walks, practice of sports games and general gymnastics exercises, control / supervision / medical guidance.

The component elements of the treatment spaces in the salines are the following:

a) rooms, spaces and services for the reception, access, distribution and circulation of patients - waiting and rest rooms, small buffets with therapeutic mineral water, dispatch, first aid points, sanitary groups;

b) rooms and work spaces for carrying out treatment procedures, control and medical guidance;

c) spaces and facilities auxiliary to the treatment in the salines - sports fields, minigolf, tennis, popice, fun shooting and the like;

d) rooms for technical and administrative-household activities - workshops, material warehouses and the like, as well as for specialized staff and services.

In Europe, over 50 salt mines or caves are known, inside which pelotherapy is practiced. A significant place is occupied by salt mines and karst caves with different parameters: Wieliczka-Poland, Solotvino/Slatina-Ukraine, Bad Bleiberg-Austria, Klutert Hohle-Germany, Zlate Hory and Cisarska Cave-Czech Republic, Bystrianska Jaskyna-Slovakia, Mine "Unirea" Salina Slănic Prahova-Romania, Tapolca Seehohle-Hungary, Park Skocjanske jame-Slovenija, Salt Mine "Avan" - Armenia.

The "Unirea" mine - Salina Slănic Prahova benefits from the following components of the underground environment:

- Lack of vegetable allergens and irritating inhalation noxes.
- The extremely low concentration of microorganisms in the environment under saline soil, the rarity of conditional-pathogenic germs and the absence of pathogenic ones – the presence of an aseptic environment analogous to the operating room.
- Constant air temperature (11.6 -12.8 C°), the air being cool.
- Relative air humidity 50-60%.
- Reduced air current speed: from 0.1 m/s - to non-dosable, resulting in a comfortable climate.
- Low radioactivity, at the limit of detection.

• Atmospheric pressure 18 mmHg higher than at the surface.
• The concentration of natural saline aerosol - significant (80-85%) of particles <3 μm in size.
• The salt pan functions as a FARADAY cavity in which atmospheric changes are retained by the salt layer - favorable effect for broncho-obstructive syndrome.

In Romania, in the mines of Turda, Praid, Cacica or Ocna Mureș, real underground cities of salt have been set up that annually receive thousands of patients who benefit from the clean and lively effects of saline aerosols.

The therapeutic agent of the saline microclimate is mainly represented by sodium chloride aerosols along with the temperature and relative humidity of the air, but also by

• high degree of air purity (sterility, relatively high air humidity (vapor content),
• mixed vapor condensation content, constant air temperature,
• low air flow,
• high carbon dioxide content in the air,
• high negative ionization (large number of micro-ions).

The speleo-climatic treatment is a complex one, with a wide range of environmental factors that affect the patient's body:

• physical factors: temperature, humidity, pressure, air flow (microclimate), radioactivity, aerosol, air ionization;
• biological factors: temporary elimination of allergens and a good chemical composition of the air;
• psychological factors: isolation from the aggressive environment (noise, vibrations, electromagnetic field) and the uniqueness of the situation – the experience.

Indications: Bronchial asthma, Chronic bronchitis, Allergic diseases of the upper respiratory tract

Contraindications: Active pulmonary tuberculosis, Chronic decompensated lung disease, Heart failure, Lung neoplasm, Infections, Fever, Chronic inflammatory diseases.

Halotherapy is a modern method of treatment based on the artificial creation of saline microclimate conditions. Currently, the practice of halotherapy is legally regulated internationally and several types of halochambers are patented as medical devices.

Halotherapy influences the symptoms of the respiratory system by improving the act of breathing and the patient's feeling of release as a result of reducing sinus edema by:

- • unblocking the nose,
- • decrease in inflammation at the level of the mucous membrane of the nasal cavities and sinuses;
- • efficient drainage of existing nasal secretions, by fluidizing the mucus that is thus eliminated more easily;
- • increasing cough productivity and pulmonary clearance,
- • reduction of infectious pus of the respiratory system due to the bacteriostatic effect
- • increasing the local defense against infections through the bactericidal capacity of salt due to the stimulation of the immune system;
- • decrease in the number of acute episodes,
- • thus decreasing the risk of chronicity in those predisposed to develop sinusitis.

9. Thalassotherapy - definition, indications and contraindications

The term thalassotherapy comes from the Greek word thálassa (θάλασσα) meaning sea or ocean and encompasses many seawater based treatments in relaxing and invigorating therapies such as hydro baths, jet sprays and general or partial body wraps.

The healing qualities of sea water and marine climate have been used for therapeutic purposes since Roman times; currently, thalassotherapy is seen as a true aid to health. In addition to restoring strength, self-care and stress reduction, thalassotherapy helps to find a state of harmony between body and spirit, as well as to solve specific problems such as: muscle tone, sleep disorders, blood circulation, arthritis, menopause or respiratory system disorders. Treatments based on marine remedies are quite common in Europe and are used in both wellness and medical tourism.



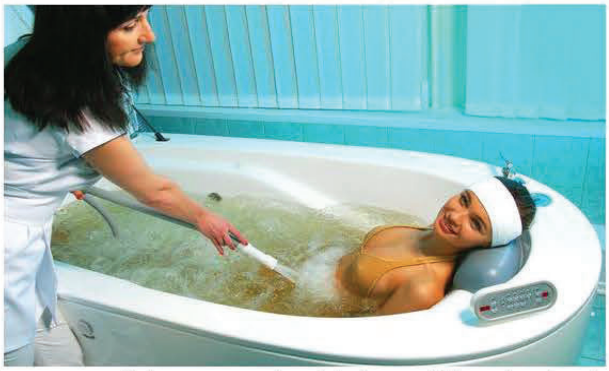
Thalassotherapy covers a wide spectrum, from the medical treatment of chronic diseases, such as respiratory or skin diseases, to the prophylaxis of healthy people. It is also a component of wellness programs. If you want to relax and pamper yourself, this is one of the best ways to do it. Thalassotherapy uses natural sea water, with all its benefits and nutrients for the skin, for revitalization and de-stressing.

Many treatments have received the label of thalassotherapy, although not all of them deserve this quality. Because of its recent success, the term has been usurped to denote so-called "spa" treatments. It would be best to limit use to seaside treatments that appeal to climatic factors, seawater bathing, wave impact, marine products (eg algal products), seawater medicines.

Thalassotherapy is the therapeutic application of the properties of the marine climate, sea water, marine mud, beach sand and seaweed. The main indications of thalassotherapy are degenerative rheumatism (arthrosis), chronic spinal pain, some gynecological disorders of functional origin (pelvis congestion, difficult and painful or irregular menstrual flow, painful intercourse), gingival disorders (irritation or congestion of the gums, boning (revelation of the root portion of a tooth following the retraction of the gingival tissue) or dermatological (psoriasis), states of physical or mental fatigue, convalescence, sequelae of trauma and surgery.

Thalassotherapy acts directly in the following cases: bone and joint pain, rheumatism, muscle contractions, sports injuries, skin diseases, respiratory diseases and acts indirectly in the following cases: states of stress and exhaustion, strengthening the immune system. In our country, sea water contains chlorine, sodium, magnesium and sulphur, in a proportion beneficial for the human body, trace elements (zinc, titanium, cobalt, iodine, chromium) and seaweed, which penetrate the tissues of the body and favor certain healing processes and various treatments.

This therapy is addressed, for the most part, to all people, from small children to the third age, with various pathologies. It greatly helps the development of children, stimulating the metabolism of calcium and the neuroendocrine system, having beneficial effects also in the case of children suffering from rickets.



According to the criteria of ESPA (European Association of SPAs), with the aim of providing a uniform European definition of the term thalassotherapy and to guarantee high quality standards, establishing the term as a brand name, thalassotherapy is defined as follows:

- The term thalassotherapy is used only if the following definitions and prerequisites are met and the following measures are offered or taken:
- Definition: Thalassotherapy is an integrated plan for therapy, prevention and health promotion. The plan will be implemented for defined indications within the medical care and with the participation of qualified expert personnel.
- Therapeutic location right next to the sea. Thalassotherapy should be performed in places where the maritime climate has an immediate effect.
- Sea water. The sea will be used for bathing in natural waters. Suitable seawater, which is drawn in locally, should be used for inhalation and/or bathing, for example in a bathtub or swimming pool.
- Marine products. It is possible to use mud or algae etc. for different applications.
- Low allergen and clean sea air. The quality of the air should ensure that prolonged stays in the open air will be a relief factor.
- Heliotherapy. Natural solar radiation will be used mainly for heliotherapy. In adverse weather conditions, artificial UV irradiation can supplement heliotherapy.
- Exposure to climate and movement therapy. Exposure to climate and movement therapy should be carried out in fixed regimes in the nearshore area.
- Associated health promotion measures. Associated health measures that emphasize relaxation, nutritional change, and exercise should be performed to improve overall fitness.

