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EDITORIAL
SLAYING LITTLE DRAGONS: LESSONS FROM THE DRACUNCULIASIS ERADICATION PROGRAM

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The word dracunculiasis comes from the Latin phrase "afflicted with little dragons." The global Dracunculiasis Eradication Program (DEP) spearheaded by President Jimmy Carter and The Carter Center has quietly "inched" towards world eradication with stunning success, as shown in Figure 1. In the midst of huge publicity and monies going into such global health campaigns as polio eradication, malaria, tuberculosis, and human immunodeficiency virus control, global guinea worm eradication is occurring without vaccine or curative therapy. As illustrated in this issue of the *American Journal of Tropical Medicine and Hygiene,* the DEP has implemented grass-root innovative public health initiatives in Uganda with the help of multiple external donors.[1] Despite civil strife, arguments about vertical or horizontal implementation strategies, migrating infected refugees, and egregious safety insecurities, the Uganda eradication effort succeeded and thus has much to teach us about tenacity, flexibility, and cooperative innovative strategies within infected communities.

Dracunculiasis or guinea worm disease is transmitted to humans in contaminated drinking water containing copepods (water fleas) that are infected with the larvae of the worm. The larvae are expelled into the water by adult worms that emerge through the skin of infected people approximately one year after infection. Emergence of the adult worm is painful, disabling, and incapacitates individuals often during prime working periods for 2–3 months. Humans are the only reservoir and there is no effective treatment or vaccine. Infection is prevented by educating people to filter their drinking water through finely woven cloth to remove copepods by using temephos (Abate®; American Cyanamid, Wayne, NJ) larvicide in water supplies to kill copepods and larva or by providing clean drinking water from safe sources such as hand dug wells or borehole wells.[2] As described by Rivakimari and others, women are often the predominant victims presumably (although not studied well) as a consequence of their role as the main gatherers of household water supplies where opportunities for drinking from contaminated sites is enhanced.[1]

In Uganda, a unique coalition of public and private sectors spearheaded by The Carter Center came together to provide ongoing operational support, filtering cloths, larvicides, and borehole wells. A national task force met monthly and cadres from ministries, non-government organizations, political leaders, religious and traditional leaders, and village volunteers all worked on empowering individual and community participation in the eradication campaign. When the usual measures of containment hit an impasse, unusual measures were taken such as employing elderly men "Pond Care Takers" to guard ponds against contamination by people with emerging worms. Water sources (to control access) were then watched over and

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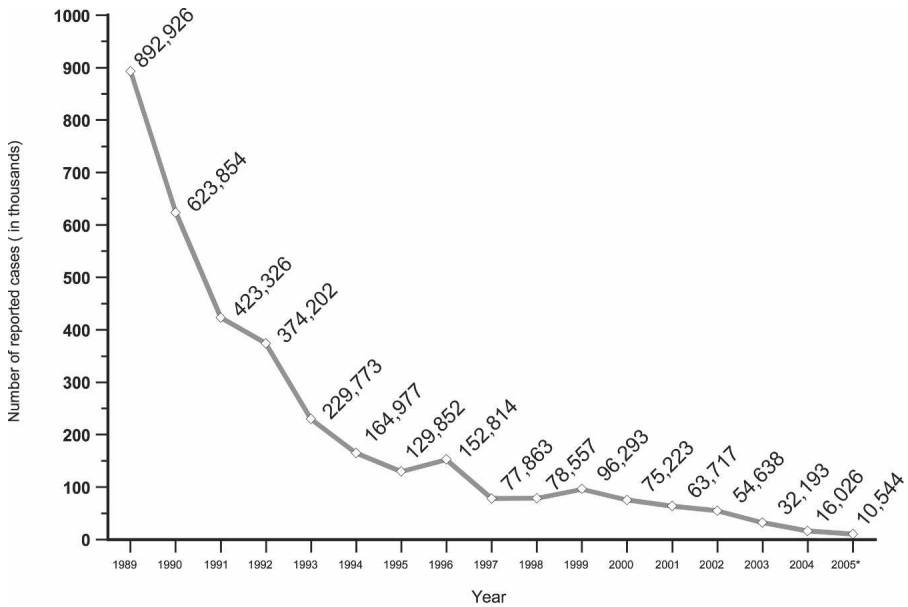

FIGURE 1. Number of reported cases of dracunculiasis by year, 1989–2005. *Provisional. (Used with permission of Donald Hopkins, The Carter Center, Atlanta, GA.)

