

NAFTALAN OIL IS A SPECIFIC BALNEOLOGICAL FACTOR OF AZERBAIJAN

V.A. Adigozalova 

Academician Abdulla Garayev Institute of Physiology, Ministry of Science and Education of the Republic of Azerbaijan, 78 Sharifzadeh Street, AZ 1100, Baku, Azerbaijan

E-mail: v.adigozalova@gmail.com

Naftalan oil, the only oil field in the world located in Naftalan, Azerbaijan, was found to contain biologically active components with medicinal properties. Naftalan is known as a health resort for the specific biological characteristics of the oil and its therapeutic effect. This article presents a review of the therapeutic usage of Naftalan oil, the historical facts about its use, and information about the main stages of studying the mechanism of its therapeutic effect. Information about its therapeutic usage is summarized.

Keywords: Naftalan oil, biological properties, therapeutic effect.

The oil produced in the Naftalan area of Azerbaijan has been used by the population as a remedy for several centuries. And since 1898, it has been recognized as an official medicine and has become an effective natural source of biologically active substances used both in balneology and pharmaceutical chemistry.

Throughout the 20th century, scientific studies of Naftalan oil were successfully carried out in order to substantiate the practical value of natural properties in the treatment of a number of diseases, including diseases of the musculoskeletal system, skin, central and peripheral nervous systems, certain gynecological, allergic, surgical, and other diseases, and also when used in veterinary medicine.

The criteria for evaluating therapeutic Naftalan oil were based on the physicochemical properties of heavy (density ρ 4 20 - 0.927-0.960 g/cm³) oil, which was traditionally used as well as having passed special clinical trials in its native form back in the 30s of the twentieth century [27].

Summarizing the available information about the healing properties of Naftalan oil, it is

necessary to pay tribute to people's observations and correct assessment of the healing properties of this particular type of oil, which is the product of the most complex chemical and biological changes occurring in the bowels of the earth. Historical and modern data on the therapeutic use of Naftalan oil indicate its particular effectiveness in diseases in the pathogenesis of which changes in the body's reactivity play a leading role [22, 26].

The rejection of organolocalistic principles made significant progress in studying the mechanism of the biological action of balneological factors.

Balneological factors were considered not as separate agents with certain physical and chemical properties and affecting certain organs in isolation but as a complex physiological stimulus that affects the entire human body.

At the same time, the impact on the body of the balneological factors included in a certain complex is distinguished by a certain specificity and originality.

Domestic balneology developed in two main directions:

- study of the reaction of the whole organism to the impact of a complex of balneological factors;
- study of the specific features of each balneological factor, which is a kind of physiological stimulus and causes a certain response in the whole organism.

With such an orientation toward balneology as a branch of medicine, the role of experimental studies devoted to the study of the mechanism of the biological action of balneological factors, including Naftalan oil, and the results of their application increased.

The clinical, laboratory, and experimental data available in the literature reveal to a certain extent the mechanism of the biological effect of Naftalan oil on the human body and experimental animals, as well as the essence of its healing effect. It should be emphasized that this effect is accompanied by significant and diverse functional and morphological disorders in the body. Naftalan oil causes physical and chemical changes in tissues and metabolism (protein, carbohydrate, mineral, water-salt, pigment) that affect the processes of hematopoiesis and the functions of the cardiovascular, respiratory, endocrine, immune, and other body systems [1, 2, 3, 6, 22, 26].

The impact of Naftalan oil on the body is also accompanied by noticeable functional changes in various parts of the peripheral and central nervous systems, which makes it necessary to study the mechanism of its action.

Of particular interest is the change in metabolism, since the violation of metabolic processes is one of the significant pathogenetic factors in the development of various diseases.

A number of researchers who studied patients with rheumatism treated with Naftalan oil found a slight decrease in acidotic parameters and an increase in the oxidative coefficient [7, 8, 16, 24, 39].

An increase in total and free blood glutathione was recorded in the Naftalan research laboratory. The same increase in glutathione was also indicated by M.M. Mir-Salimov and S.I. Mamedkhanly [28].

It has been shown that naftalan procedures affect the redox processes of the brain in

different ways: in some cases, they increase the content of ascorbic acid; in others, they reduce the levels of glutathione, catalase, and dehydrase. This effect is strongest after the first procedures with the skin application of Naftalan oil [4, 5, 19, 30].

The influence of Naftalan oil on protein-nitrogen metabolism is extremely interesting. The study of blood protein fractions (albumins, globulins, and fibrinogen) and the results of blood tests for total and residual nitrogen, urea, uric acid, and total protein in patients with various clinical forms of polyarthritis treated with naftalan baths showed that in most cases, indicators of total blood nitrogen in the middle of treatment decrease and subsequently gradually increase within the physiological norm, up to the onset of a favorable therapeutic effect. Similar changes are observed in the indicators of residual nitrogen and total protein, as well as uric acid [10, 11, 36].

On the contrary, the amount of urea increased somewhat in the middle of treatment, and in the end, it decreased. The content of albumins decreased from the beginning to the end of treatment, while globulins, on the contrary, increased; the amount of fibrinogen decreased in the middle of treatment and reached baseline values at the end of the treatment.

