



**REGIONAL COMMITTEE FOR AFRICA**

**AFR/RC53/INF.DOC/1**

1 August 2003

Fifty-third session

Johannesburg, South Africa, 1–5 September 2003

**ORIGINAL: FRENCH**

Provisional agenda item 9.1

## **ERADICATION OF DRACUNCULIASIS IN THE WHO AFRICAN REGION**

### **INFORMATION DOCUMENT**

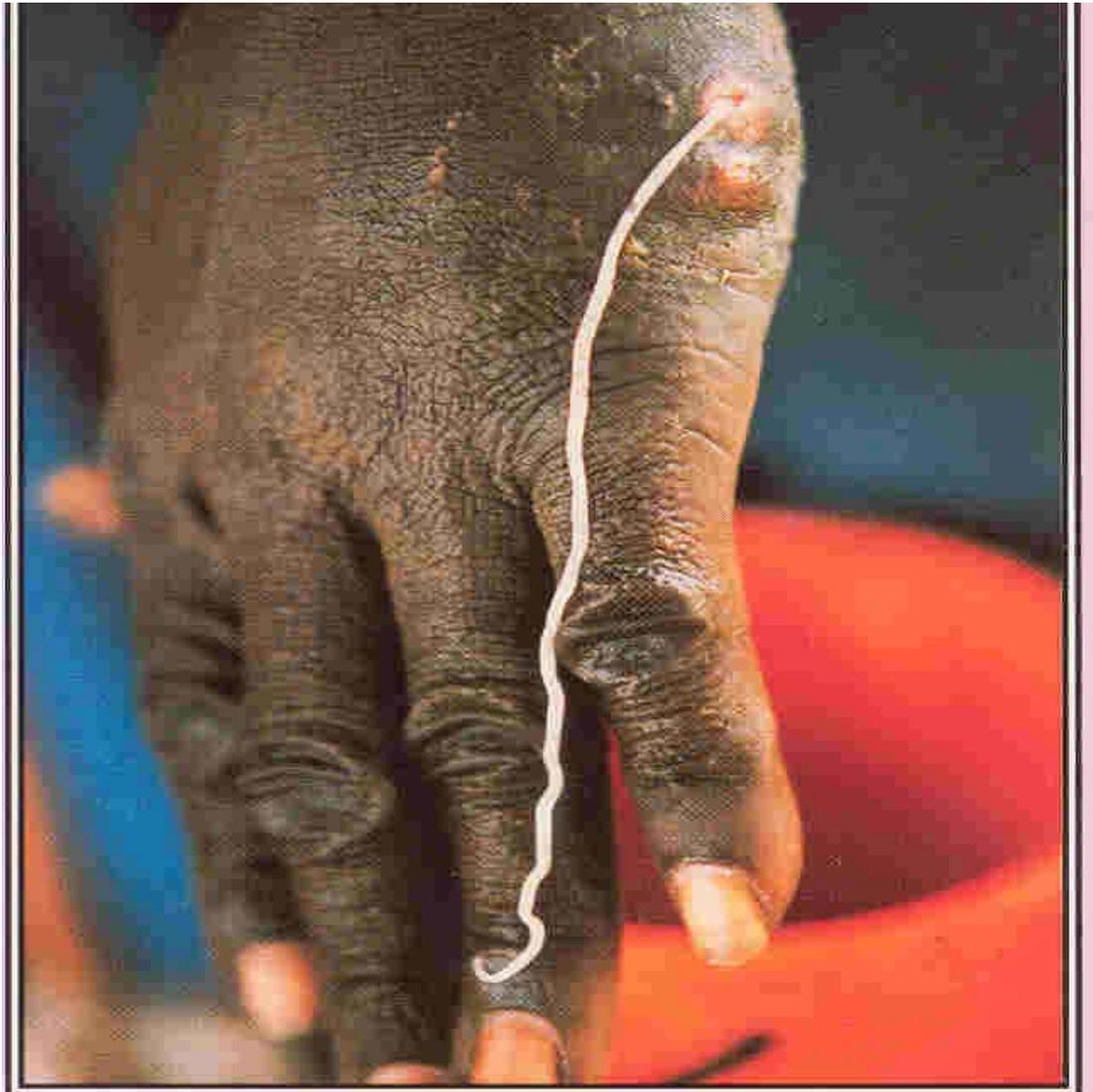
#### **EXECUTIVE SUMMARY**

1. Dracunculiasis, otherwise called “Guinea worm disease”, is a disabling parasitosis that has serious socioeconomic consequences. It is caused by the intake of unfiltered water containing microscopic crustaceans(cyclops). The disease affects especially the populations in greatest need living in areas that lack access to safe drinking water. It is a typical example of diseases related to poverty and exclusion. Yet, there are simple and effective means to eradicate it, including boiling or filtering (through clean linen) of drinking water.
2. In 1986 and 1988, the World Health Assembly and the WHO Regional Committee for Africa respectively adopted resolutions WHA39.21 and AFR/RC38/R13 by which they invited Member States to eradicate dracunculiasis.
3. Thanks to the efforts made by the Member States, the total number of cases reported annually dropped from 883 640 in 1989 to 13 150 in 2002, which represents a reduction by 98.5%. The number of endemic localities also decreased from 25 789 in 1989 to 2037 in 2002, representing a decrease by 92%.
4. Eight (8) of the nineteen (19) countries that were considered endemic in 1989 are now free of local transmission of dracunculiasis. Four (4) countries are in the precertification phase. At the end of 2002, a total of eleven (11) countries were confirmed to be still endemic as against nineteen (19) countries that were endemic at the start of the implementation of the dracunculiasis eradication programme. This success was achieved through the effort of the countries and the strong partnership which supported the programme.
5. Africa is the only continent where Guinea worm disease remains endemic. Further effort is needed to accelerate the eradication process in order to free the countries from dracunculiasis.

**ERADICATION OF DRACUNCULIASIS IN THE WHO AFRICAN REGION**

**ACHIEVEMENTS**

**INFORMATION DOCUMENT**



**DRACUNCULIASIS**

**DRACUNCULIASIS – A DISEASE ON THE  
VERGE OF ERADICATION**

## CONTENT

	<b>Paragraphs</b>
INTRODUCTION.....	1–4
DRACUNCUCULIASIS SITUATION AT THE START OF THE ERADICATION CAMPAIGN.....	5–8
Epidemiological situation.....	5–6
Socioeconomic impact of dracunculiasis.....	7–8
DRACUNCULIASIS ERADICATION PROGRAMME.....	9–18
Justification.....	9–10
Strategy.....	11–12
Partnership.....	13–14
Activities implemented.....	15–18
