Leeches for export
A threatened species as a pharmaceutical raw material
by Max Kasparek

Leeches are parasites that attach themselves to the outside of warm-blooded animals in order to drink their blood. Like mosquitoes, they introduce a secretion into the open wound in order to stop the blood from coagulating while sucking. The medicinal leech Hirudo medicinalis has been used as a natural remedy for thousands of years. Max Kasparek examines how it could contribute to more sustainable use of forests.

Experts believe that the healing properties of the leech are partly due to the loss of blood the patient experiences and the effect of the secretion the leech introduces into the wound while abstracting the blood. Leeches were bred for medicinal purposes in India as long ago as the fifth century BC, and the systematic foundations for the treatment of patients with leeches were laid in the Roman Empire. It was in this period that the leech incision was referred to for the first time as a method to increase blood-letting in which the sucking leech is itself cut. While the leech carries on sucking undisturbed, the blood flows out in rhythmic surges.

In the following centuries, doctors applied leeches to combat nearly all ailments and diseases. Leaching experienced a considerable boom at the beginning of the 19th century. It virtually became a fashion. Statistics from the Berlin Charité clinic show that no less than 16,600 leeches were used there in 1813. Researchers have calculated that leeches were abstracting a total of 84,000 litres of blood per year in Paris at the beginning of the last century. Towards the end of the 1950s, 25 million leeches a year were still being applied in Germany. Statistics in neighbouring European countries give a similar picture. But leaching was on the decline again in the 1960s and 70s.

Various species of leech

It was only recently that the practice was revived in conjunction with the renaissance of homeopathy. There are about 300 species of leech the world over. Many of them contain anti-coagulutive substances whose medical application would be worth considering. However, experiments carried out so far demonstrate that their therapeutic effect is no better than that of the medicinal leech. Moreover, all the other leech species are very rare in Europe and certainly cannot be obtained by the tonne. Another important factor is authorisation. In Germany, ointments and jellies authorised by Federal Health Authority, which has only granted licenses for remedies based on the extract of the medicinal leech. Using another species of leech as a basic ingredient would require new authorisation. The considerable effort this official re-examination would require could only be justified if significantly better results were obtained.

Countries of origin

By the 18th and 19th centuries, the leech populations of central Europe were already unable to meet the considerable demand for leeches. Excessive, non-sustainable gathering led to the species disappearing in many stretches of water. Pollution, suburban sprawl and the drainage of habitats added to their demise. Today, the leech is either extinct or at least threatened by extinction in most central European countries. Since commerce was an important factor in the demise of the species, it was declared protected by CITES (Convention on International Trade in Endangered Species of Fauna and Flora). Thus international trade with leeches is now subject to strict controls.

The dearth in leeches led to central Europe importing the animals long ago. The main coun-
tries of origin were the Balkan states and Turkey. One historical source tells us that, in 1872, 995 parcels and boxes with leeches whose total value amounted to 82,950 francs were dispatched to Austria and France from the Turkish port of Izmir.

Today, the quantity of leeches used for blood abstraction and laboratory research purposes in Europe and America is relatively small in comparison to the number of leeches turned into extracts for ointments and jellies. A total of around 7-8 tonnes of leeches a year goes into the production of Exhirud®. This corresponds to three to four million leeches. The main country of origin is Turkey, while smaller quantities come from Romania and the other Balkan states.

Resource-friendly transportation

Live animals are required for leaching. Moreover, live leeches were used almost exclusively for the manufacture of leech extract until very recently. This has presented complex logistical problems with regard to the transportation of the leeches from the points of gathering, e.g. in Anatolia, to the end-users in Europe. For leeches are very sensitive to changes in their environment. Relatively small changes in exposure to light, temperature or the density of leeches transported can cause them to die. Losses incurred in forwarding are correspondingly high.

For the manufacture of Exhirud®, a system of exporting deep-frozen leeches was introduced several years ago. This is a very efficient way of minimising the use of living matter and making the procurement of leeches from natural habitats more sustainable. While the technology this requires is readily available in Turkey, various south-east European suppliers still have considerable difficulties in providing sufficient amounts of dry ice, cold-storage lorries and vacuum packs etc.

Leeches have always been gathered in Turkey without any insight into their breed behaviour, their biological characteristics or their population growth. The lack of local knowledge about leeches among native gatherers and merchants is astonishing. Often even the most basic facts are unknown. For example, there is a widespread notion among gatherers that the rain spreads the leeches, and that they multiply more quickly than mosquitoes and represent an inexhaustible potential. Only a handful of the gatherers know that leeches can live for up to 15 years, and few appreciate their complicated breeding behaviour and strategy for surviving dry periods.

