

CRITERIA FOR THE CERTIFICATION OF DRACUNCULIASIS ERADICATION

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This document is a revised version of Document WHO/FIL/93.187, "Criteria for the Certification of Dracunculiasis Eradication", which was a document adapted from the Report of an Informal Consultation on the Criteria for the certification of Dracunculiasis Elimination (eradication), Division of Control of Tropical Diseases, WHO, Geneva, 19-21 February 1990. The original report was issued in the WHO/Fil. series under the serial number WHO/Fil./90.185. The present revised edition includes recommendations by the International Commission for the Certification of Dracunculiasis Eradication at its first meeting, Geneva, 5 March 1996. The previous edition was based on comments and modifications made by a Round Table on the Criteria for the Certification of Dracunculiasis Eradication, 26 March 1993, Cotonou, Benin, on the occasion of the Second Meeting of Programme Managers for Dracunculiasis Eradication, organized by the WHO Regional Office for Africa in collaboration with UNICEF, Global 2000 and the WHO Collaborating Centre for the Eradication of Dracunculiasis (Cotonou, 23-26 March 1993). Participants at the meetings leading up to this document are listed in Annex 3.

1. INTRODUCTION

Dracunculiasis (guinea worm disease) is a disease which is endemic in certain communities without access to safe sources of drinking-water and which has serious adverse effects on health, agricultural production and school attendance (see life cycle in Figure 1). Table 1 lists those countries where human dracunculiasis has been: (i) endemic during the 1980s, (ii) endemic or possibly endemic before 1980, (iii) endemic at one time in history, (iv) sporadically reported without evidence of endemic disease. Map 2 shows the countries that are included in these four categories. In 1996, there is still lack of knowledge about when transmission of dracunculiasis was interrupted in many countries. The listing of countries given in Table 1 will be updated as new information becomes available during future eradication and certification activities. The reliability of the data will also be checked and updated where necessary.

A global eradication campaign to eradicate dracunculiasis started in the early 1980s. In 1991 (WHO, 1991), the World Health Assembly endorsed the efforts to eradicate dracunculiasis country by country and fixed the goal of interrupting transmission by 1995 and achieving certification of eradication, at the global level, by the end of the 1990s (WHO, 1991).

The need for certification of attainment is inherent in the goal of an eradication programme, as opposed to the lack of such a need in a control programme. There must be an objective basis, according to agreed criteria, for determining whether dracunculiasis has indeed been eradicated; the criteria must take into account the risk of importation from neighboring countries as well as the need for maintaining surveillance in neighboring countries. It is expected that efforts of eradication of dracunculiasis for individual countries will be conducted until the final goal of global dracunculiasis eradication certification is achieved.

An independent International Commission for the Certification of Dracunculiasis Eradication (ICCDE) was established by WHO in 1995 to recommend to the Organization those countries which fulfil the requirements for certification, as well as to advise the Organization on criteria, procedures and progress made towards verification of absence of transmission, and contribute actively to the certification process in Member States. In 1996, a panel of specialists was created, the members of which can be assigned to the International Certification Teams (ICTs).

WHO, including the Regional offices, will facilitate national preparations for certification by carrying out regular visits by WHO staff, members of the designated ICT, or consultants to the country or sub-region concerned. A register has been established of countries requesting certification and also of those countries where official certification of eradication is pending. WHO has also established an official register, listing countries where dracunculiasis has been eradicated, based on evaluations by the ICCDE.

The aim of the present paper is to describe the criteria for verifying the absence of dracunculiasis transmission. WHO has developed several documents related to eradication and certification: (1) a practical guide: Certification of Dracunculiasis Eradication: criteria, strategies, procedures, (2) "Guidelines: Country Application for Certification as a Dracunculiasis-Free Area" and (3) "Recommendation for Dracunculiasis Surveillance in Selected Countries Without a Recent History of the Disease", which provide more detailed step-by-step guidance to countries in various epidemiological situations regarding dracunculiasis.

2. DEFINITIONS

A **case of dracunculiasis** is defined as an individual exhibiting or having a history of a skin lesion with emergence of a guinea worm (WHO, 1988). A recent history (within one year) of a skin lesion with emergence of a guinea worm is the only time-frame which must be used in surveillance programmes.

Local eradication of dracunculiasis is the confirmed absence of clinical illness (the interruption of transmission of *Dracunculus medinensis* in man) for three years or longer from a sizeable geographical unit (e.g., a country) with such a low risk of reintroduction of the parasite that preventive measures could be reduced to a strict minimum.

Worldwide eradication of dracunculiasis is the confirmed absence of clinical manifestations (the interruption of transmission of *Dracunculus medinensis* in man) for three years or longer at the global level.

3. CRITERIA FOR CERTIFICATION OF ERADICATION

Standard criteria for certification are needed for the following reasons:

- (1) To ensure international credibility for the expected future claim that dracunculiasis has been eradicated from an area.
- (2) To have an established and consistent mechanism for judging the success of recent national dracunculiasis eradication programmes.
- (3) To have a standard, effective procedure to identify and eradicate any previously unknown foci of transmission.
- (4) To help in the investigation of rumoured or sporadic occurrences of the infection in unconfirmed potentially endemic areas.

