Eradicating Guinea-Worm Disease





© World Health Organization 2008

All rights reserved. Publications of the World Health Organization can be obtained from WHO Press, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland (tel.: +41 22 791 3264; fax: +41 22 791 4857; e-mail: bookorders@who.int). Requests for permission to reproduce or translate WHO publications – whether for sale or for noncommercial distribution – should be addressed to WHO Press, at the above address (fax: +41 22 791 4806; e-mail: permissions@who.int).

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use.

Photos : Dr A. Tayeh/WHO

Printed by the WHO Document Production Services, Geneva, Switzerland

Guinea-worm in antiquity

From ancient times, guinea-worm, or *Dracunculus medinensis*, was known to various authors in India, Greece and the Middle East. It is believed that the "fiery serpent" that afflicted the Israelites during the Exodus was *Dracunculus medinensis*. The disease probably existed in Egypt and the eastern Mediterranean as indicated in several texts from pharaonic Egypt and Assyrian Mesopotamia. Although the disease may not have occurred in Greece, it was mentioned by the great Greek and Roman philosophers and physicians such as Galan, Agatharchides and Plutarch.

In the tenth century, the Arab/Persian physicians Ar Razi and Ibn Sina (Avicenna) provided the first detailed descriptions of the worm and of the disease, which was prevalent in the Arabian Peninsula and known as "Medina vein". Much later, in the early seventeenth century, several European travellers reported the disease from Asia and the western coast of Africa (from where it took its popular name – Guinea-worm). The finding by the Russian biologist Fedchenko in 1871 that Cyclops – a water flea – is the intermediate host in dracunculiasis marked a milestone in the history of parasitology.

Persian physician pulling guinea-worm from the leg of an infected person

3



Guinea-worm disease

Dracunculiasis is transmitted exclusively by drinking contaminated water. Eradication of the disease is feasible using effective and inexpensive inter-

ventions. Geographical distribution of the disease is limited and incidence is seasonal. These factors permit a more intensified focus on prevention of transmission. No animal reservoir is known, and diagnosis is unambiguous. The initiative for the **elimination** of dracunculiasis began in 1982. It was reinforced in 1991 when the World Health Assembly resolved to **eradicate** the disease by the end of 1995 (WHA44.5). In 1991, the disease was endemic in 20 countries. Although this goal was not achieved, the number of cases reported to WHO decreased by 75%, from approximately 547 575 cases in 1991 to 130 000 cases in 1995. Partners in the eradication initiative persevered, mobilizing additional support for national programmes to eradicate the



and the eradication initiative

disease. In 2004, the year in which the number of cases had been further reduced to 16 000 in 11 countries, the World Health Assembly urged Member States and partners to continue their commitment to complete eradication by 2009 (WHA57.9). The Geneva Declaration was signed in the same year by the Ministers of Health of the remaining endemic countries or their representatives, reconfirming their commitment to eradicate dracunculiasis by 2009. In 2007, the disease was endemic in only 5 countries. A strong partnership exists between endemic countries and a number of organizations that include The Carter Center, UNICEF, WHO and several NGOs.

Eradication of the disease will both free resources that can be directed to other health problems and have a positive impact on the economic, educational and social welfare of the population in endemic areas.



How does the disease spread?

Dracunculiasis is caused by the parasitic worm Dracunculus medinensis - the largest of the tissue nematode parasites affecting humans. The disease is characterized by the gradual emergence of a female worm from an ulcer, usually in the leq. When a person with dracunculiasis immerses the infected part in cold water, the worm releases

thousands of larvae. The larvae reach the infective stage after they are ingested by a small cyclopoid crustacean. When a person drinks water containing infective cyclops, the cyclops are killed but the infective larvae are liberated and penetrate the wall of the intestine; mature worms then miarate through subcutaneous tissues. Some 10-14 months after infection, the adult female worm, which may be 550-800 mm in length and 1.7-2.0 mm in diameter, emerges at the skin's surface forming a blister. The blister bursts when immersed in cold water, releasing large numbers of larvae into the water. Larvae are then ingested by Cyclops, and the life cycle is perpetuated.



1 0 0 0 2 0 0 0 Sudan Ghana 313 Mali Nigeria 73 Niger 11 Togo O 2006 Burkina Faso 0 2006 Cote d'Ivoire 0 2006 Ethiopia 0 2006 Benin 0 2004 Mauritania 0 2004 Uganda O 2003 Cent. African Rep. 0 2001 Chad 0 1998 Cameroon 0 1997 Yemen 0 1997 ind Senegal 0 1997 ast India O 1996 Kenya O 1994 Year Pakistan 0 1983

Where is the disease found?

By 2007, transmission of the parasite was limited to just 5 African countries, mostly in east and west Africa, where about 9 585 cases were reported. Sudan reported about 61% of the number of cases, Ghana reported about 35% and Mali reported about 3%. Niger and Nigeria reported less than 1%. Infection has a marked seasonal peak in most communities.

2007* 000 4 0 0 0 5 0 0 0 6000 5 815 3 358 Percentage of cases reported by endemic countries in 2007 Mali 3% Other 1% * Excludes 15 cases exported from one country to another Pakistan and India certified free of disease Sudan 61% in 1996 and 2000, respectively, Senegal and Yemen in 2004, and Cameroon and Central African Republic in 2007.

What is the impact of the disease?

The social and economic effects of the disease are attributed mainly to the temporary disability suffered by infected persons. More than half the patients are unable to leave their beds for about a month, which generally coincides with the peak season of agricultural activities, when

labour is in maximum demand. This can lead to malnutrition among children in households whose able members are affected – it is not surprising that in Mali the disease is called "the disease of the empty granary". Children miss schools when they have guinea-worm and also when they substitute for sick members of their households.



Non-infected individuals can continue with their agricultural activities

Who is infected with the disease?

The disease affects rural, deprived and isolated communities without a safe drinking-water supply and depending mainly on open water sources such as ponds. Incidence varies with age and sex, but this is probably a function of the behaviour of different groups of people with regard to sources of drinking water and also of their mobility.



How essential is surveillance?

Surveillance begins with the village-based health worker, who is usually a volunteer trained in case detection and containment. It is essential to sustain the motivation of these health workers to detect and report cases. Several village health workers in each catchment area report to a supervisor who collects the data and sends them to the district level. There, the data are collated before being sent to regional



Dracunculiasis surveillance and keeping records is essential

and eventually national level. The surveillance system depends upon the coordinators at each of these levels, under the national coordinator of the guinea-worm eradication programme. Each level should verify the data collected at their level. Copies of all reports should be kept at each level for the eventual eradication and certification process. Identifying the last patients in an endemic area is increasingly difficult and reward systems can be introduced to encourage infected individuals to report their infection. The International Commission for the Certification of *Dracunculiasis* Eradication has recommended that rewards be intro-



