



## THE IMPORTANCE OF HIRUDOTHERAPY IN HYPERTENSION

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| <b>Received:</b> April 4 <sup>th</sup> 2023<br><b>Accepted:</b> May 6 <sup>th</sup> 2023<br><b>Published:</b> June 6 <sup>th</sup> 2023 | The article contains data on the use of medical leeches in modern and traditional medicine, information on the effect of hirudotherapy in the complex treatment of hypertension, and data on the effect of hirudin on blood vessels. The article also contains information about some types of leeches. The decrease in the number of leeches in recent years is explained by the increase in their use by fishermen as bait, medical purposes and the relative pollution of the medicinal leech habitat. |
| <b>Keywords:</b> Hirudotherapy, treatment of hypertension, blood vessels, Acupuncture Points, Blood Coagulation                         |   |

### INTRODUCTION

Karl Linnaeus (1707-1778) first named *Hirudomedicinalis* in 1758. Once in Europe, there was a huge population of medicinal leeches, but now it is included in the Red Book of invertebrates in several countries [1, 2, and 19].

Mankind has known for almost 2000 years of using the medicinal leech in various fields of its activity.

The decrease in the number of leeches in recent years is explained by the increase in their use by fishermen as bait, medical purposes and the relative pollution of the medicinal leech habitat.

The use of medicinal leeches in oriental medicine is associated with the works of Abu Ali IbnSina. There is evidence of the use of leeches even in the Stone Age, and the ancient Babylonians, when they portrayed their god of healing; they portrayed him with a leech in their hands [1, 2, 9, and 17]

Hirudotherapy is widely used in the Arab world. The famous Arab physician Roses, who lived in 850-923 AD. Widely used medicinal leeches in dermatovenerology. Avicenna, in his book "The Canon of Medicine", described in detail the methods and techniques for setting up a leech, and recommended the use of leeches for snake bites, various skin diseases, etc. [9,18] As the doctors of the old practice left medicine, a certain emptiness arose in the continuity of the teaching of hirudotherapy in medicine. In the current medicine, hirudotherapy is not included in the curriculum at medical universities. The method disappeared from textbooks. In many places, leeches have disappeared from sales. Thus, modern doctors do not even have an idea about hirudotherapy, about the mechanisms of its action on the human body. In addition to this, many doctors, having no idea about the elementary basics of hirudotherapy, completely relying on medication therapy, believe that hirudotherapy does not deserve attention [9, 10, 12, and 16].

Over time, it became obvious that pharmacotherapy did not cope, and the number of side effects from the use of drugs forces us to return to the study and use of

hirudotherapy [1,2,14,15]. About 400 species of leeches are known on earth.

Despite such a huge number of types of leeches, only 2 of them are suitable for medical purposes. Medicinal leech (*Hirudomedicinalis*) and Nile leech (*Limnatisnilotica*, *Limnatisurcestanica*) is sometimes called horse.

There are three subspecies of medicinal leeches.

1. Medicinal or medical leech - brown-olive color with 6 red-yellow stripes on the back, mottled with black dots along the length of the body with a variegated abdomen and rough rings.

2. Pharmacy leech - differs from the medicinal one in that it has a dark green color, with the same six dorsal stripes, but without dots; the abdomen is yellowish without spots, the rings are smooth (it is also called Hungarian).

3. Eastern leech - looks brighter than the previous ones. Along its back, there are narrow orange stripes covered with black 4-sided spots at regular intervals. The belly of the leech is black, with green spots, located in pairs at regular intervals. For medical purposes, leeches are not used one-color, without stripes on the back, hairy, cylindrical and with blunt heads. Anatomically, the leech is quite complex, it consists of a nervous, circulatory and excretory system.

The leech has two suction cups. The front suction cup surrounds the mouth opening, the back one is located in the tail of the leech, it is larger than the front one and is easy to see. The mouth has three jaws at an angle of 120 degrees bounded by three lips. Each jaw has 60-70 cheek-like teeth with which the leech cuts through the skin. The sexual peculiarity of the leech is arranged in a very interesting way. Leeches are hermaphrodites. In the body of the leech there is both a male and a female reproductive system, but it is not able to fertilize itself. She fertilizes the other and fertilizes herself.

It is interesting that the leech lives in fresh water bodies, but does not belong to either aquatic or terrestrial animals. They like clean running water, but not well water. A medicinal leech can live without food



for one to three years. In the 18-19 centuries, hirudotherapy was used to treat a large number of diseases.

