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# A comprehensive review on therapeutic aspects of leech

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**Abstract**
Leech drug, Hirudo medicinalis, is a good example of the use of invertebrates in the treatment of human disease. It has been used for a variety of treatments since ancient times, and leech medicine is now widely used in its narrow form with well-defined medical applications, based on science. Hirudotherapy is often used for venous thrombosis combined with soft tissue and free surgery. This is a comprehensive review of the current clinical practice of hirudotherapy, including a comprehensive overview of the major medical research institutes and other listed sources. The authors focus on indications, contraindications, relief/management, and treatment problems.

**Keywords:** leech, complications, contraindications, hhirudotherapy, indications, medicinal leech

## Introduction

### What are Leech ?

Leeches are viruses or worms that form the Hirudinea class within the Annelida phylum. They are closely related to oligochaetes including earthworms, as they have soft tissues, tissues and organs that can stretch and contract. These two groups are hermaphroditic and have clitellum, but leeches often differ between oligochaetes having anchors at both ends and an annular line that does not align with their inner division. The body has nerves and is strong, as well as coelom, a wide opening and other annelid, descending into a small canal. Many weeds live in clean water habitats, where some species are found worldwide or at sea. The most popular form, such as leech, Hirudo medicinalis, which is hematophagous, is combined with a guest in a glass of water, the first of which secretes peptide hirudin to prevent blood clots. The proboscis that penetrates the skin is replaced by the pigment that guides the skin in other forms. Small species of leeches eat meat and eat a lot of small invertebrates. Eggs are placed in a coconut which, in the form of liquids, is usually placed on the surface under water; Family members, Glossiphoniidae, show parental care, while parents increase their eggs. In terrestrial form, coconut is hidden under a tree, in a crevice or buried in ground water. Nearly 700 species of leeches are known today, including about 100 oceans, 90 planets and more. Leeches have been used since ancient times until the 19th century to obtain blood from patients. Nowadays, leiches are found in the treatment of arthritis such as epicondylitis and osteoarthritis, diseases of the lower limbs and microsurgery, where hirudin is used as an anti-hemorrhagic drug in the treatment of the disease. Shiny with blood [1-4].

### Medical Importance of Leech

Herbal medicine, Hirudo medicinalis, is one of the few examples of the use of invertebrates in the treatment of human disease. The word leech can be derived from the old English word for doctor, laece. Leeches have been treated since ancient times. Egyptian tomb paintings from about 1500 BCE show the use of leeches for healing. Themison of Laodicea also reported hirudotherapy in 50 BC. Leech medicine played an important role in the 17th and 18th centuries, when it was used to treat 'red' and 'dry', a practice believed to cure many ailments, from gout to disease. to manage. The use of leeches may be popular among phlebotomy practitioners because of its ability to detect gradual blood loss. According to some sources, this treatment may have been so popular that leeches were rare in Europe at the time. Interest in the treatment of leeches disappeared in the late 19th century and early 20th century, but scientific interest in Hirudo medicalis continued. In the early 1880s, Haycraft first discovered the antithrombotic properties of leech saliva and Jacoby discovered the cause of bleeding in leech saliva and named it hirud in 1904. Hirudotherapy reemerged as adjunct to plastic surgery, reconstructive and traumatic in the 1970s and 1980s. In the 1980s, French microsurgeons began using leeches to help with interior digital reimplantation related to repair only. Today, leech is commonly used for the treatment of venous congestion and microvascular reimplantation, reconstructive surgery and trauma [5-7].

### Diversity and phylogeny

About 680 leeches have been identified, of which about 100 are liquid, 480 is pure water and the other is surface water. In Euhirudinea, good leeches, the smallest are about 1 cm in length, and the largest are the largest Amazonian species, Haementeria ghilianii, which can reach 30 cm. With the exception of Antarctica, leeches are found all over the world, but they are more common in mountain lakes and lakes. Many freshwater weeds are

