BASICS IN BALNEOLOGY, PHYSICAL AND REHABILITATION MEDICINE

FOR STUDENTS IN MEDICINE

FOREWORD

Well-known and used since ancient times, natural therapeutic factors, seem not to have disclosed all their *therapeutic value and qualities*. The complexity and diversity of their biochemical composition, the inter-relationships between their components, the physiologic and therapeutic effects (numerous, too), and the mechanisms by which they are produced (systemic and nonspecific), all these make almost impossible their dismantling according to the medical requirements based on evidence, reason for which there is an *aura of mystery* and *miracle* on them; and that is why people look for these natural therapeutic factors and regard them as their last hope for finding cure.

These are the reasons (briefly listed) for which the definition of the diagnosis and therapy procedures according to the classes used in established practice guidelines, recommended by CMR in 2002[1] cannot be applied in balneal practice as well. Without a doubt, certain balneo-physiotherapy procedures can be classified:

- in class I – functional electro-stimulation used in rehabilitation of the central motor neuron suffering or transcutaneous electrical stimulation in pain therapy;
- in class II – because they can generate differences of opinion and for this reason they are "candidates" to class II a – peloido-therapy as pathogenic treatment in arthrosis – or at class II b: applications of medium frequency currents with anti-inflammatory effect or of ultrasounds with decontracturant effect;
- in class III of diagnosis/therapeutic procedures there are few examples from balneo-physic-therapy field because only ignorance or/and incorrectness of indication may turn them into inefficient or even harmful for patients.

Scientific research in the field, although consistent and topical is little known as publishing/communication of its results is less directed towards "beneficiary" specialties:

1.DEFINITION OF CLASSES USED IN ESTABLISHED PRACTICE GUIDELINES

Class I - General acceptance of usefulness and efficiency of a diagnosis/therapeutic procedure

Class II – Differences of opinion on the usefulness and efficiency of a diagnosis/therapeutic procedure

Class II a – tendency of opinions is favourable to procedure

Class II b – tendency of opinions is less favourable to procedure

Class III - General acceptance of uselessness of a diagnosis/therapeutic procedure which, under certain circumstances, can be even be harmful

rheumatology, neurology, neurosurgery, cardiology, nephrology, dermatology, etc. and more towards the narrow circles of luxury sectors: spa, wellness, body shaping, anti-stress, etc.

Scientific papers sent to publications dedicated to established medical specialties (already mentioned as beneficiaries) are re-directed towards alternative complementary medicine. It should be emphasised the fact that **evidence based balneology** is an almost illusionary desiderate due to the impossibility of accomplishing double-blind placebo controlled studies; impossibility generated by the uniqueness and complexity of each natural therapeutic factor. In addition, we have to take into account the location of spas, further away from universities and centres/institutions of research and also the costs related to accommodation in hotels. (1)

At present, at international level there are re-evaluations of different studies in balneology and meta-analysis, in order to demonstrate with statistical data that there is evidence based balneology. For this purpose the authors investigate standard bases of medical data: Medline, Embasse, Database, Pedro, PubMed and the Cochrane Controlled Trials Register, analyzing the works and studies made according to the requirements of evidence based medicine.

Searching the database for works on the physiological effects of balneotherapy, Pal Geher has identified just over a thousand articles during 1966-2006, and of these only one hundred thirty-eight contained the original results on various therapeutic modalities.

Balneotherapy clinical trials for efficiency in arthritic sufferings are also very few: two meta-analyses, three double-blind controlled studies, fifteen studies on the efficiency of balneotherapy in osteoarthritis of the knee and hip, and one cost/efficiency study.

In these databases there are also five fundamental studies on the effects of balneotherapy on pro-inflammatory cytokines, plasma levels of cysteine, chondrocytes, and plasma levels of endorphins and of free radicals. (2)

The linking of ancient balneology **to modern medicine** is justified by:

- transversality, the holistic bio-psycho-medical and socio- economic approach respectively, as well as its inter- and multidisciplinary value, aiming towards integrative medicine – an actual goal since Hippocrates until today;
- qualified, professional contribution to ensure/increase the quality of life of our patients by specific means, targeting specific objectives, identified through evaluation;

Transversality, related to the quality of life too, the psycho-social and economic dimension, and mostly the increasing age of the potential beneficiaries of the balneal cure, at present link two medical specialities by which our country has acquired remarkable performance at international level: rehabilitation, physical medicine and balneo-climatology, and geronto-geriatrics respectively. It should be emphasized, and not the least, the fact that Romania is the country that - with his remarkable balneal potential - was in the second half of the last century one of the main promoters and also health balneo-geriatric tourist destinations. Regarding geronto-geriatrics we should just remind that due to Acad. Prof. Dr. Ana Aslan and her team, Romania is the country that founded (1952) the first specialized institute and the first country that produced biotrophic/geronto-protector medicines with results recognized internationally. (3)

The contemporary way of life requires most urgently the preservation of the balneal *treasure* consisting of approximately 30% of the natural therapeutic resources in Europe.

SOME HISTORIAL LANDMARKS OF BALNEOLOGY

Diseases appeared at the same time with the first men, who instinctively relieved their sufferings with the elements surrounding them: water, minerals, and plants. Nature was the first that offered help to the man in distress, being the first physician and the first therapeutic remedy. It is difficult to assess since when balneotherapy began because archaeological evidence dating back to the Bronze Age were found near hot springs in France and in the former Czechoslovakia. Celtic legends attributed the discovery of springs at Bath to the first kings.

In the faith of many peoples of antiquity: Persians, Babylonians, Egyptians, Greeks, Romans, bathing in springs or rivers had spiritual purifying role and protector or healer of the body.

In the medical arsenal offered by nature, water has gained, by tradition, a well-deserved role because:

- It is the oldest remedy, no other had a longer life;
- It can be administered digestively (ingestion, enemas), respiratory (inhalations and aerosols), genitally (vaginal irrigations), cutaneously (baths);
- It is used not only to satisfy some physiologic, hygienic needs, but also as therapeutic and relaxation means;
- It is the cheapest and easy to find;
- It exists in all states of matter: solid, gaseous and liquid;
- No other medicine has been a source of inspiration for different artists: poets, painters, musicians, for such a long time and in such different aspects.

One of the earliest descriptions of practising baths comes from ancient Greece. In Greek mythology there are references to the blessing given by gods to natural springs or tanks fed by seawater. Around them buildings, called *asklepion*[2], were erected, for those who wanted to bring gifts to the gods in order to be healed and to practise bathing into these waters. In Greek towns there were complexes for leisure and personal hygiene, called *gymnasium* – actually, public baths - in which there were bathrooms next to rooms for massage, relaxation.

Data about climatology, balneology, helio- and thalassic therapy, massage, gymnastics and dietetics are found in “Corpus Hippocraticum”, work in seventy-two volumes of the father of medicine, Hippocrates of Kos (460 – 375 B.C.).

The Romans surpassed the Greeks in terms of size and complexity of buildings for baths and expanded the idea of in the public bath all over the Empire. Building aqueducts provided water for agriculture, urban crafts but also for domestic needs including recreation. In the conquered territories they used sources of natural mineral waters and built thermae at: Aix, Vichy, Bath, Achen, Wiesbaden, many of them being in tourist and balneal circuits until nowadays. (1)

The Roman thermae (public baths) were centers of recreation and social activities which included libraries, gardens and many other amenities. The Romans raised baths at the level of fine art and the remaining constructions amply prove this:

- Large spaces, separated rooms for each stage of the ritual: undressing, bathing, sudation, massage, rest;

[2] Asklepios, son of Appolo, was the god of healing and the patron of medicine.

- separate circuits for women and men;
- different shapes of bath tubes for the two sexes.

The interest shown by Romans for hygiene and natural factors determined Pliny the Elder to write that:"for 600 years the Romans knew no other remedy than their baths".

Starting with the decline of the Roman Empire, public baths became rather places of debauchery where diseases were spread and no prophylaxis or treatment took place. This explains the fact why in the Middle Ages the belief appeared that frequent washing could lead to disease and suffering transmission, reason which was speculated by church, that decided to close public baths. However, some springs still continued to be used (internal treatment) those which were thought to be blessed by God or by some saints.

The history of spa begins in the 14th century, when blacksmith Collin L'Leu buys a forest near "Poujhon" (in Walloon meaning the Big Fountain), a place where people brought mineral water. Colin built an inn in 1326, and around the inn a new hamlet appeared, the New Spa. In the second half of the 16th century the water from Spa was very sought after in the neighbourhood.

In 1571 William Slingsby discovered in Yorkshire a ferruginous spring very much like the one in the Belgium place called Spaw by the English. Around the spring in Yorkshire "the English Spaw" was built and this is how the word "spa" came into use as a common noun in English, meaning "public fountain"[3].

In the 16th – 17th centuries European aristocrats washed only their faces with a wet cloth, considering the habit of washing the body with water as one suited for the lower classes. Towards the end of the 17th century the change in attitude towards bathing and public baths as a measure of personal hygiene and towards the prophylactic or curative role of mineral waters took place.

Following the thermae model and the sophisticated Roman rituals of bathing, starting with the 18th century, European spas developed and a century later fashion reached America. The tone was set by the English town of Bath, where in a province little town, on the ruins of some Roman baths a spa resort was built.

People came to resorts to restore health using mineral waters in the internal or external cure. Spas become real summer "capitals", and opportunity for social contacts and display of wealth.

A day of treatment included water cure, dancing, card games, reading, walks, balls, receptions, theatre or opera, etc., all performed according to a balanced programme recommended by a physician.

In the 19th century bathing became an accepted practice as medicine presented the benefits that cleanliness brings. Despite this progress, in America of the 19th century, in Philadelphia, Pennsylvania, between November 1st and March 15th bathing was still outlawed (as a measure of health protection), while in Boston, Massachusetts, bathing was forbidden unless it was prescribed by a doctor.