3.1 *Countries with dracunculiasis transmission after 1980*

(Group A, Table 1)

National governments, requesting certification of eradication, must submit to WHO a country report (see Annex 1) which describes the procedures undertaken and provides evidence in support of the assertion that dracunculiasis has been eradicated.

In these countries, eradication will be considered to have been achieved when adequate surveillance systems have not discovered any evidence of transmission derived from careful annual searches, carried out during the expected transmission season, for three consecutive years. Surveillance, to be adequate, should include active case detection carried out, if necessary, in the most remote areas of the country.

The objective of surveillance for dracunculiasis during the three-year pre-certification period is to rapidly detect and contain any cases that might occur, in order to prevent further transmission. Confirmation of the absence of transmission in a country is judged on the basis of:

(i) an assessment of the capability of the surveillance system to detect cases of dracunculiasis should they occur, and (ii) the records compiled by the national authorities, the quality of which can be determined during a field appraisal by an international certification team. In general, the reliability of certification will depend on the amount of time that has elapsed since the last known case and on the sensitivity of active surveillance.

The establishment of a claim in relation to a specific defined area, must fulfil the following conditions:

3.1.1 Proof that an active case detection system has operated in the area for at least three years since the occurrence of the last known indigenous case. The best is to use a village-based surveillance system remaining in place in every formerly endemic village with a system for the rapid reporting of information to the next surveillance level. Surveillance coverage will be considered to be truly adequate: (i) if 85% or more of the village clusters placed under surveillance submit their reports each month, or (ii) if each village under surveillance provides its report at least nine months out of 12. A reward for the patient detected as well as for the health worker who identified the patient and took the appropriate measures (i.e. containment or hospitalization) strongly reinforces active surveillance.

***Rationale:** There is no asymptomatic carrier state in dracunculiasis, the incubation period does not exceed one year, and there is no known animal reservoir. Normally it takes approximately two weeks for larvae ingested by cyclops to become infective, and the infected cyclops normally have a life-span of less than 50 days, at least in the conditions under which they were studied (Muller 1972). Therefore the absence of indigenous cases for a three-year period, in the presence of adequate case detection, can be accepted as proof of local eradication of the disease.*

3.1.2 In the event of suspected importation to an area not endemic for dracunculiasis, it must be established that each confirmed case was in fact imported by tracing the case to its origin in a dracunculiasis endemic area. If this case has been fully contained the locality will not be considered an endemic focus. If, following importation, transmission occurs for one or more transmission cycles, the focus will be considered one of local transmission.

3.1.3 Maintenance of a register of suspected cases of dracunculiasis reported or discovered during the three-year period. It is recommended that the date of worm emergence, age and sex of the patient, and place of residence of each person with dracunculiasis be recorded, preferably when the blister forms or before, and that adequate measures be implemented (i.e. containment, perhaps with hospitalization, and complete extraction of the worm). The register must also mention: (i) whether the suspect case was determined to be dracunculiasis or some other condition; (ii) the movements and activities of the patient since the emergence of the worm in order to identify all sources of possibly contaminated drinking water, and (iii) the origin and possible source of the infection.

***Rationale:** Each worm emergence that is not detected carries the risk of new infections a year later. There is no vaccine with which to contain the spread of dracunculiasis by protecting individuals at risk of infection. Therefore, surveillance for dracunculiasis must be active and village-based. Effective containment of residual cases is critical.*

3.1.4 Give a detailed account of the history of dracunculiasis in the country (see Annex 1).

***Rationale:** This is necessary for those who must judge the completeness of steps taken to eradicate dracunculiasis.*

3.2 Other countries with a history or possible history of dracunculiasis transmission

(Table 1 : Groups B, C, D)

In these countries certification of eradication may be granted after the provision of satisfactory documentation that no residual foci of infection exist. Countries in this group represent a wide range of situations, from those which had transmission during the 1950s and 1960s to those which have had no reported transmission for more than 100 years. Therefore, requirements for certification will need to be tailored to each situation, relating to the following issues:

3.2.1 A detailed description of the extent of any former endemic area(s).

3.2.2 The possible need to present findings of at least one active case search, conducted within the last two years in areas which may formerly have been endemic. Any search(es) should be conducted during the expected transmission season and carried out village-by-village, or nationally supplemented by a widely publicized reward, using recognition cards with the local (vernacular) name for dracunculiasis. The results should ascertain that residual foci of infection no longer exist. To this end, data obtained by passive surveillance will also be given due consideration.

4. CERTIFICATION PROCEDURES

All countries should contact WHO to initiate the verification and certification process. The proposed sequence of events listed below should be kept flexible. This listing summarizes the process for certification.

- (1) WHO will distribute a set of international guidelines on verifying the absence of dracunculiasis transmission and certifying its eradication.
- (2) All countries of the world will be encouraged to submit a formal request to WHO to verify the absence of transmission, and accordingly to certify its eradication 3 years after any dracunculiasis transmission has been halted in each country..
- (3) Such formal requests must conform with the procedures given in this document and elaborated in the guidelines prepared by WHO and approved by ICCDE. In particular, the requesting countries will produce a detailed report on all surveillance and eradication activities. Such countries may find it useful to designate a national committee to evaluate the report on the dracunculiasis eradication programme before its submission to WHO.
- (4) Some countries, especially currently endemic countries, may convene a national committee or group to examine surveillance activities and give evidence before the International Certification Team (ICT).

