

Guinea-worm Disease

S. K. Litvinov

How the USSR rid itself of dracunculiasis

The author outlines the endeavours that led to the eradication of human dracunculiasis from the Soviet Union in 1931.

Dracunculiasis is one of the oldest known parasitic diseases of man. References to it occur in the writings of ancient Egyptian, Roman and Greek physicians. Abu Ali ibn Sina (Avicenna, eleventh century) gave the first detailed clinical picture of the disease.

Light on the life-cycle

In 1868, during an expedition to what is now the Uzbek Republic, Alexei P. Fedchenko observed that dracunculiasis was prevalent in the areas of Bukhara, Dzhizak, Karshi, and Samarkand. In 1869 he identified larvae of the guinea-worm, *Dracunculus medinensis*, in the body cavity of copepods (*Cyclops*), infected *Cyclops* with the

larval parasites, and traced their development in this host. He concluded that man was the definitive host of the parasite, with *Cyclops* as the intermediate host. *Cyclops* was shown to be infected with larval parasites that entered water from persons with the disease; and it was found that people became infected when they drank unboiled water containing *Cyclops* with mature larvae of *D. medinensis* in their bodies (1). However, Fedchenko erroneously believed that the larval parasites entered *Cyclops* by penetrating its body wall.

Fedchenko grasped the epidemiological significance of small storage ponds that teemed with *Cyclops*. These reservoirs supplied water for washing clothes, bathing, and so on. Fedchenko compared the situation in Bukhara, Dzhizak and Karshi, where the reservoirs were never cleaned, the water was hardly ever changed, and dracunculiasis morbidity was extremely high, with that in Tashkent where the water in

Dr Litvinov, a former Assistant Director-General of the World Health Organization, is now Chief of Laboratory at the Central Research Institute of Epidemiology, 3a Novogireevskaya Street, 111 123 Moscow, USSR.

the storage ponds was frequently changed and dracunculiasis was not observed. He advised that, in order to avoid becoming infected, people should drink boiled or filtered water, or, at the very least, running

Control was based on the principle of breaking the link between the definitive and intermediate hosts.

water from irrigation channels. Unfortunately, in 1873 Fedchenko's researches were brought to an end by his death at the age of 29 on Mont Blanc.

From control to eradication

Studies were subsequently conducted on the development of *D. medinensis* larvae in *Cyclops* up to the invasive stage, on the experimental infection of dogs, and on other matters relating to the disease.

Between 1923 and 1932, measures were devised by the Tropical Institute in Bukhara for the eradication of the disease from this city and eight permanent settlements nearby, the only remaining foci of infection in the USSR. The previously known foci in Dzhizak, Fergana, Karshi, Katta-Kurgan, Khiva, Merv, and Samarkand had become extinct because of the drying up of water sources, the departure of entire populations, and other factors. In the Bukhara region, people habitually walked barefoot into storage ponds and then scooped up water for drinking. Neither the sinking of deep wells nor the issuing of advice against using the storage ponds had any practical effect on this traditional behaviour.

Control was based on the principle of breaking the link between the definitive and intermediate hosts. The control measures included: early detection and recording of cases, action to render them harmless as sources of contamination; destruction of *Cyclops* in storage ponds; and health education.

To prevent the contamination of storage ponds, 0.001% mercuric chloride was administered to kill larvae in human tissues. Mechanical stimulation of the helminth was sometimes performed to induce the expulsion of embryos from the uterus. Well covers were fitted and dogs with dracunculiasis were destroyed. A specially produced film was used in a major educational effort. Stagnant storage ponds were periodically drained and cleaned; the water level was lowered at certain times to make conditions less favourable for *Cyclops*.

The last indigenous case of human dracunculiasis in the USSR was reported in 1931. Since then, *D. medinensis* has been found only in carnivorous animals in some areas of the southern republics. It is important to note that eradication owed much to the construction of a safe water supply system in Bukhara in 1929. Epidemiological monitoring and prophylactic measures have been continued over the intervening years. □

Reference

1. Fedchenko, A. P. [Concerning the structure and reproduction of the guinea-worm (*Filaria medinensis* L.)]. *Proceedings of the Imperial Society of the Friends of Natural Sciences, Anthropology and Ethnography*, 8: 71–81 (1870) (in Russian). Reprinted in English in: *American journal of tropical medicine and hygiene*, 20: 511–523 (1971).

Areas in which dracunculiasis is reported or probably exists, 1990

