

Willy Guasti
Uninvited Guests. The wonderful life of Parasites
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Chapter 14

Yo-ho-ho, and a Bottle of Blood

Until not long ago, whatever ailment afflicted you, the solution was one: a good bloodletting. Which means you would be “cured” by sticking one or more leeches onto strategic points of your body. Have a fever? Leeches. Laryngitis, gastritis, inflammation of the kidneys or eyes? Leeches. Exaggerated flatulence? Leeches. Swollen testicles? You already know the answer. I’ll stop here, as I think I’ve made the point. It is certainly no coincidence that Linnaeus, the Swedish physician, botanist, and naturalist who invented the method we still use today to classify organisms, baptized the common leech in our parts in 1758 with the scientific name *Hirudo medicinalis* – commonly called the medicinal leech.

It’s not easy to figure out when we started our professional collaboration with leeches, but it’s been going on for a long time. It was certainly an established practice already in ancient Egypt: images of leeches are found in the wall paintings of the tombs of some pharaohs of the 18th dynasty (that is, more than 3,500 years ago). However, it is in the Hellenistic age that for the first time (as far as we know) someone took the trouble to write about them: the credit goes to the poet Nicander of Colophon, who mentions them in his medical poem *Alexipharmaca* more than 2,200 years ago. One of the main admirers of leeches was subsequently Galen, physician to Marcus Aurelius and proponent of the “theory of humors,” based on the previous considerations of Hippocrates, according to which there were four different fluids in our body: yellow bile, black bile, blood, and phlegm. The well-being of the organism depended on their balance, and each corresponded to different personality traits. If one or more of these fluids overwhelmed the others, thus unbalancing our body, disease arose. One of the means to restore the body to balance and health was therefore to remove the excess humors; and what better means than a good leech?

In the 1st century, traces of similar practices are found in Chinese writings, as well as in Arab literature. The ancient Romans also knew this little animal, and it was they who first called it *Hirudo*. Pliny the Elder’s writings report that, with their blood-sucking activity, they could be useful against rheumatism, fever, or gout. It is certainly no coincidence that the word leech originates from the Anglo-Saxon word *laece*, which means... “doctor.” Alexander of Tralles (525–605 AD) even used leeches to treat hearing loss (in addition to some new remedies, such as the juice of cockroaches). During the Middle Ages, barbers, who sometimes provided some medical services, often practiced bloodletting, making patients squeeze a stick in their hand so that the veins on the arm became visible. It happened that in these operations with leeches the patient lost blood, so they always had a good supply of light linen bandages close at hand. These blood-stained strips of fabric were wrapped around the barber’s pole and exposed to the wind, at the top of which, moreover, the latter was surmounted by a basin for the leeches. If you have wondered where modern red and white striped barber poles with a ball on top come from, now you know.

Leeches were kept in special water-filled jars, open at the top so the animals could enjoy a good degree of aeration. Initially, glass was used, but over time, ceramics took hold. The more recent ceramic containers were not simple jars: often lavish and finely decorated, they became objects of great value for collectors. When the doctor went to perform bloodletting at home, he brought a group of leeches with him in smaller glass or pewter containers. Although the idea of having one’s blood sucked was not pleasant even at the time, leeches were a much more pleasant alternative than other methods (which involved cutting the flesh with various types of blades). In comparison, their bite was not painful: leeches in fact produce a substance that acts as a local anesthetic at the point where they attach, as well as another substance that prevents the blood from clotting – we will talk about this later. The application of the leech made it possible to better control the blood draw and, in some particularly sensitive and vulnerable areas of the body (such as the rectum and genitals), the other methods could not be used. For these reasons, ultimately,

they were the best possible solution (while being careful not to let them suck blood more than necessary).

Don't think that leeches quickly disappeared from medicine. On the contrary: the further we go, the more they become protagonists. The climax was probably reached in the 19th century: the Parisian François-Joseph-Victor Broussais (1772–1832), who served as a doctor in Napoleon's army, was one of the biggest fans of these worms ever. According to him, all diseases had the same cause: an excess of blood. And a single cure: bloodletting and fasting galore. Indeed, to tell the truth, for him, diseases did not exist, but only symptoms, and the cure (translated: leeches) could only be administered after the patient's body had been weakened. What a joy it must have been to be treated by him. One testimony recounts that one of his patients once had so many leeches on his abdomen that his belly looked like "a black, shimmering coat of mail," so much so that Broussais was defined by some as the most bloodthirsty doctor in history. Strangely enough, for some reason, he also had considerable success, and thanks to him, the use of leeches spread even further, to the point that the prescription of bloodletting to patients even before visiting them by French doctors became standard practice.