found in shallow lakes, ponds, and streams; small form responsive software. In their preferred home environment, they may be more inclined to look for it; In a well-drained area of pollution, more than 10,000 people were found per square meter under rocks in Illinois. Some species are desirable during rainy seasons, fall into sediment, and can lose up to 90% of their weight during their lifetime. One of the freshwater seaweeds is Glossiphoniidae, dorso-borne animals that are usually bacteria and vertebrates like larvae, and are unique among the annelids in shedding their eggs and carrying their offspring under their body. Terrestrial Haemadipsidae are found in low-lying regions, while Hirudinidae of wetlands have a global reach; They both eat a lot of meat, including humans. Families of Piscicolidae, fresh or fresh ectoparasites mainly of the back, have a well-marked cylindrical body, bells in front of the drinkers. Not all grass is bloody; Erpobdelliformes, fresh water or amphibious, eat meat and do not have large teeth for larvae of insects, molluscs and other annelid worms, which are completely concentrated. In turn, leeches fall on fish, birds and invertebrates [8-10].

Subclass name, Hirudinea, from Latin hirudo, leech; The bdella element is found in many leche names from the Greek βδέλλα bdella, which also means lech. Hirudinea was named Jean-Baptiste Lamarck in 1818. Leeches was divided into two infraclasses, Acanthobdellidea and Euhirudinea. Euhirudinea and Rhynchobdellida are divided into proboscis and others, including some color species, "Arhynchobdellida", without proboscis. The phylogenetic structure of leeches and their toxic relatives is based on genetic testing of DNA systems. The first two classes "Polychaetes" and "Oligochetes" are paraphyletic: in each case, a complete team will include all the others displayed under them on the board. Branchiobdellida is the sister of Hirudinida leech clade, which belongs to the Hirudinea class. The main division of the leeches is Rhynchobdellida and Arhynchobdellida, although Acanthobdella is a sister clade with both of these [11].

**Feeding and digestion**

About three-quarters of all leeches are bacteria in the host's blood, while others eat meat. Leeches have either the pharynx from which they may originate, commonly called the proboscis, or the pharynx from which they may not originate, which in some groups uses color. In proboscis leeches, the color Arhynchobdellidae is in front of the mouth and has three strings connected from side to side. As they eat, these break the guest's skin, leaving the Y-cut. It opens into the pharynx, small esophagus, spleen, stomach and intestines, ending in force on the breast milk. The abdomen may be a simple tube, but the uterus, when it is, is the part of the uterus that contains many cecums that store blood back and forth. Leech hides the bleeding barrier, hirudin, in its fluid that prevents blood from accumulating before vaccination. Mature plants can feed only twice a year, which takes months to break down nutrients [12, 13].

The flesh of the ten leeches is similar, though large, many having a proboscis, which is usually divided by the mouth. Eaters of these animals often hide in the abyss, waiting for their prey to be eaten up like spears. Carnivorous leeches feed on small invertebrates such as snails, earthworms and larvae insects. The meat is usually cooked and eaten. Some Rhynchobdellida, however, eat the soft flesh of their meat, placing them between carnivores and blood drinkers. Bloodthirsty beasts use their owners to lure visitors for food. Once combined, they use a mixture of nose and milk to add hirudin to the guest's blood. In general, blood-sucking leeches do not respond well and do not harm their host, falling off after eating. However, some types of liquid remain until it is transported. If it is present in large numbers in the host, it can lead to depression and, in extreme cases, lead to death [14].

Leeches are different because they do not produce amylases, lipases or endopeptidases. Lack of endopeptidase means that the protein digestion process cannot follow the same process as in other animals where endopeptidase first divides the protein into peptides, and exopeptidase then degrades peptides. Leeches produce intestinal exopeptidases that remove long-lived amino acids and protein proteins, possibly from proteos derived from endosymbiotic bacteria and hindgut helps. This evolutionary choice of exopeptic digestion in Hirudinea recognizes the differences between carnivorous animals and oligochaetes, and may explain why digestion in leeches is gradual. Deficiency of digestive enzymes and vitamin B complex is compensated by enzymes and vitamins produced by the endosymbiotic microflora. In Hirudo medicinalis, these substances are produced by the interaction between the sexes in both species, Aeromonas veronii and the latter Rikenella. Blood-sucking leeches, such as the Erpobdella punctata, take three symbionts of the virus, Pseudomonas, Aeromonas and Klebsiella spp. Bacteria are transmitted from parent to child in coconuts as they grow [15, 16].