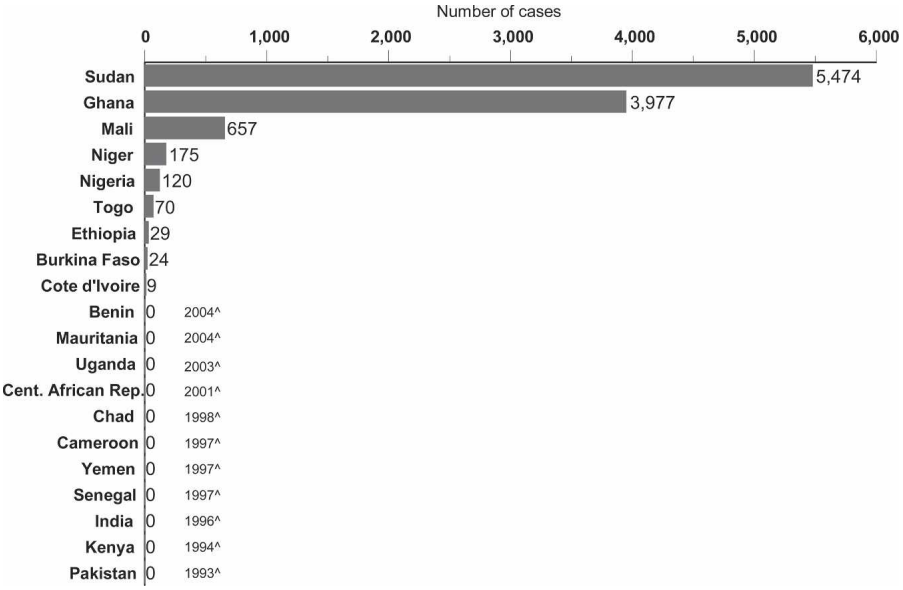

FIGURE 2. Distribution by country of 10,535 indigenous cases of dracunculiasis reported during 2005*. Cent. African Rep. = Central African Republic. *Provisional; ^Year last indigenous case was reported. Pakistan and India were certified free of the disease in 1993 and 1996, respectively. Senegal and Yemen were certified free of the disease in 2004. (Used with permission of Donald Hopkins, The Carter Center, Atlanta, GA.)

people with emerging worms were assisted by "Pond Care-Takers" with water gathering and distribution of additional nylon filters. To improve surveillance when case identification was decreasing, a cash reward system was set up to identify cases of guinea worm with rewards going to both the identifier and ill patient as well as the village volunteer who treated the case. Voluntary institutionalization of potential spreaders was instituted by rewarding patients to stay in a public health clinic until blisters burst and worms emerged. The patients were provided with free food and a cash reward.

All of these innovative programs complemented the sustained support of the government and ministry of health, and even the president of Uganda took a prominent role.[3] For a budget of approximately 5.6 million U.S. dollars from the public and private sector, Uganda managed to go from more than 125,000 cases per year to eradication in only 12 years despite continued imported cases from Sudan during the late 1990s caused by the turmoil and migration of a refugee population. The target date for ending worldwide guinea worm disease is 2009 with a focus on remaining indigenous cases (Figure 2). If that date holds, guinea worm could be the second disease after smallpox and the first human parasite eradicated in history.[4] In an era of unprecedented resources going towards vaccination and treatment of infectious diseases, one should take notice of the steadfast "inch by inch" ways of the DEP, which has been successful on a modest budget by using public-private sector partnerships to fund grass root education and by creating innovative incentives to empower unique community involvement in the slaying of little dragons.

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REFERENCES

1. Rwakimari JB, Hopkins DR, and Ruiz-Tiben E, 2006. Uganda's successful Guinea worm eradication program. *Am J Trop Med Hyg 75:* 3–8.
2. Hopkins DR, Ruiz-Tiben E, Downs P, Withers PC Jr, Maguire JH, 2005. Dracunculiasis eradication: the final inch. *Am J Trop Med Hyg 73:* 669–675.
3. Wendo C, 2003. Uganda leads Africa's charge against guinea worm disease. *Lancet 361:* 1446.
4. McNeil DG Jr. *On the Brink: Guinea Worm - A Long Crusade. Dose of Tenacity Wears Down a Horrific Disease*. The New York Times. March 26, 2006.