Leeches were an obsession, and they were not only of interest to doctors: many women at the time had clothes embellished with leech-shaped embroidery, and these worms were also used in cosmetics to enhance a pale complexion (by having blood sucked, clearly). It happened that up to 80 leeches were attached to some patients at a time. In Russia, about 30 million leeches were needed per year to meet the doctors' needs, and in 1833 alone, French doctors imported almost 42 million – for an annual consumption of almost 100 million of these animals, most of which came from Eastern Europe and were transported to France by mule. Hungary established itself as the main supplier of European leeches, exporting up to 60 tons per year: the richest merchants earned sums comparable to the income of the wealthiest Hungarian aristocrats in a year. It is estimated that, in the hospitals of Paris during that period, leeches sucked about 673,000 kilograms of blood every year; the enormous demand inflated prices, as if they were exclusive action figures for the Japanese market. The French government therefore promised prizes to companies capable of supplying the largest number of leeches possible, exploiting the populations of swamps, streams, and ponds to the maximum. For those who wanted to earn some extra money, becoming a leech collector became an excellent way to make ends meet: all they had to do was immerse themselves in stagnant pools of water and then come out and sell the leeches stuck to their legs and feet.

The demand from the United States was such that Germany annually exported 30 million leeches, and soon the German authorities became concerned about not having enough leeches for their own citizens. The Americans also had their leech, the *Hirudo decora*, but there was no comparison: our European species produced a wider and deeper incision and sucked more blood at once. However, it became increasingly difficult for Americans to import them, so much so that in 1835 a prize of \$500 was offered to anyone who could successfully breed them in the United States. Money is tempting to many, regardless of what drives them: it wasn't long before the generalized craze put European leeches in danger of extinction. Everyone wanted them, and these quiet little animals underwent an extraction from nature that was nothing short of monstrous. The Norwegians, having plundered their ponds so much that they practically disappeared, began to rob those of Sweden, jeopardizing the political relations between the two countries. In Italy, Spain, and Portugal, the leech populations were almost gone by the mid-Nineteenth century, and this led some countries to prohibit their export to protect this important resource. In some nations, real leech farms (leecheries) sprang up, and hirudiculture was born, i.e., the breeding of these animals in pools of water. The most avant-garde were once again the French: their farms were not only functional but also beautiful and orderly, so much so that they became an integral part of the country's urban reconstruction. However, they were not easy to maintain: changes in ventilation and seasonal humidity turned these elegant little lakes into total failures, and animals like birds and rats that gladly used them as a buffet were also a big problem. An 1854 testimony recounts that 200,000 leeches were swallowed in one fell swoop when a flock of wild geese stopped to rest in these comfortable pools during migration.

But fame is a fickle friend, and at the end of the 19th century, leeches lost their appeal. In some English hospitals, the “medical staff” went from about 100,000 leeches in 1832 to less than 200 some fifty years later. The fault lay with the developments of modern medicine, which simply found them... outdated, aided by the fact that bleeding an already sick patient no longer seemed like a good idea. A wound left by a leech and not adequately treated can also become infected and become something worse. There were those who continued to use them here and there until the 1940s, but not much. I asked my ninety-four-year-old grandmother, born in 1931, if she had ever heard of this practice, and she surprised me by immediately answering with great certainty that yes, she knew it very well: when she was just a child, there were still people who came to apply them at home. They weren’t doctors, though. When I asked her who they were, she replied with her usual Tuscan: “They must have been nurses, I guess... people who needed to know!” I am not convinced about the qualifications of these individuals, not at all. “They’re little animals... oh, I remember they existed even when I was a girl.”