ACHIEVEMENTS.....	19
CONSTRAINTS.....	20
CHALLENGES.....	21
CONCLUSION.....	22–25

## ANNEXES

	<b>Pages</b>
1. Number of cases of dracunculiasis reported each year in the African Region, from 1982 to 2002.....	6
2. Number of cases of dracunculiasis reported, by country, in the African Region, in 2001 and 2002.....	7
3. Status of dracunculiasis eradication in the African Region, 2002.....	8
4. Situation of eradication of Guinea worm disease in the endemic countries .....	9



## **INTRODUCTION**

1. Dracunculiasis, more commonly known as “Guinea worm disease” or *Filaria medinensis*, is a disabling parasitosis caused by the emergence on the skin of the female adult of *Dracunculus medinensis*, a thread-like worm measuring 60–100 cm in length. This parasitosis has been known, since ancient times, because of its serious socioeconomic consequences.
2. Dracunculiasis is a disease transmitted through the intake of contaminated water. It is generally rife in rural areas where stagnant surface waters such as water pools, backwaters and unprotected traditional wells are the main source of drinking water. Although there are neither vaccines nor drugs for this disease, simple and effective measures exist for its prevention.
3. In 1986, the World Health Assembly adopted resolution WHA39.21 while in 1988 the WHO Regional Committee for Africa adopted resolution AFR/RC38/R13, both with a view to eradicating dracunculiasis.
4. The present report aims to take stock of dracunculiasis control in the African Region since the adoption of those two resolutions.

## **DRACUNCULIASIS SITUATION AT THE START OF THE ERADICATION CAMPAIGN**

### **Epidemiological situation**

5. At the start of the dracunculiasis eradication programme in 1986, the number of cases in Africa was estimated at between three and five million. The magnitude of the disease became better known after active national case search surveys had been conducted. Thus, in 1989, a total of 883 640 cases of dracunculiasis were detected in 25 789 localities of the African region and 19 countries were found to be endemic. The countries were Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Côte d’Ivoire, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Mali, Mauritania, Niger, Nigeria, Senegal, Togo and Uganda. The outcomes of those national surveys showed that Burkina Faso, Ghana, Nigeria and Uganda were the most affected countries.
6. Worth noting is that, at the start of the eradication programme, four other countries outside the African Region were also found to be endemic. The countries were India, Pakistan, Sudan and Yemen but, as at 2002, only Sudan remained endemic.