These criteria were drawn up by a working group of the Thalassotherapy Committee of the German Spa Association.

- Thalassotherapy offers a wide range of packages: mud and seawater baths, underwater showers, hydromassage, aromatherapy, specific inhalations and drinks, seaweed and mud wraps. All of these are there to help bring the body back to a proper state of calm.
- For a treatment to have an effect, it is important to follow the advice of qualified professionals, and the purpose of the standards developed by them is to ensure good quality services in thalassotherapy centers with treatments always supported by medical opinion.
- These international standards establish the requirements for the provision of services in thalassotherapy centers, using the beneficial effects of the marine environment, for curative or preventive purposes, with the objective of ensuring:
- • good quality services that meet the implicit and explicit needs of the client;
- • respecting the concept of thalassotherapy;
- • implementation of hygiene and security principles;
- • customer comfort.

The standards are complex and cover all aspects specific to thalassotherapy services and include requirements regarding:

• installations and equipment required in general service areas, technical areas, care areas and staff areas;

• installations and equipment for lighting and ventilation, heating and air conditioning, drinking water supply and waste sea water treatment;

• the qualifications and professional training of medical and paramedical, technical, administrative and other categories of personnel;

• care elements: sea water, seaweed and marine mud;

• hygiene systems, which start from the requirements regarding access to the thalassotherapy center and quality control of raw materials, to maintenance and cleanliness (cleaning and disinfection plan, monitoring, waste management, linen management, etc.);

• customer relations service, regarding information and complaints;

Thalassotherapy is an alternative, adjunctive, treatment method that uses sea water, marine mud, sand, marine climate, seaweed and, in certain conditions, even the sun. Thalassotherapy is ideal for those who love the sea, want to relax and, at the same time, do something for their health. However, a marine cure is not beneficial for everyone. Those who suffer from iodine allergy and hyperactivity of the thyroid gland should not make wraps with algae or take preparations based on algae. If there are diseases of the veins, hot water procedures are not recommended. Those who suffer from heart disease, tumors or kidney disease must completely abandon this type of therapy.

Indications and contraindications

The main indications of thalassotherapy are degenerative rheumatism (arthrosis), chronic spinal pain, some gynecological disorders of functional origin (pelvic congestion, difficult and painful or irregular menstrual flow, painful intercourse), gingival disorders (irritation or congestion of the gums, ossification - revealing the root portion of a tooth following retraction of the gingival or dermatological tissue (psoriasis), states of physical or mental fatigue, convalescents, sequelae of trauma and surgery.

Contraindications concern infectious diseases in the acute period, cardiovascular disorders, hyperthyroidism or iodine allergy, arterial hypertension, otorhinolaryngological diseases (otitis, sinusitis, laryngitis, etc.), cancers and some skin diseases.

The ideal duration of a thalassotherapy course is from 7 to 12 days, so that the body has time to assimilate the trace elements on the day of its arrival at the sea, the subject must undergo a medical visit that will establish any contraindications to the course and specify the nature , the pace and intensity of the procedures.

To get back in shape, four of the following are generally proposed: baths, hydromassages, showers, wraps with sea mud or algae, re-education in the pool, etc.; they are alternated in the morning and in the afternoon.

9.1. Thalassotherapy has effects at any age

In the third age, in particular, it is indicated in rheumatic pathologies:

- degenerative rheumatism
- arthritic disease
- Ankylosing spondylitis

– in states of convalescence after various diseases,

- in states of stress, physical fatigue, mental fatigue

– for skin diseases (pityriasis, psoriasis, dry eczema)

– in certain forms of asthma and other chronic respiratory diseases (rhinosinusitis, nasopharyngitis, bronchitis)

– for relaxation and revitalization of the body and in the prevention of other diseases.

Thalassotherapy techniques

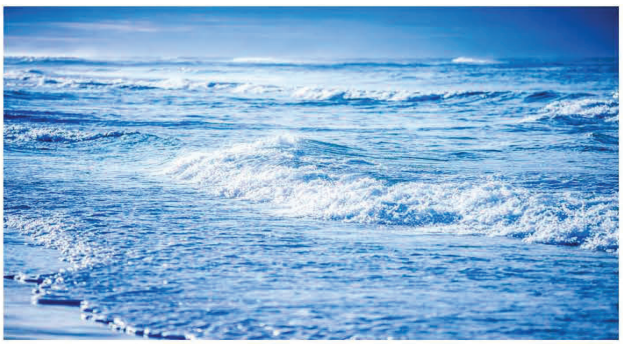
The procedures applied in a thalassotherapy center are similar to those practiced in thermal resorts.



- Marine algae are used in the form of powder or liquid extract, in baths or in local applications (wraps, for example).

- Marine muds are either mixed with seawater baths, or used in local applications (packaging) at a temperature of 35-35 degrees Celsius, kept constant with the help of an aluminum sheet or an irradiation with infrared radiation. The skin is previously well moistened and rubbed to soften the stratum corneum and to increase the body temperature.

- The marine climate (clean air, rich in iodine) are, depending on the country and region, calming or stimulating, even invigorating.



- The sea water must not be reconstituted, nor transported, nor must it have undergone a physical (radiation) or chemical treatment (addition of water). It is used at a temperature between 20 and 40 degrees Celsius, externally (showers, baths) or internally (oral or vaginal irrigation, aerosols, drinks, subcutaneous injections). The sea water bath, made individually, at a temperature of 34 degrees Celsius is the basic element of the cure.

Because of the density of water, the body is much lighter in salt water than in fresh water.

The feeling of weightlessness resulting from this makes mobilization and water gymnastics easier. With a duration of approximately 20 minutes, the bath must be followed by at least an equal period of rest. The shower under the water jet is done in the standing or sitting position. It is tonic if applied at a lower temperature - between 20 and 30 degrees Celsius - and with high pressure, sedative if applied at a higher temperature - from 36 to 38 degrees Celsius - and with low pressure, with a jet very wide (shower coat). The aspersion shower, or "horizontal shower", is done lying on the stomach or on the back. It can be combined with a manual massage.

- Sea sand is commonly used outdoors in the form of sand baths associated with sun baths (heliotherapy).

Thalassotherapy is also a way of detoxification and remineralization, the skin allowing microelements from the marine environment - especially calcium, magnesium, potassium and iodine ions - to penetrate and naturally rebalance the body structure, especially when the water temperature is warm. The transfer is all the more effective when the sea water has a temperature of over 23 - 25 degrees Celsius.

Therapeutic baths are only done when the temperature of the sea water is at least 18 degrees Celsius, and that of the air at least 20, provided that the day is sunny. To be effective, a free wave massage session must last at least 20 minutes and must be repeated for 5-7 days. Physiotherapists

even recommend "running" in waist-deep water, an exercise taken from complex medical recovery programs.

Other effects of thalassotherapy::



- It has a beneficial role in the prophylaxis of numerous diseases as well as in convalescence after various infectious diseases.
- It has obvious results in chronic inflammatory rheumatic diseases and especially in rheumatoid arthritis and ankylosing spondylitis,
- Favorably influences a series of chronic gynecological inflammatory diseases by normalizing pituitary function.

Attention: People with high blood pressure and those with heart failure will perform thalassotherapy only after consulting a specialist doctor.

We therefore note that Thalassotherapy means the application for therapeutic purposes of the properties of the marine climate, sea water, marine mud, sand from the sea coast and seaweed. Seawater is a salty water (about 35 grams of salt per liter) that hosts many living things, plants (phytoplankton) and animals (zooplankton).

There is always a risk when you think that thalassotherapy is a universal panacea, and often thalassotherapy centers do not mention contraindications. Thalassotherapy should not be considered for people allergic to iodine or suffering from infectious, evolutionary and contagious diseases, nor is it indicated in cases of dermatitis discharge; The same goes for people who suffer from incontinence, high blood pressure or have recently had a heart attack. Also on the list of contraindications are patients with inflammatory rheumatism, heart problems, decompensated kidney disorders or suffering from certain hyperthyroid conditions.

