Guidelines for Chemical Control of Copepod Populations

In

Dracunculiasis Eradication Programs

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These guidelines are intended to help persons involved with dracunculiasis eradication programs make decisions about chemical control of copepod populations in sources of drinking water. To improve the usefulness of these guidelines, please send comments and suggestions to the address below.

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INTRODUCTION

Dracunculiasis (guinea worm disease) is a disabling infection caused by the parasite *Dracunculus medinensis*. Infection is acquired by persons who drink water that contains cyclopoid copepods or, more generically, water fleas that have ingested *D. medinensis* larvae. Infected persons remain free of symptoms until about 1 year postinfection when adult female worms in the connective tissue provoke the formation of a painful blister in the skin. The blister rapidly becomes an ulcer through which the worm protrudes to release larvae when stimulated by contact with water. In about 90% of cases the worm emerges from a lower limb. The 70- to 100-cm long worm dies and must be extracted, usually by winding a few centimeters on a stick each day, a very painful process which may last many weeks. Disability from infection lasts for weeks to months, depending on the number of worms and where they emerge.

The annual incidence is estimated at 5 to 10 million cases per year, and approximately 140 million people are at risk. Dracunculiasis occurs in West Africa, extends across Sahelian countries into East Africa (a total of 19 countries). In Asia dracunculiasis is endemic in Pakistan, and western India.

Transmission usually occurs seasonally, during the dry or rainy season (depending on the local ecology), and the impact on the productivity of agricultural workers may be dramatic. Incidence is highest in the 19- to 40-year old age group. Impact on school attendance is also substantial. Infected persons do not develop immunity. There is no known animal reservoir. Neither effective drugs nor vaccine exist.

Dracunculiasis was declared eliminated from southern USSR (Turkestan) in the 1930s, from Iran in the 1970s, and from Tamil Nadu State in India in 1984. During the International Drinking Water Supply and Sanitation Decade (1981-1990) a major initiative to eradicate dracunculiasis has steadily gained momentum. The ultimate goal is global eradication of dracunculiasis. The intermediate goal is the elimination of endemic dracunculiasis from each endemic country. This goal is planned in the World Health Organization's (WHO) Global Medium Term Program for Parasitic Diseases (covering the period 1984 to 1989; PDP/MTP/83.3); it was declared in April 1981 and November 1987 by the Steering Committee of the International Drinking Water Supply and Sanitation Decade; and it was proclaimed in the resolutions "Elimination of Dracunculiasis" (adopted by the World Health Assembly in 1986, WHA39.21), and "Eradication of Dracunculiasis" (adopted by the Regional Committee for Africa in 1988, AFR/RC38/19/WP17).

There is a growing realization that dracunculiasis can be eradicated soon. The methods of control are simple. Affected populations can be educated about the origin of this disease and what they can do to prevent it, and can be provided with new sources of safe drinking water. Existing unsafe sources of drinking water can be safely treated with chemicals to control copepod populations. This manual provides guidelines and considerations for the application of these chemicals.

I. Using Chemicals to Control Copepod Populations

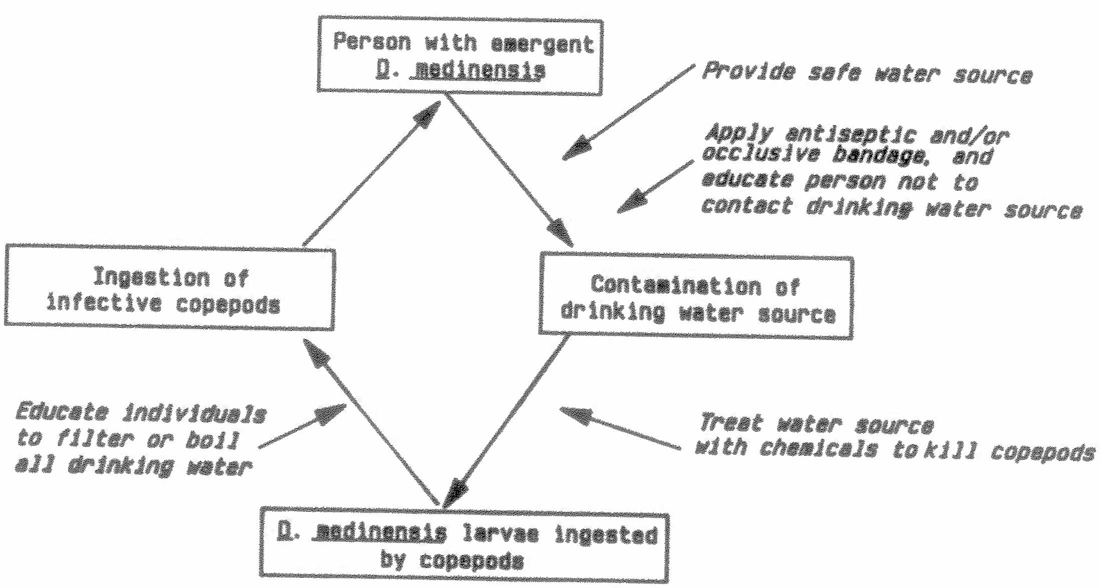
Breaking the Transmission Cycle

There are three recognized ways of interrupting transmission of D. medinensis to eliminate endemic dracunculiasis from villages.

- Provide safe (copepod-free) sources of drinking water.
- Teach residents that the disease comes from their drinking water and instruct them to use filters to remove copepods and/or to boil drinking water.
- Apply chemicals to control copepod populations in sources of drinking water.

The points of intervention in the transmission cycle are indicated in the figure below.

Figure 1.
D. medinensis Life Cycle
Points of Intervention Against Dracunculiasis



Choosing the Best Method

There is no single best intervention strategy. It is important to use the most judicious mix of available interventions, especially when permanent sources of safe drinking water are not present and when their provision is not forthcoming. In such instances, if both resources and commitment allow, chemical control of copepods may be used to complement health education. All interventions must be implemented so that interference with normal village activities is minimal.

When to Use Chemicals

Consider using chemicals to control copepods when the following conditions apply.

- When unsafe sources of drinking water are few, small to moderate in volume (500 m^3 or less) and shared by many people.
- Where provision of permanent sources of safe drinking-water is not feasible, either for geological reasons or because the community is too small or remote, and when the volume of water to be treated is 500 m^3 or less.
- Where health education compliance is poor.
- During outbreaks of dracunculiasis, to reduce incidence while villagers wait for the provision of permanent sources of safe drinking water.
- When an additional security measure is needed to prevent transmission in areas where elimination is imminent or recently achieved.

Cost Considerations

Hypothetical benefit-cost ratios have been formulate interventions in an inland West African country (Paul, et program which used epidemiological surveillance, started community participation, made health care available, and sources of drinking water, yielded a benefit-cost ratio o more than twice the investment). When chemical control temephos (Abate[*]) was used instead of underground sources the benefit to cost ratio increased to 4.14.

Which Chemical to Use

Several chemical disinfectants and pesticides have b conditions to control copepod populations in sources of d one recommended is temephos; its efficacy has been evalua studies and under field conditions in Africa and Asia. E chemical in other vector-borne disease-control programs h safe for people to use and has low toxicity to mammals.

A number of chemical compounds, e.g., chlorine, pota DDT, and zinc carbamate, have been evaluated for efficacy However, for reasons of safety of use, relative efficacy, to mammals, these chemicals are not recommended for use i control.

*The use of trade names is for identification only and do endorsement by the Public Health Service, the U.S. Depart Human Services, or the World Health Organization.