### **Socioeconomic impact of dracunculiasis**

7. When dracunculiasis erupts at a time when rural populations should be doing their farm work, the affected patients are unable to take part in farm work. The patients therefore become a burden on their families especially if the opening on the skin from where the worm exits is infected. In many families which have a dracunculiasis patient, the loss of weeks of work resulting from Guinea worm disease resulted in total loss of entire farming season.

That is why in some parts of Africa, dracunculiasis is identified with famine. Among the Dogon people in Mali, for example, dracunculiasis is called *Yoro* which, in the local dialect, means “the disease which empties the barn”.

8. Dracunculiasis also has a substantial impact on the health of any young child whose mother is infected inasmuch as the mother can no longer take care of the child and loses the daily contact necessary for the child’s psychomotor development. For their part, infected school children often trail behind their peers due to intermittent absences from school.

## **DRACUNCULIASIS ERADICATION PROGRAMME**

### **Justification**

9. Dracunculiasis is a disease which affects the poorest of the populations lacking access to primary health care, safe drinking water and health education. However, its socioeconomic impact and major repercussions on the lives of families are very often neglected and forgotten.

10. The serious socioeconomic consequence of dracunculiasis, the opportunity provided by the International Drinking Water Supply and Sanitation Decade (1981–1990), the existence of simple and effective means of its prevention and the fact that man is the only known reservoir of the causal agent prompted Member States to embark upon eradication of the disease.

### **Strategy**

11. To eradicate dracunculiasis, Member States adopted a multi-pronged strategy involving active community-based surveillance; advocacy for supply of safe drinking water to affected localities; and promotion of information, education and communication to effect the behaviour change that would help prevent the disease. The main interventions identified under the strategy are:

- active case searches in all endemic localities;
- establishment of an active system of surveillance in each endemic locality;
- information, education and communication;
- widespread filtering of surface waters (pools of water) prior to drinking;
- supply of safe drinking water to affected localities;
- strengthening of intersectoral collaboration to improve health education programmes and enhance access to safe drinking water;
- vector control;
- early case detection and management.

12. Voluntary and effective involvement of affected communities was identified as very crucial to successful implementation of any national dracunculiasis eradication programme.

## **Partnership**

13. The development and implementation of national dracunculiasis eradication programmes pivoted on strong coalition of several national and international partners. Permanent and traditional partners of the programme include the “Global 2000” Programme of the Jimmy Carter Center, UNICEF, WHO, Japan Cooperation and the Peace Corps Volunteers of the United States of America.

14. Furthermore, several personalities especially former Heads of State, became personally involved in the Guinea worm disease eradication drive. They included Presidents Jimmy Carter of USA, Jerry Rawlings of Ghana, Yakubu Gowon of Nigeria and Amadou Toumani Toure of Mali. At the start of the programme, partnership was also built with local communities and other stakeholders (nongovernmental organizations) and collaboration with the water supply sector was enlisted.

## **Activities implemented**

15. As part of the implementation of the resolutions on dracunculiasis eradication, the WHO Regional Office for Africa in collaboration with its partners, produced and made available to the endemic countries guidelines for the preparation of national dracunculiasis eradication plans. Between 1988 and 1991, the majority of the affected countries appointed national dracunculiasis eradication officers and conducted national surveys that led to the development of national dracunculiasis eradication programmes.

16. In addition, the Regional Office provided support to countries for implementing the eradication activities contained in national programmes. The holding of annual meetings to evaluate national programmes fostered information sharing among countries, monitoring of progress and planning of priority activities. This mechanism continues to play a pivotal role in the Guinea worm disease eradication process.

17. Noting the significant progress made in Guinea worm disease eradication worldwide, WHO set up, in May 1995, a twelve-member international commission for certification of dracunculiasis eradication, composed of independent health experts. The commission recommended to the WHO Director-General to endorse the certification of 150 countries and territories, worldwide, as free of dracunculiasis transmission.