The effects of thalassotherapy treatments were recently reconfirmed in a study by Guillemin et al. (Guillemin, Constant and Boulange´, 1994).

Heart disease and lung conditions have also been listed as showing improvement after thalassotherapy treatment (Bogutskiy et al., 1977; Schuzeze, 1976).

Sea cures are indicated for children to cure the many diseases that affect them in their age group but, above all, to prevent rickets.

7.2. The components of thalassotherapy

Thalassotherapy is the application for therapeutic purposes of the properties of sea water, sun, mud and healing seaweed, associated with the action of the marine climate.

Looking at thalassotherapy, the Greek physician Hippocrates himself (460-377 BC) knew that a sea bath cure relieves rheumatism and sciatica. In the middle of the 18th century, the English doctor Richard Russel laid the foundations of marine therapy and, as a result, numerous maritime spa resorts were established. In the 19th century, the French doctor La Bonnadiere described in his doctoral work, the healing power of the sea. The notion of thalassotherapy is largely due to him (from the Greek "thalassa" = sea). Sea water, mud and algae contain numerous mineral substances and trace elements such as: potassium, magnesium and calcium, iodine, chromium, iron, zinc and

copper. Essential amino acids and vitamins are found in seaweed, therefore, they are used not only in wraps, compresses and baths, but also in the form of tea and nutritional supplements.

Tabel 7.1. Talaso-grila (Adapat după Illing 2018)

Natural Therapeutic Factors	Sun / Light	Air / Wind	Sand	Mud	Seawater	Salt
	All relevant weather conditions		More solid substances as part of the beach		Seawater and its ingredients	
Treatments	Sunbath	Airtherapy	Psamotherapy	Pelotherapy	Sea Bath	Salty air inhalation
	Heliotherapy	Salty air inhalation	Peeling	Peeling	Shower (jet shower)	Peeling
	Sport and other outdoor activities (gym)		Thermotherapy	Wrapping (pack)	Underwater massage	

The skin, not being waterproof, the microelements from the marine environment that attack it during thalassotherapy, especially calcium, magnesium, potassium, iodine ions, have every chance of penetrating the body's internal environments, especially when the water temperature is warm.

Due to these characteristics, the need arose for thalassotherapy to be practiced in a place other than the sea (ocean) and in a season other than summer. This is how the vogue for these thalassotherapy centers, better said neothalassotherapy, appeared and spread, centers where seawater is introduced into specially designed swimming pools, all year round, where it is heated beforehand.

Through sea water baths, underwater gymnastics, hydromassage techniques, algae baths, algae poultices, as well as various other therapeutic procedures, we aim for functional readaptation, especially of various deficiencies of the locomotor system. Centers of this kind appeared in Eforie and Mangalia.

The natural healing factors of the sea coast

On the Romanian coast of the Black Sea, with a length of 245 km, of which more than 50% is sandy beaches, the main form of treatment is thalassotherapy, which uses, along with sea water, all the other natural factors of the coast.

The climate of our coast is a transitional climate between the steppe and the marine climate. The influence of the sea basin mitigates the thermal contrasts of the air, the characteristics of the steppe, and favors air currents with a breeze character.

Although the duration of sunshine is longer (2300-2400 hours annually and around 350 hours in the warm months) the air temperature is lower compared to the plain, in the summer during the peak heating hours due to the influence of the sea breeze and higher in the winter for the same reason (average annual temperature 110C, average temperature in winter 00C, average temperature in July 20-210C.

The humidity is high around 80%. The amounts of precipitation are the lowest in the country – 400 mm. Atmospheric pressure has the highest values around 1015 mb.

The transport of cooler air from the sea during the day provides the coast with a particularly pleasant thermal regime, preventing caloric overload of the body. On the open beaches (Mamaia, Mangalia) the air circulation reaches 4-5 m/s, it is less on the closed ones (Eforie Nord and Eforie Sud).

The air bath cannot be omitted from the thalassotherapy complex. It can be applied as an independent procedure or as an introduction procedure or alternating with sunbathing. The air is of an accentuated purity, rich in salty aerosols, present especially in the vicinity of the piers, where the breaking waves spray the sea water.

The plants and the entire vegetation, as well as the proximity of the forest to Neptun contribute to the creation of special microclimate conditions, which can be used individually for therapeutic purposes.

Solar radiation is another natural factor used to the full on the coast. Sunbathing acts on the body both through caloric and ultraviolet radiation.

The intense brightness of the sun-bathed beaches also adds to the exciting effects of the other factors of the coast.

Indications for seaside treatment must first of all take into account the excitatory character, preferring patients with slower reactive mechanisms and with sufficient functional reserves so as not to exhaust the patient.

The sand of the coastal beaches is part of the therapeutic complex (psamotherapy). Beach sand is made up of fragments of current marine sediments, shell debris and rock fragments. The basic chemical components of sand are calcium carbonates and silicon dioxide, which give sand its calcareous or siliceous character, derived from dry rock fragments. At Eforie Nord and Mangalia, calcareous sand predominates, originating from the shells of marine animals. The origin and chemical composition of the sand is reflected in its appearance, grain size and capacity to hold or absorb water.

The finer siliceous sand more discreetly excites the mechanoreceptors of the skin it comes into contact with and has a great capacity to absorb sweat. Siliceous sand is more permeable to ultraviolet radiation than calcareous sand.

The moisture content of the vertical sand layer increases with the depth of the layer. If on the surface the humidity is only 2-3 g water ‰, at 30 cm depth it reaches 20-30 g water ‰.

Coarse-grained, less water-holding sand heats up in stronger sun, with beach-level sand temperatures reaching +440C at lunchtime.

- Psamotherapy is practiced on the beach, lying on the sand or covering the body or parts of the body with sand. On the Romanian coast, the level of the beach continues underwater slowly, without too much of a slope, thus ensuring favorable conditions for swimming in the sea, as well as for walking through the water, a procedure of great value for the treatment of circulatory and lymphatic diseases of the lower limbs.
- The movement, the rhythmic massage exerted by the crashing waves, the thermal contrasts between the air and the water that bathe the skin, as well as the "mantle" of salt that is deposited on the skin after the evaporation of the sea water, also have therapeutic value.
- Sea water is part of the therapeutic factors of the coast. Considered as a remnant of the Sarmatian and Pontic seas, the Black Sea has the character of a closed, tideless sea. On the Romanian coast, being shallow at the level of the beaches, it heats up quickly during the summer. For the same reason, the waves quickly increase in height towards the beach, representing a mechanical factor of great value in sea baths.
- From a chemical point of view, sea water has the character of a chlorinated, sulfated, sodium, magnesium, hypertonic solution. Like any enclosed sea, the mineralization of the water is influenced by the intake of fresh water and is not the same on the entire coast, having variations between 13 and 18 g/l.

- Sodium and magnesium chlorides predominate among the chemical components. Iodine and bromine are fixed by marine algae for their metabolic needs, and after their death they are returned to the sediments found on the seabed.
- Through its balance with atmospheric air, seawater contains dissolved oxygen, but only in the surface area. Below 150 m depth, oxygen is replaced by hydrogen sulfide, formed by the activity of anaerobic sulfobacteria. The absence of vertical currents in the water explains the approximate delimitation of these two areas.
- Seawater also contains carbon dioxide in dissolved form, but large reserves of carbon dioxide are found as the bicarbonate anion. As an expression of ionic interaction, the pH of seawater is 7.2 - 7.6. The redox index of sea water reaches 27.15 – 32.1.
- Sea baths are recommended according to a certain individualized methodology for each individual patient. Bathing in the water of Lake Techirghiol and mud wraps are procedures that complete the thalassotherapy complex.
- Mud therapy (pelotherapy) is a particularly valuable component on the Romanian coast, due to the exceptional qualities of the sapropelic mud from Lake Techirghiol. The mud is used in the form of cold anointments, warm mud baths and hot packs.
- In the Mangalia area, the presence of sulphurous thermal mineral waters completes the therapeutic arsenal of our coast.
- The effects of the heliomarine belt
- In the context of a healthy person, the heliomarine cure exerts some of the most beneficial effects, as follows:
- • Contributes to raising the mental tone by integrating the one that presents a special attraction for this existing natural environment and health represented by the sea and the climate that characterizes it.
- It helps to harden the body as well as to revitalize it through heliotherapy, sea baths, thalassotherapy, improving breathing by inhaling exceptionally pure air, combating sedentarism by means of walks, games and running on the beach and so on
- Influences the rebalancing of the body by connecting it to the primary modes of existence, as well as by temporarily detaching it from the stressful and artificial life environment represented by the city environment.
- It has a beneficial role, especially in the case of children, in the prevention of numerous diseases, which usually attack this age group.
- Contributes to the stimulation and stimulation of somatic growth, more precisely to the stimulation of height growth of children.

