

## REVIEW ARTICLE

# A Comprehensive Review of Hirudiniasis: From Historic Uses of Leeches to Modern Treatments of Their Bites

Jeremy Joslin, MD; Amy Biondich, MD; Kara Walker, MD; Nicole Zanghi, BA

From the Department of Emergency Medicine (Drs Joslin, Biondich, and Walker); and the College of Medicine (Ms Zanghi), Upstate Medical University, State University of New York, Syracuse, NY.

Exposure to leeches in the wilderness setting is common. Leeches may attach themselves to exposed skin or pass through one of the body's orifices and attach internally. The condition of leech attachment is known as hirudiniasis, which can result in serious morbidity and, rarely, mortality. A comprehensive review of the literature was performed to detail the prevention of leech attachment, as well as both anecdotal and studied methods of removal. Complications from leech attachments include ongoing bleeding, wound infection, and poor wound healing. Although medicinal leeches are the most well-studied variety, this review examines all aspects of leech attachment, prevention, and management.

*Keywords:* leeches, wilderness medicine, review

## Introduction

Leeches have been an object of both public fascination and repulsion and have been used medicinally for thousands of years.<sup>1</sup> Today, many outdoor recreationists and travelers encounter leeches and develop leech attachments. The consequences of these attachments range from inconvenient to severe complications, such as bleeding, infection, and even death. This present work seeks to review the prevention, removal, and wound care of hirudiniasis while exploring historic, folk, and contemporary remedies.

## Background

Leeches are a subclass (Hirudinea) of segmented worms (phylum Annelida). Although there are over 600 species, only a minority of these are sanguivores (ie, blood drinking) and the cause of human morbidity.<sup>2</sup> *Hirudo* are freshwater leeches that can range from very small to up to 10 cm long. They have 2 suckers, anterior and

posterior, with 3 jaws on the anterior sucker. They can ingest almost 10 times their weight in blood (approximately 5–15 mL) in a single feeding, which typically takes place over 20 to 30 minutes. One feeding can satiate the leech for a year or more.<sup>3–5</sup> Although most attachments are short and external, attachment to internal surfaces such as the eye, ear, nose, naso/oropharynx, urethra, bladder, rectum, or vagina, can last for days or weeks.<sup>6</sup> The medicinal leech, *Hirudo medicinalis*, is the most studied variety. Figure 1 provides a photograph of *Hirudo medicinalis*.

Leech attachments can cause significant bleeding secondary to biologically active anticoagulation factors intrinsic in their saliva. The most potent of these factors is hirudin. This molecule inhibits thrombin-catalyzed conversion of fibrinogen into fibrin clots<sup>7</sup> and remains active for 15 to 20 minutes.<sup>8,9</sup> Figure 2 depicts the interruption of clotting components by hirudin. The mean duration of bleeding is approximately 10 hours, with an upper limit of 7 days.<sup>2,10</sup> Although formal data do not appear to be available, authors have estimated the rate of blood loss at the wound to be 1 mL per minute (or 60 mL per hour).<sup>11</sup> Although leeches will detach themselves and fall off after they are full, bleeding at the site of the attachment may continue for hours due to the continued presence of anticoagulation factors at the wound site.

Corresponding author: Jeremy Joslin, MD, Department of Emergency Medicine, State University of New York, Upstate Medical University, 550 East Genesee Street, Syracuse, NY 13203; e-mail: JoslinJ@upstate.edu.

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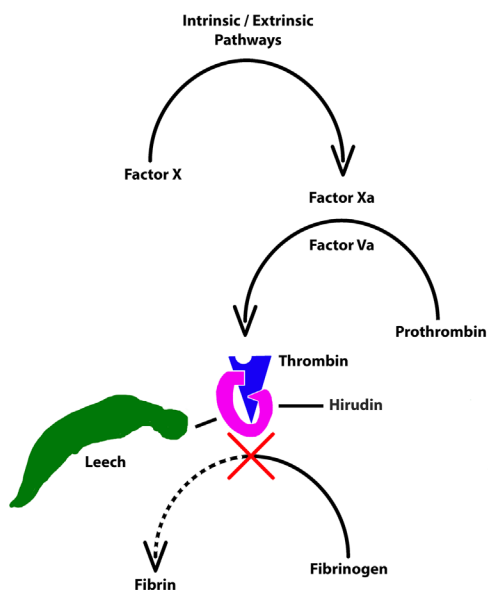