18. To accelerate the implementation of dracunculiasis eradication activities in Africa, WHO, in collaboration with its partners, organized a round table of ministers of health in Sudan, Khartoum in March 2002. The ministers who gathered at the meeting acknowledged that there were serious challenges that needed to be met. They accordingly adopted the Khartoum Declaration on Guinea worm disease by which they gave a commitment to pursue and even intensify their effort at the political and technical levels in order to achieve the ultimate goal of eradicating Guinea worm disease in Africa.

## **ACHIEVEMENTS**

19. The implementation of dracunculiasis eradication programmes in the African Region has resulted in significant reduction of the annual incidence and the endemicity of the disease:

- (a) the number of cases of dracunculiasis reported annually dropped from 883 640 in 1989 to 13 150 in 2002, representing a 98.5% reduction of annual incidence;
- (b) the number of endemic localities decreased from 25 789 in 1989 to 2037 in 2002, implying a 92% reduction of endemicity;
- (c) local transmission of the disease has been interrupted in four countries, namely Cameroon, Chad, Kenya and Senegal all of which are therefore in the precertification phase;
- (d) seven countries, namely Botswana, Burundi, Lesotho, Malawi, Namibia, Seychelles and Zimbabwe have been certified as free of dracunculiasis transmission;
- (e) the number of countries considered endemic dropped from 19 in 1989 to 11 in 2002, meaning a 42% reduction of the number of endemic countries;
- (f) there is improved coverage of safe drinking water in the affected areas;
- (g) community-based eradication activities have been integrated into other social and health activities such as control of malaria and diarrhoeal diseases and surveillance of epidemic-prone diseases as well as acute flaccid paralysis (AFP).

## **CONSTRAINTS**

20. The main constraints encountered in dracunculiasis eradication in the region include:

- (a) decrease in the motivation of people operating at field level and in the general mobilization to eradicate Guinea worm disease;
- (b) emergence of newly endemic localities or the re-infestation of previously endemic areas. For example, in 2002, 47% of the localities that reported one or more cases were new or reinfested localities which, together, accounted for 28% of total cases recorded in the African Region in 2002.
- (c) high number of cases imported from one country to another or from one locality to another within a given country. In 2002, nearly 160 cases were either imported or exported from one country to another;
- (d) inadequate supply of safe drinking water in endemic areas;
- (e) inadequate financial resources;

- (f) the fact that some areas are inaccessible due to insecurity or the unmotorable state of the roads, most often during rainy seasons, the period of transmission;
- (g) difficulties in implementing and monitoring eradication activities among nomadic populations.

## **CHALLENGES**

21. To speed up the ongoing process of eradication in the African Region in order to achieve the eradication objectives as has been the case in other regions, all the endemic States would have to take the following measures:

- (a) intensify interventions to interrupt dracunculiasis transmission;
- (b) mobilize the resources needed to implement the final activities of eradication;
- (c) strengthen active surveillance in previously endemic areas and in areas at risk;
- (d) use evaluation and monitoring at district and national levels as main tools for management of the eradication programme;
- (e) intensify mobilization for dracunculiasis eradication especially by enlisting the collaboration of development agencies and nongovernmental organizations operating in the area of water supply so that priority would be given to endemic areas that have no supply of safe drinking water;
- (f) use innovative approaches to reach out to areas grappling with insecurity or difficult climatic conditions and ensure that nomadic populations participate in the eradication programme.

## **CONCLUSION**

22. The reduction by 98.5% of the annual incidence of dracunculiasis and the interruption of local transmission in four countries of the region, between 1989 and 2002, are concrete evidence that national dracunculiasis eradication programmes have made substantial achievements. Furthermore, they clearly show that dracunculiasis is a disease on the verge of eradication in the African Region.