The same heliomarine cure exerts some of the most active effects in terms of improving or even curing various diseases, such as:

- chronic respiratory diseases (rhinopharyngitis, rhinosinusitis, chronic bronchitis, bronchial asthma), which they influence for the better especially through the inhalation of sea aerosols, then through the fluidization of bronchial secretions as well as the attenuation or suppression of bronchial spasms.
- In some blood diseases, especially in some anemias, by normalizing erythrocytes, as well as by stimulating the growth of hemoglobin, the oxygen-carrying blood pigment. Moderate cases of arterial hypertension benefit from the services of the heliomarine cure, by reducing the systolic flow, that is, the volume of blood that the heart pumps with each contraction.
- Benefit from the complex services of the heliomarine cure and mildly advanced atherosclerosis, on the way to normalizing blood lipids, lipids that in excess contribute to the

formation of this biological rust, represented by atheroma, a substance that, being deposited on the walls of the arteries, implicitly reduces the blood supply and that of oxygen, with everything that follows for the body from this reality.

- The heliomarine cure has major indications in chronic inflammatory rheumatic diseases and especially in chronic evolving polyarthritis, which mainly affects the small joints of the hands and feet, as well as the so-called ankylosing spondylitis, a disease characterized by the ankylosing of the spine as well as by its incubation progressive.
- It benefits from the same cure for extrapulmonary tuberculosis and especially osteoarticular, ganglionic and peritoneal tuberculosis, favoring the healing of wounds and fistulas, so common in these varieties of tuberculosis infestation, also favoring calcium metabolism and stimulating the neuroendocrine system.
- A series of orthopedic diseases (delays in the consolidation of fractures, muscle atrophy, joint pains, respectively their stiffness), benefit from the heliomarine cure and this by regulating the metabolism of calcium and phosphorus, as well as by regulating the neuroendocrine system, from where the regaining of the power of muscle contraction and regaining joint mobility.
- The heliomarine cure favorably influences a series of chronic inflammatory gynecological diseases by reducing painful phenomena, by decongesting the foci of inflammation, as well as by normalizing the pituitary function, hence the normalization of the internal secretion of the ovaries.
- The same cure also benefits a series of skin diseases, such as pityriasis, psoriasis and dry eczema, the cure leading to the disappearance of itching, the drying of blisters and the elimination of plaques, elements that characterize these diseases.

Contraindications.

The heliomarine cure also has a series of contraindications, the most important of which are:

- Tuberculosis in its evolutionary phases.
- Heart failure.
- Severe arterial hypertension.
- Renal failure as well as chronic nephritis.
- Diseases of the central nervous system as well as mental illnesses or neuroses.
- Certain endocrine diseases, such as hyperthyroidism.

7.4. Scientific research in thalassotherapy

Scientific research in thalassotherapy In spa medicine, both balneotherapy and thalassotherapy use salt water and peloids or mud products mainly to treat rheumatic and skin conditions. These therapeutic agents work together through mechanical, thermal, and chemical mechanisms.

In thalassotherapy, sea water is used and characterized by its high mineral content, high density and its chemical composition rich in mainly sodium chlorides, apart from magnesium, calcium, potassium and iodine, together with marine peloids known as limes . These applications include their application with methodical systematic sun exposure, total or partial application of warm sea sand, and marine climatotherapy (based on atmosphere, temperature, humidity, wind, air pressure, etc.) (Lucchetta et al. 2007; Maraver et al. al. 2011; Morer 2016b).

10. Prophylactic and rehabilitation spa cures

Balneology and climatology are traditional medical fields that capitalize on the remedies offered by nature (mineral waters, climate, muds of different compositions, etc.) for the prevention and treatment of a wide range of diseases, especially chronic diseases, and more recently, closely combined with physical medicine - and for the recovery of patients with dysfunctions and disabilities caused by chronic diseases and traumas. Romania holds an important position in the spa field.



Figura 8.1. Conferința Națională de Balneologie

Medical recovery is a complex and interdisciplinary activity that aims to restore as fully as possible the functional capacity lost by an individual due to congenital or acquired causes, as well as the development of compensatory mechanisms to maintain his capacity for work or self-service.

Specialists in recovery, physical medicine and balneology intervene through specific therapeutic means in the treatment of the following conditions that generate functional deficiencies:

a) post-traumatic conditions;
b) musculoskeletal disorders;
c) inflammatory rheumatic diseases;
d) cardiovascular diseases;
e) respiratory diseases;
f) neurological conditions;
g) neuropsychomotor disorders.

The conditions for which patients benefit from rehabilitation assistance are the following:

a) chronic inflammatory rheumatism;

b) painful and dysfunctional sequelae of bone diseases - osteopenia, osteonecrosis, genotypic and endocrine osteopathies, malformations and the like;

c) postural alignment deficits - kyphosis, scoliosis, misalignment and the like;

d) post-traumatic sequelae of the locomotor system - bone, tendon, muscle, ligament, nerve with single or multiple location;

e) post-surgical-orthopedic conditions - arthropathies, osteotomies, tenoplasties, ligamentoplasties, osteosynthesis, neurorrhaphy and others;

f) monoplegia, hemiplegia and paraplegia;

g) Parkinson's disease;

h) multiple sclerosis;

i) hereditary and degenerative neurological diseases;

j) sequelae of infantile encephalopathies;

k) chronic ischemic heart disease, including the sequelae of infarction;

l) chronic obstructive bronchopneumopathy;

m) ventilatory restrictive syndromes - thoracoplasties, pachypleuritis, pulmonary fibrosis, kyphoscoliosis and others like that;

n) sphincter disorders;

o) bronchial asthma;

p) neoplastic conditions.

The conditions for which patients benefit from physical therapy are the following:

a) algic syndromes of soft tissues;

b) neurites and neuralgias;

c) varicose disease and venous circulatory insufficiency;

d) chronic rhinosinopathies, chronic pharyngolaryngitis;

e) chronic gynecopathies - metronexitis, pelvic algae of various causes and the like;

f) psychosomatic algic syndromes on an anxious-depressive background.

The conditions for which patients benefit from rehabilitation assistance and/or physical therapy depending on the stage of evolution are the following:

a) degenerative rheumatism;

b) other forms of rheumatism - infectious, secondary, metabolic, endocrine, neuropathic;

c) cervicoradiculitis and lumboradiculitis;

d) algoneurodystrophies;

e) polyneuritis and polyradiculoneuritis;

f) peripheral arterial ischemia syndrome;

g) bronchial asthma;

h) deconditioning syndrome.

By balneological and rehabilitation medical assistance is understood the totality of the medical and sanitary services performed in the form of a cure in balneological, climatic or balneoclimatic resorts, through the use of several natural therapeutic factors and/or artificially produced physical factors, according to well-defined methodological procedures, such as and through diet, medication, psychotherapy and health education, in the following forms:

a) prophylactic cures;

b) functional recovery treatments;

c) therapeutic cures;

d) rehabilitation treatments for groups of chronic conditions;

e) rehabilitation treatments for patients with various functional deficits;

f) rehabilitation treatments for patients with different degrees of disability.

Spa treatments are a medical assistance activity that can be performed in all spa units in spa, climatic and balneoclimatic resorts.

The duration of the spa treatment is established by the methodological norms for the application of the framework contract regarding the conditions for the provision of hospital medical assistance, home care, emergency medical services and health transport, as well as health recovery services, within the social health insurance system. The medical rehabilitation treatment is carried out only on the recommendation of doctors specializing in recovery, physical medicine and balneology. The organizational structure necessary for carrying out the activities in the treatment bases may include, depending on the profile of the resort, spaces for the application of the following treatments and procedures:

a) spa with mineral waters;

b) hydrotherapy;

c) application of therapeutic mud and the like;

d) application of therapeutic gases and the like;

e) therapeutic parks;

f) physical therapy, occupational therapy and massage therapy;

g) electrotherapy;

h) respiratory therapy.

Prophylactic spa care requires the application of some of the following programs:

a) fitness programs;

b) programs to combat obesity;

c) training programs for thermoregulation mechanisms;

d) programs to combat risk factors.

