

Dracunculiasis: A Candidate for Eradication

“And the Lord sent fiery serpents among the people, and they bit the people; and much people of Israel died.” This brief Scriptural passage (Numbers 21:6) tells of an ancient ailment, with no further elaboration, afflicting those led by Moses; nor did these serpents appear elsewhere in the Bible.

Historians have wondered whether these fiery serpents were mere metaphoric expressions and whether they bore any resemblance to documented human disease. Agatharchides, in 140 BCE, described a helminthic affliction associated with intense burning limb pain; and both Aeginus and Avicenna noted such parasitisms, calling them the disease of little dragons (in Greek, dracunculiasis). The first comprehensive clinical description of those figurative serpents appeared in a scientific paper written by the Bulgarian patriot Christo Stambolski (1843 – 1932). He had trained as a physician in Istanbul but had then been exiled to Yemen in 1877 because of his alliance with Christian nationalists who struggled to achieve Bulgaria’s independence from the Ottoman Empire. While in Yemen, at the southwest corner of the Arabian peninsula, Stambolski encountered, and then described, a strange ailment called fiery serpent’s disease, detailing a human affliction with worms exiting from blisters, typically on the leg, associated with intense, burning pain.

Dracunculiasis is caused by the invasion of a filarial worm called *Dracunculus medinensis*. Its common name is Medina worm (named for the Arabian city) or Guinea worm (named after the Guinea coast of sub-Saharan West Africa.)

Dracunculiasis is confined mainly to rural areas of abject poverty burdened by episodic drought and lacking any safe drinking water supply. The disease, in the 20th Century, was endemic to many Indian districts, particularly Gujarat and Andhra Pradesh, Arabia and Central and West Africa. As of 1960, about 40 million persons were afflicted, globally.

The infectious cycle consists of the following: A person already afflicted with the disease, burdened by intense, burning pain in his leg – and with the worm having pierced the blister – will typically seek relief by bathing his leg in water. In so doing, he inadvertently allows the *Dracuncula* worm to shed its thousands of larvae into the surrounding water. Barely visible water fleas (species of Cyclops), found in virtually all bodies of still water in the tropics, avidly absorb the larvae. And when people drink that water, the *Dracuncula* larvae enter the new victim’s body.

The larvae then burrow through the wall of the digestive tract, emerging in the peritoneal cavity. Males and female larvae mate; the males die and the females migrate to the muscles of the victim’s leg, often reaching as much as a meter in length. The worm finally reaches the skin-surface of the leg, causing an intense, reactive blister; and when the blister bursts and the worm is exposed to water, it sheds its many millions of larvae to infest the bathing water. The cycle begins anew when people drink this water.

Preventing the widespread disease called dracunculiasis is quite easy when the problem is confined to a blackboard in an air-conditioned classroom: Provide safe drinking water and the disease will disappear within a generation.

In the field, however, such problems are not readily fixed. The US Centers for Disease Control, in association with the World Health Organization, confronted the problem aggressively in the 1960s, and by the 1980s had enlisted the help of the Carter Center and, more recently, the Gates Foundation in a coordinated effort to eradicate the disease by the year 2009.

Currently, there are neither medications nor vaccines to cure dracunculiasis. Yet the comprehensive campaign to eradicate the disease is gaining traction. Prior to 1960, when the first anti-dracunculiasis campaigns had commenced, there were an estimated 40 million sufferers. By 2008, only 4,613 new cases were documented. How was this achieved? As with so many communicable diseases, the goal was reached through intense education at the local, village level. Many village-based workers were required to teach several fundamental lessons: (1) Provide safe water from a well; but if stagnant pond water is the sole source for drinking, then filter the water through a finely woven fabric such as nylon. (2) Treat potentially contaminated water with a larvicide such as temephos. And (3) educate sufferers to avoid entering, and thus contaminating, stagnant sources of still surface water. The filters and supplies of larvicide were widely distributed.

The goal of total eradication, planned for 2009, was not reached largely because of the disrupting effects of civil wars and involuntary migrations. Nonetheless dracunculiasis has now been confined to only six African nations (Ethiopia, Ghana, Mali, Niger, Nigeria and Sudan) with every hope of global eradication by 2011.

Eradication, the total rooting out of a disease throughout the planet, has yet to be achieved except for one pestilence, smallpox. But polio and measles are close to planetary-wide extinction; and disorders such as dracunculiasis are close to this wondrous goal of global eradication, the dream of those who practice preventive medicine.

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Disclosure of Financial Interests

Stanley M. Aronson, MD, and spouse/significant other have no financial interests to disclose.

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