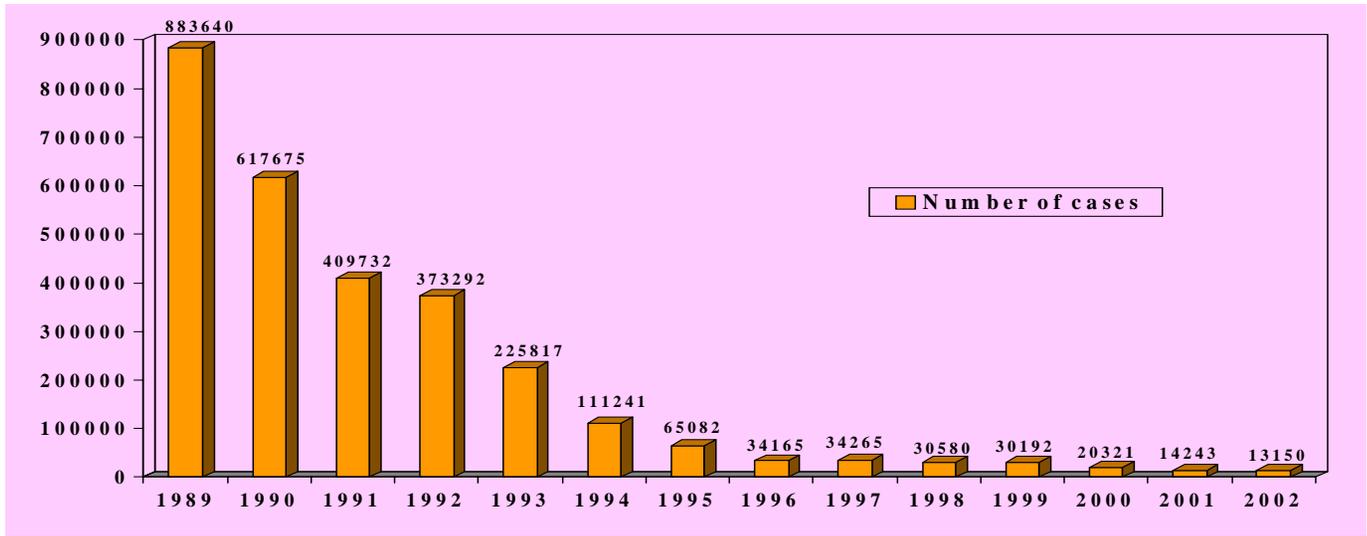
23. However, the goal of the programme has yet to be achieved and much remains to be done. For dracunculiasis to be completely eradicated, the 11 countries that are still endemic and the partners should pursue and intensify their effort and step up their commitment to the eradication objective.

24. In 1991, the World Health Assembly adopted resolution WHA44.5 urging dracunculiasis eradication by the end of 1995. As at 31 December 2002, only Africa, especially the WHO African Region, remained endemic.

25. The African Region too can be “free of dracunculiasis transmission”, only if greater attention is given to eradication and only through concerted and sustained effort.

