Success against lymphatic filariasis

Wuchun Cao, Catharina P.B. Van der Ploeg, Zhengxuan Ren, & J. Dik F. Habbema

A campaign against lymphatic filariasis began in China’s Shandong Province during 1956. Epidemiological surveillance since 1984 indicates that the transmission of infection has been interrupted. The factors accounting for this are discussed and the continuing challenges presented by the disease are outlined.

Some 120 million people in the world are affected by lymphatic filariasis, and it is hoped that the present report of a successful long-term campaign against the disease in China’s Shandong Province will contribute towards diminishing its incidence. Over 50 million people in the province were at risk from the disease in 1956, when the control programme began. Until 1969 the main effort went into epidemiological investigations aimed at determining parasite and disease profiles. Filariasis caused by Wuchereria bancrofti was endemic in 74 of the 106 counties or cities in the province. The average prevalence of microfilariae was 7.1% in the areas of endemicity, where over 2.5 million people were estimated to be affected; the mean prevalences of chyluria, lymphoedema/elephantiasis and hydrocele were 0.4%, 1.4% and 6.1% respectively, and acute retrograde adenolymphangitis occurred frequently. The main vector of W. bancrofti was Culex pipiens pallens, which made up about 95% of the mosquito population in human dwellings. On average, 13.8% of the mosquitoes were infected, and up to about half of these carried infective filarial larvae. On a limited scale, persons carrying microfilariae were selectively treated with diethylcarbamazine.

From 1970 until 1983 a large-scale antifilarialis campaign was conducted. This involved eradication of the sources of infection through chemotherapy, together with vector control through the improvement of sanitation. Diethylcarbamazine was used in the following ways.

- Blood examinations were followed by selective treatment of individuals carrying microfilariae.
- Mass treatment was performed.
- Salt with admixed diethylcarbamazine was distributed in the community.

For selective and mass treatment the usual practice was to give 0.6 g daily for 7 days, resulting in a total dose of 70 mg/kg body
weight for adults weighing about 60 kg. Selective treatment was the mainstay of the programme in 27 counties or cities of low endemicity. After three to five courses of selective treatment the average prevalence of microfilariae had fallen from 1.3% to 0.09%. Mass treatment was given in 14 counties or cities where the average prevalence was 5.8%; the level had fallen to 0.17% after three courses. Medicated salt, containing diethylcarbamazine at 0.3% by weight, was given in 1972 to about 23 million people in 33 counties or cities where endemicity was medium to high and where, in six months, there was a decline from 13.2% to 0.15% in the prevalence of microfilariae. By 1983 the prevalence of microfilariae was below 1% throughout Shandong Province.

Systematic surveillance since 1984 has indicated continuing reductions in the prevalence of microfilariae in the human population and in the infection of mosquitoes, the levels having declined to zero in many villages. There have been no instances of infection in children aged under 10 years. Positive results of immunological tests in former areas of endemicity have fallen to the same level as in areas where the disease was not endemic (1). Thus the transmission of filariasis appears to have been interrupted.

**Organizational structure**

The control of filariasis was integrated into the National Programme for Agricultural Development in 1956, when the disease was identified as a significant factor hindering economic advance. Administrative arrangements were made at the national, provincial and county levels so that political and monetary obstacles could be overcome. In 1955 the Shandong Institute of Filariasis Control was established and in 1958 it was incorporated into the Shandong Institute of Parasitic Diseases, which continues to play a key role in the implementation of the provincial control programme.

Anti-epidemic and sanitation stations at prefecture and county levels are responsible for collecting blood samples, delivering drugs, providing diethylcarbamazine-treated salt, and other activities. The National Technical Steering Group for Filariasis Control and Research provides guidance on research requirements and other matters, and organizes the assessment of provincial measures aimed at the basic elimination of filariasis.

**Control strategy**

The primary objective of the control programme was to eliminate the parasite reservoir and thereby to diminish morbidity associated with filariasis. Strategies for large-scale intervention were devised on the basis of evidence from epidemiological and sociological investigations and pilot studies, which led to the following conclusions.

