



# Therapy With a Bite

Leeches offer promise to veterinary medicine

by Jen Reeder

DONALD AND ANGELA DEMPSEY'S GERMAN SHEPHERD, BARON, was only 11 months old when he was diagnosed in 2012 with a skin lesion caused by a cutaneous pythiosis infection over his left hip. At that point, Angela Dempsey said, "We just wanted any treatments possible to heal Baron."

So when Baron's veterinary team suggested leech therapy, the Florida-based couple didn't hesitate to agree. After surgeries, medication, and therapies—including leech and hyperbaric chamber treatment—Baron is now "100 percent healed," and the grateful Dempsey said she would recommend leech therapy to others.

The word "leeches" can conjure up images of ineffective, Victorian-era bloodletting, but leeches are used today in legitimate medicine, principally to treat hematomas and in skin flap and replantation surgery, according to Mark Siddall, PhD. Siddall is curator in the Division of Invertebrate Zoology at the American Museum of Natural History in New York, N.Y., and author of *Poison: Sinister Species With Deadly Consequences*.

"The reason that it works is purely mechanical: that is, if you reattach a finger or you reattach an ear, the veins take time to grow back," Siddall said. "The veins can't grow

back if that tissue's under massive pressure of blood, so you need to remove the blood."

Enter leeches. The species *Hirudo medicinalis* and relatives like *Hirudo verbana* are effective in medicine because while they feed they can circumvent the clotting mechanisms of their hosts. They accomplish this by two means: anticoagulants in their saliva and the triangular shape of the cut created by their three jaws, which inhibits sealing of the wound.

"If you're going to fill up with eight times your unfed body weight in blood, you've got to keep it from clotting—otherwise you're going to turn into a brick," Siddall said. "So really the principal function of the anticoagulants is to keep the blood in liquid state inside of them until digestion can occur."

## A practice with ancient roots

Siddall said there is nothing "magical" about the saliva of leeches. "It's not inducing healing; it's allowing healing." He noted that the ancient use of leeches to remove "bad humors" from the blood came from an uninformed period of medicine, when all disease was thought to be intrinsic to the individual, rather than people being infected by something.



Curtis Martin, DVM, used leeches to treat ear hematomas in this English bulldog. Leech therapy “works perfectly for breaking down hematomas,” Martin says.

“The ideas actually go back to the East and Ayurvedic medical traditions that came westward through Greece,” Siddall said. “Hippocrates, and Galen in particular, had this notion that disease states are due to an imbalance of humors... blood, bile, and phlegm.” The concept of bloodletting continued in Western medicine into the 20th century.

“Interestingly enough, the use of leeches in medicine reached its zenith in the 1830s,” Siddall said. “Heavily promoted by one of Napoleon’s surgeons, leeches were almost extirpated from Europe because of collecting.”

Siddall said the first legitimate use of leech therapy was in the early 1920s, when George Haas used purified hirudin, the antithrombin compound that gives leeches their scientific name, for dialysis treatment. Haas lined the dialysis tubing with hirudin, preventing the blood coming out of patients from clotting in the tubes before being cleaned and reintroduced to the recipient. (Several years later, heparin was discovered and supplanted hirudin in dialysis treatments.)

Leeches regained popularity in the 1960s for reconstructive surgery, and, in 2004, the U.S. Food and Drug Administration (FDA) approved the use of leeches (*Hirudo medicinalis*) as a “medical device” for humans in certain circumstances, such as treating venous congestion issues.

The FDA currently has no official position on the use of leech therapy in veterinary medicine, and it would be regulated by individual states, according to Megan

Bensette, a press officer for the FDA’s Office of Foods and Veterinary Medicine.

### **Veterinary uses**

Caleb Hudson, DVM, MS, DACVS, and staff surgeon at Gulf Coast Veterinary Specialists in Houston, Texas, has been using leeches to treat veterinary patients, including Baron, for the past five years in special cases. He said leeches are primarily used after reconstructive surgery to treat venous congestion in skin flaps or skin grafts and can also be used to treat polycythemia (increased red blood cell count).

Hudson said, although clients are often initially skeptical of leech therapy for their pet, once the benefits are explained, most are “fine with the idea.”

In one successful case, Hudson treated a middle-aged toy poodle with a tumor that had been removed twice in the past with minimal margins, and it recurred both times. He surgically removed the tumor with 5-mm margins and a deep tissue plane and closed the defect by creating an advancement flap with skin from the dorsal cervical region.

“The surgery went smoothly, but I was worried that tension in the advancement flap would compromise the venous drainage from the skin flap,” Hudson said. So he applied two leeches to the flap every 12 hours, allowing them to feed for up to 25 minutes per session for three treatments. “The entire skin flap survived, and the patient healed from surgery without complications and made a full recovery.”

Hudson said leeches are relatively safe to use, although it’s wise to treat patients with antibiotics in case of infection. Bacteria in the leeches’ gastrointestinal tract can be transmitted into a patient when the leeches are feeding, particularly if they are forcibly removed instead of allowed to dislodge voluntarily. Siddall also stressed that antibiotics should be given to any patient prior to leech therapy.