Depending on the applied program, the following minimum equipment level is required:

a) physical therapy room equipped with equipment for aerobic training;

b) alternative hydrothermotherapy compartment;

c) swimming pools and beaches;

d) marked routes;

e) terraces;

f) solariums;

g) room for relaxation and group psychotherapy.

Curative spa care requires, depending on the different types of pathology, the following facilities and equipment:

a) rheumatic pathology: spa compartment with mineral waters, mud packing compartment which, in the resorts where it cannot be arranged, will be replaced by thermotherapy compartment, electrotherapy compartment;

b) mineral water bar - crenotherapy - with possibilities of heating and keeping them warm, bibs set up at the mineral water springs - alleys, benches;

c) gynecological pathology: facilities for spa with mineral waters and therapeutic mud - general baths, sitting baths, vaginal irrigation, mud pads - electrotherapy compartment, physical therapy compartment;

d) allergic pathology: spa compartment with mineral waters, inhalation therapy compartment, injectable treatment compartment with mineral waters;

e) mental pathology and neuroses: hydrotherapy compartment, physiotherapy and massage therapy compartment, spaces for relaxation and group psychotherapy, outdoor facilities - sports, field treatment and others like that;

f) locomotor pathology: physical therapy compartment, occupational therapy and orthosis, mineral water spa and hydrokinetotherapy compartment with mineral waters and/or plain water, thermotherapy and massotherapy compartment, electrotherapy compartment;

g) cardiovascular pathology: spa compartment with carbonated mineral water and facilities for mofettes, physical therapy and occupational therapy compartment, local thermotherapy compartment, electrotherapy compartment - galvanic baths and limb pressure apparatus, spaces for relaxation and educational therapy, marked routes for field treatment and, optionally, outdoor facilities such as a therapeutic park;

h) respiratory pathology: respiratory therapy compartment arranged and equipped for individual and collective inhalation therapy with mineral waters and medicinal solutions, for overpressure therapy and for bronchial drainage, physical therapy and occupational therapy compartment.

The types of installations and equipment for each compartment can be varied depending on the options of the owners of the treatment bases and of the specialist doctors, provided that they allow the provision of spa and recovery assistance in accordance with the pathology treated.

In the treatment centers there must be arrangements for the easy circulation of patients with severe functional incapacity:

a) handrails on the stairs and on the stairs;

b) wheelchairs;

c) inclined planes at the stairs;

d) sufficient width of the doors, the elevator and the aisles so as to allow the movement of wheelchairs.

Medical offices specializing in recovery, physical medicine and balneology are organized according to the number of patients and equipped according to the type of assistance provided and the profile of the resort. The equipment of the offices must include, regardless of the type of pathology presented by the assisted patients, the following minimum scale:

a) electrocardiograph;

b) breathing kit;

c) infusion kit;

d) oxygen installation;

e) emergency cabinet/kit (apparatus);

f) small surgery kit;

g) analysis for emergency analysis.

In addition to specialized medical offices, it is mandatory to organize and equip 1-2 rooms necessary for providing first aid, the equipment of which is independent of the type of pathology presented by the assisted patients.

The main functions of recovery services for patients are:

a) group of access functions - reception of patients;

b) the group of functions of medical consultations and explorations;

c) the group of specialized therapy functions;

d) the group of service and technical-administrative functions;

e) the equipment and exterior arrangements group;

f) the emergency and medical guards insurance group.

The technology flow links between function groups are as follows:

a) the access of patients to the reception areas and the passage to the area of consultations, functional explorations and lab determinations, filter - social groups - bathrooms and sanitary groups;

b) performing relaxation, warming, decontracting, stimulation procedures;

c) individual and later group mobilizations through combined applications of hydrokinetotherapy and kinetotherapy;

d) global synthetic group exercises and re-education of walking;

e) adjuvant physiotherapy applications, as appropriate;

f) occupational therapy for the re-education of usual skills and movements.

The access of patients to the rehabilitation bases is carried out concurrently or differentiated by gender, following the passage to the treatment spaces through changing rooms equipped with changing rooms, receiving and handing over of underwear and personal items, sanitary groups, sinks and showers with double accessibility for patients dressed and undressed and with hot air dryers for hair and hands.

The service of preparatory procedures includes a room boxed by screens made of washable materials and furnished with massage beds, paraffin wraps and the like, as well as annexed spaces with sinks and showers and a warehouse for the preparation of paraffin treatments whose ventilation must be very efficient.

10.1. Spa applications in inflammatory rheumatic conditions

The treatment of chronic inflammatory rheumatism has been a permanent concern of balneology, it being known that therapy with physical agents can effectively complete the medical and hygienic-dietary therapeutic complex. It is difficult to treat a condition with a plurietiological interest, with evolutionary autonomy and marked progressive potential, such as rheumatoid polyarthritis, in which natural factors can easily break the existing precarious balance, moving from a useful physiological stimulus to harmful reactivations. Balneophysical therapy aims to influence some physiopathological components, acting as a non-specific excitotherapy.

The prophylactic treatment will be addressed to patients with persistent, but unsystematized, painful muscle-articular syndromes, which may be associated with angioneurotic or Raymond-type disorders installed on a hyperergically sensitized area or with disorders of the thermoregulation.

The cure for therapeutic purposes can be applied to patients with rheumatoid polyarthritis in early stages, with present inflammatory phenomena, ankylosing spondylitis, psoriatic arthropathy and arthritis secondary to some gonococcal or genital infections.

The rehabilitation treatment is aimed at patients with rheumatoid arthritis in biologically stabilized stages II or III, but with functional deficits, forms of rheumatoid arthritis that have undergone orthopedic-surgical interventions and forms of ankylosing spondylitis, central or peripheral, without systemic complications, with static disorders or with respiratory dysfunction.

The goals of the cure are to reduce pain, combat muscle atrophy, increase joint mobility, increase the body's defense capacity, rebalance the neuro-vegetative field.

Special contraindications refer to valvular sequelae after acute articular rheumatism, febrile forms or those with systemic manifestations or with marked evolutionary potential of rheumatoid arthritis and also to febrile, disabling forms with marked kyphosis and advanced respiratory insufficiency, forms with systemic lesions or with losses high in weight from ankylosing spondylitis.

10.2. Spa applications in degenerative rheumatic conditions

Arthritis is a chronic, degenerative, slowly progressive arthropathies, generally related to premature joint wear and aging. Pain, swelling and sometimes joint deformities are the clinical expression of the lesions that intersect mainly the cartilage, the subchondral bone as well as the synovio-capsular insertion area.

Destructive cartilaginous injuries result mainly from the imbalance between the importance of the mechanical stresses exerted in the joint and the very limited possibilities of restoration of the cartilaginous tissue. In fact, arthrosis represents the response that the modified organism gives to mechanical factors.

Hormonal, metabolic, vascular and nervous disorders modify the mechanical qualities of the connective tissue on the one hand, and on the other hand, through their effect on nutrition, muscle tonicity and nerve endings, they also intervene in the course of the disease.

Clinically, arthrosis is translated for a long time, especially in the pre-arthrosis phase, by almost exclusively dysfunctional symptomatology, i.e. by painful fatigue that mainly affects the lumbar region, the base of the head, the knees, the legs and which is frequently associated with an algic tendinous component as well as with a particular neuropsychic reaction (psycho-emotional and vegetative lability, sometimes depressive tendency).

Of particular importance in the appearance of pre-arthrosis or arthrosis conditions in the early, functional phase, are deficiencies related to muscle-ligament hypotonias and hyperlaxities, deviations and deformations of statics and posture at the level of the trunk and joints of the lower limbs, disharmony of muscle synergies and stereotypes of movement, average childhood, adolescent and young adult obesity.

The main localizations of arthrosis allow their classification into cervicarthrosis, dorsarthrosis, lumbar arthrosis, coxarthrosis, gonarthrosis (at the knee level), hand and foot arthrosis.

The natural therapeutic factors used in the spa therapy of degenerative rheumatism are represented by thermal waters (Băile Felix, Geoagiu), concentrated salt waters (Sovata, Ocna Sibiului, Amara, Turda, Techirghiol, etc.); iodized salt waters (Govora, Bazna), sulphurous salt waters (Călimănești, Govora), sulphurous thermal waters (Herculane), therapeutic muds.

The spa treatment in the framework of these sufferings produces complex thermal, mechanical, chemical and psychological effects.

The objectives of peloidotherapy are to combat deviations, restore the harmony of muscle synergies, combat psycho-nervous tension states, prevent and combat overweight tendencies, general and circulatory toning.