In the 19th and 20th centuries European spas flourished and studies were made that founded scientific balneology. Initially, internal cure was more important than external one, but then things were reversed, bathing pleasure being greater than that of drinking waters.

Balneal treatment in Europe contained many elements accumulated over time on the structure of Roman thermalism: immersion in hot water, drinking of mineral water, sudation in the steam room, relaxation in a cool room and a light diet. The programme began at six in the morning with drinking water in beautifully decorated, spacious pavilions, accompanied by musical arrangements. A frugal breakfast followed, then bathing in mineral waters, lunch and then rest. In the afternoon walks were recommended, then performances and dinner. "Bedtime" was at nine

[3] Today they are trying to introduce the idea that spa would be the acronym of some Latin expressions like: "salus per aquam" or "sanitas per aquam", but acronyms appeared in the 20th century, so much later than the documentary statement of using this word as a common noun. There may be that the name of the hamlet comes from the Latin word "spargere" which means to sprinkle, to wet, to spread.

o'clock because then the next day everything started again at dawn. The cure lasted for a month or more. At the beginning of the 20th century spa cure in Europe combined strict diet, exercise and bathing complex procedure. Patients were examined by a doctor before starting the cure. After examination they headed for the balneal pavilion where they paid for treatment and deposited their valuables before entering the undressing cabin. From the pavilion they received towels, slippers, and sheets. The procedure began with a hot shower after that the cure-takers entered a walk room with hot air for 20-30 minutes, then a short steam bath, a shower and a massage with soap. After the massage followed swimming in the pool with water heated to body temperature and then 15 - 20 minutes rest in a special hot pool - "sprudel pool room" that contained a layer of sand through which carbonated natural mineral water was gushing. A number of refreshing showers followed, then patients were rubbed with hot towels, afterwards they were wrapped with sheets and covered with blankets for 20 minutes. Thus a spa procedure ended. Treatment also contained dietary indications, exercise and drinking cure.

Entertaining in European spas included: gambling, horse races, fishing, hunting, tennis, skating, golf, riding, walking, theatre performances, all meant to create an environment which could convince the patient to come back next year, too. (4)

In Romania, although there is archaeological evidence of continuity of activity in balneal resorts founded during the Roman conquest, their revitalization takes place in the 17th century, the 18th century and especially the 19th century, when such spas as: Sânmartin, Bazna, Homorod, Tuşnad, Borsec, Călimăneşti, Căciulata, Olăneşti, Govora, Slănic Moldova, Vatra Dornei, Covasna, etc. assert themselves.

The qualities and virtues of Romanian mineral waters became known and appreciated in Europe. Dr. Carol Davilla recommended Napoleon III rd a cure of mineral water from Căciulata and later the French president Émile Loubet was treated with mineral water bottled at the source and transported to Paris. Bottled mineral waters from Borsec reached as far as Budapest and Vienna.

The asserting of scientific Romanian balneology begins with Ladislau Pop's work "About mineral waters from Arpâtac, Bodoc and Covasna", published in 1821 in Transylvania. In 1837, Stefan Vasile Episcupescul elaborates his "Metallic waters of Greater Romania" in which he describes the qualities of mineral waters in Romania. In 1851 Anastasius Fatu publishes "On the use of simple waters and mineral waters in Moldova", which has been the major reference work in the field of balneology for over 50 years. In 1889, the Romanian delegation to the Congress of Hygiene in Paris presented a comprehensive article about muds. In 1906, Al. Saabner Tuduri, considered the father of Romanian balneology, published the monography "Mineral waters and climatic resorts from Romania". In 1931, at Cluj, the first department of balneology was established under Professor Dr. Michael Sturza, after in 1925 the specialty was officially recognized and in 1935, under Professor Dr. Gheorghe Băltăceanu the department of "Balneology and dietetics" was founded in Bucharest. Anibal Teohari laid the foundations of scientific research in balneology making the first experimental and clinical studies on crenotherapy (drinking cure) and published simultaneously in Bucharest and Paris in 1934 "Treaty of therapeutics".

In 1949 the National Institute of Balneo-physiotherapy was established in Bucharest. In the second half of the 20th century, balneology becomes a place of convergence of several medical specialties, underlining the integrative and nuanced interdisciplinary character of the therapeutic balneo-climatic and physiotherapy approach. (3)

Nowadays the elegance and refinement of yesteryear spas have decreased or acquired other dimensions, but people still go to baths for relaxation and health.

BALNEAL MEDICINE IN THE 21ST CENTURY

Modern medicine means in terms of our study, entering into the infrastructure of the cell and in the privacy of biochemical processes, while "scouring" the nucleus and deciphering the genetic code. If we add to this, the avalanche of targeted action drugs and the appearance of the concept of medicines / drugs modifying the (natural) evolution of the disease, it is understandable the difficulty in which the clinician in general, but especially the GP is, when establishing a therapeutic plan in which a (balneo-climatic) spa cure should find a place, too.

Balneo-climatic cure is a form of medical assistance which is applied in balneo-climatic resorts for definite periods of time with prophylactic, curative or rehabilitation aim and which uses mainly the natural therapeutic factors of the resort, applied according to a specific methodology.

Balneology or more completely, **balneo-climatology** is the science that studies the **natural therapeutic factors**: climate, (including the microclimate from salt mines and caves), mineral waters, lakes, muds, therapeutic gases.

Balneotherapy is the applied component of balneo-climatology that has as subject the appropriate usage of the natural therapeutic factors in prophylactic, curative and rehabilitation medical assistance.

Balneo-climatic resort is the place that possesses natural therapeutic factors (traditionally recognised and scientifically proven as being therapeutic efficient) and that has the organisation that is required for offering balneo-climatic medical assistance in appropriate conditions. (5)

Balneology has been an important part of medicine for centuries but in recent decades has lost much of its academic reputation. Empirical evidence, mostly from ancient sources, suggests that balneology has great therapeutic potential for many of the health problems that affect the population. But nowadays balneotherapy has an outdated air due to scientific and technological progress which brought synthetic substances acting on the causal factors of the diseases or on pathogenic mechanisms providing a faster and easier means of treatment than balneotherapy.

In general, the methods used in balneotherapy are not harmful or less aggressive, and their intervention is not limited only to "repair" the physical body but also extends to the mental state of the patient, i.e. the quality of life.

Understanding the concept of ***quality of life in medicine*** is important for improving the quality of life of the sick or disabled person is more than a therapeutic target, it is an element with impact on the decision to finance health systems and studies and researches. (3)

The concept of quality of life is a ***holistic concept*** encompassing four essential dimensions: condition and physical capacities/performance, psychological well-being (self-esteem, opinion about own appearance, cognitive performance, inter-personal relationships), position and social relationships, and economic status.

Crystallization of this medical concept together with rediscovering the virtues of holistic medicine, of the therapeutic value of some natural remedies or belonging to the traditional medicine of various peoples led to the revival of interest in balneology. (6)

Balneotherapy has the physiological/physio-pathological support of its effects in the adjustment mechanisms of the body and in addition it provides a high degree of improvement in the quality of life of patients with various sufferings.

A. Hoff and B. Jungmann have classified ***therapeutic methods*** into 4 groups[4]: 1. amputation (removal), 2. substitution, 3. directing functions and 4. stimulating the body in order to produce complex adaptive responses. The first three methods are defined as artificial therapeutic means, and the fourth group includes methods that appeal to the regulatory functions of the body and are called natural methods.

Complex adaptive responses of the body functions to systematic, sequential, dosage application of some stress factors: thermal, chemical, mechanical on the skin or mucosa represents adaptive therapy.

Adaptive therapy applies to the entire body and aims at balancing the homeostatic balance. We can compare the couple patient/natural therapeutic factor with a cybernetic system optimized at the level of auto-tuning systems under the complex action of therapeutic factors.

Modern life with the numerous facilities obtained as a result of technologic development brings about some ***unwished consequences on the human being***.

Reducing the contact with nature, carrying out activities in enclosed air conditioned spaces, led to the new concept of "homo domesticus" and to the consequences of this way of life, respectively the **de-conditioning syndrome** characterized by the *deperformance of the functional thermoregulatory capacity*.

In relation to the evolution of seasons thermoregulation has a seasonal rhythm by requiring successively two major aspects: thermolysis in the summertime and thermo genesis in the winter season. The two functions have a negative mutual influence, adaptation to cold weather cancelling the one to hot weather and vice versa[5]. The most popular and effective way to optimize thermoregulation is helio-marine cure which consists of applying successive contrasting factors: hot - sun exposure, cold - immersion in seawater.

Another consequence of modern life is the **hyperkinetic syndrome** manifested by *reduced muscle mass, reduced exercise capacity and obesity*. This complex syndrome is a risk factor in the emergence of many diseases: degenerative rheumatism, cardiovascular, respiratory diseases, etc. Preventing the onset of this syndrome and fighting against its negative health consequences require complex measures that can be established in balneal resorts. During the cure the patient is instructed on a proper diet, the importance of physical activity and the

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[4] 1. **amputation or removal** concerns the surgical means, partly to antibiotic and vaccines and serums therapy and high energy therapy in oncology.

2. **substitution** includes methods of treatment through which are replaced artificially vital substances impossible to be produced by the sick body: insulin in diabetes, vitamin B_{12} in megaloblastic anemia, etc.

3. **directing functions** represents the pharmacologic, dietary and immunologic arsenal aimed at changing and directing some disturbed functions: gastric secretion, bowel movement, blood pressure, etc.

4. **stimulating/regulating the adaptation functions** involves the application of systematic, sequential, dosage of some stimulating factors like: thermal, chemical, mechanical, on skin (balneotherapy) or mucosa (crenotherapy) in order to obtain physiological reactions of adaptive response.