**ANNEX 1**

**Number of cases of dracunculiasis reported each year in the African Region, from 1989 to 2002**

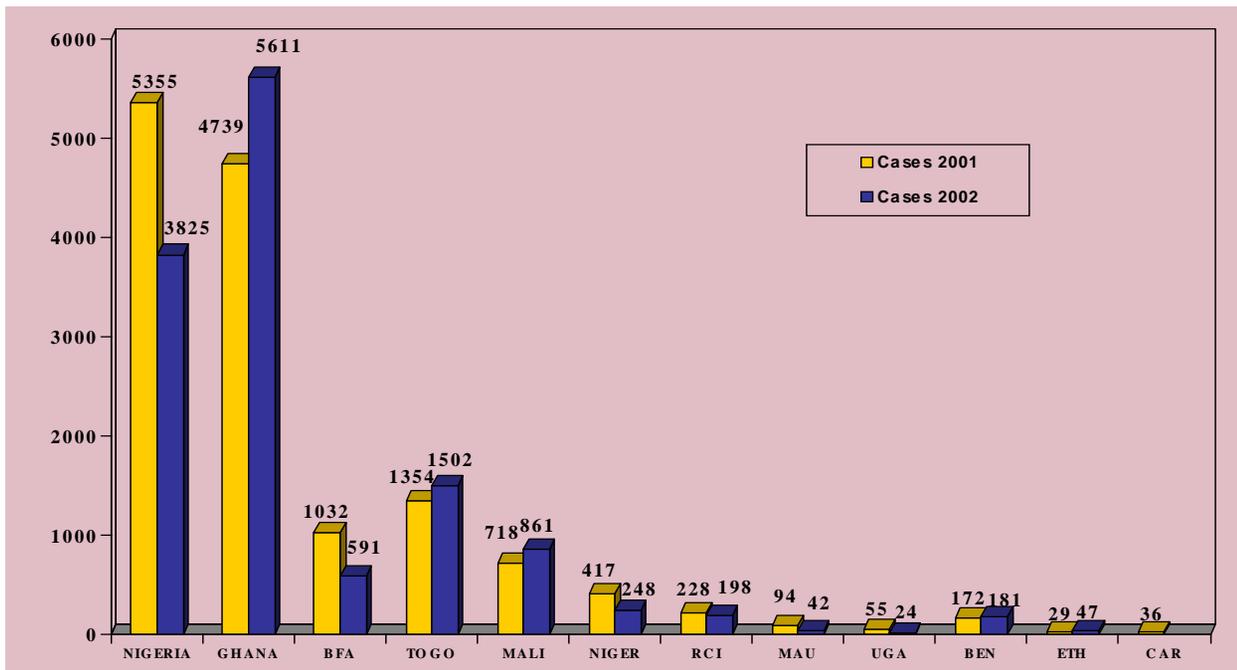


**Graph 1**

Source: WHO/AFRO, based on annual country reports

ANNEX 2

**Number of cases of dracunculiasis reported by country, in the African Region, in 2001 and 2002**



**Graph 2**

Source: WHO/AFRO, based on annual country reports



## ANNEX 4

**SITUATION OF ERADICATION OF GUINEA WORM DISEASE  
IN THE ENDEMIC COUNTRIES**

**Benin:** the national survey carried out in 1990 shows that a total of 37 414 cases of Guinea worm disease were found in 3762 localities. The implementation of the national dracunculiasis eradication programme has made it possible to reduce annual incidence and the number of endemic localities by 99.5% and 99.2% respectively, between 1990 and 2002. In 2002, 181 cases of the disease (including 18 cases imported from Ghana and Togo) were reported in 31 localities. The Savalou district, a mountainous region, remains the most affected district, accounting for over 72% of all reported cases. The challenges to be met by the national programme of Benin and its partners are to intensify activities to arrest local transmission of the disease soonest and; continue or even strengthen active surveillance countrywide, especially in areas along the country's borders with neighbouring countries that are still endemic.

**Burkina Faso:** during the national survey undertaken in 1991, 42 187 cases of Guinea worm disease were found in 2626 villages. The implementation of the national dracunculiasis eradication programme made it possible to reduce annual incidence by 98.5% and the number of endemic villages by 95% between 1991 and 2002. In 2002, 591 cases of the disease (including nine cases imported from Ghana, Mali and Cote d'Ivoire) were notified in 129 villages. Seventy-one per cent of total cases reported in Burkina Faso in 2002 were from five districts, namely Gorom-Gorom (134 cases), Batié (96 cases), Gaoua (94 cases), Kaya (51 cases) and Djibo (46 cases). Substantial progress has been made in the past two years. The challenges that remain to be met by the programme and its partners are to maintain, and even improve the current performance of the programme so as to speed up the interruption of local transmission of the disease and to continue active surveillance countrywide, especially in previously endemic areas where there are movements of nomadic populations along the borders with Mali and Niger.

**Côte d'Ivoire:** The outcome of the national survey carried out in 1990-1991 shows that 12 690 cases of Guinea worm disease were found in 503 villages. Following the implementation of the national dracunculiasis eradication programme, the annual incidence of the disease decreased by 98% and the number of endemic villages by 90%. In 2002, 198 cases of the disease including six imported from Ghana, Burkina Faso, and Mauritania were notified in 46 villages. The Tanda district is still the most affected in the country, accounting for about 92% of total cases countrywide. The main challenges of the programme and its partners are to accelerate the process of interruption of local transmission of the disease in the Tanda district and continue active surveillance throughout the country especially in the previously endemic zones and the zones at risk.

**Central African Republic:** The first surveys conducted between 1990 and 1994 could not help confirm any local transmission of dracunculiasis in Central African Republic. Several support and evaluation missions were therefore undertaken to the field by various partners especially WHO. Simultaneously, surveillance activities and awareness campaigns were organized by the programme with WHO's technical and financial support. Between 1995

and 2001, the established community surveillance system reported some cases but the cases could not be confirmed by health workers. In 2002, the Ministry of Health decided to transfer to Bangassou the officer in charge of managing the data on the programme in the region concerned. The purpose was to enhance the validation of information provided by the community health workers and to better monitor the situation. The second-semester programme coordination report (2002) shows that no confirmed case of Guinea worm disease was reported. The challenge to Central African Republic and its partners is to pursue active surveillance countrywide especially in suspect zones, for the purpose of certification of eradication of the disease.

