

An overview on the Medicinal Value of Leeches

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Abstract

The present article highlights on the medicinal value of leeches. Leech belongs to phylum Annelida have played a significant role in ancient medicine for centuries, with their therapeutic and medicinal applications dating back to ancient human civilizations such as those of Egypt, Greece, and India. Historically, incidences shows it associated with blood letting, leeches were believed to restore balance to the body's humors. In recent times, new experiments are being seen in the treatment method. Along with this, ancient therapies are also used to some extent in the treatment method. One of these treatment methods is using animals like leeches. It is called leech treatment in modern times. Animals like leeches have been used medicinally since ancient times. One of the main and prominent reason for turning to leech therapy is, its ability to improve blood circulation in human. Leech saliva contains bioactive substances. Studies showed that such substances act as anticoagulants. It stops the blood from clotting. As a result blood circulation becomes smooth. This medicinal property of Leech review focuses on the medicinal and pharmacological benefits of Leech in prevention and treatment of diseases. This article intended to explore leech and its therapy, highlights its evolution from traditional practice to scientifically supported medicine practices, and provides insights into specific applications in the conventional healthcare system.

Keywords: Leech, therapy, medicinal, pharmacological, healthcare

INTRODUCTION

From past period Leeches have long been a part of human medicine, dating back to ancient civilizations, where they were valued for their probable ability to restore the balance of human body's internal systems. These tiny and small, segmented ecto-parasites have an interesting medicinal legacy that spans for thousands of years, from their use in very long ancient bloodletting practices to now a days their modern application in microsurgery and beyond. The medicinal species of leech, *Hirudo medicinalis*, has been absolutely recognized for its therapeutic properties due to its salivary secretions from the mouth, which contain biologically active compounds chemically eglins, antistatin, guamerin, saratin, hirudin, bdellins, carboxypeptidase inhibitors with anticoagulant, anti-inflammatory and antimicrobial properties (Ali K Sig et al., 2017) [1].

In recent times, new experiments now are being performed in the treatment method. Along with this,

ancient experiments which are used to some extent in the treatment method. One such treatment method is using animals from animal kingdom belongs to phylum Annelida like leeches. It is called leech treatment in modern times. Animals like leeches which are segmented worms have been used medicinally since ancient times. It has been used as a therapeutic method since ancient civilizations in India. In ancient Ayurvedic treatment, leech was used for bleeding to balance the bleeding in the body. This leech therapy historical method exists in India. In this removing excess blood from the body for therapeutic purposes can treat various ailments.

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This leech treatment were used to remove excess amount of blood from the body. That is, the medicinal importance of leech has been used since ancient times. This type of medicinal value has been reviewed through the present article.

Historical Background of Leech therapy

In ancient India, various medical vedas Sushruta Samhita described leech application for skin diseases and blood disorders. Scientist like Hippocrates and Galen also recommended leeches for the purifying blood. During the 19th century, popularity of leeching became so widespread in Europe vast number of that over 30 million leeches were used annually. However, by the late 19th century, the practice was declined due to the rise of scientific medicine that is Allopathy. The late 20th century witnessed a revival when surgeons discovered that leeches could restore venous circulation in reattached tissues and grafts.

Leeches, once seen as primitive tools of medieval medicine, are now scientifically validated biological assistants in modern medical therapy. Their anticoagulants, anti-inflammatory, and analgesic properties make them invaluable, particularly in microsurgery and reconstructive medicine. Continued research on leech-derived active compounds very much promises even broader therapeutic applications in the future.

Biological and Chemical Composition

Medicinal leeches belong to the species *Hirudo medicinalis*, *Hirudo verbana*, and *Hirudinaria manillensis*. Their therapeutic action arises primarily from secretions in their salivary glands. Afterward scientifically more than one hundred biological bioactive substances have been identified, with major components including:



Figure 1. Kingdom:Animalia, Phylum:Annelida, Clade:Pleistoannelida, Clade:Sedentaria, Class:Clitellata, Subclass:Hirudinea, Order:Arhynchobdellida, Family:Hirudinidae, Genus:Hirudo, Species:H. medicinalis

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- *Hirudin*: A potent anticoagulant that directly inhibits thrombin, preventing blood clot formation.
- *Calin*: Prevents platelet aggregation and maintains continuous blood flow.
- *Bdellins and Eglins*: Possess anti-inflammatory and protease-inhibiting properties.
- *Hyaluronidase*: Enhances tissue permeability, promoting better diffusion of other active molecules.
- *Destabilase*: Breaks down fibrin clots, further improving micro-circulation.
- *Anesthetic substances*: Reduce pain sensation during the leech bite.

These compounds collectively help improve local blood flow, prevent tissue necrosis, and accelerate healing.

The Medicinal Value of Leeches Species

Origins of Leech Therapy: Leech therapy, is also known as Hirudo-therapy, has a rich history dating back thousands of years. Its origins can be traced to ancient civilizations like Egypt, India, Greece and Rome, where leeches were widely used for therapeutic purposes (More RN *et al.*, 2000) [2].