Sustainable leech gathering

Clearly worried about the lasting damage caused to the population in Turkey by the large-scale extraction of leeches, the main purchasers, the Sanofi SA company, have commissioned a survey in collaboration with Germany's Federal Office for Nature Conservation (BfN) that is to establish the distribution and levels of leech populations in Turkey and make recommendations on a future extraction strategy. Initial results have already shown that there are still considerable as yet untapped populations.

However, it has also become apparent that gathering activities severely interferes with the natural structure of individual populations. While, for example, sexually mature leeches are now often very rare in areas in which leeches are regularly gathered, they are represented
The active agents of the leech

In 1884, Haycraft detected a substance in the secretion of the leech that inhibits coagulation. In 1903, a team of scientists headed by Jacob Friedrich Franz succeeded in isolating this substance. It was called hirudin. In the 1950s, it was characterised as a thrombine-specific protease inhibitor. And in the 1980s, hirudin was successfully genetically engineered.

Although an important field of application has been found for the manufactured hirudin as a substitute treatment for patients showing intolerance towards heparin, it has not demonstrated the desired effect in the classic external applications. It was later discovered that hirudin is not the only active agent the leeches have.

They also produce a large number of other enzymes that inhibit blood coagulation. These include various inhibitors of blood factors as well as substances that prevent blood platelets from clotting.

On the basis of these findings, there is, at least for the time being, no alternative to the leech's active agent. However, as substitute for the standard leeching procedure, which has been practised for thousands of years, the leech's active agent can be extracted and applied in the form of ointments and jellies.

Leech extract is nowadays sold under the trademark Exhirud® by the Franco-Swiss pharmaceutics company Sanofi SA/AG. The main areas of application are blunt injuries (trauma) with or without haematomes, superficial inflammations of the veins, haemorrhoids, perianal thromboses and anal excema.

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much more strongly in protected areas where gathering is prohibited. In an effort to devise a strategy to protect the species in future, intensive research is under way to determine how rotation of the gathering areas and times could, on the one hand, help maintain or even increase the current harvest of gathered leeches and, on the other, secure the long-term survival of the species.

Leeches as alternative source of income

Most people abhor leeches. They regard them as ghastly little "vampires" that attack people bathing in lakes and suck out their blood. In this respect, the people in the countries that export leeches are no different from those in the countries that import them. Locals therefore tend to have a very low opinion of the value of the leech. Hardly anyone is willing to gather leeches, and quite a few people would be happy if all leeches were caught as quickly as possible.

In Turkey, it is therefore almost always marginalised groups that gather leeches. Often, gypsies are the only people prepared to engage in this activity. At a daily wage of between six to ten US dollars, gathering leeches will not provide a proper living, but it is a welcome additional income.

Further reading:


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is an independent expert. His work for gtz is primarily in the framework of the "Implementation of the Biodiversity Convention" project. He also acts in an advisory capacity for the Franco-Swiss pharmaceutics company Sanofi SA/AG in connection with the development of concepts for a sustainable use of the leech in Turkey.
Résumé
La sangsue médicinale est un remède naturel en usage depuis des millénaires. Les vertus curatives des applications de sangsues reposent à la fois sur la saignée et sur la substance sécrétée par l'animal dans la plaie. Les essais de fabrication de cette substance par synthèse n'ont jamais entièrement abouti, de sorte qu'il n'existe toujours pas de produit de substitution valable à l'heure actuelle. La thérapie par les sangsues a même pris un nouvel essor depuis les années quatre-vingt, c'est-à-dire depuis que les médecines douces connaissent un regain de popularité. Parmi les quelque 300 espèces de sangsues recensées de par le monde, beaucoup se prêtent à une utilisation médicinale.

Extracto
Las sanguijuelas se utilizan desde hace milenios como elemento natural en el tratamiento médico. La sanguijuela *Hirudo medicinalis*, por ejemplo, además de reducir la pérdida de sangre deja una secreción terapéutica en la herida. Los intentos de elaborar esta secreción en el laboratorio sólo han tenido un éxito limitado, por lo que hasta el día de hoy no ha sido posible reemplazar este producto natural. Por otra parte, con el resurgimiento de la medicina naturista a partir de los años ochenta, la sanguijuela ha vuelto a establecerse como instrumento terapéutico. Existen unas 300 especies de sanguijuelas en todo el mundo, muchas de las cuales podrían utilizarse para el tratamiento médico.

Leeches prefer shallow ponds and lakes.  
*Photo: KNA*