Hudson said a leech removes around 2.4 milliliters of blood in a single “meal,” on average, so in very small patients, leech therapy should be used cautiously to avoid removing too much blood. For example, only one to two leeches should be applied to a 1-kilogram puppy.

For disposal, he said leeches should be placed in a container of 70 percent alcohol for 5 minutes and then disposed of in a biohazard container or other infectious waste disposal container.

David A. Puerto, DVM, DACVS, and chief of surgery at the Center for Animal Referral and Emergency Services (CARES) in Langhorne, Pa., uses leeches occasionally for special cases.

He first observed leeches used in 1998 at the Veterinary School of the University of Pennsylvania and has seen leeches used successfully to relieve venous congestion after reconstructive surgery when blood drainage became compromised, once in the ear reconstruction of a Doberman and once in a skin flap used to reconstruct the leg of a dog named Dusty after a tumor removal.

In that latter case, within 12 hours after Dusty's surgery, the flap became engorged with blood that was not

draining out of the tissue. Puerto and his team obtained medicinal leeches from a local hospital; however, after a couple of days, the leeches were full and stopped feeding. They then ordered leeches from a commercial company and had them air couriered in.

"We kept the flap alive for an additional 5 days or so, but ultimately the flap did not survive and was removed," Puerto said.

Fortunately, Dusty's surgery to remove the tumor was successful, and there was no recurrence. Puerto and his team were able to nurse Dusty and get the surgical wound to heal, using careful wound care and excellent follow-up and compliance by the owner, Puerto said.

One takeaway Puerto learned was that leeches can be reused on the same patient (although never on another patient, to avoid transmitting disease), but they don't feed well after about two applications. He said the main contraindications of leech therapy are coagulopathy (clotting deficiency such as hemophilia) or an immune deficiency, which could increase the risk of infection.

Curtis Martin, DVM, emergency veterinarian at Animal Emergency and Specialty Center in Knoxville, Tenn., used leeches three times this year while working at AAHA-accredited VCA All Pets Animal Hospital in Salinas, Calif., to treat ear hematomas in an English bulldog, yellow Labrador, and a cat—each time successfully. "It works perfectly for breaking down hematomas," Martin said.

Martin said leech therapy is a cheaper alternative to hematoma surgery. He typically charges \$100 per leech and a \$50 application fee. Furthermore, this therapy is embraced by clients who are wary of anesthesia, since the animals stay awake during the procedure. He said leeches are relatively



This middle-aged toy poodle had a tumor surgically removed with 5-mm margins and a deep tissue plane. Caleb Hudson, DVM, MS, DACVS, closed the defect by creating an advancement flap with skin from the dorsal cervical region. He applied two leeches to the flap every 12 hours, allowing them to feed for up to 25 minutes per session for three treatments, with the goal of reducing tension in the flap that could have compromised venous drainage. "The entire skin flap survived, and the patient healed from surgery without complications and made a full recovery," Hudson said.

inexpensive to purchase from commercial companies, such as Leeches USA and Biopharm Leeches, but the overnight shipping is pricy.

### Handle leeches with care

Martin said it's important to keep pets calm during the 30–40 minutes while the leeches feed before voluntarily dislodging because animals can shake them off. He concluded, after a cat shook off its leech a couple of times and “there was some screaming” by staff, that a little sedation would have been helpful.

When handling leeches, he advises against using forceps because they can cause the leech to regurgitate, which creates issues. However, he strongly suggests wearing gloves.

“The first time I pulled out a leech, I wasn't wearing gloves, and it tried to attach to my thumb,” he said. “Luckily, it attached to my fingernail, and it didn't attach to my actual skin. It sort of sat there for a little while, then realized it wasn't getting any blood and dropped off.”

Martin has also experimented with ways to get the leech to attach to the desired location. One option that worked well was pulling the plunger out of a syringe and putting the leech into it, then inverting the syringe so that the wide part of the opening was where he wanted the leech to attach.

“The other option is getting little gauze squares. We cut a little 1-centimeter hole in the middle of the gauze square and soaked the gauze square in distilled water so it was damp, and then put that on the ear so that the leech could only attach to that little 1-centimeter spot,” Martin said.

He added, “That way gets a little trickier because the



A comparison of leeches before feeding (left) and after (right).

leeches move a lot faster than you'd expect, so we had a lot of runaway leeches.”

Martin said the smaller a leech is, the hungrier it will be, so choosing smaller leeches helps because they'll attach more readily. Another trick is to prick the area with a 25-gauge needle to create a little drop of blood. “Once they smell that blood, they go crazy and attach pretty quickly,” he said.

Martin noted that it's important not to try to aspirate a hematoma or inject anything else into it to avoid losing any leech saliva. He said it can take several weeks for the hematoma to completely reduce in size after treatment.

While the anticoagulants in leech saliva help keep blood flowing during therapy, Siddall reiterated that there is nothing in the salivary compounds of leeches that induces healing. “They're allowing it to occur; it's a nuance,” he said.