(5) WHO will designate an International Certification Team (ICT) in the case of recently endemic countries and countries considered to potentially be at "high risk" of having dracunculiasis foci. The ICT will have the mandate to evaluate the country report and to determine, in collaboration with the host country, the status of the certification schedule.

(6) The ICT will evaluate the likelihood that dracunculiasis would have been detected and reported, had any transmission occurred during the previous three years, and make appropriate recommendations to WHO regarding approval of the claim that dracunculiasis has been eradicated (see Section 4.1).

(7) If certification of eradication is granted, the country will then be listed on a WHO official register of areas now verified as free of dracunculiasis transmission.

4.1 National preparations for certification.

4.1.1 Pre-Certification Surveillance

The methods employed in national preparations for the certification will depend on whether an eradication campaign is followed immediately by a surveillance phase and by preparations for the certification, or if pre-certification activities are carried out many years after the last known case of dracunculiasis.

The following apply to countries where pre-certification surveillance programmes are carried out immediately after the dracunculiasis eradication campaign (Group A, Table 1):

- (1) Enhance the sensitivity of case detection nationwide by maintaining a high degree of public awareness of dracunculiasis and its eradication, of the importance and need of reporting cases of dracunculiasis, of rewards for reporting cases, and of procedures for the containment of cases. Monitor the awareness campaign periodically to assess coverage and comprehension of messages, particularly in remote rural areas where the potential risk for transmission of dracunculiasis is thought to be highest.
- (2) Maintain compulsory notification of cases of dracunculiasis by all units of the national passive disease-surveillance system (i.e., primary health care posts, health centres, and hospitals).
- (3) Maintain a village-based surveillance and containment programme, in all villages formerly affected by dracunculiasis.
- (4) Maintain a register in all endemic or formerly endemic villages of suspected dracunculiasis infections reported or discovered during the pre-certification period, and indicate for each confirmed case that it was either imported, by tracing the case to its origin, or indigenous.
- (5) Incorporate surveillance of other diseases or other health and development activities into the surveillance system for dracunculiasis, or vice-versa.

In other countries where pre-certification activities are carried out, certification will have to be developed on a country by country basis taking into account the time elapsed since the last case is known to have occurred, incidence of the disease at that time, the geographic distribution of any previously reported cases, etc. One or more of the following approaches may be suitable:

- (1) Enhance the sensitivity of case detection nationwide by promoting a high degree of public awareness of dracunculiasis and its eradication in neighbouring countries, and by stressing: (i) the importance and need of reporting cases of dracunculiasis, (ii) the offering of rewards for the reporting of cases, and (iii) the measures required for the containment of cases. Monitor the awareness campaign periodically to assess coverage and comprehension of messages, particularly in remote rural areas where potential for dracunculiasis is highest (e.g., villages without safe sources of drinking water and situated near borders with other countries affected by dracunculiasis or in a formerly endemic area).
- (2) Institute compulsory notification of cases of dracunculiasis by all units of the national passive disease-surveillance system (i.e., primary health care posts, health centres, and hospitals).
- (3) Maintain a register of dracunculiasis cases and use it to: (i) note any suspected cases of infection reported or discovered during the pre-certification period, (ii) indicate that each confirmed case was either imported, by tracing the case to its origin in a dracunculiasis endemic area, or indigenous. Ascertain that all reports were well documented.
- (4) Conduct at least one active case detection survey, village-by-village, in any areas which may have been formerly endemic. Search(es) should be conducted during the presumed transmission season, using case recognition cards and the local vernacular name for dracunculiasis. School-based (Chippaux & Larsson, 1991) and market-based (Brieger, 1991) surveys, as well as surveys at religious gatherings, in refugee camps and other places where people congregate, in addition to surveys of relevant data collected by non-governmental organizations (NGOs) working in the field, can be useful in eliciting information about villages where cases might have occurred previously.

4.1.2 Preparation of a "Country-Report"

Countries must submit a "Country-Report" to the International Commission for the Certification of Dracunculiasis Eradication as part of the certification process. The level of detail required varies widely from a brief statement in countries which have never had dracunculiasis to the highly detailed reports needed from countries applying after a national dracunculiasis eradication programme.

Previously endemic countries should include the following information in their reports, a checklist for the preparation of the report is proposed in Annex 1:

- (1) An historical account of dracunculiasis in the country, including a detailed overview of the dracunculiasis eradication campaign(s) as well as of the status of water and sanitation projects and of their contribution to the eradication effort.

- (2) The results of active case detection including: (i) data from at least three annual reports of case detection, based on the monthly readings of daily case registers regularly up- dated at the village level in the three years immediately preceding the application for certification, (ii) any evidence of validation of results from active searches and case containment measures, and (iii) the results from any other assessments carried out, e.g., in schools, markets, or other places where nomadic or migratory people congregate.
- (3) An evaluation of the effectiveness of the routine disease reporting system. Such evaluation will include: (i) evidence of the inclusion of dracunculiasis as a reportable disease on the official disease reporting forms, (ii) the regularity and completeness with which the health reporting units reported, (iii) validation of the reports, (iv) records of action taken when dracunculiasis cases were reported during the latter stages of the campaign, and (v) the number and distribution of health units: primary health posts, dispensaries, health centres, hospitals etc., throughout the endemic areas covered by the smallest officially recognized administrative unit in which guinea worm was reported in the years preceding the application for certification.
- (4) A description of all public health education campaigns, including, if applicable, details of whether any rewards have been paid for reporting cases of dracunculiasis and the results of these efforts.
- (5) Demographic information, including population distribution by geographical region and significant migration patterns.