In other areas of the world (such as Turkey, China, New Zealand, and Australia), other species of leeches were used compared to ours, but the substance remains the same. Comparing someone to these freshwater cousins of earthworms, as has happened with other parasites, has become an insult: calling a person a “leech” is equivalent to calling them greedy, opportunistic, and a drainer of finances. They are not portrayed very well in the various media. In the *HunterXHunter* manga (and anime), Leech is a really improbable minor character, unpleasant in appearance, an assassin hired by the mafia whose power is to host leeches in his body, which he inserts into his opponents through a kind of tongue, condemning them to death (something that, spoiler, will instead happen to him in very little time). The leech devil also appears in the *Chainsaw Man* manga and anime, a female devil (again, unpleasant in appearance) who attacks the protagonist, then meeting a bad end. In fact, reading how often they are mercilessly cited, it seems strange to think of the cultural importance they held until the day before yesterday. There are over 650 known species of leeches, and, although they are often associated with freshwater environments, there are also marine ones (some parasitize angel sharks, for example) and terrestrial ones. They have a flattened body, consisting of 34 segments, thanks to which they can exchange oxygen with the surrounding humid environment. They possess a sort of sucker at each of the two ends; the posterior one, larger, is used to adhere to the host, while the one positioned at the head is used to properly adhere the jaws to the flesh. They have two or three, depending on the case, and each is armed with numerous small teeth, which leave a small V-shaped incision on the host if the jaws are two, and a Y-shape if they have three. The suckers are also used to adhere to the substrate and “walk”: leeches sometimes move like a compass, as some caterpillars do, bringing the posterior end closer to the anterior one, then detaching the anterior sucker and stretching forward. They digest blood very slowly, so much so that common medicinal leeches can go more than a year without eating after drinking enough blood. During this operation, they swell, dilating and taking on a quantity of fluid far greater than their body weight. On average, they are very small (around 2.5 centimeters or even less), but there are species up to 20 centimeters long.

It is not true that leeches are only parasites: many species are predators in all respects, capable of eating other relatives of the annelid group (such as earthworms), snails, insect larvae, and other small invertebrates. Some are even more daring: in 2020 in England, leeches were seen feeding *en masse* on an unfortunate common toad (*Bufo bufo*). Several specimens covered the throat and eyes of the poor amphibian, and, after being studied, they were identified as *Batracobdella algira*, a species never reported before in the country, characteristic of the Mediterranean area and some areas of Eastern Europe. It is unclear how it arrived on English soil: perhaps it was transported by some migratory birds without their knowledge. The attacked areas of the victim, however, were probably chosen because the skin glands that make toads toxic are not present on the throat and eyes. However, further studies are needed to understand the impact on the amphibian population and the origin of these leeches. That said, most leeches are ectoparasites that feed on the blood of vertebrates (such as mammals, fish, frogs, or snakes), not disdaining, however, in some cases, other invertebrates, such as crustaceans, insects, and molluscs. With their blood-sucking activity, it is known that they can transmit some diseases to their hosts, as happens among fish, but their real potential as vectors of blood diseases has not yet been fully understood.

Some time ago, Vincenzo, a friend and colleague with whom I shared several business trips, was in Sumatra and told me that there wasn't a walk in the jungle that didn't end with a generous dose of leeches stuck to him. In fact, if they stick to your skin, they are easy to spot with the naked eye. The problem is that not all of them stay outside. There are leeches that attach to the mucous membranes and can therefore remain inside the orifices for days – if not weeks, causing so-called hirudiniasis, i.e., the condition in which a leech settles in our body. They usually attach to the mucous membranes of the nasopharyngeal region, but they can also sneak into the eyes, urethra, vagina, or rectum. The presence of these parasites, accompanied by the sensation of a moving body in the nasal cavity, is revealed by obstructions, increased sneezing and coughing, itching, hemoptysis (coughing up blood), hematemesis (vomiting blood), and even anemia and dyspnea (difficulty breathing). As if that weren't enough, in some severe cases, potentially fatal infections can develop.