**Nervous System**

Your nervous system is the center of law in your body. Out of your brain, it controls your movements, thoughts and responses automatically and the world around you. It controls other processes and processes, such as digestion, respiration, and sexual development. Illness, accidents, poisoning and the natural aging process can damage your nervous system. Your nervous system controls everything you do, think, say, or feel. It controls complex processes such as movement, thinking and memory. It also plays an important role in your system without thinking about it, such as breathing, massage and wiping. The leech nervous system is made up of a few nerve cells; their large size makes leeches a model for the nervous system of invertebrates. The central nervous system is the cerebral ganglion above the intestine and the other ganglion below, along with the connective tissue that surrounds the small pharynx behind the mouth. The nerves from there enter the ventral coelomic canal, which has 21 openings and 6 to 26 parts. In sections 27 to 33, the other parts of the mouth combine to

form a caudal mouth. Many nerves immediately connect to the cerebral ganglion; there are nerve cells in the motor connected to the ventral ganglia on both sides [17, 18].
Leeches have between two and ten eyebrows, arranged two pairs in front of the body. There is also the effect of papillae arranged in rows at the sides and ends of each side. Each papilla has many sensory cells. Some rhynchobdellids have the ability to change color effectively by rejuvenating pigments in chromatophore cells; this process is under the control of the nervous system but its function is not fixed because color change does not seem to affect the color of the environment. Leeches can detect the touch, vibration, movement of objects near and the chemicals their guests are hiding. Fresh water falls or swims to the point where a visitor can stand in their pool for seconds. The type of hot plates that guests choose for the hot plate. Most leeches avoid fire, although some drinkers enter the light when they are ready to eat, perhaps increasing their chances of finding a visitor [19, 20].

**Leeches and Humans**

Fear comes from Proverbs 30:15 as a form of covetousness. In general, leech is a permanent social organ or sycophant. The leech Hirudo medicinalis has been used in medicine, and in other forms, for at least 2,500 years: The Ayurvedic literature describes their use in causing bleeding in ancient India. In ancient Greece, blood transfusions were performed as a mockery of the Hippocratic Corpus of the fifth century BC. Blood flow in the leech caused doctors to restore balance if they thought there was too much blood. Pliny the Elder reports that lech can become an elephant by climbing its trunk to drink blood. Pliny also noted that leeches were used to treat gout in ancient Rome, noting that it was commonly used for gout and that patients relied on the treatment. In Old English, lǣce is the name of a doctor as well as an animal, although the words have different meanings, and lǣcecraft, leechcraft, is a medical term. William Wordsworths 1802 song "Decision and freedom" describes one of the last lech collectors, who traveled to Britain to capture wildlife and bring their treasures, even though they were still great at Romney Marsh. By 1863, British hospitals had become a beast, with an estimated seven million people admitted to a London hospital that year [21, 22].
By the 19th century, leeches were widely sought after in hirudiculture, the development of leeches, on the market. The use of leeches declined due to the elimination of laxatives, but it continued in the late 1980s, with the advent of microsurgery, where venous insufficiency may occur due to "venous insufficiency". Leeches can reduce tissue swelling and promote healing, including helping to restore circulation after microsurgery to reshape the organ. Other medical applications include varicose veins, arteries, thrombophlebitis and joint diseases such as tennis and osteoarthritis. Leech secretion has a number of antioxidant properties, including anti-inflammatory, anticoagulant and antimicrobial effects. The active ingredient in leech water is a small protein, hirudin. It is often used as an anticoagulant to treat blood clots and is made up of DNA recombinant technology. In 2012 and 2018, Ida Schnell and colleagues tried to use Haemadipsa leeches to collect data on different species in the wild in Vietnam, where wildlife data is hard to find. They showed that the mitochondrial DNA of mammals, whose polymerase reaction increases, could be detected by blood feed at least four months after feeding. They saw rabbits split into the Annamese division, badger ferrets small teeth, Truong Son muntjacs, and serow along the way [23-25].

**Aim of Study**

The purpose of this study is to review the lectures and their use in the health sector. This trial focused on the current treatment of leech medication.