4.2 Operation of International Certification Teams

ICTs will be asked to reach one of two possible conclusions: either (i) they are satisfied that eradication has been achieved, or (ii) they are not satisfied. ITC reports will spell out any reason for their decision. The government of the country being certified should guarantee the ICT full access to all documentation of programme activities and to all parts of the country where further investigation is needed.

The timing of the International Certification Team (ICT) visits to the countries and Team membership will be decided by WHO in consultation with national authorities. Persons selected as Team members should be able to be critical in their assessments, and their views as experts should be respected both nationally and internationally. Members should be chosen from different areas of the world so that the nature and extent of the efforts made to document the interruption of transmission may become widely known. Scientists working on dracunculiasis and countries with eradication programmes should both be represented on ICTs so that technical expertise can be exchanged and applied to the certification process. Potential conflicts of interest, such as nomination of a national from a country under review as a member of the Certification Team, should be avoided. In general, contiguous formerly endemic countries should be considered and evaluated at the same time.

The principal aim of an ICT visit to a country will be to evaluate the reliability of that country's report, by interviewing health personnel and others, and by examining records at both central and peripheral levels, in order to ascertain the likelihood that dracunculiasis transmission has been interrupted as claimed. Because Team members will not usually be able to spend more than a few weeks in a country, the objective will be to assess the quality of the surveillance programme and to determine the probability of detecting dracunculiasis cases if transmission had occurred during the preceding three years. Preliminary visits by selected consultants or temporary advisers may be arranged by WHO to examine the status of documentation and to recommend any additional measures they think

After arrival in the country, the ICT would spend several days at the Ministry of Health to review the country report with nationals of the host country and to listen to presentations by designated officials concerning the activities carried out. To facilitate visits to all epidemiologically important areas the Team would divide into groups. The areas selected for visits would be those identified as having the least satisfactory documentation or as being at unusual risk of continuing transmission, for example: (i) areas near countries with affected populations, (ii) previous highly endemic areas, (iii) areas where the last cases occurred, (iv) areas with little progress in the provision of safe sources of drinking water, and (v) areas with a history of poor surveillance for dracunculiasis. Team members will decide exactly which areas, villages and health units they wish to visit.

5. DRACUNCULUS SPECIES, INFECTIONS IN ANIMALS AND SIMILAR INFECTIONS OF ANIMAL ORIGIN

No animal reservoirs of human infection have been identified (see Annex 2).

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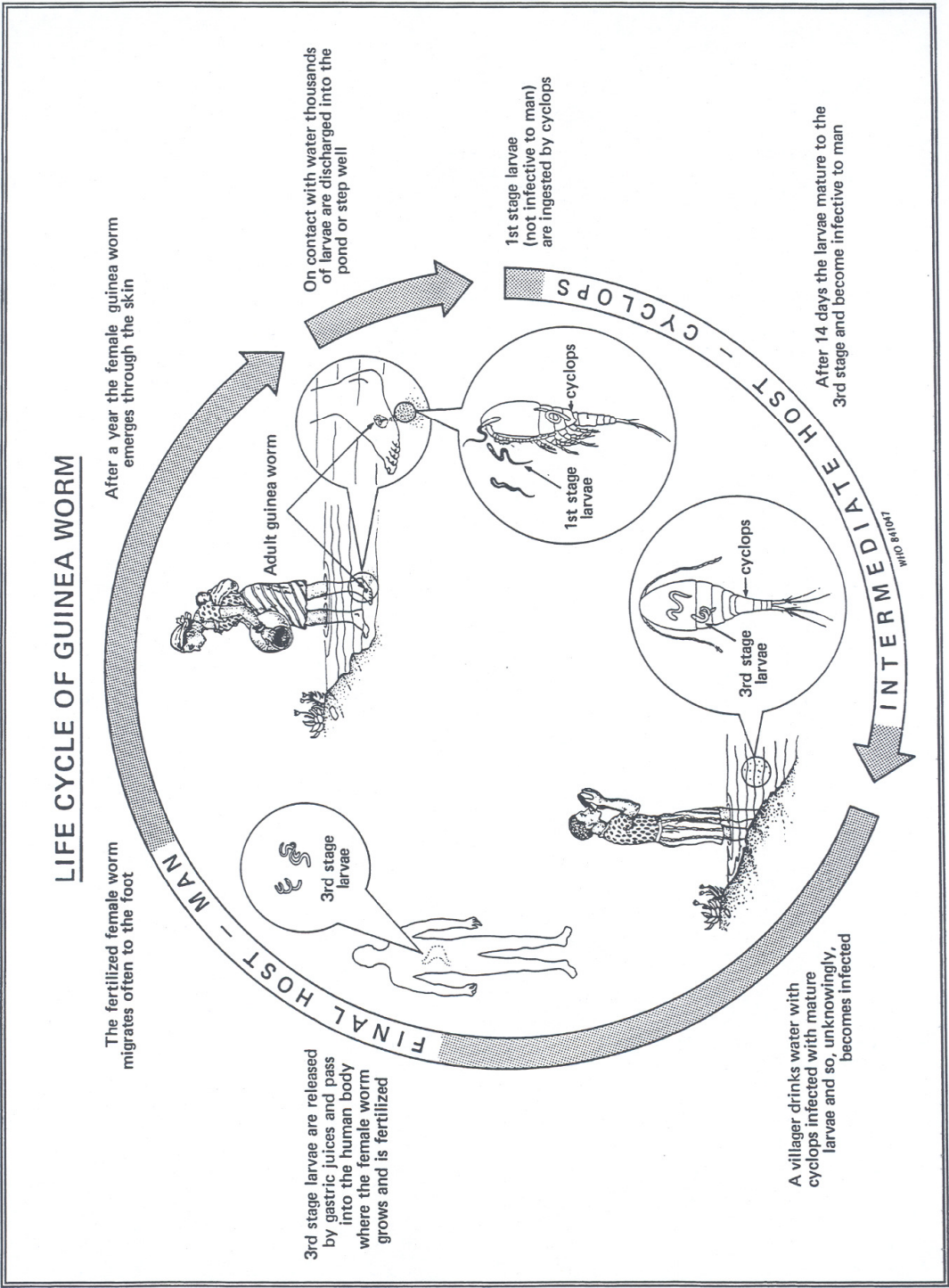
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FIGURE

