

Eliminating onchocerciasis as a public health problem: the beginning of the end

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Onchocerciasis is one of the diseases targeted by Vision 2020. It is the world's second leading infectious cause of blindness, responsible for at least one million blind or severely visually disabled people. The Onchocerciasis Control Programme (OCP) in sub-Saharan Africa will be closed down in 2002, after 27 years of operation. This is the clearest indication that the prospects of eliminating onchocerciasis as a public health problem may be achieved by the end of this decade. The programme's potential now is to serve as a model of global and multiple partnership, to address other poverty related, serious and intractable problems such as needless blindness in the world.

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Onchocerciasis is one of the major diseases targeted by Vision 2020, the global initiative for the elimination of avoidable blindness. It is also one that has inspired many of its current strategies. It is the world's second leading infectious cause of blindness, responsible for at least 1 million blind or severely visually disabled people. To these were being added each year, until recently, an estimated 40 000 new blind. About 125 million people are estimated at risk of the disease, of which some 18 million are already infected.¹

Onchocerciasis is endemic in 30 sub-Saharan African countries, where 99% of all those infected live. It is an insect borne disease, caused by a nematode worm, *Onchocerca volvulus*, and transmitted from one individual to another by a black fly of the genus *Simulium*. The black fly larvae require well oxygenated water to mature, and eggs are laid in rapids in fast flowing rivers and streams. Female black flies require a blood meal to initiate ovulation, and it is during this meal that they may transmit or receive the onchocercal infection. It takes infective larvae about 12 months to mature into adult male or female worms, after entering the skin of the human host. However, this must be repeated many times over, and many years of exposure are usually required, before a heavy load of adult worms and hence, pathogenic microfilariae, builds up in the human host.²

The clinical features of onchocerciasis (Table 1) may be divided into two main groups: ocular and non-ocular, the latter being dominated by various manifestations of onchocercal skin disease. Early stages of both forms of the disease are completely reversible.

As its other name "river blindness" suggests, onchocerciasis is a focal disease. Its impact, however, on those communities most at risk is often extensive and devastating, affecting not only the infected individuals themselves, but also their families and communities at large. The people most at risk from the disease are those who for reasons of occupation (for example, fishermen, farmers, sand diggers) or residence (for example, members of first line villages), spend long hours or live nearer to the breeding sites. In many hyperendemic communities with blinding onchocerciasis, almost every person will be infected, and half of the population will be blinded by the disease before they die. Once blind, affected individuals have a life expectancy of only one third that of the sighted and most die within 10 years. In west Africa, many such communities were totally and irrevocably abandoned; but doing so also meant leaving behind the only fertile areas of those otherwise arid regions. An unending cycle of increasing human misery was thus entered by entire communities.^{3, 4}

Blindness in onchocerciasis, however, is only one facet of the medical, social, and economic tragedy that this disease represents. As recent studies in Ethiopia, Nigeria, and Sudan have shown, onchocercal skin disease is just as damaging, being responsible for poor school performance and a higher dropout rate among infected children (due to itching, lack of sleep, etc); low productivity, low income, and higher health related costs among infected adults; and extreme forms of social stigmatisation, especially among women.⁵

ONCHOCERCIASIS CONTROL IN THE WORLD TODAY

Current activities

Today, nearly all endemic countries in the world are covered and monitored by one of the three major regional programmes: the Onchocerciasis Control Programme of the Americas (OEPA) in Central and Latin America; the Onchocerciasis Control Programme (OCP) and the African Programme for Onchocerciasis Control (APOC) in sub-Saharan Africa. All three are the result of joint efforts and support from WHO and other UN agencies, the World Bank, and a coalition of non-governmental and development organisations (NGDO).

Underlying strategies

All current control activities are based essentially on two basic strategies, used alone or in combination—*Simulium* vector control and large scale chemotherapy with ivermectin.

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Table 1 Clinical features of onchocerciasis

Ocular manifestations	Non-ocular manifestations
<p>Anterior segment</p> <ul style="list-style-type: none"> Live microfilariae in anterior chamber (AC) Punctate keratitis, leading onto sclerosing keratitis Early uveitis, leading onto chronic uveitis Secondary glaucoma <p>Posterior segment</p> <ul style="list-style-type: none"> Choroidoretinitis, leading onto choroidoretinal atrophy or optic nerve atrophy Acute optic neuritis, leading onto optic atrophy <p>Others</p> <ul style="list-style-type: none"> Night blindness Visual field loss and constriction Irreversible blindness, from any of the above 	<p>Skin disease</p> <ul style="list-style-type: none"> Pruritus: often severe and unrelenting Nodules: subcutaneous, painless, typically found around bony prominences (iliac crest, greater trochanters, ribs, knees, coccyx, and skull) Severe, disfiguring skin disease: may lead to social stigmatisation, psychological and sleep disorders <p>Others</p> <ul style="list-style-type: none"> Lymphatic: lymphadenopathy, hanging groin Unknown associations: hyposexual dwarfism, higher prevalence of epilepsy

The main goal in vector control is to interrupt transmission of *O. volvulus* by regular aerial spraying of all *Simulium* larval breeding sites; and to maintain this for at least 14 years—that is, until the infection has died out in the human population. Vector control, used initially alone and more recently, in combination with ivermectin, has been the chief strategy of OCP since its establishment in 1974.

