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**FEATURES OF SANATORIUM TREATMENT OF PATIENTS WITH SKIN DISEASES****Polion N.M. / Поліон Н.М.***c.med.s., associate professor/ к.мед.н., доцент*<https://orcid.org/0000-0002-5791-0254>*Dnipro State Medical University, Dnipro, 9 Volodymyr Vernadsky St., 49044**Дніпровський державний медичний університет,**Дніпро, вул. Володимира Вернадського, 9, 49044***Diudiun A.D. / Дюдюн А.Д.***d.med.s., professor/ д.мед.н., професор*<https://orcid.org/0000-0002-8374-3023>*European Medical University, Dnipro, Academician Dzyak George St., 3, 49005**Європейський медичний університет, Дніпро, вул. Академіка Дзяка Георгія, 3, 49005***Hladkykh N.O. / Гладких Н.О.***PhD, assistant/ доктор філософії, асистент*<https://orcid.org/0000-0003-3966-7462>*European Medical University, Dnipro, Academician Dzyak George St., 3, 49005**Європейський медичний університет, Дніпро, вул. Академіка Дзяка Георгія, 3, 49005***Polion M.Y. / Поліон М.Ю.***c.med.s., associate professor/ к.мед.н., доцент*<https://orcid.org/0000-0001-9307-1411>*Dnipro State Medical University, Dnipro, 9 Volodymyr Vernadsky St., 49044**Дніпровський державний медичний університет,**Дніпро, вул. Володимира Вернадського, 9, 49044*

**Abstract.** Sanatorium treatment of dermatological patients is one of the important stages of patient management, especially for those suffering from common dermatoses that occur with frequent prolonged exacerbations and short-term remissions.

Natural factors have a physiological effect on the human body and have fewer side effects and complications than pharmacological drugs. Sanatorium and resort treatment has an important health-improving, preventive, therapeutic and rehabilitation effect

**Keywords:** sanatorium treatment, rehabilitation, psoriasis, UVB, climatotherapy, heliotherapy, peloid therapy, photodermatoses, plasmapheresis, dermatoses

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Natural factors have a physiological effect on the human body and have fewer side effects and complications than pharmacological drugs. Sanatorium and resort treatment has an important health-improving, preventive, therapeutic and rehabilitation effect [2, 9].

The history of spa treatment of dermatologic pathology goes back centuries.

In Ancient Egypt, a decoction of the fruits of medicinal plants (*Ammi majus*, *Psoralea corylifolia*), which cause hypersensitivity to sunlight, was used to treat vitiligo. The experience of three thousand years ago became the basis for the concept of a modern treatment method - PUVA therapy.

The first historical evidence of the beneficial effects of sulfide waters and sulfide mud on the skin dates back to the eighth century BC, when the first resort in England,



Bath, was founded. In the XVI century, the great surgeon Ambroise Pare wrote: "Sulfur waters really warm, dry, relieve itching and heal ulcers."

Since ancient times, mud has been used not only in the treatment of diseases with skin pathology, but also as a widely used cosmetic product. The Dead Sea waters and mud were transported by camel caravans through the Judean desert to Cleopatra's palace. In 1365, Francesco Petrarca was cured of a skin disease by the thermal iodine-bromine waters of the Italian resort of Abano Terme. The siliceous calcium-containing waters of the French resort of Aven-les-Bains were visited several times by Napoleon I, who suffered from "persistent itching of the thighs" and used its water in military campaigns. In 1838, Dr. Jules Wolfranck-Gérdy wrote the famous work "Skin Diseases Cured by the Thermal Water of Urijah". This is the first work to scientifically substantiate the therapeutic properties of sodium chloride water rich in silicon and its beneficial effects on the skin. In Azerbaijan, skin diseases were treated with naphthalene. In 1890, German engineer E.I. Eger, borrowing from the local population's folk treatment experience, built a small factory for the production of naphthalene ointment [10].

The experience of thousands of years and modern methods of spa therapy based on scientific research form the basis of comprehensive spa treatment of dermatological patients. In addition to the local effect on the skin, spa treatment has a beneficial effect on the entire body, providing a more lasting therapeutic effect. Spa treatment for skin diseases can be used as a stage of rehabilitation therapy after successful drug treatment, at the stage of post-treatment, and to prevent relapses. The effectiveness of spa treatment is significantly increased if the principle of continuity between dermatologists of different levels and the resort's doctors is observed.