LIFE CYCLE OF GUINEA WORM

FIGURE



TABLE**TABLE**

**PROVISIONAL LIST OF 70 COUNTRIES AND TERRITORIES
WITH A HISTORY OF DRACUNCULIASIS IN HUMANS**

**Countries with dracunculiasis transmission after 1980
(Group A)**

- | | | |
|------------------|----------------|--------------|
| 1. Benin | 7. Ghana | 13. Nigeria |
| 2. Burkina Faso | 8. India | 14. Pakistan |
| 3. Cameroon | 9. Kenya | 15. Senegal |
| 4. Chad | 10. Mali | 16. Sudan |
| 5. Côte d'Ivoire | 11. Mauritania | 17. Togo |
| 6. Ethiopia | 12. Niger | 18. Uganda |
| | | 19. Yemen |

**Countries with a known or possible history of endemic dracunculiasis before 1980
(Group B)**

- | | | |
|-----------------------------|------------------|-----------------|
| 1. Central African Republic | 4. Guinea | 7. Liberia |
| 2. Eritrea | 5. Guinea-Bissau | 8. Sierra Leone |
| 3. Gambia | 6. Iran | 9. Somalia |
| | | 10. Zaire |

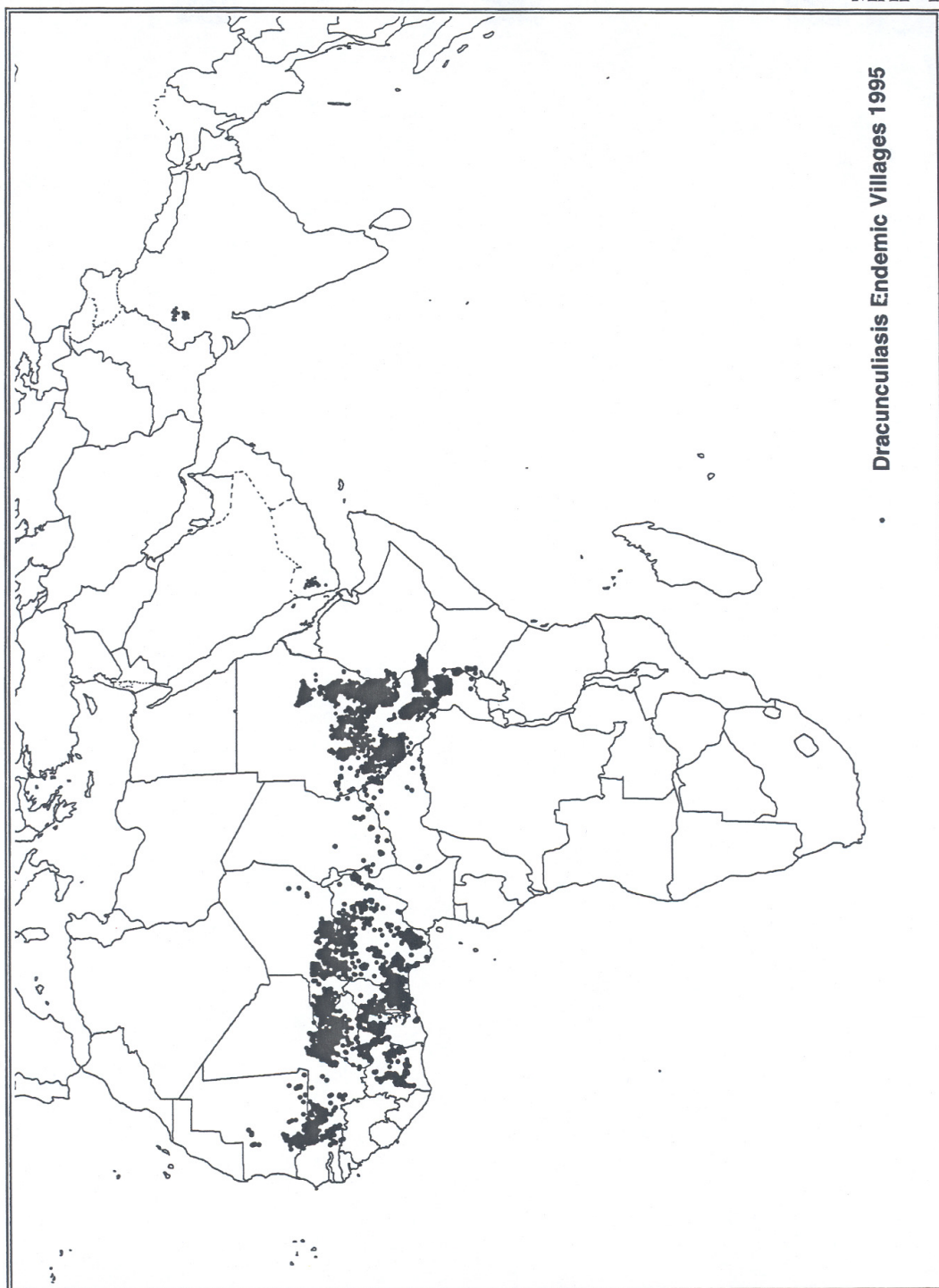
**Other countries and territories with a possible history of endemic dracunculiasis
(Group C)**