[5] Adaptation to cold is in direct connection with the defense against diseases "a frigore", specific to the cold season: respiratory diseases, rheumatism, gynecological, renal and urinary tract, ear, nose and throat sufferings. Cold thermoregulation is an adaptive function, so not stimulating it can lead to deperformance of the peripheral circulatory response. Its systematic, repeated requirement by applying cold stimuli on large areas of skin, in the warm period of the year, induces an appropriate response of the peripheral circulation of thermoregulation.

concrete way of achieving it, on how one can fight with everyday stress, on the importance of a healthy life and work style. (7)

I. Climate

Climate has a significant impact on body, often disregarded by both the patient and the physician who makes the recommendation for balneal cure. Climate is the natural therapeutic factor most intense and intimately connected with the biology of living humans, the contact with the patient being permanent, unlike the contact with muds or mineral waters, which is limited by the exposure time or by the ingested amount.

Climate includes all physical (cosmic, atmospheric and terrestrial) and biological factors characteristic for an area, that act together upon human body. The impact of climate on body is measured by thermal comfort index and bioclimatic stress.

Thermal comfort index is referring to a complex relationship between temperature, humidity and wind on one side, and thermal sensation perceived by the organism on the other side. The value of this index is between 16.8ºC and 20ºC and this is named effectively equivalent temperature.

Bioclimatic stress referes to oscillation limits of the main meteorological elements; between these limits human body is maintaining a balance of principal regulation systems and beyond these limits are trained homeostatic adaptation mechanisms.

Acclimatization is a complex of functional changes by which the human body transposed in a new climate replays to the request of new factors by a vegetative, humoral and metabolic reorganization. Rhythm and intensity of these changes depend on the specificity of the factors and on body adaptability.

Depending on the solicitation of constitutive climatic elements upon the body, there are three types of climate:

Sparing climate, found around hills and plain areas, foothills and forestry, where acclimatization is easy, with minimal functional variations, near physiological limits. This type of climate is recommended for recovering persons or persons with physical debility;

Exciting climate, found over 1000 m high and around prairies. Functional changes determined by acclimatization exceed physiological variations. It's recommended for healthy people and for patients with hematologic and endocrine disorders.

Tonifing stimulating climate has mixed elements, depending on the season: in winter and summer elements of exciting climate prevail, meanwhile in spring and autumn sparing climate is preponderant. It can be found on the Black Sea side and in alpine to subalpine areas. These areas are suitable for the recovering patients after traumas, patients with rheumatological, neurological, dermatological, gynecological, respiratory disorders, but with a good cardiac vascular function.

Meteorological sensibility is the reaction of some persons to weather changes, which means to intensity and/or unusual combination of some climatic factors. It can be considered as a lack of adaptability to natural factors induced by the deconditioning syndrome and by hypomobility.

II. Mineral waters

Mineral waters are natural solutions of salts ionic dissociated or not, in balance at the source/spring. A mineral water must meet at least one of the following criteria, in accordance with international definition given by the Congress at Bad Nauheim in 1912:

• to contain at least 1 g salt/l;

• to contain chemical elements, solid or gaseous, with scientifically proved therapeutic action;

• the temperature at source must be at least 20ºC;

• to contain microelements;

Depending of the concentration in salts, mineral waters are grouped as follows:

– Hypotonic waters contain less than 6 g/l;

– Isotonic waters contain 7 to 9 g/l;

– Low hypertonic waters contain up to 15 g/l;

– Hypertonic waters contain more than 15 g/l.

Depending on the temperature of the water on spring, mineral waters are grouped in:

– cold mineral waters with temperature around 20º-22ºC;

– hypothermic/oligothermic mineral waters with temperature between 23º-34ºC;

– isothermic mineral waters with temperature around 37ºC;

– hyperthermic mineral waters with temperature more than 38ºC.

Because of the complexity of chemical composition and physical properties, mineral waters have been grouped into **three groups** containing 11 categories, as follows:

- group A: mineral waters with mineralization over 1 g/l – sodium chloride, alkaline, alkalinoterous, sulfate-sodium-magnesium, carbogaseous;
- group B: mineral water with mineralization lower than 1 g/l containing oligominerals or with thermal properties - oligometallic, ferruginous, arsenicale, iodinated, sulphurous;
- group C: radonic/radioactive waters. [(7) (8) (9)]

Depending on the level of mineralization, therapeutic mineral waters are classified as follows:

a**) Mineral waters with mineralization (dissolved solid substances) over 1 g/l** subgrouped in:

- mineral waters with mineralization between 1 and 15 g/l,
- concentrate mineral waters with mineralization from 15 to 35 g/l,
- very concentrate mineral waters with mineralization from 35 to 150 g/l,
- high concentrate mineral waters with mineralization more than 150 g/l.

b) **Mineral waters with mineralization (dissolved solid substances) lower than 1 g/l** – oligomineral, which contain active biological components that give specific character and which are subdivided into: sulphurous, ferruginous, carbonated waters etc. and oligothermic waters, depending on temperature.

Depending on physical and chemical composition, therapeutic mineral waters are classified into: oligometallic, acratic; alkaline and alkalinoterous, bicarbonatated, sodic, calcic, magnesic, sodium chloride (salted), iodinated, bromurated, sulfate, ferruginous, sulphurous, carbogaseous, radioactive.

Depending on the type of mineral substance and its concentration, mineral waters can be used as follows:

- for usual consumption, daily, for a variable period, in closed bottles, in order to preserve health and to prevent diseases - *drinking mineral waters*;
- for treating some diseases or as secondary prevention, following the prescription from a physician and according to standard protocols - *therapeutic mineral waters*.

Depending on the chemical composition and concentration of mineral substances, there are different ways of administration of mineral waters:

- internal cure (drinking mineral waters – crenotherapy), aerosol and inhalation;
- parenteral use in injection;
- external cure, using mineral water as bath in individual tubs or in swimming pools, as well as for medical irrigation;
- extraction of salts or natural gases, used for theraphy or in industry;

The main types and sources of mineral waters that help maintain health, with their specific therapeutic indication are:

1. Saline / chloro-sodic waters, rich in **sodium chloride** (common salt), are widespread. As an internal cure, saline water excites the gastric mucosa, increases gastric secretion and intestinal peristalsis, activates digestive enzymes of the pancreas and intestine, dissolves inflammatory mucus and catarrhs, lowers and regulates blood sugar level. This type of water is indicated, as internal cure, in chronic gastritis, colitis, enterocolitis, intestinal dyspepsia, diabetes. In aerosol inhalations, its anti-catarrhal action is beneficial for chronic rhino-pharyngitis, sinusitis, and tracheo-bronchitis. As an external cure, immersion in saline water increases cutaneous circulation, decreases inflammatory processes, that's why is indicated in inflammatory rheumatism, peripheral nervous system disorders, post-traumatic complications of the limbs, sequelae of phlebitis, chronic gynecological disorders, endocrine dysfunction and hypofunction, skin disorders. Here are some places where saline waters can be find: Sovata, Amara, Ocna Sibiului, Techirghiol, Slãnic Prahova, Govora, Bazna and Olaneşti (Romania), Bourbonne-Les Bains (France), Nauheim, Baden-Baden (Germany), Battaglia, Montecatini (Italy).

2. Sulfate waters, rich in the **sulfate salts: Glauber's salts ($NaSO_4$), Epsom salts ($MgSO_4$)** or **Gypsum ($CaSO_4$)**. Used as internal or external cure, sulphate waters detoxify the organism, help healing suppurative processes, accelerating collection and excretion of the pus; it also reduces gastric secretion, increases intestinal peristalsis, increases production and secretion of bile, has a mild diuretic effect. It can be found at: Baltatesti (Romania), Karlovy-Vary,

Marlanske Lazne (Czech Republic), Montmiral (France), Friedrlchshall (Germany), Sandanski, Kustendil, Varchets (Bulgaria), Soci (Russia).

3. Ferruginous waters, rich in **iron (**iron salts and oxides). Administered internally and externally, this type of waters has a vitalizing, tonic effect in convalescence, and is therapeutic for various types of anemia. It is contraindicated in peptic disorders or glomerulonephritis with bleeding tendency. It can be found in: Vatra Dornei, Tuşnad, Buziaş, Covasna (Romania), Horrogate (England), Levico, Roncegno (Italy), Vals, Autenil (France), Kissingen (Germany).

4. Iodinated waters, which contain 1 mg ‰ iodine. Iodine, with its metabolism controlled by the thyroid, has been used from old times to treat chronic rheumatism, atherosclerosis, and increased blood pressure. These waters are used in internal and external cure. Spa resorts are situated near salt deposits: Govora, Olaneşti (iodinated, saline, sulphurous), Bazna (saline and iodinated).

5. Sulphurous waters, rich in elemental **sulfur** or **hydrogen sulphide**, have usually a sulphurous odor. As internal administration, sulphurous waters increase gastric, hepatic and biliary secretions, stabilize blood sugar level, and have an antiallergic effect. This type of waters is indicated for chronic atonic gastritis, enterocolitis, intestinal dyspepsia, poor bile flow and post-operative sequelae of the biliary ducts, incipient diabetes, uremia and digestive allergies. Inhalations with aerosols are indicated in chronic rhino-pharyngitis, sinusitis and tracheo-bronchitis. External immersion, prefferably in very hot baths, is indicated for articular rheumatism, pre-arthritic states, polyarthrosis, post-traumatic sequelae, peripheral nervous system disorders, peripheral circulatory disorders, and skin disorders. Immersion in hot water triggers nervous and metabolic reflexes, which have a strong impact on the whole body.

6. Oligometallic waters (1 g ‰) are poor mineralized waters and may be warm or cold. This type of waters contains: Na, I, S, Ra (Geoagiu, Felix, temperature around 40º-45ºC) and is used in musculoskeletal diseases. Cold waters are used, also, as drinking cure in digestive or urinary disorders: Olãneşti, Cãlimaneşti.