**Ethiopia:** According to the outcome of the active case search survey undertaken in 1993, 1120 cases were recorded in 116 localities. The implementation of the national dracunculiasis eradication programme has helped reduce the annual incidence of dracunculiasis by 99.5% and the number of endemic localities by 99.2%. In 2002, 47 cases of Guinea worm disease including 23 imported from Sudan were notified in 18 villages. Eighty-seven per cent (21 out of 24) of indigenous cases were from the Gog district (Gog Woreda), Gambella region. The situation of Guinea worm disease in the Akobo district is still unknown because of the area's inaccessibility due to insecurity. The challenges to be met by the national programme and its partners are to assess the situation in the Akobo district, intensify activities for accelerating the interruption of local transmission of Guinea worm disease in the Gog district and pursue active surveillance countrywide especially in the areas along the border with Sudan.

**Ghana:** During the national survey carried out in 1989, 179 483 cases of Guinea worm were recorded in 6515 villages. Thanks to the implementation of the national dracunculiasis eradication programme, the incidence of the disease was reduced by 97% and the number of endemic villages by 87%. In 2002, 5611 cases of the disease including five cases imported from Togo and Niger were notified in 739 villages. Seventy-six per cent of all cases of dracunculiasis reported in Ghana in 2002 were from the northern region. The situation is characterized by detection of a high number of newly endemic or reinfested villages and a very low coverage of safe drinking water especially in the northern region. The challenges to be met by Ghana's programme and its partners are to intensify eradication activities particularly the supply of safe drinking water and pursue active surveillance throughout the country especially in previously endemic zones and zones at risk.

**Mauritania:** The outcome of the national survey conducted in 1990 shows that 8036 cases of Guinea worm disease were reported in 511 localities. The implementation of the national dracunculiasis eradication programme has helped reduce annual incidence by 99.4% and the number of endemic localities by 96%. In 2002, 42 cases of the disease were reported in 18 localities. Sixty-two per cent of all the cases notified in Mauritania in 2002 were from four localities. The localities are: Bokoul, Argoup, Barkeol, Lakhdar and Hsey Thall. The challenges to be met by the national programme and its partners are to intensify activities to accelerate the interruption of local transmission of dracunculiasis in those four localities and continue active surveillance countrywide especially in previously endemic areas.

**Niger:** The outcome of the national survey carried out in 1991 shows that 32 829 cases of Guinea worm disease were found in 1687 villages. The implementation of the national dracunculiasis eradication programme has made it possible to reduce annual incidence by 99% and the number of endemic localities by 95%. In 2002, 248 cases of the disease including 15 cases imported from Nigeria, Burkina Faso, Mali, Ghana and Benin were reported in 91 localities. The Tillaberi region is the most affected region in the country. The challenges to be met by the national programme and its partners are to intensify activities with a view to accelerating the interruption of local transmission and to continue active surveillance, countrywide, especially in areas where there are movements of nomadic populations along the country's borders with Mali and Burkina Faso.

**Mali:** The outcome of the national survey conducted in 1991 shows that 17 716 cases of Guinea worm disease were found in 1230 villages. The implementation of the national dracunculiasis eradication programme has helped reduce annual incidence by 95% and the number of endemic villages by 85%. In 2002, 861 cases of the disease, including three cases imported from Niger, were reported in 183 villages. Worth noting is that, in 2000, only 290 cases were reported in Mali. However, since then, there has been a recrudescence of dracunculiasis, with 718 cases reported in 2001 and 861 cases in 2002. Ninety-five per cent of all cases reported in 2002 were from three districts, namely: Ansongo, Gao and Gourma-Rharous. A common feature of those three districts is that the people lead a nomadic lifestyle and are very mobile and dispersed. The challenges to be addressed by the national programme are to intensify interventions to accelerate the interruption of local transmission of the disease in the northern regions (Gao and Tombouctou) and continue active surveillance throughout the country especially in previously endemic areas and regions with nomadic populations.