When choosing a resort, one should take into account the peculiarities of the influence of natural factors, taking into account concomitant and competing diseases, the climatic zone of the resort, and the season. It is necessary to maximize the possibility of sanatorium treatment in the climatic and geographical conditions familiar to the patient. For meteorologically sensitive people, especially children and the elderly, resorts in the region of residence are preferable, as staying in unusual climatic and geographical conditions requires adaptation of the body and re-adaptation after returning from the resort.

Of particular importance is the choice of season for spa rehabilitation of children with atopic dermatitis and patients with hypersensitivity to UVB.

In the case of allergic dermatoses combined with pollenosis, it is necessary to take into account the possibility of growing plants whose pollen can cause allergies at the resort, as well as the season of their active flowering. The choice should be made in favor of a region or season that excludes contact with this allergen.

Dermatologists should prepare patients with dermatoses for spa treatment. Sanatorium treatment is indicated in remission or when acute inflammatory processes subside. When selecting dermatologic patients for sanatorium treatment, it is necessary to take into account the peculiarities of the clinical course of dermatosis. The skin process should be in a stationary regressive stage or in a state of clinical remission. Patients with dermatoses in which exacerbations occur in the summer are sent for sanatorium treatment in the autumn and winter months, and with dermatoses that



exacerbate in winter - in the summer [8, 12].

All skin diseases in the acute and subacute stages, infectious skin diseases, scabies and other parasitic skin diseases, skin reticulosis, lupus erythematosus, and photodermatoses are contraindicated for spa treatment.

Before prescribing sanatorium treatment, it is necessary to conduct a mandatory examination: blood test, urine test, biochemical tests, ECG, chest X-ray. Patients with atopic dermatitis and skin and respiratory syndrome should additionally undergo a specific allergic examination, immune status examination. Other examination methods are performed depending on the patient's concomitant diseases.

The leading factors in the sanatorium treatment of dermatological patients are climatotherapy (aerotherapy, heliotherapy); balneotherapeutic factors: hydrogen sulfide, radon, iodine-bromide, nitrogen, silicon, sodium chloride waters, as well as peloid therapy and thalassotherapy.

Climatotherapy is one of the main factors in the spa therapy of children with atopic dermatitis. There are well-known facts of improvement in the condition of patients after staying on the seashore of the Azov, Black and Baltic Seas. Among the climate therapy procedures, heliotherapy, aerotherapy, and sea bathing are used.

Heliotherapy is especially indicated in the case of certain dermatological diseases with a seasonal course: a tendency to improve in the summer and worsen in the winter. The sun's rays have a pronounced antidepressant effect, they contribute to positive dynamics in the treatment of psoriasis, atopic dermatitis, various forms of ichthyosis, etc. The therapeutic effect of heliotherapy is due to the simultaneous action of several ranges of optical radiation - infrared (IR), visible and ultraviolet (UV). IR rays have the ability to penetrate to a depth of 50-60 mm, passing through the epidermis and dermis, they reach the subcutaneous fat. Under the influence of infrared rays, the generated heat enhances tissue metabolism, increases the phagocytic activity of leukocytes, accelerates tissue regeneration, has a tranquilizing, analgesic and antipruritic effect, which, together with increased blood flow, contributes to the reversal of inflammatory processes.

Visible radiation affects the photoreceptors of the retina, which affects the functional state of the central nervous system, circadian rhythm (through the melatonin/serotonin ratio), humoral regulation of metabolic processes through activation of the production of gonadotropin-releasing hormones of the pituitary gland and the effect of glucocorticoids and adrenaline on nonspecific resistance. UV rays penetrate to a depth of 0.5-0.6 mm: medium-wave rays (UV-B) reach the spinous layer of the epidermis, long-wave rays (UV-A) reach the papillary and reticular layers of the dermis. Under the influence of UV rays, photochemical processes are triggered in the skin, leading to changes in the protein structures of cells with the release of histamine and other biologically active substances. This results in capillary dilation, increased blood flow, increased permeability of capillaries and cell membranes, changes in water metabolism, hydrophilic cell colloids, changes in the physicochemical properties of the skin, and a decrease in pH due to a decrease in cationic levels and an increase in anionic levels. These and other reactions are externally manifested by erythema of the skin and visible mucous membranes. Under the influence of UV radiation, skin pigmentation appears, which increases the skin's resistance to repeated irradiation, stimulates the



formation of vitamin D and the production of cytokines with anti-inflammatory and immunosuppressive effects, and induces apoptosis of cells involved in the pathogenesis of the disease.