These data indicate some compensatory activation of protein metabolism under the influence of naftalanotherapy. The application of oil, aromatic components, and resins causes a noticeable intensification of nitrogen metabolism. According to some reports, carbohydrate metabolism is disturbed in arthritis [9]. By the end of the treatment with Naftalan oil, a constant increase in blood sugar was observed. With a sugar load in patients with rheumatism, an increase in the blood sugar curve and a delay in returning its content to normal are recorded. After treatment with Naftalan oil, this delay increases even more [11, 12, 40]. The latter position is clearly confirmed by experimental studies that studied the effect of skin lubrication with Naftalan oil on the glycogen curve [11]. The sugar content was examined on an empty stomach and after a sugar

load, as well as after the administration of adrenaline and insulin. Based on their research, the authors come to the conclusion that after 4-5 times of lubrication of the skin with Naftalan oil, hyperglycemia is possible. The glycemic curve under a sugar load in animals receiving Naftalan oil increases more sharply than in controls and returns to its original level more slowly. An adrenaline test after exposure to naftalan causes slower glycemia with a delay in returning to its original position. With the introduction of insulin to naftalanized animals, hypoglycemia is mild and disappears [11, 12].

The glycogen reserve in the liver, heart, and skeletal muscles is greatly reduced under the influence of Naftalan oil.

In order to identify the effect of Naftalan oil on liver function, the sugar curve was studied at various sugar loads. In the experiment, the authors applied Naftalan oil externally (on the skin of a rabbit) and intravenously injected a 20% emulsion of oil in Ringer's solution [13].

After the 5-fold application of Naftalan oil, the sugar curve remained almost unchanged; distinct changes appeared only after 10-fold lubrication. At the same time, in most cases, the content of sugar in the blood increased significantly.

The authors studied the blood sugar levels on an empty stomach and after a load of glucose in numerous patients with rheumatism, untreated and treated with Naftalan oil, and established a pronounced tendency to normalize impaired carbohydrate metabolism under the influence of Naftalan therapy [13, 15]. All this indicates an improvement in carbohydrate metabolism after the application of Naftalan oil. In the experiment, it was proven that the skin lubricated with large doses of Naftalan oil can cause impaired functions of the liver and pancreas [11, 34, 35].

However, some negative effects of Naftalan oil on carbohydrate metabolism obtained in experiments did not raise doubts about its therapeutic effect, which depends on the method of application and dosage of oil.

The results of studying the effect of Naftalan oil on cholesterol in the blood made it possible to establish the following:

- cholesterol metabolism naturally changes in the experimental and clinical conditions of the use of Naftalan oil;
- the effect of Naftalan oil on cholesterol metabolism depends on its dose, duration of use, and individual characteristics of the body;
- in experimental studies, after 20-fold lubrication with Naftalan oil, the amount of cholesterol in the blood slightly increases; it increases even more after 30 lubrications.

At the same time, in the liver, spleen, bone marrow, adrenal glands, kidneys, both normal and naphthalized skin, muscles, and bile, the amount of cholesterol was increased, and in the brain and spinal cord, on the contrary, it decreased:

- between the 10th and 15th lubrication, the level of cholesterol in the liver, spleen, bone marrow, and adrenal glands decreased somewhat, which was accompanied by an increase in cholesterol in the blood and spinal cord.

The dependence of cholesterol metabolism on the general reactivity of the body was confirmed by the studies of M. Mustafaev as well as T. G. Pashaev and G. I. Kasimov, which, using a large amount of experimental material in various experiments, stated the relationship between cholesterol metabolism and various functional disorders of the body [31, 32, 33, 34].

The results of studies conducted by A.I. Karaev and co-workers indicated that the amount of cholesterol in repeatedly naphthalized skin increased compared to the tissue of non-naphthalized skin from the same animal [21, 22, 23]. Similar changes were recorded in the blood of patients undergoing naftalanotherapy. The therapeutic effect was characterized by a decrease in the content of cholesterol in the blood.

Data on a decrease in the level of cholesterol in the blood of patients with naftalan therapy were also confirmed by studies on the effect of naftalan therapy in combination with intrasternal blood transfusions on the course of lichen scaly [17, 18].

The effect of not only native naftalan on cholesterol metabolism but also the effect of various fractions of naftalan oil on it has been studied [14, 20, 29].

The impact of Naftalan oil on mineral metabolism was also studied. Maintaining the correct ratio of calcium and potassium is necessary for the normal functioning of body systems (bone-articular, endocrine, digestive, etc.), whose pathological changes can be successfully treated with Naftalan oil [27].

The content of calcium, potassium, and sodium was studied in 14 patients before and after treatment with Naftalan oil. Patients were treated with Naftalan oil lubrication in a chamber heated to 39–45°C. After 5 procedures, the ratio of potassium to calcium increased and, in some cases, slightly decreased. In 8 patients, the sodium content increased; in the majority of patients who received more than 10 procedures of Naftalan oil, the ratio of potassium to calcium increased, and only in 4 patients it slightly decreased. After 15 procedures, this ratio was most often increased. The amount of sodium in some patients was increased; in others, it was reduced [24, 25].