- | | | |
|------------------------|----------------|--------------------------|
| 1. Afghanistan | 14. Gabon | 27. Morocco |
| 2. Algeria | 15. Grenada | 28. Myanmar |
| 3. Argentina | 16. Guyana | 29. Oman |
| 4. Barbados | 17. Haiti | 30. Qatar |
| 5. Brazil | 18. Indonesia | 31. Saudi Arabia |
| 6. Colombia | 19. Iraq | 32. Sri Lanka |
| 7. Comoros | 20. Israel | 33. Suriname |
| 8. Cuba | 21. Jordan | 34. Tajikistan |
| 9. Djibouti | 22. Kuwait | 35. Tanzania |
| 10. Dominican Republic | 23. Libya | 36. Thailand |
| 11. Egypt | 24. Madagascar | 37. Tunisia |
| 12. Equatorial Guinea | 25. Malawi | 38. United Arab Emirates |
| 13. French Guiana | 26. Mexico | 39. Uzbekistan |

**Sporadic indigenous cases reported, but no history of endemic disease
(Group D)**

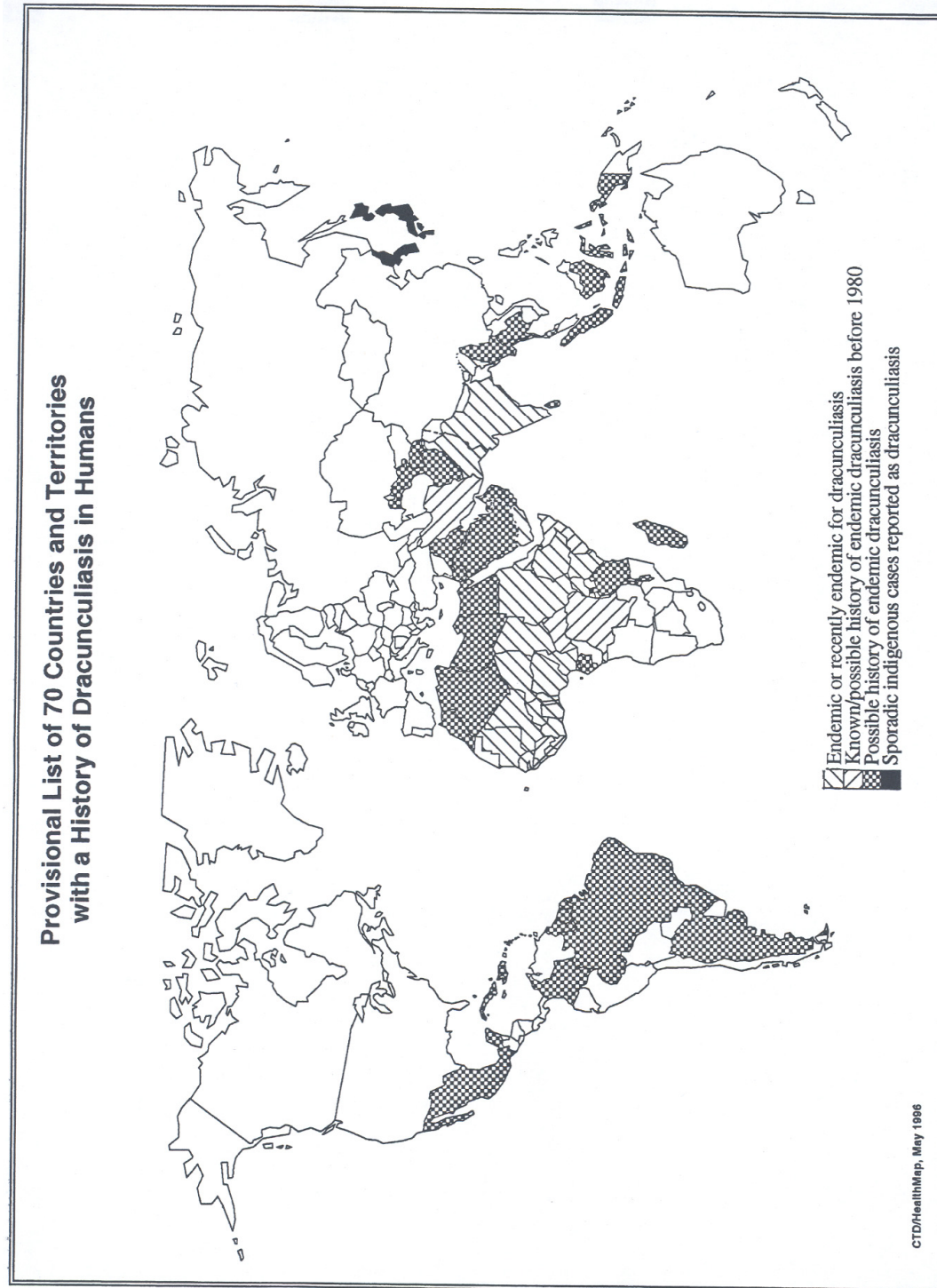
- | | |
|----------|----------|
| 1. Japan | 2. Korea |
|----------|----------|