**Figure 1.** *Hirudo medicinalis* attached to a human hand. Photograph credit/rights: Shamleen/Shutterstock.

### Historic context

Leeches have been used throughout history for a variety of medicinal purposes. The earliest recorded use of leeches was in 1500 BCE, as depicted in an Egyptian tomb.<sup>1</sup> They were used to reduce inflammation, which was thought to be the source of all subsequent disease.<sup>1</sup>

Leeches are mentioned both in the Bible and the Koran.<sup>2</sup> Europeans were so enamored with the use of medicinal leeches in the 17th and 18th centuries that they depleted the supply.<sup>1,12</sup> Use of leeches then declined in the 19th century, coinciding with the rise of germ theory, but a renaissance in the use of medicinal leeches occurred in the 20th century in the field of reconstructive surgery.<sup>1,12</sup> In 2004, the US Food and Drug Administration approved leeches for use in micro- and plastic surgery.<sup>1</sup> Outside of the hospital, contemporary folk remedies have involved the use of leeches to treat black eyes and varicose veins.<sup>3</sup>



**Figure 2.** Coagulation interruption by hirudin found in leech saliva (adapted from Hildebrandt and Lemke<sup>4</sup>).

### Prevention

Methods to avoid and prevent leech attachment are largely intuitive; the easiest and most effective way is to avoid leech-infested regions. Indeed, leeches can be encountered in more than aquatic environments. Some land species simply perch on vegetation awaiting the opportunity to attach to a host and obtain a blood meal. Other prevention methods that have been suggested, but remain mostly speculative, include wearing tall, light-colored socks pulled over pants<sup>13,14</sup>; inserting tobacco between the toes<sup>15</sup>; placing dried, powdered Neem leaves under clothing<sup>16</sup>; or applying body oil because leeches have a difficult time attaching to slippery surfaces.<sup>16</sup> Strategies borne from formal study include application of N,N-diethyl-meta-toluamide<sup>17,18</sup> or N,N-diethyl phenylacetamide<sup>17</sup> as chemical repellents. Based on this literature, the authors' recommendations are to wear clothing that covers the lower extremities (tucked, long socks) and to apply insect repellents such as N,N-diethyl-meta-toluamide or N,N-diethyl phenylacetamide.

### Removal and incapitation

#### SIGNS AND SYMPTOMS OF ATTACHMENT

Most leech attachments are external. General symptoms of a leech attachment include painless bleeding, bruising, itching, burning, swelling, pain, irritation, redness, irritant contact dermatitis, follicular pseudolymphoma, and mucosal synechiae.<sup>2,13,19–24</sup> A single discovered leech should prompt an investigation for other attached leeches.<sup>2</sup>

Internal leech attachment can be indicated by symptoms such as bleeding from the associated orifice(s), obstruction of the associated orifice(s), or a sensation of foreign body movement. Voice alteration or hoarseness, cough, stridor, and dyspnea are present when the leech attachment is associated with the larynx. Gross painless hematuria and dysuria, fever, pallor, and vomiting can also be found with internal leech attachment.<sup>3,13,19–22,25–32</sup>

#### REMOVAL

Due to severe local alterations in coagulation associated with leech attachment, initial treatment should focus on removing the leech(es), controlling blood loss, and preventing exposure to blood-borne pathogens.<sup>2</sup> Other factors to consider include infection and morbidity from mechanical obstruction or internal hemorrhage.<sup>33</sup>

The medical literature is full of anecdotal and individual recommendations for leech removal. Unfortunately, few data are available to compare methodologies. Table 1 lists removal strategies that have been previously described but which are not necessarily recommended due to their anecdotal nature. They are presented to the

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