10.3 Spa applications in abarticular rheumatic conditions

Abarticular rheumatism represents a group of sufferings of the periarticular soft parts, so-called rheumatic, relatively common, of non-unitary etiology and pathogenesis, which presents from an anatomo-clinical point of view in an inflammatory, degenerative and especially mixed form, with pain and dysfunction as a clinical expression mild or moderate functional.

The etiopathogenetic factors in the occurrence of abarticular rheumatic manifestations are generally common to arthrosis, speaking of spondylogenic and static factors at the spine level, microtraumas, overuse, vicious stresses at the level of the joints, infectious factors, environmental factors (moisture, cold, weather sensitivity), dysmetabolic, hormonal factors (obesity, hyperthyroidism, etc.), sedentary and professional factors, psychological and vegetative factors (neuroses), factors and sources of irritation at the level of internal organs.

According to the location of the pathological processes at the tissue level, we distinguish: tendinitis, tendinoses, tendoperiostosis, tenosynovitis, bursitis, tendomyositis, myositis and especially tendomyosis and miosis, myogelosis, myalgia, muscle contractures, fibrositis, panniculitis, panniculosis, etc.

According to the topographical location, the most clinically defined entities are scapulo-humeral and hip periarthritis, epicondylitis, muscle contractures, tendomyoses and myogeloses around the belts, tenosynovitis and bursitis of the hand and foot.

Electron microscopy research in recent years has revealed clear and impressive pathological conditions in the tissues taken by biopsies from these patients (necrosis of myofibrils, considerable alterations of endothelial cells, etc.), based on relative hypoxia processes that occur during a exaggerated and lasting muscle tone corresponding to muscle contractions, respectively myogelosis. Important mesenchymal transformations were also highlighted in the collagen tissue of tendinous sheaths, tendons, bursae and joint capsules, as an expression of the same chronic local oxygen deficiency.

The curative and recovery objectives will mainly aim at: suppressing areas and irritating factors, stimulating local circulation, relieving pain, combating muscle contractions and improving movement coordination, combating postural anomalies, general sedation and metabolic and psychic vegetative restructuring, avoiding functional overwork articular.

Special contraindications are acute tendinitis, tenosynovitis and bursitis, acute myositis, acute scapulo-humeral periarthritis.

10.4. Spa applications in post-traumatic sequelae

Spas present special possibilities for the therapeutic assistance of patients with post-traumatic sequelae, it being pointless to talk about prophylaxis in this case.

From the basic methodology of therapy and recovery of post-traumatic sequelae, it is known that thermotherapy and hydrokinetotherapy are two of the main physical directions used. The spa resort through the natural factors it possesses can perform them at a much increased degree of efficiency by using these factors. Thus, thermotherapy is performed very well by therapeutic mud wraps.

There are still not enough studies to be able to explain the effect of mud thermotherapy. However, there is an impressive medical practice that attests to the clearly more favorable response of this type of thermotherapy compared to other procedures (paraffin, thermopack, etc.) in various post-traumatic sequelae. Thus, we recall the anti-inflammatory, resorption effects of edema, vasculotrophic effects on the skin, prolonging the vascular reaction after heat, etc. It must also be added in the case of mud thermotherapy and its specific chemical effect.

Sequelae can leave trauma to all anatomical regions. Based on the usual classification, we speak of cranio-cerebral, thoracic, abdominal, limb and spine trauma.

Among the consequences of trauma on the integument and subcutaneous connective tissue, I raise the issue of physical therapy edema, graft wound - no earlier than 4 weeks after the graft, hypertrophic and atrophic scar, hyperchromic scar.

The typology of posttraumatic muscle sequelae refers to muscle rupture, muscle atrophy or hypotrophy, muscle retractions and contractures. All of these benefit from vascular and elasticity-enhancing effects.

Joint instability, post-traumatic arthrosis, arthroplasties are post-traumatic joint sequelae, less septic ones, those with unconsolidated fractures, with intra-articular foreign bodies are treatable by peloidotherapy.

The involvement of the bone in the traumatic process determines an increased degree of severity and a specialized orthopedic assistance. In these cases, balneotherapy is contraindicated.

The natural therapeutic factors and spa resorts indicated for orthopedic-traumatic patients are the seaside climate (thalassotherapy), concentrated sodium chlorinated mineral waters, sulphurous waters, carbonated waters and mofettes.

Cases of bone infection, fractures without a tendency to consolidation, fractures on pathological bone are totally contraindicated.

10.5. Spa applications in neurological conditions

The entire pathology of the peripheral nervous system can be systematized into two major syndromes: the neuralgic syndrome and the neuropathic syndrome.

Neuralgias are manifested by pain and paresthesias in the respective territory of distribution and refer to major syndromes such as cervical-branchial neuralgia, sciatic or crural neuralgia, scapulo-humeral neuralgic amyotrophy, thoraco-abdominal neuralgia, lumbar neuralgia, etc.

Neuropathy is a syndrome that is characterized by motor disorders associated with subjective and objective sensitivity disorders, trophic and vegetative. The etiology of neuropathies is varied, the identified causes being local (traumatic, compressive processes in the vicinity) or general: physical factors (cold, dampness, electric current), infectious, allergic, toxic, metabolic or vascular.

Anatomically and clinically, radiculopathies, plexulopathies, mononeuritis, polyneuropathies and polyradiculoneuropathies are differentiated.

The central idea on which the entire process of functional recovery in peripheral motor neuron injuries is based is the possibility of peripheral nerve fiber regeneration.

Due to the denervation, there is a total or partial motor deficit in the affected territory, sensitivity and reflectivity disorders in the sense of their reduction, changes in neuromuscular excitability and vasculotrophic changes accompanied inconstantly by causal pain with a variable vegetative component depending on the affected nerve. Secondary to the denervation process, there are atrophies and fibrous transformations of the muscle fibers, as well as changes at the level of all articular, periarticular, capsuloligamentous and tendinous connective structures. If the causative factor disappears, or if the integrity of the nerve has been restored, the spontaneous process of reinnervation begins, which can be favorably influenced by peloidotherapy.

The methodology according to which the functional recovery program is carried out varies depending on the diagnosis and the evolutionary stage of the disease. In principle, during the denervation period, an appropriate postural treatment and a program of passive physical therapy are applied to the deficient segments with the aim of maintaining joint mobility, preserving myotendinoarticular kinesthetic information and avoiding muscle retraction.

Thermotherapy and locoregional massage procedures are used to improve vascularization and implicitly local trophicity.

10.6. Spa applications in dermatological conditions

In dermatology, numerous studies and research on the curative and prophylactic action of salt water have established that certain dermatoses can benefit from long-lasting improvements, by

correcting certain visceral deficiencies, metabolic or endocrine-thyroid disorders, frequently associated neurotic states with skin diseases.

Through their properties, salt waters manage to influence the body's deregulated mechanisms; in general, the therapeutic effects obtained in scaly dermatoses (especially in psoriasis, early-stage ichthyosis, keratodermas and sometimes in parapsoriasis), in seborrheic syndrome (seborrheic dermatitis, polymorphous acne, rosacea acne), in allergodermas (eczema and chronic urticaria) are well known), diffuse and limited neurodermatitis, pruritus, prurigouri, occupational eczema and constitutional eczema (atopic dermatitis), peripheral irrigation disorders, scleroderma and others.

In the various dermatological conditions described above, therapeutic muds can be used in different forms of application;

a) Mud baths, at temperatures of 36-37°, lasting 15-30 minutes, 2-3 times a day, indicated in psoriasis, chronic eczema, itching and prurigouri

b) Applications of cold mud (unctions with mud), associated with heliotherapy and lake baths (e.g. La Techirghiol), indicated in psoriasis, chronic eczema, itching and prurigouri

c) Wraps with warm mud, at a temperature of 46-48°, lasting 15-30 minutes, indicated in extended neurodermatitis with lichenification, in forms of old psoriasis, rebellious to usual spa treatments.

General contraindications refer to disfiguring dermatoses (organizational contraindication) and acute inflammatory conditions of the skin, contagious dermatoses, dermatoses accompanied by light sensitivity (medical contraindications). Among them are: cutaneous mycoses (trichophytosis, microsporia, favus, blastomycosis, actinomycosis, mycetoma, scabies and other parasitic skin diseases of animal origin, pyodermas, leprosy, cutaneous tuberculosis (ulcer-hypertrophic form), malignant skin tumors, lupus erythematosus (acute, subacute and disseminated, as well as the discoid form, in the spring and summer season), bullous diseases (pemphigus and M. Duhring), hematodermas (leukemia, phugoid mycosis) and erythrodermas.