At that time, leeches were in all pharmacies. But at that time, doctors mistakenly believed that the main therapeutic effect of using a leech was bloodletting. And only by the end of the 20th century, scientists proved that the healing effect comes from the leech secret, which contains a huge amount of useful substances. Until now, scientists have not been able to synthesize a drug that would have the same therapeutic effect as hirudin. The therapeutic effect of leech saliva is based on the fact that it contains a large number of biologically active substances that support homeostasis. The leech saliva contains hirudin, which slows down the activity of trypsin and plasmin, inhibitors of alpha-chymotrypsin, chymosin, subtilisin and neutral proteases of granulocytes - elastase and cathepsin C, inhibitors of blood clotting factor Xa and blood plasma kallikrein, as well as highly specific enzymes, hyaluronidase apyrase, collagenase. The main component of leech secretion is hirudin, which prevents blood clotting and stimulates the process of resorption of blood clots.

During therapy with leeches, the patient's body is affected by three main factors: reflex, mechanical and biological. The mechanical effect of the leech is based on the principle of curative bloodletting. When a certain amount of blood is removed from the bloodstream, unloading and release of blood vessels occurs, which leads to a decrease in pressure, and a new flow of blood brings oxygen and nutrients to the affected area. This helps to reduce swelling and pain relief. Reflex action can be compared to acupuncture. The leech bites only certain points (acupuncture) that are associated with certain organs and systems. The activity of hirudin in the body lasts from 3 to 6 months, during which the resorption of blood clots and the replacement of erythrocytes occurs. The studies carried out showed that the blood that was sucked out by the leech had a different property and differed from the venous one. Before research, it was thought that the blood does not undergo any changes in the leech's body. Venous blood taken from a person is quickly divided into a clot and serum, while the blood of a leech that has been in the stomach loses these properties. Blood from a leech is always liquid and does not clot.

Professor K. Dyakonov in 1868 wrote in his research that "the incoagulability of blood and the dissolution of blood corpuscles indicate the existence of some dissolving agent in the intestinal canal of the leech." In 1884, Highcraft confirmed that a substance obtained from the body of a leech prevents blood from clotting and rotting in a test tube. In 1902, in laboratory

conditions, preparations were allegedly obtained from the extract of the body of a leech and named it "hirudin". In the course of research, other leech secretion enzymes were also found, one of which is hyaluronidase, which is widely used in medicine, and at the present time, the researcher I. Baskova has identified other highly active biological components. Together with I. Shishkina, it was established that a bacterium lives in the intestines of the leech, which prevents the development of various diseases of the leech itself, and also destroys the microbes that entered with the sucked blood. Modern researchers have proven that a leech is a single living organism, a very complex and peculiar non-specific irritant in relation to the human body as a whole. The use of leeches is the only bloodletting at the level of microcirculation. As a system, it is here that the metabolic processes of cell vital activity, which are basic for the body, proceed. The medicinal leech is considered a unique healing remedy. Its therapeutic effect arises as a result of the finely coordinated and rapid work of the whole complex of organs of this complex built animal. Therefore, proper care of the leech is considered important so that they can provide assistance so that the number of leeches is sufficient to cover all the needs for daily use in hospitals. Leeches are usually kept in small containers or in swamps, artificial planters, biofactories, etc. More than 50 leeches cannot be planted in glass jars. Water should not be boiled, not well water, it should be ordinary, preferably river or lake water. For leeches, the best option would be if there is about 40-120 cm<sup>3</sup> of water per leech. A neat and clean keeping of leeches will serve as a guarantor of their health and activity. It is imperative to regularly change the water in which leeches live. When changing the water, you need to pay attention to the new water being the same temperature at which the leeches were on the eve. In winter, it will be sufficient to change the water once every 3 days, and in summer 2 times a day. Keep the container in a cool place with a temperature of 150 C and at least 50 C. At the end of the last century, scientists from St. Petersburg made a discovery, they revealed the neurotrophic effect of leeches. The neurostimulating effect of hirudin is due to the presence of the destabilase enzyme, bdellastazine. According to a number of researchers in this field, leech saliva is able to stimulate the growth of nerve cells, with the help of which nerve cells communicate with each other. This discovery further expanded the field of application of leeches in the treatment of neurological diseases such as multiple sclerosis, Alzheimer's disease, cerebral palsy and others [11,16].