**Approaches to Review Leeches in Medical Field**

A comprehensive review of medical research applications (i.e. PubMed, Google Scholar, Scientific Commons) has been performed. The following search terms are used, in different versions: (a) leech treatment; (b) forest; (c) hirudotherapy; (d) presentation; (e) contraindications; (f) problems; (g) disease. Articles most relevant to the current study topic are then included in the text for general discussion, topic discussion, or both. References defined as the corresponding section are collected. [26]

**Basics of Leech in Medical Field**

Originally named Linnaeus in 1758, Hirudo medicinalis pervaded the drinking system of North America and Europe. Leeches are usually hermaphroditic, but they need a second herb to breed. They belong to the phylum Annelida, a class of Hirudinea. Hirudo medicinalis is a type that causes severe weed and long-term effects in its class. Distributed worms without exoskeleton, a special leech drug that fits naturally. It has 102 rings. Hirudo medicinalis can grow up to 12 cm in length, and its rest and rest is about one-third of its length. Lech goes with the help of a big fish. At the back, the leech has three triradial arches that connect and feed the human body with small fish that are used for food. The feeding activity of Hirudo medicinalis is well regulated by the neurotransmitter serotonin and leech neuronal cell, Retsius cell. Food activity is actually stimulated by proximity to mammalian temperature as well as sodium and arginine in the blood. Leeches can discriminate in their diet, preferring the blood of certain species. Hungry animals depend on the shore and can swim well in the waves. While some leeches feed on other small invertebrates, others feed only on themselves for a short period of time. Some species cut the aliens' skin with a razor blade; other types secrete enzymes that help tighten the pores of the skin. Visitors are less likely to notice this attack because of anesthetics hidden in leech water. Leech also

produces one of the most potent anti-inflammatory drugs, hirudin, a 65-amino acid peptide that inhibits thrombin-catalyzed conversion of fibrinogen to fibrin and inhibits blood clotting. Other important components of the secreted salivary gland include vasodilators and hyaluronidases. Interestingly, some leeches are able to eat up to nine times their body weight, which can be up to a year old. Essentially, endosymbiotic bacteria control leeches, primarily Aeromonas spp, which help shed blood in their digestive system. The presence of these bacteria, although not harmful to visitors, can sometimes contribute to infection and / or systemic. At times, these diseases can be serious, even fatal [27-30].

**Anatomy and physiology**

Leeches have significant similarities in morphology, very different from the most common types of annelids which have a water-filled cavity, a coelom (cavity). In leeches, the coelom is reduced to a narrow rectangular canal, and the abdomen is filled with solid dermis between the sides. Usually the body pays back and beats on both ends. The long veins are connected to the outside of the wall by diagonal muscles, which gives the leech the ability to make changes in different shapes and to show significant changes. Most leeches have front and back noses, but some older leeches have a watery nose [31].

Like other annelids, the leech is a split animal, but unlike other annelid, its limbs are covered with an outer ring. The number of cancellations varies, both between different parts and between models. In one form, the upper part is divided into 102 rings, but the body has 33 parts, a permanent number for all types of leeches. Of these parts, the first five are called the main lobe, which includes the frontal lobe, ocelli, and ventral suction. The next 21 segments each contain nerves and, between them, two testicles, a female gonopore and two pairs of testicles. The last seven parts have a spinal cord and connect it to become a fat absorber for animal fat [32].

The wall consists of a barrier, an epidermis containing a thick layer of connective tissue from the intestine, the diagonal veins, and the long, hard veins. There are also dorso-ventral muscles. The coelomic vessels run long, with two heads on each side; These take over the function of the hemal system and other annelids. A part of the epithelial skin is a chlorogenic cell that is used for food storage and detoxification. There are 10-17 pairs of metanephridia in the middle of the leech region. From these, the urinary tract usually carries the intestine, which extends to the level of nephridiopores [33].

**Reproduction and Development in Leeches**

Leeches are protandrous hermaphrodites, reproductive organs, testicles, ovaries during adolescence and later. In hirudinids, the leech is connected to the clitellar contact area, with the front end of one leech pointing backwards from the other; The result is that the male gonopore of one leech interacts with the female gonopore of the other. Semen transmits spermatophore into the female gonopore, and sperm are transmitted and stored in the vagina. Some leeches lack bone marrow and proboscis no penis, and these fluids are transmitted from person to person through hypodermic therapy. leeches associate with mamma. The spermatophore is moved from one end to the other, usually in the clitellar region. The sperm are also released into the ovisacs, through coelomic or interstitial ducts through a special "terget tissue" [34].