**Nigeria:** The outcome of the national survey conducted in 1988 shows that 643 464 cases of Guinea worm disease were found in 5270 localities. The implementation of the national dracunculiasis eradication programme has helped reduce annual incidence by 99.4% and the number of endemic localities by 89.4%. In 2002, 3825 cases of the disease were reported in 557 localities. Seventy-two per cent of all the reported cases were from four States, namely: Benue State, Oyo State, Ebonyi State and Niger State. The challenge to be met by the programme is to further mobilize the structures of the Ministry of Health so that they participate in the activities of the programme especially active surveillance of previously endemic zones.

**Uganda:** The outcome of the national survey carried out in 1992 shows that 126 369 cases of Guinea worm disease were found in 2677 localities. The implementation of the national dracunculiasis eradication programme has made it possible to reduce annual incidence by 99.98% and the number of endemic localities by 99.3%. In 2002, 24 cases of the disease including 18 cases imported from Sudan were notified in 18 localities. Insecurity in the northern and north-eastern parts of the country has, no doubt, affected programme activities including active surveillance of the disease. The challenges to be met by Uganda are to intensify activities to interrupt local transmission of the disease, as soon as possible, and to continue and even strengthen active surveillance, countrywide, especially in zones of insecurity and areas along the border with Sudan.

**Togo:** The outcome of the national survey undertaken in 1991 shows that 5118 cases of the disease were found in 584 villages. Thanks to the community-based surveillance system established between 1991 and 1993, 10 394 cases were found in 698 villages in 1993. Between 1993 and 2002, the implementation of eradication activities helped reduce annual incidence by 85% and the number of endemic villages by 67%. In 2002, 1502 cases of the disease, including 30 imported cases, were reported in 228 villages. The Haho and Ougou districts are the most endemic, accounting for 60% of all cases countrywide. Since the past two years, the situation has been characterized by an increase in the number of cases as a result of the discovery of newly infested or reinfested villages. The challenges to be met by the national programme and its partners are to intensify activities in order to accelerate the interruption of local transmission of the disease and to continue and even strengthen active surveillance countrywide especially in previously endemic zones.

**Countries in precertification phase:** The implementation of the national dracunculiasis control programmes in Cameroon, Chad, Kenya and Senegal has helped interrupt local transmission of Guinea worm disease in all these countries. However, given their proximity to some other endemic countries, Cameroon and Kenya continue to record imported cases. Senegal, where the last known indigenous case dates back to 1997, should submit an indepth report to the international commission that certifies dracunculiasis eradication so that the country can be certified as free of dracunculiasis transmission. The last reported indigenous case in Chad dates back to 2000 and the country should also prepare a detailed report on the dracunculiasis situation, based on which the country can be certified as free of dracunculiasis as from 2004. The challenges to be met by this group of countries are to continue active surveillance and document activities implemented. Important issues considered for certification include provision of evidence that there has been adequate active surveillance in the last three years following the last known indigenous case and that safe drinking water is available to the affected rural areas.

**Countries certified as freed:** The 44th World Health Assembly passed resolution WHA44.5 by which it requested the WHO Director-General to start, on country-by-country basis, the certification of dracunculiasis eradication, including in countries that have no known history of dracunculiasis. In the implementation of that resolution, 15 countries of the African region submitted certification requests to the international certification commission. After reviewing the requests, the commission certified as free of dracunculiasis transmission, seven countries namely, Botswana, Burundi, Lesotho, Malawi, Namibia, Seychelles and Zimbabwe. The commission called upon the eight remaining countries that could not be certified as freed to provide additional information or produce a detailed national report on the prevailing dracunculiasis situation for consideration by the commission.

**Countries to be certified as freed:** Apart from the 11 countries that are currently endemic, the four countries in precertification phase and the seven countries certified as freed, each of the remaining countries of the region would have to formulate certification request. Countries whose requests had been examined at the preceding sessions of the commission should provide the commission with the additional information requested, for certification purposes. Countries that have yet to submit their certification requests should do so as soon as possible. Countries without any known history of dracunculiasis should submit to the commission a letter declaring that they have no dracunculiasis cases. The letter should have

as attachment a questionnaire, issued by WHO, and duly filled by the national authorities. Countries with remote history of dracunculiasis or at risk of dracunculiasis transmission should provide the commission with a detailed national report on the dracunculiasis situation. The countries include Angola, Algeria, Congo, DRC, Gabon, Gambia, Guinea, Guinea-Bissau, Liberia, Madagascar and Sierra Leone.