An increase in the content of potassium, a decrease in calcium, and dry blood residue were observed when using Naftalan oil in experimental rabbits [36, 38].

A.Kh. Kuliev investigated a number of ingredients of mineral metabolism: potassium, calcium, chlorine, and total blood phosphorus in patients with arthritis of various etiologies who took naftalan baths (from 14 to 16 baths at a temperature of 37–38°C) followed by periodic washing and rest for 30 minutes, and found that the content of potassium in the blood of most patients before treatment was below normal, in the rest, within the normal range, and above normal. In patients with a low potassium content, by the end of treatment, an increase was noted, which did not exceed the norm; and vice versa, in most patients with a high potassium content, a decrease was observed [24].

The amount of calcium in the blood of most patients fluctuated within the physiological norm. In patients in whose blood the amount of calcium before treatment was

above the norm, by the end of treatment it was normal.

The content of chlorides in the blood, which was within the physiological norm in almost all patients, slightly decreased by the end of treatment, mainly in those individuals in whom it was elevated before treatment.

The amount of total blood phosphorus in most patients was lowered before treatment and increased by the end of treatment, reaching the norm. In some patients, it was more than normal, and by the end of naftalanotherapy, it was normal; others have a slight fluctuation within the physiological norm both before and after treatment.

The data by A.Kh. Kuliyeu on the individual ingredients of mineral metabolism basically coincide with the clinical results of naftalanotherapy [24].

The phenomena associated with pigment metabolism in the application of Naftalan oil were studied. S.I. Samedov, who in the conditions of the Naftalan resort and in non-resort conditions studied pigment metabolism in 45 patients with rheumatism during the treatment with Naftalan oil without subsequent washing in various combinations (with the sun, a quartz lamp, at 37°C, 35°C, etc.). In patients, the amount of bilirubin in the blood was determined before, during, and after treatment. Stercobilin and urobilin were determined daily. In almost all procedures, the increase in the indicated pigment indicators was pronounced, especially with naftalan-solar procedures. These shifts can be explained by increased hemolysis of erythrocytes [36, 37].

From the above data, it can be seen that under the influence of Naftalan oil, the metabolism changes significantly. The therapeutic effect depends on the correct choice of the method of application and dosage of Naftalan oil.

CONCLUSION

A review of the literature, as well as clinical, laboratory, and experimental data on the effect of Naftalan oil, allows us to draw the following conclusions:

- Naftalan oil has a strong, unique, and diverse effect on the human body and experimental animals.
- Clarification of the biological effect of Naftalan oil is possible only by studying the leading link in this problem, namely the reactivity of the body with all its manifestations and changes under the influence of oil, carried out by neuroreflex and neurohumoral mechanisms.
- In light of the above provisions, the development of a methodology for the therapeutic use of Naftalan oil, taking into account the individual characteristics of the body's reactivity, is of particular importance.

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НАФТАЛАНСКАЯ НЕФТЬ – СПЕЦИФИЧЕСКИЙ БАЛЬНЕОЛОГИЧЕСКИЙ ФАКТОР АЗЕРБАЙДЖАНА

Вафа Алман кызы Адигозалова

*Институт физиологии им. академика Абдуллы Гараева, Министерство науки и образования
Азербайджанской Республики, Баку, Азербайджан*

Нафталанская нефть является единственной в мире своеобразной лечебной нефтью. Представляют большой интерес её биологические свойства, терапевтическое воздействие как специфического бальнеологического фактора. В данной статье представлен обзор лечебного применения нафталанской нефти, приведены исторические факты о ее использовании, собраны данные об основных этапах изучения механизма действия нафталанской нефти. Обобщены имеющиеся сведения о ее лечебном применении.

Ключевые слова: нафталанская нефть, биологические свойства, лечебное действие

NAFTALAN NEFTİ AZƏRBAYCANIN XÜSUSİ BALNEOLOJİ AMİLİDİR

Vəfa Alman qızı Adıgözəlova

*Akademik Abdulla Qarayev adına Fiziologiya İnstitutu, Azərbaycan Respublikası Elm və Təhsil
Nazirliyi, Bakı, Azərbaycan*

Naftalan nefti – dünyada yegənə müalicəvi əhəmiyyəti olan neft formasıdır. Onun bioloji xüsusiyyətləri ilə yanaşı, bir müalicəvi üsul kimi terapevtik təsiri böyük maraq yaradır Bu məqalə Naftalan neftinin müalicəvi istifadəsinə dair retrospektiv icmalı təqdim edir. Onun istifadəsi haqqında tarixi faktlar verilmiş, Naftalan neftinin təsir mexanizminin öyrənilməsinin əsas mərhələləri haqqında məlumatlar toplanmışdır. Onun terapevtik istifadəsi haqqında mövcud məlumatlar ümumiləşdirilmişdir.

Açar sözlər: Naftalan nefti, bioloji xassələri, müalicəvi təsiri

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