It is believed that low doses of UV radiation should sensitize, while high doses should desensitize the body. This assumption is confirmed in the practice of spa therapy for dermatological patients. Thus, the best therapeutic results are observed in patients who adequately perceive sun exposure without any complications. The clinical effect of sunbathing is incomparable to UV irradiation with quartz paws in tanning beds.

In the case of skin diseases, hydrogen sulfide, radon, sodium chloride, flint, and iodine-bromide waters are used. Among balneotherapeutic procedures, general and local baths, showers, and irrigation with hydrogen sulfide, radon, sodium chloride, flint, and iodine-bromide waters are the most widely used and recognized, as they have a beneficial effect on the entire body and improve the course of the skin process.

Sulfide waters have a pronounced anti-inflammatory, resorptive, trophic effect. By irritating the exteroceptors, hydrogen sulfide causes an increase in capillary blood circulation in the skin, which improves its trophism and regeneration processes, which justifies the use of sulfide waters in dermatology [8]. An important factor in the mechanism of action of sulfide waters is changes in mediator metabolism that occur due to the formation of vasoactive substances in the skin (histamine, acetylcholine, etc.). Balneotherapy with sulfide waters is especially effective in the case of diseases with severe disorders of cellular keratinization (psoriasis, ichthyosis), as well as sebaceous gland function (acne, seborrheic eczema). Contraindications to balneotherapy with sulfide waters are those common to hydrotherapy, as well as kidney disease, hepatitis, and liver cirrhosis. Resorts with sulfide waters: Kyustendil (Bulgaria), Saturnia (Italy), Smardaki, Trenčianske Teplice (Slovakia), Harkany (Hungary).

Under the influence of carbon dioxide water, a kind of micromassage of the skin with gas bubbles occurs, while the skin capillaries expand, their number increases, and capillary blood flow accelerates. Carbon dioxide has a chemical effect on the receptors and effector apparatuses of the sympathetic and parasympathetic nervous system, promoting the formation of active biological substances: active acetylcholine, histamine, serotonin and cholinesterase. Carbon dioxide baths are prescribed to patients with psoriasis and other dermatological patients where the underlying disease is combined with cardiovascular diseases.

Radon baths have a sedative, calming effect on the central nervous system, as well as anti-inflammatory and keratoplastic effects. The effect on the skin is manifested in the stimulation of epithelial regeneration, correction of immunological disorders. Radon water resorts are indicated for patients with allergodermatoses, dermatoses prone to frequent exacerbations occurring against the background of endocrine disorders and functional disorders of the nervous system, in combination with diseases of the musculoskeletal system, peripheral nervous system. Contraindications are those common to hydrotherapy, as well as pregnancy, benign tumors, and systemic blood diseases. The resorts with radon waters are Momin Prohid (Bulgaria), Ischia (Italy), and Bad Gastein (Austria). Silicon maintains skin elasticity and firmness, blood vessel elasticity, restores skin immune defense, and is of great importance in the growth and



formation of the skin and its appendages, bones, cartilage and connective tissue. The astringent and drying effect of flinty waters is very important. Therefore, they are indicated for patients with dermatoses prone to exudation (exudative psoriasis, various types of eczema).

Very often, silicon mineral waters contain nitrogen as a component. Nitrogen baths have a pronounced calming effect on the central nervous system, increase capillary tone and reduce arterial tone, and affect the endocrine glands and metabolism. There are resorts with nitrogen-silicon baths in Lazne Kinzhvart (Czech Republic).

Fundamental research conducted at the Avranches-les-Bains resort (Pierre Fabre Dermo-Cosmetique Laboratory, France) showed that the therapeutic effect of the thermal silicon (14 mg/l) bicarbonate waters of Avranches-les-Bains is due to the cationic composition, mainly calcium ( $\text{Ca}^{2+}$  - 266 mg/l). In vitro studies have shown that Avranches waters, by changing the dynamics of cytosolic  $\text{Ca}^{2+}$ , affect the synthesis of various types of keratin and epidermal proteins. In addition,  $\text{Ca}^{2+}$  waters help to reduce the synthesis of IgE, have an antihistamine effect, cause inhibition of keratinocyte proliferation, accelerating their morphological differentiation. These mechanisms determine their therapeutic effect in atopic dermatitis, urticaria, eczema, and psoriasis [10].