10.7. Spa applications in gynecological conditions

Within the complex treatment programs of diseases of the genital sphere in women, balneotherapy, through the good results obtained in local lesions and in functional disorders, has emerged as an effective therapeutic modality in the following conditions:

- chronic inflammatory diseases of the pelvic organs and pelvic tissue in women;
- secondary female sterility;
- pain and other symptoms related to the genitals;
- pre- or post-operative conditions in the genital area.

Balneotherapy applied for prophylactic purposes aims at: states of hypothalamic-pituitary functional imbalance, which can prevent the normal functioning of the gonads (due to stimulation defect) and cause menstrual disorders (amenorrhea, oligomenorrhea), dysmenorrhea, frigidity; as well as in the secondary prophylaxis of inflammatory conditions, by increasing the general and local non-specific resistance, by changing the body's receptivity to microbial agents, and by a more adequate adaptation to thermal factors.

In tubal and peritubal inflammatory sequelae from secondary sterility, as well as in functional disorders and postoperative adhesion syndromes, treatment should be continued for 2-3 years.

It is indicated in chronic inflammations, uterine hypoplasia, tubal sterility, pain in the lumbosacral region, postoperative adhesions.

Ovarian secretory insufficiency, due to estrogen and progesterone deficiency, is eliminated as a result of the presence in the sapropelic therapeutic mud of estrogen and progesterone-like substances.

8.8. Spa applications in metabolic, nutritional and endocrine disorders

These diseases have an important place in the general morbidity and have an increasing dynamics in the conditions of modern civilization.

Salt water baths improve the body's metabolism in general, stimulating the functioning of the endocrine glands. The main endocrine conditions for which balneotherapy is a therapeutic adjunct are: hypothyroidism, hypoparathyroidism, pituitary dwarfism, obesity and rickets or weakness in children.

Remarkable advances in the knowledge of etiopathogenesis and pharmacological and dietary therapy of nutritional and metabolic diseases have determined substantial changes in the approach to balneo-climatic cures, with modern orientations towards the prophylaxis of the risk factors of these conditions and the recovery of the dysfunctions that determine their evolution and complications.

Obesity as a disease or as a risk factor, with complex and insufficiently known etiopathogenesis, with the involvement of endocrine-metabolic and nutritional mechanisms that ultimately lead to an unbalanced energy balance, with the accumulation of adipose tissue deposits, is the subject of numerous "methodologies " of treatment for excessive weight reduction, most without a rigorous scientific basis. The spa addresses this pathological segment in a functionally balancing manner, and balneotherapy has scientifically proven beneficial effects in stimulating the body's energy.

10.9. Spa applications in digestive ailments

Sufferings of the digestive tract hold one of the main places in morbidity with temporary incapacity for work in contemporary society. From the radiological, endoscopic, biopsy, radioisotopic, electromanometric explorations, as well as biochemical investigations, new and valuable data have been brought on the etiopathogenesis, diagnosis and anatomical-pathological substrate, the conservative treatment of these conditions continues to be difficult. Etiological therapy being used very rarely, therapeutic means with pathogenetic and symptomatic action, including balneoclimatotherapy and physiotherapy, hold the main place in the treatment of digestive ailments. The use for this purpose of the hygienic-dietary, crenotherapeutic and balneohydrothermoelectrotherapeutic means available at the spas has an old tradition in our country.

Included in the complex therapeutic plan of some digestive ailments, the spa intervenes less on the causal factors and especially on the ways of action and the changes they produce on the body. For this reason, the indication of a spa treatment implies, in addition to the correct diagnosis of the patient's sufferings, a good knowledge of the therapeutic factors in the recommended resort.

Although many of the balneo-climatic resorts have the opportunity to provide the practitioner with therapeutic means for almost all diseases of the digestive tract, they bring an important contribution especially in chronic gastroduodenitis, gastric and duodenal ulcers, some sufferings from stomach surgery for ulcers, some diarrhea and constipation, as well as in functional disorders of the colon.

Due to the particular, long evolution of the complex pathological framework of digestive disorders and especially the limited possibilities of evaluation and establishment of functional balances, the notion of recovery in the pathology of the digestive tube is less precisely outlined than in the pathology of other devices.

On the other hand, the prophylactic and curative possibilities offered by resorts are particularly important for medical practice, due to the very large number of patients who benefit from spa treatment every year.

Conditions of overload, irrational eating with irregular meals and excess of irritating foods, alcohol, tobacco, coffee, etc., make the frequency of digestive ailments very high. These unsystematized sufferings, of moderate intensity, which do not bother the patient much, are often the prelude to future digestive ailments with long evolution, difficult treatment and many days of temporary incapacity for work.

In the current practice of using natural factors as a therapeutic means, clinical observation was the basis for assessing the effectiveness of cures and remains today the main criterion for the indication of an individualized cure, but a correct indication equally requires knowledge of the patient and the factor used. Modern scientific research on mineral waters pursues both their physico-chemical characteristics and their pharmacodynamic and therapeutic action.

Studies of chemical composition preceded to some extent those of pharmacodynamics and therapeutics. In the last century, physical-chemical researches were carried out by Ladislau Pop (1821), Anastasie Fătu (1851), Mihai Zotta (1854), after 1900 the works of Al. Saabner-Tuduri, considered the father of Romanian balneology.

Clinical-experimental research is related to the scientific activity of A. Theohari (1873-1933), Gh. Băltăceanu (1895-1952), as well as their school represented by Gh. Tudoranu, Gh. Niculescu, I. Gheorghian- Popescu, E. Cociaşu etc.

With the establishment in 1924 of the Institute of Balneology in Bucharest, a period of sustained research began, characterized by a pioneering activity, which laid the scientific foundations in this specialty.

The reorganization of the institute on a modern basis in 1949, under the leadership of Prof. Dr. Marius Sturza (1876-1954), allowed the carrying out of systematic physico-chemical, biological and microbiological scientific research to inventory the resources of natural therapeutic factors, concretized in four volumes edited in the period 1961-1973.

Pharmacodynamic research has established their potential therapeutic effectiveness, by studying the effects on all functional devices and systems, which make up the so-called "pharmacodynamic profile" of a natural healing factor.

Clinical studies carried out on large and comparative groups of patients tested and studied before, during and after the end of the spa treatment have medically valued the complex research on the spa therapeutic factors.

10.10. Spa applications in respiratory conditions

Otorhinolaryngological (ENT) diseases, post-TB sequelae and allergic bronchial asthma stabilized by treatment are conditions on which hydromineral treatment, through the use of therapeutic muds, acts prophylactically, especially on complications and therapeutically.

Spa treatment in these diseases should not only be understood from the aspect of local treatment of the upper airways, but also aims at other equally important objectives. Thus, it is known that many ENT diseases are based on or evolve on a diabetic, hepatic, renal, endocrine-

metabolic, etc. or are maintained in polluting and stressful conditions of the working and living environment.

Sensitivity to cold, to sudden changes in temperature is a characteristic of these patients, and the spa resort provides a therapeutic solution at hand.

10.11. Spa applications in cardiovascular diseases

Sending a patient with cardiovascular disease to the spa treatment is a medical act that implies responsibility and knowledge.

Prophylactic spa treatment - Primary prophylaxis - This treatment addresses atherosclerotic and coronary risk factors. It is achieved through: the effect of specific natural therapeutic factors, the effect of the climate, physical training dosed to effort, health education, the induction of behavioral changes. The advantage of the primary prevention of cardiovascular diseases in the form of a spa treatment is that the patient benefits from continuous medical supervision and guidance throughout the course, which can last up to 21 days.

For the primary prophylactic spa treatment of cardiovascular diseases, the natural therapeutic factors used are: the complex of natural therapeutic factors of the coast, the therapeutic muds, carbon dioxide, in the form of saffron and carbonated mineral waters, sulphurous mineral waters, iodized mineral waters.