At the present time, ivermectin (Mectizan, MSD) is the only chemotherapeutic agent recommended for use against onchocerciasis, and its mass distribution constitutes the main strategy for the other two regional programmes, APOC and OEPA. It was developed during the early 1980s and donated free in 1987, for the treatment of human onchocerciasis, by the manufacturers, Merck, Sharp & Dohme. A microfilaricide, ivermectin is effective for up to a year, at the recommended single dose of 150 µg/kg, and is quite safe, having a very wide therapeutic range (150–800 µg/kg). Moreover, it is highly attractive and popular in endemic communities for its many other beneficial (ancillary) effects on intestinal worms, scabies, head lice, and for its supposed enhancing effect on libido. Its main drawback, however, is its lack of any demonstrable direct macrofilaricide effect, which means it must be given repeatedly every year for up to 12–15 years—that is, the time it takes for most adult worms to die.

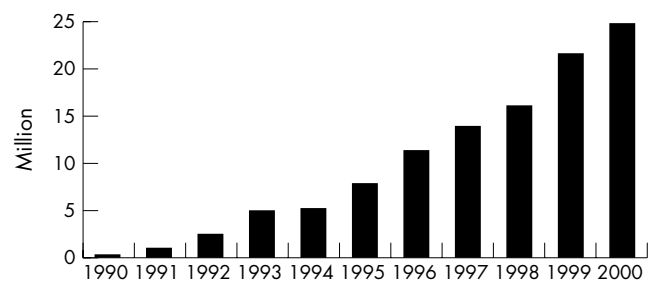
Achievements to date

In the OCP area of operation, vector control combined with mass distribution of ivermectin have been so effective that onchocerciasis has been virtually eliminated as a public health problem in the original seven countries of the programme. In the remaining four, control activities are so advanced that OCP will officially and safely close down in 2002, and all residual control and surveillance activities transferred to member states. Thanks to the programme, an estimated 600 000 cases of blindness have been prevented and 16 million children born in the area since 1974 spared from the risk of the disease. Likewise, some 25 million hectares of fertile, riverside land, previously deserted for fear of the disease, are now being reclaimed for resettlement and cultivation.

Equally spectacular has been the progress made in ivermectin treatments since its donation by Merck. As can be seen in Figure 1, close to 24 million people had received treatment in 2000, against some 227 000 in 1990. This represents a more than 10-fold increase in only 10 years!⁶

The reasons for the success of onchocerciasis control

There will no doubt be a more appropriate opportunity for a thorough review of these remarkable achievements against a condition which, not too long ago, was still being looked at with a great deal of scepticism and cynicism, as it was consid-

**Figure 1** Annual treatment with ivermectin (1990–2000).

ered too complex and too expensive to tackle. It is quite likely that the battle for paternity for the success of onchocerciasis control will be fierce, the more so because there has not been one single recipe or one miracle solution, but a number of small steps and contributing factors which, put together, have led to what is already being hailed as a modern public health success. The following is a non-exhaustive list of some of these contributing factors:

- The historic donation by Merck of ivermectin to “as many as need it, for as long as needed,” which has served as a catalyst for most control activities of the past decade. Nearly 15 years on, the depth and breadth of this landmark act of philanthropy by a pharmaceutical company is still unsurpassed.
- The development of a cost effective, rapid assessment method, the REMO (Rapid Epidemiological Mapping of Onchocerciasis), which, within 5 years, has enabled the mapping of nearly all the mesoendemic and hyperendemic communities targeted for mass treatment with onchocerciasis, and their incorporation into a geographic information system (GIS).
- The availability at country level, of an extensive database (GIS), not only of all endemic communities and their corresponding population targeted for mass treatment, but also of other relevant data (for example, information on access, schools, health facilities in these communities). These data are updated regularly by well trained local (national) teams of technicians, and used more and more for both planning and monitoring purposes.
- The establishment of a complex, multiple, and well coordinated partnership, both at the international and national level, bringing together endemic states, donor countries, agencies and foundations, WHO, and other UN agencies, the World Bank, and a growing coalition of NGOs.
- The long term commitment on the part of all the partners, not only to support control activities, but also to ensure the

achievement of the main objective of the various regional programmes, which is to eliminate onchocerciasis as a public health and socioeconomic problem. Even more remarkable is the fact that many of the early supporters of OCP 27 years ago are still active members of the "onchocerciasis control family" today.

- The existence in each member country of truly functional national coordinating structures, known as the National Onchocerciasis Task Force (NOTF), in which all key players in onchocerciasis control (programme managers, researchers, NGOs), meet regularly, under the leadership of the ministry of health to plan, implement, monitor, and evaluate together all ongoing activities. Some of these structures have been in existence for several years and have led to the emergence of polyvalent national onchocerciasis teams in many countries.
- The possibility and provision within the programmes to initiate operational research as and when appropriate, on any of the programme components, and apply and integrate any significant finding into ongoing operations. This has often led to the significant improvement of many of the tools used in control activities.
- A flexible use of mass distribution of ivermectin, which over the years has evolved from mobile strategies used in the early days following ivermectin donation, to various forms of community based treatment. The latest and most widely used of these, also as known as Community Directed Treatment with Ivermectin (CDTI), is the preferred and official method used throughout Africa by both OCP and APOC. Its main strength is the extent to which it seeks to empower affected communities themselves by getting them involved at all stages of treatment activities (planning, mobilisation, implementation, and monitoring) and by helping them to creatively contribute to the overall success of ongoing control efforts.^{7 8}

The future of onchocerciasis control

The closing down of OCP in 2002, after 27 years of operation, will be the clearest indication yet that the prospects to eliminate onchocerciasis as a public health problem are not only real, but may be achieved by the end of this decade, provided current distribution activities and their support by the international community are sustained. In fact, this time frame may be further reduced if a safe and effective macrofilaricidal drug is soon made available, through the *MACROFIL* project, a WHO based research project specifically established for that purpose.

The hope for the successful control of onchocerciasis however is not just the millions in endemic communities who will be delivered from the irreversible damages of a dreadful disease, but its potential to serve as a new model of global and multiple partnership, to address other poverty related, serious and intractable problems such as needless blindness in the world.

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