Oligomineral waters have various actions and indications, depending on the mineral. Oligominerals (trace minerals) include: **Metaboric Acid, Lithium, Manganese, Cobalt, Nickel, Copper, Zinc, Molybdenum,** and **Chromium.**

7. Carbonated waters contain 1 g ‰ **CO_2**. As crenotherapy (drinking water), naturally carbonated water stimulates the appetite and digestion, increases digestive secretion of the stomach, pancreas and bowel. It also has a diuretic effect. This type of water is indicated as internal cure in chronic, hypoacid gastritis, gastrointestinal dyspepsia, chronic enterocolitis, biliary stagnation, kidney and urinary tract conditions. As external cure acts as a vasodilator, increases peripheral blood flow, decreases blood pressure; it's indicated in heart affections, polyneuritis, and neuralgias. We can find carbonated waters in: Borsec, Tuşnad, Vatra Dornei, Covasna, Buziaş (Romania),

8. Alkaline and **alkalinoterous waters,** rich in alkaline minerals and ions: **bicarbonates, calcium, magnesium, potassium**. As internal cure, streamlines and stimulates biliary secretion, increases glycogen storage in the liver, lowers blood cholesterol, alkalinizes the urine and the blood, increases the alkaline reserves of the organism, and increases pancreas and bowel secretions. **Calcium** and **magnesium** decrease allergic sensitivities. These types of waters are indicated as internal cure in chronic gastroduodenitis, ulcers, gastrointestinal dyspepsia, chronic enterocolitis, chronic cholecystitis, and biliary stagnation, metabolic

disorders - gout, uremia, diabetes; acidic urinary stones, allergic reactions - cutaneous, respiratory, and digestive. Aerosol inhalations streamline and help to expectorate bronchial secretions in chronic rhino-pharyngitis, laryngitis, and tracheo-bronchitis. Spa resorts where one can find this type of waters are: Slănic Moldova, Malnaş, Bodoc (Romania), Vichy, Royat, Mont D'or (France), Ems, Betrich (Germany), Hisaria (Bulgaria).

9. Arsenical waters

10. Radioactive waters are waters which contain radioactive elements (radium, uranium, and thorium), emitting radiation a (alpha), b (beta), g (gamma). The most important is radium, which emits radiation called radon. In order to be radioactive, water must have minimum 80 U/1.

11. Litinifere waters contain more than 3 mg Li/l and are used in the treatment of manic-depressive syndrome. Lithium salts have therapeutic effect in bipolar disorder. Between 0.4 and 1.6% of the population suffers from this psychiatric condition**.**

Crenotherapy (internal cure with mineral waters)

The aim of the internal cure with mineral waters is to improve and to ajust homeostasis mechanisms.

Internal cure with mineral waters include three stages of action: reflex, neuro-chemical and postcure stage.

1. **Reflex stage** includes conditioned and unconditioned reflexes triggered by ingestion itself.

2. **Neuro-chemical stage** begins when mineral water and its chemical components penetrate the liquid medium of the body, causing non-specific responses to maintain the hydric, acid-basic, ionic balance of human body.

The physical and chemical properties of mineral waters generate specific answers:

- change dynamics of cholecist and billiary ducts,
- change the intestinal peristalsis,
- streamline bronchial secretion, etc.

In this stage, intrinsic qualities of natural resources are exploited. Besides simple substitution of water and electrolytes, which may be deficient, local and systemic adaptive responses appear. *Local responses* are produced by digestive organs (stomach, liver, pancreas, and bowel) and consist in modulation of the rithm, quantity and quality of digestive secretion, modulation of response of osmo- and chemoreceptors from digestive and urinary tracts. *Systemic responses* consist in modulation of neuro-endocrine reactivity and secretion, with consequences on hydric, electrolytic and osmotic balance.

3. **Post-cure stage** is represented by the optimal functioning of homeostasis balance, expressed in effective adaptive responses, as a result of the body "training" during the balneal cure.

The prophylactic action of internal cure is based on the fact that body will respond to controlled intake of water and electrolytes by adjustment of homeostasis mechanisms. During balneal cure, these mechanisms are trained/corrected/improved.

Depending on the intrinsic qualities of mineral waters and their effects on human body, there are several types of **internal cure:**

- *Internal cure for biliary, duodenal and intestinal tracts* determines a better elimination of digestive secretions. It is realised with sulphurous, sulphurous-sulfate or saline mineral waters (in some countries with sea water). This type of cure is indicated for healthy individuals with stressful jobs, which cause changes in dynamics of biliary tract and who's unique medical complain can be habitual constipation.

- *Diuresis cure* is necessary "to wash" urinary tract and to remove metabolic waste. It is realised with hypotonic, oligomineral and sulphurous water. This type of cure is indicated for persons with renal malformation that predisposes to stasis with all subsequent consequences.

- *Hydric and electrolytic balancing cure* is indicated for people who work in conditions that involve thermoregulatory effort and loss of salts and liquids: miners, steel workers, etc.

- *Excito-secretory gastric cure* is indicated for people with poor appetite, with tendency to constipation and is realized with hypertonic waters. [(8), (9)]

Exploitation and commercialization of natural mineral waters

Mineral waters used / indicated in internal cure are often drunk straight from the source. Mineral water can be bottled and can be marketed for consumption, on a daily basis. By Governmental Decision nr.1.020 of September 1, 2005 have been established "Technical rules of exploitation and marketing of natural mineral waters". This law (including attachments) contains the necessary elements for proper management and use of mineral water. Labeling of mineral waters must contain information about chemical composition, including its constituents, name and location of the source. On the label can be written instructions as "stimulates digestion", "stimulate biliary secretion" or similar indications. (10)

The springs of mineral water must be microbiological and biochemical protected, according to law in force and must be regularly analyzed.

Inside the flag for crenotherapy each source must be labeled with the name/number, type of mineral water, indications, mode of administration and contraindications. The way to the spring must be marked by signs; it must be paved, equipped with handrails and benches for resting.

Patients receive instuctions for the balneal cure from the spa physician. On the treatment chart are listed: the source of mineral water, the amount of ingested mineral water, the rhythm and the moment of administration, depending on the disease. Some mineral waters can be administrated as inhalations or/and vaginal irrigation. For this type of application are needed adequate facilities, approved by the Ministry of Health. (11)

In spa resorts were patients can have an internal cure with mineral waters, they can have also an external cure, with the same mineral water or with tap water, in indoor or outdoor swiming pools. Electrotherapy, masotherapy, and kinetotherapy departments are similarly organized all

over spa resorts. Medical prescription is made by a physician, specialist in medical hidrology and performed by therapists (assistants) with short-term medical studies in this field.

III. Therapeutic lakes

This type of lake has formed through one of the same mechanisms as mineral waters do, and can be used for bathing, for prophylaxy/therapy/rehabilitation.

In our country there are three types of lakes:

- Shore lakes, appeared where a river flows into the sea;
- Plain lakes, its chemical composition is determined by the nearby soil composition;
- Lakes from the salt massifs.

External cure with mineral waters

External cure runs into individual tubs or swimming pools, using mineral waters from the sea, lakes or from the sources.

Bath using mineral waters acts on the body by physical (mechanical, thermal) and chemical factors/vectors. If mineral water is used in swimming pools, hidrokinetotherapy itself represents an important beneficial therapeutic factor within the complex balneal treatment.

1. The thermal factor. All responses of organs and systems to the thermal factor action depend on: physiological state of the body (nutrition, skin irrigation, and reaction/constitutional type), physical properties of used thermal agent (specific weight, caloric capacity, termoconductibility, thermopexy) and skin temperature when applying the therapeutic factor.

Thermal neutrality represents the environmental temperature which determines a minimal request of the thermoregulatory mechanisms; this means that the person has no thermal need.

Hyperthermia is the increase of core temperature more than 37.3°C by passive heat input. Increase of core temperature determines: *increase of the inhibitory factor for leukocyte migration (LIF) and for macrophages migration (MIF), activation of lymphoblast transformation, stimulation of platelets activity and of fibrinolytic system, increase of synthesis of interferon*. Hyperthermia determines not only structural, but also functional changes. Cellular defense and immunity have benefits after hyperthermic applications. When the core temperature is around 38º-39ºC, the following systems are activated: central serotonin system (which inhibits sympathetic nervous system activity at central level), hypothalamic – pituitary system (releasing ACTH, endorphins, melanotrophine) and prolactine synthesis. (12)

Characteristics of physiological responses after application of thermal factors in correlation with reactive type (Lampert and col. 1961)

Parameter	Microkinetic type	Macrokinetic type
Core temperature	Stable, low	Labile, relatively high
Caloric erythema and vasodilatation to cold stimuli (Lewis)	Intense erythema at 43ºC and vasodilatation under 10ºC	Intense erythema at 41ºC and vasodilatation between 15-18ºC

Response to cold and warm stimuli	Vasoconstriction and weak, slow, incomplete vasodilatation	Vasoconstriction and strong, fast, exagerrated vasodilatation

Warm partial baths

Heat storage	Low	High
Increase of core temperature	Nonsignificant, by sweating	Increased

Cold partial baths

Heat transfer	High	Weak
Core temperature	Decreased	Constant or increased

Hyperthermic baths

Biological immune response	Weak	Strong
Heat storage	High	Lower
Metabolical type	Trophotrophic, stable	Ergotrophic, unstable
Systolic/diastolic blood presure	Late increase/decrease	Fast increase/increase
Pulse	Stable	Tachycardic
Respiration	Calm	Tachypneic
Nervous response	Sleepiness, apathy	Excitation, fear

Parameters dosage

Temperature	Extreme (38-42ºC)	Mean (34-36ºC)
Time	Increased	Decreased
Interval between applications	Increased	Decreased
Heating of extremities	At 43-45ºC	At 43-45ºC
Body surface	Increased	Decreased

In accordance with Archimedes law, body immersion in the bath water produces an apparent loss of body weight, more obvious the water concentration is higher. Thus, movements become easier, less painful, and muscle groups act more easily upon body segments.

