

Crawling Through the Millennia: Maggots and Leeches Come Full Circle

Maggots and leeches probably do not come quickly to mind when you think of medical devices. Yet devices they are, according to the U.S. Food and Drug Administration, and they do fit the regulatory definition nicely:

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A medical device is an article intended to diagnose, cure, treat, prevent, or mitigate a disease or condition, or to affect a function or structure of the body, that does not achieve its primary effect through a chemical action and is not metabolized.

In its January 2004 letter allowing domestic marketing of medical maggots, the FDA includes the following indications:

For debriding nonhealing necrotic skin and soft tissue wounds, including pressure ulcers, venous stasis ulcers, neuropathic foot ulcers, and non-healing traumatic or postsurgical wounds.

In fact, these uses of medical maggots — actually blow fly (*Phaenicia sericata*) larvae — predate the FDA's blessing by several millennia. Ditto for medicinal leeches (*Hirudo medicinalis*), also cleared by the FDA for U.S. marketing.

In its classification memo, the FDA recognizes the efficacy of maggots in wound therapy by reviewing the considerable literature on the history of maggot

therapy, which has been practiced by many cultures around the globe.

Napoleon's chief surgeon noted that maggot infestation (myiasis) seemed to prevent infection and accelerate the healing of battle injuries. Confederate surgeon J. Zacharias also noted the beneficial effects of myiasis on wounds during the Civil War and may have been the first American physician to deliberately introduce maggots into wounds. He claimed to have saved many lives with



Leeches (*Hirudo medicinalis*) are used to drain blood from hematomas and to draw blood into transplanted tissues until circulation is established.

maggots, which cleaned even gangrenous wounds better than any other method, reduced the incidence of septicemia, and speeded recovery.

The founder of modern maggot therapy, William Baer, a professor of orthopedic surgery at Johns Hopkins, came to similar conclusions in caring for soldiers during

World War I. Baer successfully used maggot therapy in treating intractable osteomyelitis. After several of his patients developed tetanus, Baer devised a way to produce sterile maggots.

By the mid-1930s, maggot (or larval) therapy had become mainstream medicine in the United States. Within a decade, however, medical maggots were displaced by penicillin and other wonder drugs, along with better surgical and wound management techniques.

"YUCK" FACTOR

None of this is news to Ronald A. Sherman, MD, MSc, who coauthored his first study on the utility of maggot therapy in 1983 as a medical student. In that article, Sherman and plastic surgeon Edward A. Pechter, MD, speculated that maggot therapy would come back into vogue, without recognizing that he would one day be a practitioner and play a leading role in the modern renaissance of maggot therapy in the United States.

As an assistant researcher at the University of California—Irvine, Sherman has studied myiasis for 15 years and ran the UCI lab that filled the burgeoning domestic demand for medical maggots. He still works on myiasis at UCI, but in late 2005, the new sole domestic source of medical grade maggots (since the last one closed in 1935) became Monarch Labs, in Irvine, where Sherman is medical director.

Sherman says sales of medical maggots within the last decade have increased 25 to 50 percent annually. Monarch Labs now supplies 400 U.S. hospitals and clinics with about 50 bottles of maggots weekly (\$80 for a small bottle, \$110 for the large size).

"The significant need for better wound care, and the dramatic efficacy of the maggots have increased demand," he says. "We've done no advertising. It's been word of mouth plus my clinical research papers." Many of those published studies are listed online at: «http://www.ucihhs.uci.edu/com/pathology/sherman/home_pg.htm».

Sherman dismisses reactions from people who've never had a "chronic, draining, stinky hole in their leg. To those so afflicted, the maggots are not yucky, their wounds are."

In Europe, four labs meet the continent's demand for medical maggots. Sherman speculates on why they are used more extensively in Europe: "Many physicians there are salaried. Medical care is less procedure-driven." In the United States, maggot therapy is usually reimbursed under a general wound debridement CPT code.

EQUALLY DISTINGUISHED

Medicinal leeches (*Hirudo medicinalis*), cleared by the FDA for U.S. marketing in 2004, also have a distinguished role in medical history. The reputation of medicinal leeches has suffered due to their ill-advised use in therapeutic bloodletting, which involved both venipuncture and the application of leeches. Bleeding was thought to be a positive until the late 19th century, when germs, not humors, were found to carry disease.

In his monograph, *A Sanguine*

Attachment: 2000 Years of Leeches in Medicine, the acknowledged world authority on therapeutic leeching, Roy T. Sawyer, credits two Slovenian surgeons for pioneering the use of leeches in modern plastic and reconstructive surgery. Their paper in the *British Journal of Plastic Surgery* in 1960 described leech-assisted tissue flap surgery. Medicinal leeches have since become indispensable to microvascular surgery, including soft tissue transfers and replants.

"We've been using leeches since microvascular surgery came about in about 1972," says Hill Hastings II, MD, a surgeon and a partner at the Indiana Hand Center in Indianapolis.

Surgeons like Hastings will do as much as possible in the operating room to repair the bones, tendons, nerves, and blood supply of a severed or crushed body part like a finger. But good blood inflow is easier to restore than outflow because veins are more friable and less stiff than arteries, and thus, harder to suture together. The result can be venous congestion — a perfect scenario for applying a medicinal leech, which anesthetizes the area around its bite, drains the accumulated venous blood, and introduces hirudin — a powerful blood thinner — to keep the venous blood flowing.

A medicinal leech detaches itself when engorged with blood in a few hours and is replaced with a new leech. After three to five days, the body will have started growing a new arteriole/venule network at the attachment site and leech therapy can be stopped.

"A THOUSAND LITTLE HELPERS"

San Diego plastic surgeon Barry S. Handler, MD, may be one of

California's first physicians to implement maggot therapy. When the FDA cleared them for marketing, he remembered an article by Sherman on maggot therapy that he had read in 1997.

"I'd been seeing patients at the Wound Care Center at Scripps Memorial Hospital in La Jolla and suggested to our nurse clinical manager that we start using maggots on wounds," Handler recalls.

He finds medical maggots to be gentler and more exacting than conventional wound treatment, especially in challenging cases. "It's like having a thousand little helpers," says Handler. "The maggots are so foolproof and safe that I can just tell my wound nurse to 'Put maggots on, and call me when the wound is clean.'"

Medicinal leeches, usually part of a hospital reimbursement claim, cost about \$5 each and are the therapy of last resort. Leeches can be stored at most microvascular surgery centers for about 6 months without feeding. Medical maggots also appear to be extremely effective for chronic wounds, and cost a mere \$50 a day.

Sherman serves on the board of the BioTherapeutics, Education and Research (BTER) Foundation «www.bterfoundation.org», which supports research in biotechnology, including maggot therapy and the other forms of symbiotic medicine, defined as "diagnosing and/or treating diseases with live animals." That means honey bees, sniffer dogs, fish, and bacteria could join the FDA's list of medical devices. **BH**

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