After a while, the small eggs are laid without egg yolks. In many species, the coconut albumen is secreted by the clitellum and achieves one or more levels passing over the female gonopore. In the case of the Erpobdella punctata from North America, it is about five eggs and about ten seeds. Each coconut is soaked in water, or in the case of leeches of the ground, which is either placed under a rock or buried in the ground. The skin of the Hemibdella soleae is attached to the back of the proper host. Glossiphoniid enlarge their eggs, either by placing coconuts and seeds in their cavities, or by placing coconut on top of their nests, and even carrying these newborns in the first feeding ha. During production, many water leeches leave their guests at the port free of charge. Here they produce their own cocoons, after which the adults of many species die. When the eggs hatch, their cubs look for receivers as they reach the shore. Most leeches have circles every year or half [35, 36].

**Mechanism and Rationale for Leech**

Modern leech treatment is usually used if there is a local venous obstruction or hematoma. Venous thrombosis occurs as a result of venous thrombosis of the lower extremities or thrombosis that occurs in the vascular or vascular system. Reports of hirudotherapy and soft tissue hematomas include leech application for large scrotal and tongue hematomas. In this case, the purpose of the leech application is to avoid the need for surgery. The amount of blood taken by leech is small, about 2 ml to 20 ml per breast. After removing this small amount of blood, the weeds usually begin within 10 to 30 minutes, separating it from the host and giving no further food unless they are cleared from the field. back. However, due to the presence of hirudin in the leech water, the continued removal of the leech completely once the leech is removed may extend the treatment time to one hour. 6-8. Interestingly, the secretion of leech has been shown to prevent in vitro coagulation of 50-100 ml of human blood. Since the leech area and the visitor may continue to bleed for 24 to 48 hours, it is believed that the benefits of leech phlebotomy will outweigh any individual diet. In the case of hirudotherapy for captured hematomas, continued removal of unhealthy black blood from the leech site indicates that hematoma resolution may continue for some time after the lesion has healed. Leeches will appear at the same time after successful completion. During this time, they will be removed and discarded as a risk when 70% alcohol is consumed. If the leech does not go away, it may indicate a weakness of the skin, and the leech should be removed with 5% cocaine, which will paralyze it. Mixing herbs and wine will not be allowed [37-40].

Although the current use of leech therapy is a temporary replacement for venous outflow and venous congestion of tissue flaps, one still has to distinguish between venous congestion and arterial ischemia in the body. It is considered for hirudotherapy. Of course, the use of leeches in skin with vascular rupture not only promotes physical healing, but can also help in the development of ischemic stroke. The following sections describe the applications of hirudotherapy that is commonly used, focusing on clinical manifestations, risks, and benefits in veterinary medicine [41].

**Leech for Soft Tissue Hematomas**

This language response indicates a large air gap. It is often said that this is an irritating condition, as well as traumatic macroglossia can also lead to malignant lesions or penetration of the lower part of the face leading to the development of permanent hematoma. In closed face lesions, macroglossia may be secondary to bleeding from the rupture site in the mandibular symphysis through distribution to the sublingual opening. Poor language response is associated with confusion, back surgery, and oral repair. While tradition and expectations are also used in linguistic feedback, it is generally accepted that flight work will be done in anticipation of a greater response to prevent major air crashes. Once the tongue is severely swollen, a process of venous and lymphatic congestion begins, contributing to persistent / worsening swelling. Other treatments reported for this condition include elevated, decreased manual sales, and administration of corticosteroids. The application of effective medical leeches has been described as controlling the large swelling of the tongue following trauma. Clinical results are satisfactory, with the resolution of the swelling and only a small mark of the leech glossal irritation problem [42, 43].