Iodine and bromine stimulate metabolic and reparative processes, have anti-inflammatory effect. The anti-inflammatory effect of iodine-bromine waters is due to their effect on hemodynamics, which is manifested by vasodilation, active redistribution of blood, and regulation of local blood circulation. Iodine, as one of the main components of iodine-bromine waters, affects microcirculation processes, improves the elastic properties of the vascular wall, rheological properties of blood, and lipid metabolism. Iodine ions inhibit alteration and exudation, stimulate reparative regeneration processes. Bromides enhance inhibition processes in the central nervous system. Deposits of iodine-bromide waters accompany the outflow of sulfide waters. The most famous resorts: Abano Terme and Montegrotto Terme (Italy); Bad Hall (Austria); Hajduszoboszló, Szarvar (Hungary); Bazna (Romania).

Thermal and chemical irritation of the skin under the influence of sodium chloride waters leads to the release of biologically active substances and mediators and further activation of proliferative and metabolic processes, improvement of blood supply to the skin and internal organs. The mechanism of therapeutic action of sodium chloride waters of medium and high mineralization is due to the increased osmotic pressure of sodium chloride water, which leads to dehydration of surface tissues. The result is a decrease in the excitability and conductivity of nerve fibers, a decrease in pain and tactile sensitivity. Dehydration also helps to improve microcirculation and capillary blood flow, accelerate the resorption of inflammatory foci, and activate the anti-clotting system. These factors cause analgesic, anti-inflammatory, and antipruritic effects.

The treatment of dermatological patients is especially effective in summer, as most of the salt lakes are located in steppe areas characterized by dry, hot summers with a high number of hours of sunshine, when brine baths and mud therapy in water mud baths are supplemented by bathing in highly concentrated brine from lakes and estuaries, as well as solar therapy. Brine baths, bathing, and heliotherapy are the main



factors of the Dead Sea resorts, which rightfully occupy one of the first places in the resort treatment of dermatological patients. This drainless salt lake is located at the lowest point on Earth - at a level below the level of the World Ocean. The climate is characterized by constant (without sharp daily and seasonal changes) high air and water temperatures throughout the year and low relative humidity. The high content of various minerals in the Dead Sea water turns the coast into a natural inhaler, and the clean, hypoallergenic air, with an increased oxygen content of 15%, creates the effect of a natural barocamp. Studies have shown that the Dead Sea coast has the lowest concentration of pollen in December and February. This is the most favorable time for patients with skin and respiratory syndrome. [3] The study showed that solar therapy at the Dead Sea improves in 72% of cases, while bathing with Dead Sea water improves in 28%, and complex treatment, which includes solar therapy and bathing in the Dead Sea, improves in 83% of cases.

Despite the fact that even hours of sun exposure do not lead to burns, doctors at Dead Sea clinics recommend limiting sunbathing time. The resort has developed insolation programs that take into account age, weight, height, skin type, and skin reaction to the sun. [4].

The degree of risk of developing skin cancer and other potentially adverse effects of climatotherapy at the Dead Sea was studied in the Department of Dermatology at Rabin Medical Center, Tel Aviv. Examination of 605 patients with psoriasis after treatment in Dead Sea clinics did not reveal any cases of melanoma or other forms of skin cancer. All signs of skin photoaging and actinic damage correlated with the duration of sun exposure and the frequency of climatotherapy at the Dead Sea [7].

In a retrospective study of 1,738 patients with psoriasis (Institute of Preventive Medicine in Copenhagen) treated in Dead Sea clinics between 1972 and 1993, a significant (almost fivefold) increase in the risk of melanoma was noted compared to the general Danish population [5].

Taking into account the data of Danish studies, treatment at the Dead Sea can be recommended for patients with a burdened family history (familial melanoma) and patients with numerous nevi only after consultation with a dermatological oncologist.

Sanatorium treatment of patients with psoriasis at the Dead Sea is indicated in the inpatient or regressive stage, the optimal time of year is from mid-March to mid-November. Summer forms of psoriasis are contraindicated for treatment at the Dead Sea.

For patients with vitiligo, a four-week course of treatment at the Dead Sea resorts is recommended, with mandatory re-treatment. According to the results of randomized trials by the Department of Clinical and Experimental Dermatology at the University of Bradford, UK, the initiation of repigmentation is observed from the second week (10–16 days) with a combination of climatotherapy at the Dead Sea (21 days) and external therapy with pseudocatalase cream (PC-KUS) compared to conventional pseudocatalase monotherapy (8-14 weeks) or climatotherapy at the Dead Sea (5-6 weeks).