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MAP 1**MAP 1**

MAP 2

MAP 2



ANNEX 1**COUNTRY-REPORT CHECK-LIST FOR CERTIFICATION
OF DRACUNCULIASIS ERADICATION**

Countries must submit a "Country-Report" to the International Commission for the Certification of Dracunculiasis Eradication as part of the certification process. The level of detail needed in the report will vary considerably, depending on the extent to which dracunculiasis has existed in each country. Countries which are on the "Provisional list of 70 countries and territories with a history of dracunculiasis in humans" may use this checklist to help assure that all necessary parts of the report are included. Countries not on that list can make a simplified Report, as described in the Guidelines for Country-Applications (reference in the sentence which follows). This checklist is based on the text in the body of the present document and of "Guidelines: Country-Applications for Certification as a Dracunculiasis-Free Area" (WHO/FIL/96.189), where this checklist is also included as an addendum.

COUNTRY-REPORTS SHOULD INCLUDE:**1. A historical account of dracunculiasis in the country, including:**

- 1.1 *a detailed overview of any dracunculiasis eradication campaign;*
- 1.2 *the country's water supply situation, including especially the status of water and sanitation projects and water supply in any formerly endemic areas;*
- 1.3 *any available data which indicates the contribution water-supply projects made to the eradication effort.*

2. Results of active case detection activities including:

- 2.1 *If the country was endemic for dracunculiasis during the 1980s:*
 - data from at least three annual reports of case detection, based on the monthly reading of case registers regularly up-dated at the village level;
 - any evidence of validation of results from active searches and case- containment measures;
 - the results from any other assessments carried out, e.g., in schools, markets, places of worship and other places where nomadic or migratory people or others congregate.
- 2.2 *If the country was not endemic for dracunculiasis during the 1980s:*

The same information as above, with the modification that active searches for dracunculiasis may have been done through fewer than three years and may not have used village-level registers in their surveillance, relying instead on widely publicized rewards and other survey methods mentioned above.

3. If the country was endemic for dracunculiasis during 1970s or 1980s:

A description of the final parts of the case-containment phase under the national dracunculiasis eradication programme and details surrounding the last year or two, including where the last few cases were found, etc.

4. A description regarding the handling of rumours of dracunculiasis during the certification period, including the rum our-register and the case/rumour registration forms.

5. An evaluation of the effectiveness of the routine disease reporting system, including¹:

- 5.1 *the number and distribution of primary health posts, health units, health centres, etc., throughout the endemic areas;*
- 5.2 *evidence of the inclusion of dracunculiasis as a reportable disease on the official disease reporting forms, if certification is undertaken in continuation of an eradication programme;*
- 5.3 *the regularity and completeness with which the health reporting units reported; if dracunculiasis is a reportable disease as discussed above;*
- 5.4 *validation of the reports;*

and, if the country was endemic for dracunculiasis during the 1970s or 1980s:

- 5.5 *records of action taken when dracunculiasis cases were reported during the latter stages of the campaign.*

6. Maps should be presented as part of the Country-Report, to visualize as many as possible of the points described in the text of the report, especially:

- 6.1 *the distribution of "health units/hospitals";*
- 6.2 *the status and distribution of safe water sources;*
- 6.3 *the location and distribution of schools relative to the previously endemic areas in the country;*
- 6.4 *the location of cases during the last years of case-containment;*
- 6.5 *the sources of reports which were not confirmed and turned out to be rumours.*

7. If the country was endemic for dracunculiasis during the 1980s, tables and graphs should also be presented in the Country-Report, to visualize:

- 7.1 *trends in the numbers of cases up through the case-containment phase;*
- 7.2 *reporting from villages, including percentages of timely monthly reports, to show trends in the application of the various interventions against dracunculiasis up through the case-containment phase*

8. A description of all public health education campaigns for dracunculiasis eradication including, if applicable, details of whether any rewards have been paid for reporting cases of dracunculiasis and the results of these efforts. If rewards have been offered, an important part of the report will be:

8.1 *a description of publicity efforts to make populations aware of the rewards,*

8.2 *the results of any surveys undertaken to evaluate what percentage of populations in various parts of the country are aware of the reward and its purpose.*

9. Demographic information, including:

9.1 *population distribution by geographical region,' and 9.2 known significant migration patterns.*

10. If the country has set up a National Committee or group to critically examine and/or oversee programme activities:

Information describing work undertaken by the National Committee to ensure the quality of surveillance activities during the certification period.