As a scientist concerned with the conservation of the species, Siddall supports the use of leeches for legitimate medical purposes but not “quackery,” such as leech spas. In 2008, Demi Moore famously told David Letterman on air that she traveled to Austria for leech therapy to detoxify her blood, drawing Siddall's ire. “It doesn't purify your blood; they [leeches] just take blood. It doesn't purify anything.”

Siddall also said there is “zero evidence whatsoever anywhere” of any compound in leech saliva being an anesthetic. However, animals wouldn't feel pain from a leech bite because they would already be in the process of being treated for a painful condition.

Siddall said, “I can tell you from personal experience that they [leeches] hurt. So the question is ‘why don't we feel them when we get bit by them in the natural environment?’ And the answer's simple: You're in water. The surface of your skin has been cooled down, your neurons are not firing like they normally do, and, furthermore, you've got reeds or water or other stuff brushing against it so you're basically desensitized.”

But compounds in leech saliva could hold some promise of fighting cancer. “What we need to do is find out what part of the anticoagulant protein is principally

# A Closer Look

Tiny little teeth arranged in a longitudinal row move parallel, back and forth and make an incision in the skin—it goes subcutaneous—so they can feed on the blood in the capillary beds.

The jaws themselves have little pores through which the anticoagulants are secreted

The principle function of the anticoagulants is to keep the blood—8 times their unfed body weight in blood—in liquid state inside of them until digestion can occur.

Behind the jaws is a pharynx, which is like a muscular throat that pumps and applies negative pressure.

## Bite Pattern



When the leech makes its cuts, you end up with a tripartite cut, a prestigious Mercedes Benz mark.

The physical structure of the incision is such that it's difficult for the host to heal quickly. The mechanics of the cut inhibits quick clotting and sealing up of the wound.

It has a very large stomach, what we call a crop, and the stomach is big enough that your average medicinal leech can fill up that crop with something like 6–8 times the unfed body weight of itself.

## Crawling Movements



responsible for getting the job done and try to restrict whatever the therapy would be down to that region of the amino acid chain of the protein, so you're not injecting a huge protein, you're injecting a small peptide," Siddall said. "This is possible, but it's not easy to figure out what part of the molecule that is."

To avoid overharvesting leeches, it's important medical providers and the public understand what leeches can and cannot do. As Siddall said, "They're lovely, they're pretty, they're amazing creatures—but, no, bloodletting is not a good idea." ✱

### References:

1. Gulf Coast Veterinary Specialists: [gcvcs.com](http://gcvcs.com)
2. Center for Animal Referral and Emergency Services: [vetcares.com](http://vetcares.com)
3. Animal Emergency Specialty Center: [animalerspecialty.com](http://animalerspecialty.com)
4. VCA All Pets Animal Hospital: [vcahospitals.com/all-pets-salinas](http://vcahospitals.com/all-pets-salinas)
5. Leeches U.S.A. Ltd.: [leechesusa.com](http://leechesusa.com)
6. Biopharm Leeches Ltd.: [biopharm-leeches.com](http://biopharm-leeches.com)



Go to [youtu.be/pLhiECSGttl](https://youtu.be/pLhiECSGttl) for a video of leeches in action. David A. Puerto, DVM, DACVS, Center for Animal Referral and Emergency Services, said: "The images are of a dog named Dusty after a tumor removal. The skin flap is severely congested, and you can see in the areas near where the leeches are attached and feeding the congestion is reduced."

Video provided courtesy of David A. Puerto, DVM, DACVS, Center for Animal Referral and Emergency Services



Freelance journalist Jen Reeder grew up with an irrational fear of leeches because of her mother's tales of George Washington dying from bloodletting, so she found researching this article quite therapeutic.

## For More Information



### Published studies on leeches in veterinary medicine

- Hirudotherapy in veterinary medicine; *Annals of Parasitology*, 2014; 60(2):89-92  
[ncbi.nlm.nih.gov/pubmed/25115059](http://ncbi.nlm.nih.gov/pubmed/25115059)
- The use of medical leeches for venous congestion. A review and case report, *Veterinary and Comparative Orthopedic Traumatology*, 2014; 27(3):173-8.  
[ncbi.nlm.nih.gov/pubmed/24764080](http://ncbi.nlm.nih.gov/pubmed/24764080)
- Leeching as initial treatment in a cat with polycythaemia vera, *Journal of Small Animal Practice*, 2001 Nov; 42(11):554-6  
[ncbi.nlm.nih.gov/pubmed/11721985](http://ncbi.nlm.nih.gov/pubmed/11721985)

### Studies on leeches in human medicine

- Clinical uses of the medicinal leech: a practical review, *Journal of Postgraduate Medicine*, 2011 Jan-Mar; 57(1):65-71  
[ncbi.nlm.nih.gov/pubmed/21206115](http://ncbi.nlm.nih.gov/pubmed/21206115)
- Leech therapy in nearly total amputation of fingers without vascular repair: a case report, *Iranian Red Crescent Medical Journal*, 2014 May;16(5):e6897  
[ncbi.nlm.nih.gov/pubmed/25031865](http://ncbi.nlm.nih.gov/pubmed/25031865)