Ancient Egypt: Evidence from Egyptian medical texts, such as the Ebers Papyrus (circa 1500 BCE), indicates that leech therapy was practiced for treating ailments related to blood and inflammatory conditions. Artistic depictions on tomb walls further suggest that leeches were a recognized part of medical practice in ancient Egyptian society (Wells MD *et al.*, 1993) [3]. **Ancient India:** In India, leeches were used in Ayurveda, one of the world's oldest traditional medical systems. References to leech therapy can be found in ancient Ayurvedic texts like the Sushruta Samhita (circa 600 BCE).

Today, they are majority utilized in dermatology like cosmetic surgery and different surgery. This is often used as because leeches secrete peptides and proteins which are used by employment to stop blood clots. (Herlin C., *et al.*, 2016) [4]. These secretions by Leech are called anticoagulants which means resistance to clot. This keeps blood flowing to wounds to assist them heal. Leeches have traditionally been used for bloodletting. Leech medical care has been investigated for its analgesic and wound healing effects, and for exciting blood flow at post-surgical sites. Leech also use in arthritis has additionally been investigated. However, run knowledge area unit lacking to suggest use for any indication. Some recommendations to hospital pharmacists on prophylaxis during *Hirudo medicinalis* treatment, might enhance the safety of it's use by reducing the number of infections (Abrutyn E. 1988) [5].

Medicinal leeches *hirudina medicinalis* anatomically have 3 jaws with small rows of teeth. They are ecto-parasites and pierce a person's skin with their teeth and insert secretion anticoagulants through their spittle. The leeches are unit then allowed to remove blood, for twenty to forty five minutes at same time, from the person who undergoing treatment. This equates to a comparatively touch of blood, up to fifteen milliliters per leech. Healthful leeches most frequently return from Hungary or Kingdom of Sweden. There is a unit many things within which leech medical care could also be used. Those who could profit embrace those that risk limb amputation thanks to the aspect effects of polygenic disease, those that are diagnosed with cardio-pathology, and people UN agency area unit undergoing face lift within which they risk the loss of a number of their soft tissue. The medical care has additionally been counseled to treat blood clots and unhealthy veins. People with anemia, curdling conditions, or compromised arteries aren't candidates for leech medical care. Kids underneath the age of eighteen years recent and girls UN agency area unit pregnant are sometimes suggested to avoid it. Leech saliva is the source of a number of anticoagulants, including the antithrombin agent hirudin and its synthetic analogues, which have been approved for human use (Cherniack E.P.2011) [6].

In the Treatment of Heart Disease

People with cardio-pathology use leech medical care attributable to its potential. Trusted supply to enhance inflammation and blood flow. Within the past few years, leech medical care has become a suitable different medical care for folks with vascular malady and disorders (Akalın Ç, *et al.*, 2020) [7].

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In the Treatment of Cancer

Cancer treatments mistreatment leech medical care area unit being explored trusted supply attributable to the blood platelet inhibitors and special enzymes contained in leech spittle. whereas folks with bound blood cancers aren't suggested to use leech medical care, it's been shown to slow the consequences of carcinoma. Animal testing additionally shows that directly injecting leech spittle into mice helps stop the formation of cancer cells.

In the Treatment of Diabetes

In various conditions where the progression of polygenic disease will cause various issues. These issues will cause in vessel diseases that limit or stop blood from reaching the other parts such as toes, fingers, hands, and feet. Once blood flow becomes severely restricted, the affected tissue will die. This is often the leading explanation for amputation among folks with polygenic disease. Losing a digit or limb thanks to complications from polygenic disease could be a major concern for variant folks worldwide. the foremost effective thanks to stop this method is to extend circulation to the affected tissues while not the danger of blood clots. Research Trusted supply has shown that leech medical care will play a job. The medicinal Hirudin substance in leech spittle thins the blood and keeps it from action. Since folks with polygenic disease condition tend to own thicker blood, Hirudin will facilitate relieve the pressure on the center and circulatory system by dilution of the blood. Researchers now have observed Trusted supply positive outcomes in cases wherever Hirudin has been used for treat polygenic disease.

A recent case study, Trusted supply showed however ancient Unani medication, which incorporates leech medical care, was able to facilitate save the foot of a 60-year-old lady with poly-genic disease. Artificial varieties of leech spittle currently exist, however researchers have discovered that mistreatment as few as four leeches in one session will facilitate cut back the danger of amputation.

