Dracunculiasis—a case study for infection eradication

On Sept 30, *Nature* reported that WHO had pushed back the guinea worm eradication target by a decade: from 2020 to 2030. No formal announcement had been made by the time *The Lancet Infectious Diseases* went to press, but the news appears to be true, with both the *Nature* article and a report in NPR's global health blog quoting WHO spokespeople. Tellingly, 3 days before the *Nature* report (on Sept 27), the Carter Center announced a new US$40 million fundraising campaign to eradicate guinea worm, with $20 million coming from the centre itself. But what has led to this setback?

Guinea worm (dracunculiasis), a parasitic infection and neglected tropical disease, was only the second infection (after smallpox) to be targeted for eradication. This decision was made by the World Health Assembly in 1986, when it was thought the parasite infected only humans and that simple preventive measures could halt transmission. Infection was associated with contaminated water sources—specifically, drinking water containing *Dracunculus medinensis* larvae—and so the global Guinea Worm Eradication Program (GWEP), led by the Carter Center, began to support ministries of health and local communities in endemic countries to identify sources of the parasite, improve sanitation, and provide health education. Communities were instructed to drink water only from protected sources, to filter drinking water from unsafe sources, and to prevent community members with signs of the disease from entering water and thus completing *D medinensis*' lifecycle. Moreover, as a vector-control strategy, contaminated water was treated with the larvicide temephos.

This strategy of educational interventions, behavioural changes, sanitation improvement, and vector control has been largely successful: cases of guinea worm disease decreased from 3·5 million in 1986 to 28 in 2018, with at least 80 million cases averted. Given the absence of treatments and a vaccine for the disease, this achievement is astonishing. Nevertheless, eradication of guinea worm is still not in sight. The deadline, initially set in 1991 with a target of ending transmission within 4 years, has since been delayed to 2009, 2015, 2020, and now—purportedly—2030. After being targeted for eradication in 1967, smallpox was eradicated within 14 years. However, several factors have made eradicating dracunculiasis challenging. Internal conflict in parts of Mali, Sudan, and South Sudan have hampered eradication efforts by preventing access to disease-endemic areas and disrupting in-country surveillance programmes. Dracunculiasis has re-emerged in several countries that had achieved eradication status, including Chad, where transmission was reported in 2010 for the first time in 10 years. Moreover, in 2018, Angola reported its first ever case of human dracunculiasis, suggesting the existence of previously unrecognised sources of the parasite.

Since 2012, guinea worm infections have been identified in dogs, cats, and even baboons. Canine guinea worm infections in particular are numerous and appear to be increasing: in Chad, 1516 infections were reported in the first 7 months of 2019, compared with 834 in the same period in 2018. Although this increase is probably due to increased surveillance, and there is no evidence of direct transmission from dogs to humans, it puts the eradication of guinea worm further out of reach. Obtaining this status has been made all the more difficult by a revision made at the 12th meeting of the International Commission for the Certification of Dracunculiasis Eradication (ICCDE) to how guinea worm eradication is defined; eradication now requires transmission to be interrupted in animals as well as in humans for 3 consecutive years.

Fortunately, it seems that controlling transmission of guinea worm in dogs and other animals will require a similar approach to that already in place for human transmission, albeit with greater emphasis on a One Health approach. In endemic countries, larvicide treatment of water sources has been scaled up, and communities have been instructed to tether dogs with signs of infection (to prevent them from contaminating drinking water) and to bury or burn fish entrails (given their potential as a source of infection when eaten by dogs). A working group established by the ICCDE deemed that elimination in animals is feasible but requires careful assessment of the differing epidemiology of transmission of guinea worm between countries. Whether eradication of dracunculiasis by 2030 is realistic awaits to be seen, but the actions and achievements of the global eradication campaign to date should be applauded, and guinea worm should be considered a case study of the multifaceted approach needed in any infectious disease eradication effort. ■ *The Lancet Infectious Diseases*

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For the **report** in *Nature* see https://www.nature.com/articles/d41586-019-02921-w

For the **NPR report** see https://www.npr.org/sections/goatsandsoda/2019/10/04/767177987/the-end-of-guinea-worm-was-just-around-the-corner-not-anymore

For more on the **Guinea Worm Eradication Program and the Carter Center** see https://www.cartercenter.org/health/guinea_worm/index.html

For the **latest guinea worm case numbers** see https://www.cartercenter.org/news/publications/health/guinea_worm_wrapup_english.html

For more on **certification of dracunculiasis eradication** see https://www.who.int/dracunculiasis/certification/en