In the Middle East, Africa, and Asia, leech infections are particularly common, but reported cases involve virtually every continent. Domestic livestock is often at the greatest risk, especially when it spends a lot of time at watering holes infested with leeches, which can then slip into their noses. In our species, cases of leeches attached to the mucous membranes are probably more common than one might think: only those recorded by doctors are reported, and often affected people go to the hospital only when they cannot extract the intruder themselves. Probably the most studied leech among those capable of parasitizing the mucous membranes of mammals is *Dinobdella ferox*. Its name says it all: it means “terrible fierce leech,” and it is one of the species most capable of attacking humans. Despite being the subject of numerous studies, we didn't know much about it until at least 2019, when the authors of an article solved the problem the old-fashioned way: a good voluntary infestation. In three trials, conducted between 2016 and 2017, a young leech was introduced one at a time onto the skin below one of the consenting volunteer's nostrils (a man), leaving it free to crawl wherever it wanted. Videos of the operation are available, of course. This was the first study to document the behavior of this leech, monitoring the host's symptoms and the development of the parasites. They stayed for 49 to 75 days, and one of the leeches spontaneously left the host after doing its business – this was the first testimony of a *Dinobdella* infestation not to be interrupted manually. In any case, since the blood loss caused by the parasite while feeding on the mucous membranes ends weeks before the leech leaves the host, it has been established that these animals stop eating several days before exiting the nose. They are also more inclined to put their head out in low light environments and in the presence of water. Thus, now that the leech has grown enough to reproduce, these conditions are the signal that it is near an excellent place to return to a free life (such as a body of water that is not too sunny).

There are several leeches with these habits, probably including some unknown species, which perhaps we could discover by going to look for them exactly where we expect to find them: in someone's nose. That's how we caught a particular species from Peru. In 1997, a six-year-old boy was taken to a hospital in the province of Lamas, complaining of a frontal headache. Although there was no trace of blood, a 2.5 cm leech was extracted from his right nostril, then preserved in formalin. It was learned that the small patient regularly bathed in local streams and lakes. Similar things happened two other times (once in the same year and once in 2007), and in both cases, dark-colored specimens were extracted from the noses of two other children, both lovers of bathing in small lakes. Years later, light was shed on the identity of these three leeches: it was realized that they were a new species, which was described in a 2010 study. Unlike any other known leech, this new little monster has only one jaw, but with eight very large and threatening teeth. A name, a guarantee: they called it *Tyrannobdella rex*.

Living in water, leeches often parasitize vertebrates they find in their environment, such as turtles; in fact, at least in some contexts, these worms seem to be the most common parasites to observe on these animals. Leeches of the genus *Placobdella* in North America are often found on these reptiles and more frequently affect turtles that usually stay near the bottom, such as snapping turtles (*Chelydra serpentina*), compared to semi-aquatic ones that come out of the water more often. The same applies to those who spend a lot of time out of the water basking (i.e., sunbathing): they have a reduced parasite load since, probably, for the leech to stay attached to a turtle while it lies in the sunlight for a long time dramatically increases the chances of drying out. In any case, leeches

are tough cookies: some of them can lose up to 92 percent of their body water and still survive. It has also been observed that there is a greater probability of finding leeches attached to turtles in murky water ponds and on larger turtles.

There are leeches that have particular associations with their hosts. *Hemiclepsis kasmiana* feeds on the eggs of bitterlings (fish of the family Acheilognathinae). The peculiarity is that these fish lay their eggs in the gills of some freshwater mollusks, which act as unaware “incubators,” protecting them inside their body. The leech, however, has the pleasant habit of settling inside the mollusk, eating the fish eggs and considerably decreasing their prolificacy. This behavior, in fact, qualifies this leech as a hyperparasite, since the fish can also be considered a parasite. However, not even leeches are immune to parasites: several trematodes choose them as hosts, with the result that in certain ecosystems they play an important role in the spread of their colleagues. Although fossil evidence of this group is rare, we know that they have been around for a long time: in 2025, *Macromyzon siluricus* was described, a leech more than 436 million years old from the Brandon Bridge Formation in Wisconsin, a deposit with an exceptional level of preservation dating back to the Silurian period. This not only pushes the origin of these animals back by at least 200 million years compared to what we knew, but it also tells us two other things. One: the first true leeches were marine animals, which only later adapted to live in fresh water; two: contrary to previously supported hypotheses, most likely they did not feed on the blood of vertebrates at all in the beginning. Judging from the fossil data, the most common animals in that environment were in fact trilobites, a famous extinct group of arthropods; since some modern leeches can feed (sometimes by choice, sometimes by obligation) on the hemolymph of arthropods, trilobites seem like the perfect candidates for the diet of this ancient vampire. Whether *Macromyzon* was a true predator or “just” a parasite is unknown, but it is certainly fascinating.