By immersion, gravitational and thermoesthesic information is reduced, resulting a minimal cortical activation, which allows stabilization of neuro-endocrine and humoral homeostasis up to parameters of neuro-psychological and biological comfort.

While gravitational and thermic information is substantially decreasing, information from inner receptors begin to increase, especially from pressure receptors stimulated by new hemodynamic conditions; this results in activation of neuro-endocrine depressant cardiac processes (Bainbridge effect), in triggering Henry-Gauer reflex, which inhibits the vasopressin secretion and has a natural consequence - decrease of blood pressure.

Extension of immersion more than 20 minutes leads to prevalence of endocrine and humoral adjustment processes, followed by secretion of an natriuretic and diuretic factor (ANF-Atrial Natriuretic Factor), connected by a feed-back loop by vasopressin. Vasopressin stimulates secretion of ANF, which in turn inhibits secretion of vasopressin. Thus, a thermoneutral bath which takes 30-40 min can determine a decrease in arterial blood pressure of about 30 %. (9)

Hydrostatic pressure of the bath water exerts on soft tissues a compression more obvious on chest and abdomen level (decreases thoracic and abdominal circumference, increases intrapleural and intraabdominal pressure) and on venous circulation of the limbs. [(8),(12)]

Chemical composition of the mineral water gives individuality to the water source and, thereby, to applied therapy. Certain effects can be seen meanwhile immersing the body in bath water:

- non-specific stimulation/action - produced by the thermal and mechanical factors;
- specific stimulation/action – produced by skin resorption of various substances.

In case of salted water, crystals and salts remained on the skin surface form „the salt mantle"; this mantle, together with hygroscopic action of NaCl, stimulates "a la longue" nerve endings within derma and retains atmospheric water, so performing dermic osmotic shifts different from body usual conditions. Acid pH of the skin gives permeability only for cations. Change of pH during external cure with salted water increases dermic permeability also for anions. Warm alkaline mineral baths produce an electronegative skin charging, while acid baths (which contain bivalent ions Ca^{2+}) determine an electropositive skin charging. Attachment of ions to the skin determines a metabolism change. Part of ions leave the skin and pass into the bath water. So, there is a double passage of ions, which changes dermic excitability and the reflexes with starting point inside the derma. Concentrated salted baths stimulate dermic circulation, fact that influences general blood circulation. In case of carbogaseous baths, there is a smooth massage of CO_2 bubbles on skin surface. (8)(11)

The action of mineral waters as external cure can be seen more significant or more discreet from cellular level up to all tissues and systems of human body. This feature is at the same time the strong and weak link of balneotherapy. Balneal medicine is the strong point because is involving the whole body – holystic medicine, approach necessary to modern practice more and more, because of fragmentation of medical fields through high specialization, fact that leads to ignoring human body as a whole. Also, balneal medicine is the weak link because the great variety of interdependent elements, constituting the therapeutic factor, makes difficult to study them in concordance with evidence based medicine requirements, which ignore persistence of balneoterapy along human existence.

General rules for balneotherapy

The most common way to use externally mineral waters is as warm bath. For a proper application of the bath, the assistant/therapist from thermotherapy department must comply with certain rules:

1. Inspection of the patient before immersion in the tub.
2. General warm procedures must not be applied secondary abundant meals (lunch), stress, physical exercises, tensed situations. It is preferred that application occurs in the morning.
3. If the patient has two major procedures the same morning, it’s mandatory to have a 2 hours break between them. The physician must avoid too many procedures on medical prescription for one patient.
4. Menstrual bleeding contraindicates any balneal procedure first 2-3 days, the next days allowing only partial applications to upper limbs.
5. Draining of kidney and digestive residues.
6. The application of cold thermoterapy will be done only on warm skin or on areas heated before and begins always with the warm factor.

7. Hot or warm applications will always be followed by a cold procedure, in order to avoid consecutive vasoplegia.

8. When the time for bathing finishes, the patient steps out of the tub and must be dried with a sheet, intensity of this process being correlated with the intented aim: with vigorous movements (for a tonifying effect) or softly (to reduce response).

9. Precise application of the prescription: temperature, duration, level of immersion or application area. The assistant/therapist may add minor procedures - friction or brushing, in order to rush appearance of dermo-vascular reactions.

10. The therapist must provide psychological support to the patient by explaning him the applied procedure and avoiding unpleasant discussion or arguing.

11. The assistant/therapist must supervise the patient carefully meanwhile the application, in order to prevent incidents or accidents which can happen.

If the water is carbogazeous, sulphurous or radioactive, patient is advised to stay still in the water, in order not to remove the gas from water; the gas particles adhere to the skin surface and acts like a very fine mechanical factor. (13)

During kinetics inside water, passive or active movements will be performed systematically, following a schedule supervised by qualified personnel.

The tub baths can be general or partial, when the physician considers that procedure is too demanding for the patient. Partial baths, having a moderate effect, determine subtile changes to circulation and metabolic mechanisms of the organism. Mineral baths can be taken in swimming pools – indoor or outdoor, in therapeutic lakes or in the sea.

Balneal reaction will be followed up and corrected; if it's too intense, breaks must be taken even during the cure or physician will use symptomatic medication, in order to alleviate the signs and symptoms characteristic for balneal crisis.

Mineral waters use in inhalations and aerosol

The action of mineral water on the respiratory system is based on local effects, as well as on general pharmacodynamic effects, appeared after water has dissolved into the alveolar epithelium of the lung. Therapeutic effects depend on physical factors (water temperature, quantity of water - 6-9 l/min, thickness of the particles mist, its content, the degree of spraying/dispersion of the water, osmotic pressure and the degree/force of striking against membrane) and on chemical factors:

~ Saline waters soften mucous secretions and stimulate movement of vibrating ciliae

~ Sulphurous waters produce local vasodilatation and have a trophic effect upon respiratory membrane

~ Carbonated waters promote elimination of mucus, neutralise local acidity from chronic inflammation and have sedative effect upon sore mucosa

~ Arsenic waters have hyperemiant effect on respiratory mucosa

~ Iodinated waters stimulate secretion of mucus and resorption of secretions

~ Silicon waters have spasmolytic and desensitizing effect

Collective inhalation is applied in specially designed rooms, the mist being produced by sprays of high capacity. The air in the room is properly heated. In case of individual inhalation the patient participates actively, controlling the rate and depth of respiration, cleaning rhyno-bronchial area through elimination of secretion. Temperature of the sprayed liquid is 35-40ºC and exposure time is 15-20 min. The natural aerosol is administered meanwhile the patient is walking outdoor, through parks or cliffs. (4)

Mineral water use in vaginal irrigation

Mineral waters from natural springs or therapeutic lakes are used in order to remove secretions, to stimulate epithelization of mucosa, to increase local trophycity, to treat especially chronic, local inflammation; irrigation can be associated or not with vaginal mud tampons. This procedure is associated with general/partial baths or with mud packing. The following types of waters are indicated for this purpose: saline, iodinated, and sulphurous waters.

Necessary equipment for department of balneotherapy and surveillance measures (microbiological and biochemical) of therapeutic resource

The room used for balneotherapic procedure must be provided with a space where the patient takes off his cloths (cloakroom), with a suitable sized tub and with shower. Tub dimension must be between 80x175 cm and 100x190 cm and the volume of used water is 180 - 220 l. Minimal area allocated for a tub is 8 m^2, and for the shower is 2-3 m^2. It is preferred that these spaces are completely separated, but it is possible to have rooms with more than a tub and, in this case, privacy of patients should be provided by incomplete walls or screens. Drainage system and filling valves must be dimensioned in order to allow filling, respectively drainage of the tub in 3-5 minutes.

The necessary space for therapeutic showers (contrasting shower, Scottish shower, massage shower, etc) is minimum 3-4 m^2 per room; for Scottish shower is necessary a distance of 3-3.5 m between the nozzle and the patient. The mud packing room must has an optimum surface of 4 m^2, height of 2.5 to 3.5 m, must contain beds with dimensions between 80x175 cm and 100x190 cm, with a height of 70 to 80 cm.

Balneotherapic rooms must have the floor coated with non-slippery materials, be provided with adequate drainage system, wooden grills and naturally illuminated. Fluorescent lamps provide most proper artificial light, which allows the therapist to see dermo-vascular reaction. The walls must be covered by tiles up to the ceiling or at least up to a height of 2 m from the floor. Ventilation of the rooms must ensure vapor removal during application, so that humidity in the air doesn't exceed 75%. Optimum temperature in the baths rooms/chambers is 22ºC to 24ºC, and in the corridors and waiting rooms 20ºC to 22ºC. It is appropriate to have ambiental thermometers in every room, for better monitoring of thermal comfort necessary during the procedures.

Duration of a warm bath is 20-30 minutes, after this resting is necessary for 1-2 hours. For time monitoring every room must have a signalizing clock or an hourglass with sand. Sweating and resting shall be carried out in the hotel room and when hydrothermotherapy is applied in specialized outpatient must exist specially designed spaces: rooms for resting and/or sweating, where the staff provides to the patients fluids for hydration: mineral water, tea.

Special attention must be paid to surveillance of surface/source of mineral water, to protection of perimeter in accordance with the existing laws, checking periodically microbiological and biochemical parameters. Personnel involved in this activity will carry out periodically a medical exam, according to valid epidemiological and working protection normatives. Special attention will be paid to selfcontrol rhytmically realised by the owner of the base. [(7)(8)(11)]

Therapeutic mud

Muds consist in natural plastic materials, rocks of pasty consistency, used as therapeutic remedies. They have formed either by underwater storage of organic and inorganic material (curative sediments), or by decomposition of rocks through the action of atmospheric agents (therapeutic muds). Depending on the deposited material, there are two types of curative sediments: biolitics (from organic material) and abiolitics (from inorganic material). From the category of therapeutic muds belong: clay, marl, loess.