Mechanisms of action of the complex of coastal factors:

- Influence of thermoregulation – quick adaptation
- Adaptation to effort
- Lipid changes
- TSH stimulation, endocrine-metabolic changes
- Increases plasma renin activity, urinary catecholamines - risk in hypertensives

Indications of the spa treatment on the Black Sea coast

- Hypertension – first stage
- metabolic disorders of the dyslipidemic type (hypocholesterolemic, HDL-increasing effect)

General contraindications of the spa treatment on the Black Sea coast

- focus of infection
- Pulmonary TB even recently stabilized
- digestive diseases with potential for decompensation: ulcer disease, chronic hepatitis
- endocrine diseases: hyperthyroidism, Basedow's disease, hyperestrogenism, menopause
- bleeding uterine fibromatosis
- advanced cardiovascular diseases
- malignant or benign processes with a risk of malignancy
- high acclimatization effort, with risk of decompensation

Therapeutic muds (peloid therapy) - when applying the therapeutic mud, due to its thermal, mechanical and chemical properties, a stimulation of the peripheral neuroreceptors is produced, which determines a series of local and remote reflexes, with a favorable effect on various functions. After this first phase of action, called the reflex, follows the neurohumoral phase, with the release of chemical mediators and the influence of the diencephalon-pituitary-adrenal system.

The effects of peloidotherapy on the cardiovascular system are the stimulation of cardiovascular reactions with the accentuation of hemodynamics through peripheral and central mechanisms, as a consequence of the need for thermoregulation following the application of warm mud, with vasodilation. Immediate consequences are the mobilization of blood deposits and their

training in the general circuit, so that a multitude of pathological processes in which blood stasis, ischemia predominates, are clearly improved or stagnated, and inflammatory, degenerative processes, post-traumatic sequelae with the predominance of stasis and edema are improved . These effects last 2-4 hours depending on the individual vascular reactivity. Late consequences (months) a vasomotor training superior to those who did not follow this therapy. The sanogenic effect of peloids is vasodilatory, resorptive, anti-inflammatory, optimal vascularization of ischemic areas, vascular gymnastics.

Contraindications of peloidotherapy

• cardiovascular diseases with limited functional resources and risk of decompensation

• Hypertension > 180mmHg or hypotension < 100mmHg

• recent myocardial or ischemic vascular accidents

• peripheral vascular diseases: serious arteriopathy, thrombophlebitis or varicose ulcers, trophic disorders

Sulfuric waters with a high concentration have the following mechanisms of action:

• Increase in the sulphoconjugation power of catecholamines in the aortic wall - sympatholysis

• Decrease in plasma lipids

• Decrease of catecholamine effects on the myocardium and peripheral vessels

• Probable heparin action

Carbon dioxide is used in the form of sparkling water and sparkling water

For resorts like Tusnad, Vatra Dornei, Borsec, due to the demanding alpine climate, the indications for their prescription in cardiovascular diseases are limited to:

- primary prophylactic spa treatment

- recovery spa treatment for peripheral arteriopathy

Iodized mineral waters have the following effects:

• effects on peripheral circulation (vasodilator effects)

• effects on lipid and calcium metabolism, uric acid

Indications

• crenotherapy with mixed iodized waters – alkaline, chloride-sodium, possibly sulphurous, with hypotonic and isotonic concentrations (Baile Olanesti, Calimanesti-Caciulata) – in endocrine diseases (thyroid, ovary) and in metabolic diseases (atherosclerosis, gout, hyperuricemia)

• external bathing with iodized salt water in peripheral circulatory disorders due to atherosclerosis

Spa treatment for prophylactic purposes - Secondary prophylaxis

A patient with established cardiovascular disease can be prescribed a spa treatment for the purpose of secondary prophylaxis, with the following conditions:

• Have a known history of heart disease

• Heart disease to be treated

• Heart disease to be controlled

• Assessed risk of complications – no foreseeable risk of decompensation

Spa resorts recommended for secondary prevention of cardiovascular diseases: Covasna, Buzias, Lipova, Herculane, Litoral (for venous diseases)

Indications for the secondary prophylactic spa treatment

• Arteriopathy

• Chronic ischemic heart disease: phase II post-infarction (3 months, without angina, without rhythm disorders), stable angina, BCI without angina

•Hypertension under control, without associated diseases

• Valvulopathies

• Stroke sequelae

• Chronic venous diseases

Natural therapeutic factors used in the secondary prophylactic spa treatment

• **Sulfuric waters** with demonstrated effects on some metabolic mechanisms, translated by the normalization of lipemia and lipidogram, the increase of endogenous heparinemia and hypoglycemic effect have led to the indication of cures with sulfurous waters in diabetes mellitus and atherosclerosis with uric diathesis. Sulfuric waters whose concentration can exceed 200mg H2S/l (Nicolina-Iasi) cause the appearance of adenylic acid in the skin → cutaneous vasodilation, with a decrease in blood pressure and improvement of peripheral arterial irrigation after sulphurous baths. Integumentally resorbed sulfur causes a decrease in blood sugar in diabetics. Cutaneous vasodilatation occurs through sympatholysis (sulfoconjugation of catecholamines in the vascular wall), muscle vascular blood flow increases

• **Carbonated and still waters** cause cutaneous vasodilatation through the direct action of CO_2 at the level of the metaarteriole, increasing cerebral blood flow, increasing skeletal muscle blood flow, influencing the dynamics of urinary catecholamines and plasma renin activity

Applications of carbon dioxide in the form of mofettes

In Romania there is natural therapeutic mofette, consisting of natural emanations of carbon dioxide dry gas; currently, natural spontaneous emanations of CO_2 gas are used or drilled into the gas layer, which is then directed and used therapeutically.

Effects of mofetotherapy

• cerebral circulation: cerebral blood flow by 75%, determines increasing power of concentration and intellectual performance

• peripheral circulation: skin hyperemia through the direct action of CO_2 on the meta-arteriole, with an increase in skin temperature by 1.5-4° C; increase of muscle blood flow by 44% in the skeletal muscles → improvement of the claudication index in patients with arteriopathy

• general hemodynamic

• general beneficial effects

The indications of the mofette

• secondary prophylaxis and recovery treatment in cardiovascular diseases, including heart diseases with limited functional reserves, arterial diseases with skin trophic disorders and atherosclerotic manifestations by increasing the claudication index and walking distance

• lower weight in the primary prophylaxis of cardiovascular diseases

• carbon dioxide is the most physiological vasodilator through a direct, unmediated mechanism

The effects of the mofette are superior to carbonated baths, because:

• CO_2 is inhaled and dissolved in plasma, with hemodynamic effects superior to those due strictly to skin penetration

• allows avoiding the added thermal factor and hydrostatic pressure factor due to immersion, which limits the indications of carbonated baths

10.12. Balneotherapy contraindications

GENERAL CONTRAINDICATIONS

1. Acute febrile and chronic conditions in the course of acute exacerbation;
2. Infectious diseases during the period of contagiousness and convalescence;
3. Venereal diseases in the contagious stage (syphilis, gonorrhea);
4. Cachectic states, regardless of the cause.
5. Malignant tumors, regardless of shape, location or evolutionary stage.
6. Repeated and abundant hemorrhagic states of any nature.
7. Carriers of pathogenic germs or infested with parasites.
8. Pathological pregnancy in any month and normal pregnancy over 3 months.
9. Epilepsy.
10. Blood or system diseases with alteration of the general condition (anemias, leukemias, lymphomas).
11. Psychopaths with social behavior disorders.
12. Chronic alcoholism with neuropsychiatric disorders.
13. Drug addictions.
14. Decompensated diabetes, difficult to control through diet and drug treatment, especially insulin-dependent.
15. Manifest heart, liver or kidney failure.

SPECIAL CONTRAINDICATIONS

1. Valvular sequelae after acute articular rheumatism.
2. Rheumatoid polyarthritis: febrile, systemic, malignant, lupus forms,
3. Ankylosing spondylitis with advanced respiratory failure, systemic lesions.
4. Recent non-callus fractures and without sufficient internal contention; unstable spine fractures with potential secondary medullary injury; pathological bone fractures.
5. Polyneuropathies in the acute stage, paraneoplastic neuropathies, neuropathies from collagenoses.
6. Hemiplegia of infectious etiology, malignant tumor, those of hemorrhagic cause with blood pressure values difficult to control;
7. Painful ischemic heart disease with frequent crises, the painless one with severe rhythm and conduction disturbances, decompensated valvulopathies, decompensated heart failure, patients with embolic potential. Decompensated pulmonary cord.
8. Advanced cerebral atherosclerosis with social behavior disorders.
9. Active pulmonary tuberculosis. Pulmonary mycosis, bronchiectasis with severe hemoptoic forms, silicotuberculosis, manifest pulmonary insufficiency.
10. Dyspnea of degree IV and V regardless of the cause.
11. Bronchial asthma with frequent attacks or asthmatic ailments.

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