Leech secret has a wide range of effects on the human body, both local and general. 1) antithrombotic action, based on blocking the platelet-vascular and plasma links of the internal mechanism of blood coagulation, as well as the plasma link of the hemostatic process at later stages of its development and thus prevents thrombus formation; 2) the thrombolytic effect is determined by the activity of destabilase-M, which leads to the dissolution of the formed thrombi. The mechanism of thrombus lysis is such that biologically active substances in the secretion of the leech affect only the formed fibrin clots, in which fibrin polymers are "stitched" by isopeptide bonds. There is a possibility that the destabilase complex is also sorbed on newly formed thrombi, stimulating their firm attachment to the vascular wall and rapid stabilization; and only subsequently starting a smooth dissolution of the formed thrombus; 3) hypotensive action. The secret of the salivary glands of the medicinal leech ensures the normalization of the functions of the vascular endothelium, which leads to a decrease in the level of endothelin-1 and a decrease in the total peripheral vascular resistance. This effect can be partially explained by the implementation of the reflex mechanism of action, leading to a generalized vegetative reaction and normalization of the processes of excitation and inhibition in the central nervous system; 4) repairs the damaged vessel wall. Associated with blocking the synthesis of procoagulants and pro-inflammatory substances by endothelial cells, division and proliferation of intimal smooth muscle cells. Leech secretion normalizes the function of the vascular endothelium and the synthesis of substances with anti-inflammatory and anticoagulant properties. 5) antiatherogenic action. Under the influence of leech secretion, lipid metabolism improves, the level of cholesterol and triglycerides in the blood decreases, which leads to regression of atheromatous plaques; 6) the antihypoxic activity of the secretion is due to low molecular weight fractions of the secretion of the salivary glands; 7) immunomodulatory action. It is associated with the activation of the body's protective properties at the level of the macrophage link and other levels of the human immune system. 8) analgesic effect. Both local and general (central impact) 9) neurotrophic action; 10) psychocorrective action; 11) antiatherosclerotic action; 12) bactericidal, antiviral effect, etc.

In 1993, scientists from St. Petersburg revealed an energy-informational effect not yet known to science in the healing potential of a leech, which is based on a wave signal of a medical leech in the process of bloodsucking. Under the influence of hirudotherapy, the

vibration characteristics of all human organs and systems are optimized, which determines the biological and therapeutic role of this phenomenon, as well as their integral normalization. This finding allows hirudotherapy as a factor in natural physiotherapy [3,4,9]. It was found that leeches are able to stabilize the human biofield more efficiently in time compared to other known methods. The question of the influence of hirudin on the therapy of various neoplasms remains controversial. Thus, it can be seen that hirudotherapy is not fully understood, and has great prospects.

Currently, the rules for drug treatment of most diseases, including hypertension, are known, which consists in the normalization of intracardiac and central hemodynamics, microcirculation, activity of the body's neurohumoral systems, prevention and treatment of cardiac arrhythmias, sudden cardiac death, thromboembolic syndrome [4,5, 6.16], etc. The use of diuretics, ACE inhibitors, adrenergic blockers made it possible to significantly improve the quality and life expectancy of patients. Despite the great achievements of modern science in the study of the pathogenesis, diagnosis and treatment of hypertension, it remains a widespread, severe and prognostically unfavorable complication of many diseases of the cardiovascular system [6,7,16]. According to the WHO, it is noted that arterial hypertension affects 20-30% of the adult population. With age, the prevalence of the disease increases and reaches 50–65% in people over 65 years of age.

In recent years, in medical practice for the treatment of hypertension, together with drug treatment methods, non-drug electromagnetic radiation based on the effect of various physical factors, extracorporeal removal of blood components, surgical correction of heart pathology, exposure to the secretion of the salivary glands of the leech, others have begun to be used [1,2,12]. The influence of hirudotherapy on the clinical dynamics of hypertension has been well studied. In patients suffering from ischemic heart disease, hypertension, the positive effect of hirudin on indicators of central hemodynamics, cardiac arrhythmias, blood lipid spectrum, fibrinogen level, and platelet functional activity was determined [1,2,7,8,15]. In the treatment of cardiovascular diseases, biologically active substances of the medicinal leech show positive effects - thrombolytic, anti-thrombotic, anti-inflammatory effects. The secret of the medicinal leech contains special components, under the influence of which thrombosis is prevented and dissolved, has a positive effect on the reduction of atherosclerosis, blood pressure decreases, inflammation, cardiovascular and skin diseases subside, etc. Studies have shown that the



use of hirudotherapy in the complex treatment of hypertension causes a longer stabilization of blood pressure in the next 6 months, corrects lipid metabolism disorders, and decreases the frequency of hypertensive crises.

### CONCLUSION

The use of hirudotherapy in various areas of human activity has shown its effectiveness, and even after many centuries it does not lose its relevance. Hirudotherapy for hypertension has proven itself on the positive side. The especially observed hypotensive effect in the next 6 months after hirudotherapy in the complex treatment of hypertension leaves no doubt and shows the need for its wider use in practice.

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