**Leech in Tissue Flap Reconstructions**

Perhaps the most recent application of leech treatment is to rejuvenate the skin. Despite our good understanding of body toxins, flaps continue to fall apart for a number of reasons. The most common cause of wing fractures is incomplete venous flow. Many authors believe that the first step in this process should be a surgical examination and examination of the venous pedicle to compensate for the scar tissue. Only when venous implantation is not possible or if surgery is inappropriate should hirudotherapy be considered. In one article, hirudotherapy was linked to heart disease, including the need for blood transfusions. In another study, the use of leech therapy and the treatment of heparin-induced thrombocytopenia was associated with lower bone density. In this case, the patient received the first implant, which fell despite the Doppler mark on the entire pedicle. Subsequently, flap microvascular gracilis was constructed but began to collapse during immediate operation, despite the strength of the nerves in the vein revealed in further examination. After all heparin administration was discontinued, hirudotherapy was started, retaining full strength for a short period of time to stop the leech treatment in 7 days. At the same time, necrosis of the nerves began. During the next surgery, a patient with heparin-induced thrombocytopenia was shown. In this case, the prospect of recovering flap from hirudotherapy - therefore hirudin, a non-heparinized anticoagulant found in leech water may provide unfounded evidence that the initial fall of the flap is associated with heparin causes thrombocytopenia, especially in its case. The fall of the gracilis flap after leeches are cured [44-47].

**Leech in the Setting of Severe Soft Tissue Injury and Surgical Replantation**

Nerve blockage poses a great challenge in surgery. severe injury with significant loss of soft tissue and / or need to move is an important indicator of a medical condition. Clinical signs to consider for hirudotherapy in these settings include the development of skin edema, yellowing, and scarring of the skin, all indications that it is continuous venous dissection and the presence of veins [48].

**Leech in Penile Replantation**

A well-known feature of urologic trauma, penis size leads to severe surgical complications. Methods of penile transplantation now include recurrent resection of the urethra and tissue and microsurgical dorsal fin anastomosis. Good ventilation during the operation is essential for a good recovery. Before the microvascular system is commonly used, non-microsurgical penile rupture is prevented by skin lesions, rupture of the urethra and fistulas, rupture of the penis, and rupture of sensation. Evidence in the literature suggests that the progression of migraines without surgery may increase with the addition of hirudotherapy [49].

**Less Common and Controversial Applications of Leech**

In a rare application of hirudotherapy, Heckmann explained that the use of leech is effective for the treatment of arthritis.

However, this treatment method is highly debated and it should be noted that hirudotherapy is not a treatment option for any type of disease. The authors of this study believe that the published findings of the original report suggest that the risks associated with functional impairment of the organ do not currently exist. However, for completeness, this report was not included in the analysis. Due to the presence of anti-inflammatory drugs in the fluid, leech therapy has also recently been used to treat inflammation and local pain. Michalsen recently published a randomized controlled trial that also showed better pain relief in rheumatoid arthritis patients compared with the above treatment with Diclofenac [50].

**Special Topics in Leech: Infectious Complications**

Leeches should be obtained from well-designed business sources. They are a risk factor for blood-borne diseases, especially hepatitis B and hepatitis. Leech leads to direct communication between the digestive tract of the leech and the soft tissue of the host. Infectious diseases most commonly encountered during hirudotherapy are gram-negative rodents, Aeromonas hydrophila, an important part of the intestinal mucosa of the leech. However, Pseudomonas spp and Vibrio spp have also been described. Due to the close relationship between leech and patient, hirudotherapy-related infections occur in 2.4-20% of patients who do not receive antibiotics. Various clinical manifestations have been reported including cellulitis, flap necrosis, acute necrosis and even septic shock. Ischemia develops local anesthesia, another cause of hirudotherapy should be reserved for large inflammatory areas. Aeromonas spp. produce beta-lactamase, i.e. first generation penicillins and cephalosporins do not work. This bird is often involved in hirudotherapy-related infections and is usually effective for second- and third-generation cephalosporins, aminoglycosides, chloramphenicol, fluoroquinolones and trimethoprim. [51]

**Conclusions**

Leeches have been used since ancient times until the 19th century to obtain blood from patients. Nowadays, leiches are found in the treatment of arthritis such as epicondylitis and osteoarthritis, diseases of the lower limbs and microsurgery, where hirudin is used as an anti-hemorrhagic drug in the treatment of the disease. shiny with blood. Modern leech treatment using Hirudo medicalis based on sound scientific principles and leading to great progress in patient care. Leech therapy is often used for local venous insufficiency associated with flap removal and surgery. Hirudotherapy is also used to treat soft tissue swelling, ulcers and trauma. Infectious problems can be reduced by obtaining leeches from a suitable commercial location and using antibiotics against Aeromonas.

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