- Infection with filariasis was a slow process because of the relatively long life cycle of the parasite, which did not multiply in either mosquitoes or humans. There was consequently a prospect of using chemotherapy to eliminate sources of infection and thereby stop transmission.

- Epidemiological assessment of endemicity was essential at the onset of the control programme so that suitable approaches could be adopted. For community-based intervention, selective treatment was preferable in areas of low endemicity, whereas mass treatment and the distribution of salt with added diethylcarbamazine were of greater value in areas of medium to high endemicity.

- The administration of salt medicated with diethylcarbamazine was feasible and efficient because the salt supply could be strictly controlled by the health authorities.

- Once the prevalence of microfilariae was reduced to less than 1%, mass intervention was unnecessary and satisfactory progress was attainable through elective detection
and target treatment of individuals carrying microfilariae.

- It was desirable for the control of the mosquito vector, under the auspices of the Patriotic Health Movement, to be integrated into the filariasis control programme.

**Involvement of communities and health workers**

Initial discussions were held between government and local officials and medical personnel, village leaders met to consider plans of action, and general village meetings were organized to educate the public about the disease, its transmission and the benefits of intervention. Posters were put up, a film was shown, and leaflets on objectives and planned activities were distributed. Investigators and technical personnel worked with the community to solve problems. The Patriotic Health Movement promoted community participation in the control of the mosquito vector and the administration of diethylcarbamazine through mass treatment and the distribution of medicated salt. The general population became involved in all activities associated with the control programme.

Personnel attached to anti-epidemic stations and community health service centres were trained to meet the requirements of the programme. Young persons who had just left school were trained as field health workers, microscopists and health educators. They joined antifilarial teams performing control activities in areas of endemicity, and many eventually became rural doctors providing primary care in the community.

**Prospects for eradication**

Attention is being directed to certain outstanding problems.

- A few cases of microfilaraemia remain in some areas and could act as sources of infection where mosquito vectors cannot yet be controlled.
- Filariasis caused by *W. bancrofti* is still endemic in the neighbouring province, with the result that the disease is brought into Shandong Province by migrating workers.
- New cases of filariasis emerge even after basic elimination has been achieved. In fact over two million persons with lymphoedema/elephantiasis, hydrocele and chyluria await treatment.

The principal task at present is that of epidemiological surveillance. Traditional blood examination has major financial and practical drawbacks. Cost-effective, practical monitoring methods are needed to replace the routine nocturnal blood smear check, which at present is the only reliable way to detect microfilaraemia. Immunological assays on blood samples collected during daytime could be of value in monitoring changes in antibody levels after the control of filariasis, but active infection cannot be detected in this way.

Furthermore, blood examination does not allow the discovery of sources of infection because the density of microfilariae falls to extremely low levels at the post-control stage. The counting of filarial larvae in dissected mosquitoes has been performed instead. This, however, requires morphologically intact specimens and is excessively time-consuming, and consequently the method is unsatisfactory. A means of dealing with large batches of crudely preserved specimens is required.

Action against the vector is vital if the achievements of filariasis control are to be consolidated. Environmental measures should be further
strengthened so as to reduce the mosquito population density. Personal protection against mosquitos is also important, particularly through the use of bednets and window screens.

The success of the filariasis control programme in Shandong Province is attributable to:
- the importance attached to it nationally;
- an excellent organizational structure;
- appropriate control strategies;
- community involvement;
- the efforts of scientists, health care personnel and special antifilarial teams.

The main requirements now are to tackle problems arising from the introduction of sources of infection through migration and from the lack of cost-effective and practical methods of surveillance. Moreover, improvements are needed in the management of patients with clinical manifestations of filariasis.

Reference


Global malaria control strategy

The goal of malaria control is to prevent mortality and reduce morbidity and social and economic losses, through the progressive improvement and strengthening of local and national capabilities. The four basic technical elements of the strategy are:

- to provide early diagnosis and prompt treatment;
- to plan and implement selective and sustainable preventive measures, including vector control;
- to detect early, contain or prevent epidemics;
- to strengthen local capacities in basic and applied research to permit and promote the regular assessment of a country’s malaria situation, in particular the ecological, social and economic determinants of the disease.