In Europe there are different types of mud:

- Sapropelic mud: these are sulphurous, unctuous deposits, formed on the bottom of shore lakes, plain lakes, from former seas (Techirghiol, Amara).

- Peat mud: these are brown deposits (Poiana-Stampei, Mangalia - the only marine peat, Stobor - the only vitriolic peat).

- Mineral mud: formed by sedimentation of salts from natural springs (carbogaseous, calcic, ferruginous, sulphurous).

Physically speaking, muds are composed from a liquid phase, which contains water, and soluble mineral salts, from a solid phase, containing crystalline salts, clay salts (silicates and silicic acid) and organo-mineral colloidal substances (humic acids) and sometimes from a gaseous phase (which contains hydrogen sulphide). The action is induced by means of both physical and chemical mechanisms.

1. Because of its physical properties, mud is acting through thermic factor. So, circulation within the skin, diffusion of substances and ionic exchange are modified. The increase of temperature modifies the status of colloids from plasma and the speed exchange.

2. Mud acts as ion exchanger through humic substances, which have high inflation capacity and proven enzymatic inhibitory action upon hyaluronidase. (7)

3. Sapropelic and peat muds have antibacterial (bacteriostatic and bactericidal) and anti-inflammatory action.

4. Mud accelerates metabolic speed, thus stimulating tissular breathing.

The mud is used as cold ointments, warm mud baths or hot mud packing.

Cold mud ointment is a therapeutic complex, which consists from hot-cold contrast. Cold mud ointment is performed in the summer time, on a specially designed beach, where fresh extracted mud is brought daily or every other day. After a 15-20 minutes sun exposure, the patient applies on the whole body surface a mud layer of 1-1.5 cm thick. Drying of the mud on the skin takes 15-30 minutes, depending of the environment temperature. The patient enters into the lake water in order to remove dried mud, and then performs active movements of all body segments. In the end of the procedure the patient takes a tap water shower. Duration of sun exposure is

increasing daily (from 5-10 minutes first day up to 30-40 minutes in the end of the cure), as well as the number of lake immersions. The number of mud applications per day is constant. During the cure one must take only one mud application per day. (Teleki et al., 1984)

Thermoneutral mud bath is prepared using 10 kg of mud in 120-150 L of salted water from the lake. Application temperature is around 37.5ºC -38ºC, neutrality point for mud being at 38ºC. The mud bath takes 20-25 minutes and temperature is maintained almost constant adding warm water after half the time. Once the time expired, the patient takes a warm shower in order to remove the mud from the skin and a quick cold shower in order to avoid systemic vasodilatation. General mud bath is indicated once every two days, alternatively with salted warm bath (in the swimming pool or in the tub) or plants extract warm bath (Onose, 2000).

Hot mud general packing is prepared using 10-15 kg of mud heated at 42ºC-45ºC. The mud is smeared all over the body surface, from neck to toes. The patient is covered with a sheet and a blanket, gets a cold compress on his forehead in order to avoid a strong vasodilatation of cerebral vessels and remains like that for 30 minutes. After time expires, the mud is washed using a warm shower. The procedure ends with a short cold shower, in order to prevent irreversible dilation produced by heat. Mud packing is performed once two days, alternative with a warm salted bath or with a bath containing plant extracts (Surdu, 2006; Onose, 2000).

Mud collection is performed from the central area of the lake, where there are three deposits (“islands”) of therapeutic mud. Here the mud is settled uniformly, without any foreign material, having a characteristic aspect: black, shiny, unctuous, very plastic, with a very fine granular structure and a specific smell. This is the area from where mud is extracted for over one hundred years and used in all sanatoriums on the seaside (Diaconescu et al., 1973; Ţuculescu, 1965). For mud collection is necessary a claw bucket mounted on a boat. From the boat mud is absorbed with a pump and loaded into a tank, which transports it inside the treatment area, where is deposited in special boilers provided with electric heating and mixing systems. Mud shelf life in the bunker is 4-6 days. From here is provided also the mud for cold ointments in the summer time. After collection from the lake, mud is transported to the solarium, where is stored in the recipients outside (Surdu et al., 2005).

PROPHYLACTIC BALNEAL CURE

Considered as a whole, therapeutical approach may be divided as it follows (5):

1. primary prophylaxis, which addresses to disease prevention and to elimination/removing of the risk factors;

2. therapy, that means treating of acute or chronic ailments;

3. secondary prophylaxis, which establishes measures to prevent illness to become chronic or to prevent relapses;

4. tertiary prophylaxis, which has as aim to prevent sequelae formation or to prevent functional deficits to become chronic. Tertiary prophylaxis is somewhat equivalent to rehabilitation. Medical content of primary prophylaxis is varied and is addressed to a large category of apparently healthy people, tired of the rythm of daily life, which have a food diet that overcharge digestive and/or kidney system.

Primary prevention aims to increase the capacity of some adaptive functions or of the whole body, possibly correction/removal of neuro-endocrine disorders.

Prophylaxis of relapses consists in the correction of restant functional changes, of some disturbed regulatory mechanisms after solving the problems of the acute phase, clinical manifest of the disease.

Prophylactic balneoclimatic cures aim optimization of thermoregulation function, of the neuro-endocrine response, increase of the capacity to effort, to ensure a good biliary drainage and a proper evacuation of solid and liquid waste out of the body, to balance sleeping-awakening rhythm, etc.

Balneal cure as primary prophylaxis use some methodological groupings of physical medicine: electromedicine (electrotherapy), photobiology (phototherapy and heliotherapy), hydro-thermo-biology (hydrotherapy and thermotherapy), kinetology (kinetotherapy and massotherapy).

Methodological grouping represents all procedural means which mainly use the same physical vector (possibly with some association/mixture). Physical vector designates the type of energy which acts on human body during physical therapy. The name of the methodological group includes the main physical vector (5). So:

- methodological group of electromedicine use predominantly electric current or electric field as vector
- methodological group of photobiology use electromagnetic radiation (light);
- methodological group of hydro-thermo-biology use the thermic vector.

In order to produce bio-physiological effects, physical vectors interact with the organism. The carrier of physical vector's energy is the physical support of the vector. For example, in case of thermic vector, physical supports are varied and somewhat heterogeneous:

- water in all forms of aggregation, simple, with additives or mineral;
- air (phönn);
- natural or artificial substances with thermopexic characteristics (mud, wax, sand, siliconic gels, salt);
- ultrasound;
- alternative electric current with high oscillation frequency (diathermia with short waves);
- electromagnetic radiation (infrared light);
- composite textures, which by encapsulation causes an exogenous reaction with local heat.

Natural therapeutic factors are vectors and physical supports, which are found in the natural state: mineral waters (springs, lakes, and seas), muds, therapeutic gases (pits and sulfatarii). (3)

The application of contrasting thermal factors

This is a method practiced during the warm season, outdoors, in order to develop body ability to adapt to cold; it requires 10-14 consecutive days. This method can be applied on the seaside or on the side of any other type of water.

Helio-talasso-therapy consists in 4-6 succesive exposures to warm/cold contrast: sun exposure (warm), immersion in the sea/lake water (cold), packing in warm sand – psamotherapy (warm), again immersion in cold water (cold), with thermic contrasts as strong as possible, progressive as duration and intensity of the cold factor.

Heliotherapy together with cold mud ointments and immersion in the lake water, described as Aegyptian method, is a type of application of thermic contrast. As the first phase, sun exposure lying on the warm sand for about 20 min is performed, followed by mud ointment of whole body. Next phase is another sun exposure for about 20-30 min, which produces a light hyperemia, then a cold bath in the water of the sea or lake.

In spa resorts with thermal waters, cold factor is represented by cold showers, appropriate as temperature and duration.

Heliomarine cure

It represents a complex of methods and means offered by the marine climate and bathing into the sea, used for prophylactic, therapeutic and/or rehabilitation purpose.

Romanian Black Sea seaside is 245 km long and offers environmental and therapeutical conditions on its whole lenght. Black Sea is a closed sea, continental type. Water is not so deep near beaches, which favours a good penetration and retention of sun radiation. Mean temperature of the water in summer time is 21-24ºC. Beaches are wide, with smooth sand, having an eastern sun exposure, protected against the wind. There are three elements that compete to therapeutical effects of heliomarine cure: water, air and sun radiation.

Water acts through following vectors: chemical, thermic, mechanical.

Water of the sea is a hypertonic mineral water, with a concentration of salts of 15-18 g%, chlorinated, iodinated/brominated, sulphate, with sodium, magnesium. It also contains: Zn, Cu, Co, Mn, Cr. Because is a hypertonic water, rich in Na and Mg, at least in theory it may be indicated/used in the treatment of chronic constipation. Except the mineral content, inorganic, the presence of algae, plankton determines inside dermis the release of biologically active substances (ionizing compounds, minerals, and vitamins), all stimulating natural defense mechanisms of the organism.

Minimum temperature of the water for balneal therapy is 15ºC in adults and 18ºC in children. Immersion into the sea water ensures the cold element from contrasting therapy, used in prophylaxis of chronic diseases "a frigore"; prophylaxis of infectious diseases specific to cold season - common cold, flu, sore throat, chronic inflammatory and degenerative rheumatismal diseases, gynecological diseases, bladder pathology, etc.

Application of thermic contrast for 12-14 days in the summer time, by sun exposure together with immersion in the water of the sea, is efficient for stimulation of thermoregulation during cold weather (autumn/winter season). Mean temperature of sea water in the summer is around 21-24ºC. Higher the water temperature is, greater is the capacity of skin penetration of the salts.