On the other hand, leeches are still important today. In fact, for some years now, our dear medicinal leech has been experiencing a personal Renaissance. Already towards the end of the Nineteenth century, someone had noticed its qualities: in 1884, John Berry Haycraft reported the presence in leech saliva of a substance with anticoagulant properties, which he baptized “hirudin” in honor of the humble creature that produces it (although he probably confirmed what had already been intuited by a Russian professor years earlier). In any case, the molecule, which we now know to be a peptide, was isolated in crystalline form only in 1957, and produced in quantity by genetic engineering only in 1986. It is an excellent inhibitor of thrombin (the enzyme responsible for blood clotting), and this makes the antithrombotic capabilities of this substance truly remarkable... However, given that its quantities have not been very abundant for research, it has been used less than expected. The speed at which molecular biology has galloped in recent years, however, has stimulated renewed interest in hirudin, developing recombinant forms of the molecule (called r-hirudins) that are easily available. With sufficient investment, it would be possible to develop new drugs capable of successfully managing thromboembolic diseases, both of venous and arterial origin.

Microsurgery is also getting its fair share of work with leeches: today they are used by maxillofacial surgeons (as well as their other colleagues) to promote the recovery of compromised venous tissue – for example, on the flaps of amputated fingers, ears, and nose tips. When these small body parts are reattached, blood tends to accumulate at that point; this happens because, even if the arteries bring it there, the veins, being more fragile, have difficulty making it flow away, with the result that the incoming blood does not drain correctly and remains there. Leeches can help; in one case they even helped reattach a man’s tongue that had been bitten off during a fight. Some data even show that the healing of a flap compromised by an amputation and congested by the veins is better if a leech is applied to it. It also relieves the pain and symptoms of some bone arthritis, and although most of the reports in question refer to isolated cases or small-scale studies, there is enough evidence to take a serious interest and conduct further checks.

Therapy with leeches already has its official name: hirudotherapy. It requires waiting for the leech to do its business and detach itself (doing so while it is on the job is not advisable, since it has its mouthparts inserted into the flesh and could regurgitate blood due to stress, a bit like ticks). Unfortunately for the leech, when it has done its duty it is killed: using one that has already sucked

the blood of another patient definitely increases the risk of transmitting infections. Since they are still used for research purposes, there are companies that successfully breed them to meet the demand: the Welsh company Biopharm Leeches Ltd, founded in 1981 by the American biologist Roy Sawyer (who quit his academic career to follow this adventure), exports about 25,000 leeches every year to England and Ireland and 60,000 to the United States – so maybe we can leave the wild ones alone. And there are even those who have gone further, developing... robot leeches. A group from the University of Wisconsin Medical School in 2002 published research where they attempted to build various prototypes capable of replacing real leeches with an artificial counterpart. The tests showed that these “leeches” (actually more similar to small automatic pumps controlled by a computer) in some cases managed to suck more than 800 percent more blood than the real ones, paving the way for the development of small instruments capable of treating venous congestion with even greater success. All this would make it possible to overcome some of the problems created by leeches: they don’t always stay where you put them, and they might go off to suck blood by attaching to healthy skin instead of the spot to be treated, which necessitates the constant presence of medical staff and increases the negative perception of the situation by the patient and their family. Apparently, moreover, people prefer to have a small robot attached to their body than a dark worm that sucks blood. *De gustibus.*

In any case, retirement time for these creatures still seems far off. Also because lately there is another trend: domestic leeches. Looking for information in the White Rabbit’s hole, the Internet,, I came across where I had no doubt I would find answers: Reddit. Here, the best sites to find them are recommended (the aforementioned Biopharm is popular) and there is also information on how to feed them. You already know the answer. One user writes that they feed them three or four times a year by keeping them stuck to their calf. “It’s unpleasant and annoying, but not too much. The bite bleeds for quite a while, but usually just sticking a Kotex pad on it overnight solves the problem,” he says. I am not a doctor, but in all honesty, I feel, without too much presumption, that I should advise against the practice. I read that there are also some Instagram accounts that deal with the matter, and it is not difficult to find videos on Youtube that explain how to take care of them. Elsewhere I read that a small piece of raw liver may be enough to feed them. You decide.