Its Uses in Medicinal Leech therapy

Medicinal leech medical care or hirudo-therapy could be a reasonably complementary and integrative treatment technique applied with blood-sucking leeches. One or a lot of leeches area unit connected to the skin of problematic space and also the purpose is to realize potential utilities of leech spittle that's secreted whereas the leeches area unit feeding. MLT has been used for hundreds of years back and also the term leech was provided from the word "laece." Leech medical care that is additionally stated as hirudo-therapy remains used nowadays by several medical professionals. The leech enjoyed a revival in quality within the Seventies and has been used with some success. the assorted reports indicate that hirudinean medical care has potential advantages for patients experiencing blood vessel congestion of the skin and tissues, further as varied sorts of ulcers. Such medical care is verified to own clot buster, anti-coagulant, blood and humor enhancing, medicinal drug and pain-relieving effects (Adams SL.1989) [8].

Uses in Increasing Blood Flow

In medical field Leech feeding and therapeutic effects need raised blood flow. These area unit were achieved primarily by histamine-like molecules that cause vaso-dilatation and arise via native vascular porosity observed. Neurotransmitter is additionally an element in leech secretions, inflicting epithelial tissue muscle relaxation and vaso-dilatation.

Uses in Inhibition of Blood Platelet Functions

Destruction of the vas wall for intake blood causes activation of platelets and also the action cascade, that area unit fatal for the leech. For this reason, leech secretions contain several bio-active molecules to domestically inhibit these actions.

SUMMARY

Leech therapy always represents a remarkable example of the combination of traditional medicine and modern science. Its efficacy in re-establishing venous drainage and promoting tissue survival has been repeatedly confirmed through clinical research (Mory R.N., et al., 2000) [9].

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Moreover, the bioactive molecules isolated from leech saliva continue to inspire the development of novel pharmaceutical agents. The interdisciplinary applications of hirudo-therapy, in surgery, cardiology, and pharmacology, reflect its evolving importance in integrative medicine (Eldor A., et al., 1996) [10].

In Modern Scientific Research and Applications nowadays studies have explored that novel applications of leech derived bio-active molecules in drug development in pharmaceutical industry, regenerative medicine, and modern biotechnology. Some key research areas include (Hosseini M. et.al., 2024, Hohmann, C. D et.al., 2018) [11, 12].

1. *Leech in Nanomedicine and Drug Delivery*: In medical field Hirudin-based nano formulations used for targeted anticoagulant therapy.
2. *Leech in Cancer Research*: In medical field Identification of leech-derived peptides which can be as potential use as anticancer agents.
3. *Leech in Neuroscience*: In medical field Potential use in neuroprotection and stroke recovery.
4. *Leech in Diabetes Management*: Medical Research on leech therapy in improving blood circulation in diabetic foot ulcers.
5. *Leech in Treatment of Varicose Veins*: Medical field use in treating conditions like varicose veins, osteoarthritis, and other conditions Challenges and Future Prospects in Leech therapy

Along with their medicinal potential, leech therapy faces certain challenges in the use:

- *Regulatory Concerns*: Standardization and quality control issues in pharmaceutical applications.
- *Ethical issues Considerations*: Sustainability of medicinal leech harvesting.
- *Patient Acceptance*: Psychological barriers associated with leech therapy.

CONCLUSION

Now a days, new experiments are being performed in the treatment method. It is observed, people are seen to be adopting and use to ancient healing methods to some extent. Because of some traditional ancient treatment methods are proving effective. One of them from ancient treatment is leech therapy. One of the physiological main reasons for turning to leech therapy is its ability to improve blood circulation to various body parts. Biochemistry of Leech saliva is interesting which contains bioactive substances. Such biochemical substances act as anticoagulants resist to clot. It works by stopping the blood from clotting. As a result blood circulation becomes very smooth in vessels. This Circulation problems exist in many people now days due to sedentary lifestyle in recent times. It can be typically beneficial for such people. Leeches have a scientifically documented historical significance in ancient traditional medicine and continue to hold a crucial place in contemporary medical practices. Their salivary secretions contains biochemical which are bio-active molecules, such as hirudin, eglins, and destabilase, which exhibit potent anticoagulant, anti-inflammatory, thrombolytic, and antimicrobial efficacy properties. These bio-active compounds have increased the clinical use of leech therapy in medical field such as micro-surgical procedures, particularly in various cases of venous congestions following reconstructive surgeries, digit re-plantation, and skin grafting surgery. Along with that, leech-derived anticoagulants have shown promise in managing certain thrombo-embolic disorders and certain cardiovascular conditions.

Hence, the role of leech therapy is becoming important in removing blood clots from the human body. Now a days advancements in biotechnology and molecular pharmacology have further increased the therapeutic potential of leeches by enabling the isolation process and modification of their bio-active constituents for different pharmaceutical applications. Research is also going on to explore their role in advance targeted rational drug delivery in treatment of wound healing, and in the management of chronic inflammatory disorders. Along with this increasing scientific novel validation and technological innovations, leech-based therapies continue to evolve day by day, which offering biomedical applications that may significantly contribute to upcoming future advancements in medical-sciences.

Future in future research should focus on biotechnological advancements to synthesize and modify leech-derived bio-active compounds for broader therapeutic applications in medical field.

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