Rythmic massage produced by sea waves and by water pressure influences general circulation acting directly upon veins, which are more compressible, but also indirectly, exciting peripheric receptors. Playing in the sea water stimulates secretion of hypophyseal growing hormone.

Air is the second element of the heliomarine cure. On the surface of the water and near its vicinity, air is iodinated and produces a slight stimulation of thyroid gland, which is responsible for a good overal state. The presence of negative aeroions has a favorable effect on organism. Relative humidity of the air is similar with that of Mediterranean and Adriatic coasts (70-75%) and reduced nebulosity determine a brightness of the sun in more than 70% of the summer time. Aerosolotherapy with cloride-sodium particles, iodinated and magnesium particles is inseparable linked to the notion of heliomarine cure, because sea is considered the greatest natural inhalatory.

Solar radiation is the other element of the heliomarine cure. Both infrared and ultraviolet radiation acts on the body exposed to sun. In the morning and at dawn predominate ultraviolet radiation and at noon infrared radiation. Abusive exposure to any of the two types of radiation is followed by ultraviolet, respectively actinic burning.

Ultraviolet radiation exerts revulsive action on the skin, producing specific erythema, followed by pigmentation and then by exfoliation. It activates vitamin D from the skin, promoting a better absorption of Ca and its deposition to bones (antirachitic action).

Increase of secretion of growth hormone, combined with stimulation of processing provitamin D, lead to a stronger skeleton in children which are taking frequently sunbaths on the beach. By ultraviolet radiation, sun stimulates hematogenic spine (antianemic action), clotting function and glucidic metabolism. Ultraviolet radiation has also bactericid action (being known this saying: „inside a sunny house will not enter the doctor"). It changes the threshold of nervous excitability and influences nociception, having antialgic action. Oncogenetic risk of solar radiation does not occur, unless in case of prolonged exposure (months, years), in persons with a predisposition or a pre-existing injury. No way that an annual heliomarine cure of not more than 12-18 days, correctly carried out, exposes the person to this risk. Actual socio-economic conditions have shortened seaside vacation to 7-10 days. In this context, the risk to which is exposed the person arrived at the seaside for a short period is that of actinic burning, because people want to stay as much in the sun, in time as short as possible.

Heliomarine cure produces rebalancing of the body, by approaching of primary ways of existence (phylo- and ontogenetic development took place in amniotic water/liquid), through temporary tearing apart from the stressful environment from great cities. Alleviation of cardio-vascular, respiratory, endocrine, nervous functions determine a better general status. By playing on the beach, walking or swimming, both healthy and ill people can combat sedentary life, hypokinetic syndrome and mio-cardio-respiratory deconditioning syndrome,.

Prophylactic thalassotherapy is indicated for children, adolescents and young people suffering from:

a) constitutional mio-arthro-kinetic deficiencies (axial deviations of spine column or limbs);

b) growth disturbances, meteosensitivity, predisposition to “a frigore” diseases, and poor adaption to cold and wet season.

Favorable prophylactic effects are beneficial for adults who work in cold, moisture, environments with dust or other respiratory pollutants, mycroclimate with lack of natural light or who are living in areas iodine free. [(21) (7)]

Sweating cure

It's addressing both to cardio-circulatory system and to sudoripar thermolisis. Aim of sweating is to produce a certain „metabolic purge". All resorts have technical means for sweating cure, as thermotherapy "a sec" (light baths), performed all over the year. [(7) (13)]

Mobilization of the body is essential in order to combat hypokinetic syndrome. There are some kinds of movements with progressive physical effort:

- light jogging, walking on the complex field, climbing up slopes, walking rapidly;
- group gym with the guidance of a kinetotherapist;
- swimming, tennis and other sportive games.

In all these forms of movement practiced by untrained people, is essential the request up to the effort limit of the organism, and being conducted in open air.

Dietotherapy applied in spa resorts has as objectives:

- weight reduction to obese people
- learning to feed proper, rational and healthy
- ensure a digestive resting necessary to every organism from time to time

Sparing diet must be considered as a method of maintainance therapy, a vacation spent in a balneal resort is an occasion of renouncing to toxic substances (tobacco, alcohol, spices), for ensure the conditions necessary to eliminate nocive substances accumulated during the year and to allow the liver and stomach to restaurate. (7)

THERAPEUTICAL BALNEAL CURE

Fields of pathology/prophylaxis that benefit from balneal cure are:

1. Neurological pathology (central/periphery);

2. Rheumatologycal diseases: osteoarthritis, inflammatory arthritis, both in acute, sub-acute, subchronic or chronic steady;

3. Posttraumatic pathology: shoemaker, orthopedic-surgical, sports;

4. Cardiovascular pathology (cardiac diseases; peripheral-arterial/venous/lymphatic);

5. Respiratory pathology (restrictive/obstructive/mixed type);

6. Pathology of civilization (sedentariness; stress/breakdown - with important prophylactic connotations);

7. Geriatric pathology, prophylaxis, and reabilitation;

8. Pediatric pathology;

9. Psychiatric pathology (stress/breakdown, neurotic syndromes/neurastenia);

10. Digestive pathology (gastro-intestinal, biliary, hepatic);

11. Kidney and urinary pathology;

12. Metabolic pathology;

13. Gynecological pathology;

14. Dermatological pathology and cosmetology;

15. Ears-nose-larinx pathology;

16. Professional-occupational pathology. (3)

Nowadays is less indicated balneal cure with therapeutic purpose for any kind of diseases, because pharmaceutical industry offers remedies that correspond to the concept of evidence based medicine. It's difficult to assess the effects of therapeutic balneal cure, because this is a complex of factors that includes, besides the main natural factor: climate, habitat, and food changing, lack or at least diminish of everyday stress; all these elements make statistical analysis difficult.

There is a list of absolute general contraindications and there are, also, relative contra-indications.

General contraindications for balneal cure in adults

• Acute and chronic fever during the flare;

• Infectious diseases - including the venereal diseases (syphilis, clap, AIDS, hepatitis acute type B, C, etc.); tuberculosis - except in cases with healing confirmed by the specialist physician; healthy carriers of pathogens - including parasitic agents;

• Cachectic states, regardless of causes;

• Cancer of any type, no matter of the location or stage;

• Bleeding of any cause;

• Hematological diseases;

• Diseases to the limit of organ failure (cardiac insufficiency, renal, hepatic) and/or metabolism status unbalanced or difficult to control with therapeutic means; oscillating blood pressure and/or with high values – without therapeutic control;

• Epilepsy, psychopaties - including chronic alcoholism and other drug addiction;

• Disturbances of sensitivity (hypersensitivity to specific current links it was perhaps psychogenic/hypo - anesthesia emanating on the areas relatively taut)

• Lesions and/or skin diseases, with risk of aggravation by F. F. T. N. and/or lesions large, unsightly; areas with skin irritation, solutions of continuity;

• Patients who can not care for themselves;

• Patients recovering from serious and recent illness

• Pathological pregnancy regardless the age and normal pregnancy after three months [(7) (8) (11)]

Contraindications and/or limits for balneal cure in elderly

- Painful ischemic heart disease (especially angina at rest), myocardial infarct, cardiac arrhythmias (except possibly chronic atrial fibrillation with average rate, well tolerated),
- Severe high blood pressure, uncontrolled/difficult to control by medication
- Clinical cerebral atherosclerosis, demential syndromes
- Sphincter disorders (bladder and/or anal)

Physiological features of aging process and modulation of thermal parameters required for application of balneal factors in the elderly

In ancient times, Aristotel said about old age that is a natural disease. In our own day, H. Pequinot argues that the sole topic of the future is geriatrics. Between these two statements is the old man, together with geriatrics physician, family and society.

Because of global socio-economic positive evolutions, life duration increases continue, so the number of retired persons tends to exceed that of active persons. Wishes/requirements/claims of people regarding the quality of life have changed; they have grate expectation, including elderly peoples. In this context, the concern for the composition of prophylactic programs, therapeutic and recovery addressed to elderly is fully justified.

Aging process is not a disease or a dysfunction itself. It only represents a decrease of the optimal physiological levels of all ongoing processes within the organism**.** This global malfunction does not occur equally within all systems and does not start precisely from a certain moment. The human body can or cannot be affected previously to this moment. So is now taking shape the concept of a “differential aging", which makes aging may be regarded as a generally process but in the same time an individual form for everyone.

Recent scientific data relating to physiology and genetics aging

From the biological point of view, fundamental for aging process is a decrease of adaptability of both functions of various systems and cellular level, so that adaptive mechanisms that lead to maintenance of internal environment balance - homeostasis - are slowing down and sometimes are ineffective in elderly. Homeostasis is disturbed especially under physical (including heat stress and climate), chemical and physical stress, consequently adaptive mechanisms are restoring slowly or insufficiently the perturbed parameters.

Nowadays, there are two currents for the most frequent accepted intimate mechanisms of aging process: theories based on genome and theories without direct genetic determination. There is a certain consensus on genetic determination of aging, at least at the time when it’s initial. Theories based on the genome, addresses aging is a genetically programmed phenomenon, either as a genetic phenomenon but not "predestination". Genetic theories of aging schedule shows or just assume the existence of genes that modify the beginning of aging phenomenon, the specific genes or non-specific aging genes, longevity of genes, or initiate this redundancy of genes, repair inadequate genes or simply aging passive / slow them. Theories which relate to aging as a phenomenon not programmed, submit an aging as a result from the accumulation errors in DNA replication and in transcription genetic information via RNA, piling up consecutive periods of deterioration when synthesis structural proteins or enzymes. This

process is marked by accumulation of free radicals toxic of oxygen (reactive species of oxygen with very short life, non-continuous) appearing in a continuous manner in the body (stress in antioxidant and prooxidant levels during pregnancy) connected with food and the supply (stress sprayed) and body interaction with various environmental factors, including excessive aerobic exercise.