11. A copy of the International Certification Team's report.

In some cases, countries which were not endemic for dracunculiasis during the 1980s may be advised in writing by the International Commission or its Secretariat at WHO that a visit by an International Certification Team is not considered necessary, in view of documentation provisionally provided to WHO and the International Commission for the Certification of Dracunculiasis Eradication. Such countries can refer to that letter in their Country-Report, in lieu of a Certification Team report.

ANNEX 2

**DRACUNCULUS SPECIES, INFECTIONS IN ANIMALS
AND SIMILAR INFECTIONS OF ANIMAL ORIGIN**

No animal reservoirs of infection have been identified. Although it can be difficult to differentiate dracunculids, natural infections allegedly caused by *Dracunculus medinensis* have been reported from a wide variety of animals in many parts of the world. These animals include dogs, cats, horses, cattle, wolves, *foxes*, badgers and leopards. The possibility that some of these animal infections are due to *Dracunculus* species which are not known to be infective to man cannot be ruled out. Most reports have been from dogs. However, there is no evidence that either domestic or wild animals act as reservoir hosts capable of transmitting the infection to man. Nevertheless, infection in dogs is still said to occur in regions where human dracunculiasis was formerly endemic, e.g., Uzbekistan (Litvinov & Litvinov, 1981; Litvinov & Lysenko, 1982) and Tamil Nadu State in India (Joseph & Kandasamy, 1980; Lalitha & Anandan, 1980).

Domestic and wild mammals presumably become infected by accidental ingestion of infected copepods while drinking water. Although this mechanism is possible, it probably occurs rarely for two reasons. First, these animals drink water by lapping, an inefficient mechanism for the ingestion of copepods since the lapping action itself disturbs the water surface sufficiently to drive the elusive and rapid-swimming copepods away from the immediate area. Secondly, the altered swimming behavior of infected copepods (Muller, 1971; Crichton & Beverley-Burton, 1977) makes their presence near the water surface unlikely. A potential alternative and likely mode of transmission is through paratenic (transport) hosts, such as frogs or fish, which ingest copepods and are capable of concentrating infective larvae in their tissues. Such a mechanism of transmission has been postulated for dracunculids of raccoons (procyonids), mustelids and reptiles (which drink directly very little, if any, water), and has been experimentally confirmed (Brackett, 1938; Crichton & Beverley-Burton, 1977; Eberhard, 1989, personal communication).

Documented transmission of *Dracunculus* species from animals to man is extremely rare; only two, apparently *bona fide*, cases have been described; one case from Korea (Hashikura, 1926, 1927), and another from Japan (Kobayashi et al., 1986). In both instances there was no evidence to indicate that the patients had traveled to endemic countries during the 12-24-month period preceding patency. Moreover, there is no record that foci of human dracunculiasis in Korea or Japan have ever existed. What was common to both occurrences was a history of ingestion of uncooked loaches (small fresh-water fish of the Cobitidae family). Loaches are effective predators of copepods from which they acquire *Gnathostoma*. This nematode, which is a parasite of carnivores, only accidentally infects humans in Asia who eat raw loaches; it causes ocular and visceral manifestations as well as larva migrans syndrome. There was no subsequent transmission to other humans in either case.

At a time when *Dracunculus medinensis*, the causative agent of human dracunculiasis, is on the brink of being eradicated, WHO felt that it was absolutely necessary to carry out precise identification of *D. medinensis* isolated from humans in different ecological and climatic environments in Africa and in India. It would also be useful to compare *D. medinensis* isolated from humans with *Dracunculus* species isolated from mammals in endemic or formerly endemic areas. A taxonomical study using recent technology (DNA probes) was expected to start in 1993, but is not yet under way as of the editing of this document in April of 1996.

**References on *Dracunculus Medinensis* in animals
are given below, arranged in chronological order.**

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ANNEX 3**LISTS OF PARTICIPANTS****PARTICIPANTS AT THE FIRST MEETING OF THE INTERNATIONAL COMMISSION
FOR THE CERTIFICATION OF DRACUNCULIASIS ERADICATION****Geneva, Switzerland, 5 March 1996***Commission Members*

Dr Abdul Rahman Al-Awadhi, formerly Minister of Health of Kuwait, Executive Secretary,
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Prof Pierre Ambroise-Thomas, Centre collaborateur OMS Département de Parasitologie,
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Dr Frederick K. Wurapa, Former WHO Medical Officer, Ghana.

WHO-Secretariat

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Mrs Eva Carlsson-Hopperger, Legal Officer, Office of the Legal Counsel.

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Dr R. H. Henderson, Assistant Director General.

Dr Philippe Ranque, Chief, Dracunculiasis Eradication Unit, Division of Control of Tropical Diseases.

Dr Anders R Seim, Medical Officer, Dracunculiasis Eradication Unit.

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Dr Greg Watters, Division of Operational Support in Environmental Health.

Observers

Dr Donald R Hopkins, Senior Consultant, Global 2000, USA.

Dr Trenton K. Ruebush II, Director, WHO Collaborating Center for Research, Training, and Eradication of Dracunculiasis, Centers for Disease Control and Prevention (CDC), USA.

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DRACUNCULIASIS ERADICATION**

Cotonou, Benin, 26 March 1993

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WHO/FIL/96.187 Rev.1

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Geneva, Switzerland 19-21 February 1990

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