Common contraindications for treatment at the Dead Sea resorts include unstable angina, severe heart failure, uncontrolled hypertension, renal and hepatic failure, and photodermatosis.



Mud therapy (peloid therapy) for dermatological patients consists of external procedures using silt sulfide and sapropel mud, peat, and sapropels. Mud applications, due to the mechanical factor, affect the receptor apparatus of the skin and mucous membranes, reflexively affect the neuroendocrine, neurovascular mechanisms, which leads to functional, microcirculatory and metabolic changes in tissues and is manifested primarily by the trophic effect. The adsorption properties of therapeutic mud lead to cleansing of the skin from metabolic products, bacteria, and keratinized epidermal cells. The mineral and organic substances of peloids have anti-inflammatory, coagulating, keratolytic, and analgesic effects. The sulfur content in peloids in the form of sulfides, sulfates, thiosulfates has an anti-inflammatory, keratolytic or keratoplastic, exfoliating effect, stimulates collagen production. The antimicrobial, antiparasitic, and resorptive properties of sulfur have traditionally been used in medicine to treat severe forms of acne. A high concentration of silicon compounds affects the trophism of the skin epithelium. Lecithin, which is part of sulfide mud, has a pronounced effect on the restoration of skin barrier functions and cell nutrition. Due to the fact that silt mud is a hypertonic mass, it is prescribed for the purpose of drying and dehydrating the skin. Mud therapy is particularly effective in patients with limited chronic dermatoses such as eczema, atopic dermatitis, scleroderma, plaque psoriasis, and psoriatic arthritis. Mud therapy is mainly used in the form of local mud applications.

In patients with arthropathic psoriasis, in addition to peloid therapy, ozokerite therapy and paraffin therapy are often used.

An important place in the spa treatment of dermatological patients is occupied by naphthalan and naphthalan preparations. The positive effect of naphthalene on the skin is due to the normalization of keratinization. Its local anesthetic effect is manifested in a decrease in skin sensitivity, in particular tactile sensitivity, which causes the antipruritic effect of naphthalene. Such properties of naphthalene as anti-inflammatory, desensitizing, antihistamine, analgesic have determined the indications for a wide range of dermatological patients: psoriasis, eczema, atopic dermatitis, seborrhea, boils, sycosis and other pyodermas, urticaria, itching, wounds, bedsores, chronic ulcers, etc. [6].

There are two known deposits of therapeutic oil in the world, on which the Naftalan resorts in Azerbaijan and Naftalan in Croatia were built. In addition to naphthalene, both resorts have iodine-bromide thermal waters, which are necessary for naphthalene treatments and balneotherapy [6].

Naphthalene and naphthalene oil preparations are used with caution on large areas of the body in case of kidney disease with renal failure, hemorrhagic syndrome, and severe anemia.

The method of choice for the sanatorium treatment of dermatological patients is resorts that have balneotherapy waters or mud and drinking water.

An important role in the treatment of patients with atopic dermatitis and eczema is assigned to the correction of gastrointestinal disorders. The method of choice is resorts that have drinking water along with balneotherapy waters and/or mud. In the complex spa therapy of dermatological patients, various methods of hardware physiotherapy are used: magnetic field, ultrasound treatment, laser therapy, and electroshock.



An important place among the methods of spa medicine in the treatment of dermatological patients is occupied by elimination measures. In recent years, this arsenal has been supplemented by extracorporeal methods of treatment and endoecological rehabilitation.

The complex factors of psoriasis pathogenesis, manifested by pronounced changes in metabolic processes accompanied by endogenous intoxication, served as the basis for the use of plasmapheresis in complex sanatorium therapy. Plasmapheresis can be recommended for use in the complex treatment of patients with psoriasis in its various clinical forms, since detoxification of the body potentiates the therapeutic effect of traditional spa therapy [2].

The World Health Organization defines health as a state of complete physical, mental and social well-being and not merely as the absence of disease or infirmity. Therefore, successful treatment of a patient should not be limited to restoring or maintaining only physical status, without taking into account the psychosocial aspect. Clinicians have always recognized the negative impact of skin diseases on human life. Spa treatment allows not only to achieve a stable remission, but also to significantly improve the quality of life. Repeated courses of spa treatment improve the short-term and long-term results of therapy, improve the quality of life and allow for the control of dermatoses.

#### **Conflicts of Interest**

The authors declare no conflict of interest.

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