The disturbance of the major homeostatic functions: immune, neurological, endocrine, thermoregulatory, together with alteration of self-control mechanisms, they all generate the transformation of the normal stress within a relationship into a pathogenic stress.

The main targeted tissue structures for physiological aging – whose senescence influences the global rhythm of aging – are the blood vessels and the neurons. The complex aging changes to these structures have as general results aterosclerosis and neurodegeneration.

Main link morpho-physiologic adaptation to exercise is related to the cardio-respiratory, responsible for exercise tolerance. Common expression of its decompensation is dyspnea.

The important changes related to normal aging of cardiovascular system, to exercise requirements and to the clinical response to each other (discordant/concordant) are represented in Table 1.

Morpho-physiological parameter	Morpho-physiological changes connected to age	Required adaptive demands for physical activity	Change/Request report
Systolic flow	Decreases with 1% /year, from 7 l/min, in terms of effort, at 40 years old, to 4 l/min at 80 years old	Increases 2-3 times compared with resting phase	
Cardiac frequency	Adaptability decreases by increasing the frequency to requests; decreases the chronotropic and inotropic adrenergic reply	Request an increase of cardiac frequency (limited to max.140 beats/min in elder	
Arterial blood pressure	Increased, normal, low – adaptive deficit to environment requirements	Decreases the arterial blood pressure	
Peripheral resistance	Increases, because of the decrease of vascular walls elasticity	Decreases, due to vasodilatation produced by local metabolites: adenosine, K^+, Ach, ATP, lactic acid, CO	
Speed of blood circulation	Decreases	Increases	
Maximum oxygen consumption	Decreases from 45-50 ml O_2 per kg.body/min, in an adult, to 18-23 ml O_2 per kg.body/min in adults over 60 years old	Increases to 85-90 ml O_2 per kg.body/min	

Table 1. The cardio-vascular system senescence and adaptive demands for balneal application

The aging of respiratory system, its request to physical effort and the ratio are showed in Table 2.

Morpho-physiological parameter	Morpho-physiological changes connected to age	Adaptive needs required by physical activity	Change/Request report
Respiratory system	Progressive deterioration of the pulmonary tissue (parenchyma and interstitial). The decrease of chest elasticity and respiratory muscles activity. The increase of the residual volume	The respiratory rhythm (tachypnea) and amplitude increase. The CO_2 partial pressure in the alveolar air decreases.	**Relatively discordant**

Table 2. Respiratory system senescence and balneal application

Physical efforts have general and tissue metabolic consequences. It is the responsibility of blood to supply nutrients for metabolic processes involved, and he removed residues. Hematoformator system aging-related changes and their relations efforts are systematized in Table 3.

Morpho-physiological parameter	Morpho-physiological changes connected to age	Adaptive needs required by physical activity	Change/Request report
Plasmatic volume	Decreases due to intercellular water loss	Increases due to blood mobilization from deposits	**Discordant**
The number of red-blood cells	Does not modify	Decreases	**Relatively Discordant**
White-blood cells	The incapacity to trigger calcium signals because of decreased intercellular calcium and low synthesis of phosphoinositol and diacil-glycerol	Decreases	**Concordant**
Thrombocytes	"Status trombofilicus": The activation mainly of the coagulation system with the imbalance of the fluid-coagulant status	Decreases blood coagulation	**Discordant**
Variation of concentration of the dissolved gases in the peripheral blood	Decreases the consumption and extraction of O_2 from the arterial blood	Decreases arterial CO_2 concentration due to hyperventilation and amino acids loss through perspiration	**Concordant**

Table 3. Hematopoetic system senescence and physical effort changes

Somatic nervous system is one that coordinates and controls the physiological realization of conscious and harmonious movement. In other words, an aging nervous system means progressive accumulation of defects/failures followed by restructuring. The aging of the nervous system generate disturbances in signal transmission, in thermic receptors, in the transmission and/or integration of information, in the transmission of afferent stimuli.

Morpho-physiological parameter	Morpho-physiological changes connected to age	Adaptive needs required by physical activity	Change/Request report
Cellular populations	•***Decreases the number of neurons:*** Synaptic plasticity changes; apoptosis; neurofibrillary damage; loss of myelin sheath; decrease of speed transmission along the nerve; granular-vacuolar degeneration; Levi corps in high number; areal accumulations of lipofuscine; occurrence of Hirano corps; senile plates •***Compensatory proliferation of conjunctive tissue between the neurons*** •***Changes of the hemato-cerebral barrier permeability***	Nervous structures able to gather and transmit information, to elaborate the reply and to carry it to the effective organs, in order to realize the vegetative feed-back	**Discordant**
Central nervous system circulation	1. Decompensation of self-control mechanisms of cerebral circulation 2. Pathological mechanisms: Oclusive (through thrombosis or embolism)	The acute phase: Contraindicates physical activity and effort The chronic phase: Requires parametrical	**Discordant**

Table 4. The nervous system senescence and physical activity

Older people have particular characteristics in relationship with warm balneal prescriptions:

- the decrease of immune system's response capacity to new antigenic challenges
- the increase of the quantity of endogenous antigenic products and, in addition, propensity for autoimmune phenomena
- the alteration of expression phenomena of surface antigens, of their products and also of the subtle mechanisms of presentation /recognition /cooperation /connection from the major complex of histocompatibility

Structural and functional alterations of aparates and systems induced and / or maintained by any of the assumptions and theories summarized above, generates functional insecurity that generates vulnerabilities for elder people:

- the cardiovascular function vulnerability
- the motor activity vulnerability
- the sensitive-sensory function vulnerability
- the psycho-affective vulnerability

Usually, skin trophicity is not as important as the cardiovascular function, but under certain conditions it may become at least as important as prognosis ad vitam as state cardiovascular system. The precarity of muscular trophicity disturbs motor activity of the muscles.

The decrease of muscular force happens gradually starting from early ages:

- between 44-55 years old, there is a loss of 1% /year
- between 55-65 years old, there is a loss of 1,5% /year
- over 65 years old, there is a loss of 2% /year, remaining 30-40% from muscular force value from age 25

The precarity of bone structure generate risk for osteoporosis.

The precarity of near joints structures trophicity determine risk for stretching, loss of continuity of insertions, breakings and all of this in the end generate limited range of motion.

The damage of motion includes:

- The decrease of passive mobility usually due to pyramidal muscular hypertonia of the lower limbs, but also due to extrapyramidal hypertonia
- The increase of support base in upright position and walking;
- The decrease of the miotatic reflex, usually symmetrical;
- Conservation of general sensitivity, with the possibility of decreasing the vibratory sensitivity in the lower limbs.

The result of all this damages is senile walking.

An important pathological cause for walk disturbances in elderly people is stroke. Vascular pathology in the nervous system can be distinguished two models of evolution different clinical:

- bleeding irreversible ischemic damage with clinically significant rebound when their installation;
- ischemic lesions, but minor bleeding rarely without express clinic at the time of their occurrence, but repeated that accumulate, creating a progressive degradation.

The prevention/recovery of these states are very important, because with all these deficiencies, elder must remain independent in the family environment and/or social. Any particular therapeutic goal must have a precise purpose.

- The precariousness of sensory functions: sight, smell, taste, hearing, constitutes vulnerability in older people. Reduction in sensory functions increases the risk of injury, creating additional difficulties in composition of rehabilitation programs.
- The precariousness of psycho-emotional functions is one of the great dangers/potential vulnerabilities in the elderly. The decrease of this function, combined with instability and damage of motion induce tendency to isolation, reducing compliance to treatment recovery.
- In terms of our subject, is important to assess psycho-sensory disorders, NMAK system and cardiovascular system of the patient arrived in the spa resort, so that it can properly receive a therapeutic prescription for rehabilitation in maximum security with minimum risk of incidents/accidents.
- Polipatologia is often the main problem with impact on vital prognosis and as well as on the effects/limitations/risks of therapeutic act

The therapeutic objectives in elderly rehabilitation in balneal resort are:

- The maintaining/regaining of articular mobility;
- The maintaining/regaining of muscular force and resistance;
- The maintaining/correction of body posture and alignment;
- The maintaining/correction of motor coordination and control and equilibrium.

Kinetic programs conducted at the gym are organized in groups or applied individually to disease criteria.

Therapeutic objectives followed in balneal treatment in elderly are:

- The decrease/control of pain;
- Prevention of loss/recover of joint mobility;
- Prevention of loss/recover of muscular force and resistance;

In case of neurological sequelae, the aims of the kinetic program are:

- recover of the muscular tonus – decrease in muscular hypertonia and increase in muscular hypotonia;
- prevention of axial deviations;
- recover the balance between agonists/antagonists, synergists/stabilizers, and also between the physiological alternation contraction/relaxation;
- re-establishment of body equilibrium, voluntary motor control, walking and abilities.

Kinetotherapy along with hydrokinetotherapy, with their various prescribing forms, are used in balneal resorts, in procedural complexes**,** usually belonging to the entire methodological gatherings of our field: hydrothermotherapy, electrotherapy, masotherapy, balneoclimatotherapy.

Therefore, we should bare in mind a certain margin of vital relationships when discussing and concluding all the conceptual and methodological aspects regarding kinetic prescriptions, the latter ones being unable to react on their own on the elder's organism, but all of them together.

One might say – has been proved by statistic analysis – that parameter modulation of kinetics and hydrokinetotherapy clinically motivated prescriptions, may allow 3-rd age and even 4-th age patients to do efficient balneal and physical treatments, not only with the purpose of training/stimulating the organism's adaptability, with the delay of global decrease of performance/maladjustment phenomena characteristic for senescence - thus gerontoprophilaxis, but also with the purpose of treating ailments and/or chronic dysfunctions – gerontorehabilitation, both aspects leading finally to the same objective – improvement of life quality.

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