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ONCHOCERCIASIS: IMPACT OF INTERVENTIONS

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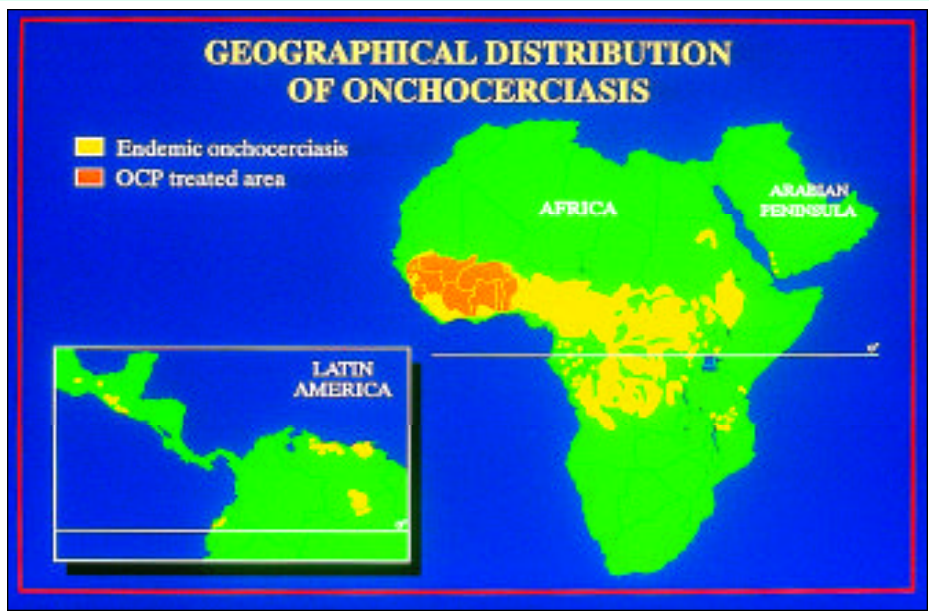

Geographical distribution of onchocerciasis

Graphics: International Centre for Eye Health

The Disease

Onchocerciasis, more commonly known as 'river blindness', is a parasitic, blinding disease, endemic in 30 African and six Latin American countries. Recent estimates point to around 18 million people infested with the parasite, the nematode *Onchocerca volvulus*, and some 270,000 who are blind from ocular complications.[1]

Control Efforts

Since before 1972, onchocerciasis had been subject to attempted control of transmission, beginning in the late 1940s in Africa. A unique success was the elimination of transmission of *Onchocerca volvulus* in one valley in Kenya, through the use of DDT. This result was lasting because of the ecological situation within a very isolated focus. However, similar attempts of vector control in other foci in West Africa had all failed because of re-invading flies from nearby endemic areas. At a meeting in Tunis in 1968, the idea of a large vector control zone in the Volta River Basin Area, which could encompass all known transmission and breeding sites and rule out re-invasion, was introduced. This was the philosophy behind the creation of the Onchocerciasis Control Programme (OCP) in West Africa, which was planned by WHO from 1972 to 1974, with joint input from the United Nations Development Programme (UNDP), the Food and Agricultural Organization (FAO) and the World Bank. OCP started its aerial operations for vector control in seven West African countries in early 1975, eventually covering an area of 1,235,000 km^2 and 50,000 km of river stretches. It was then expanded to 11 countries, and has undergone significant changes in terms of strategies and operations for control of onchocerciasis. It soon became clear that the problem of re-invading flies could occur, even in the new, vast programme area. After a few years, resistance by *Simulium* to the first insecticide used (temephos, or Abate®) became evident in certain foci. Despite these difficulties, OCP managed to continue its operations, with rotational use of other insecticides. When ivermectin (Mectizan®) was made available by Merck & Co., a new strategy was added; the distribution of ivermectin to affected populations in certain foci. It had been demonstrated that ivermectin, taken in annual doses, had a pronounced suppressive effect on onchocercal disease,[2] also reducing the microfilarial skin load down to very low levels for many months. A number of studies have been carried out on delivery systems and cost recovery for ivermectin delivery to those in need.[3] It became possible

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tocontrolboth thedisease andcontributeto transmission interruption in affected areas.

Twenty-Five Years of Progress

OCP has celebrated its 25th anniversary. It is a hugely successful programme, which has protected approximately 11 million children against onchocerciasis – and around 500,000 people have been saved from blindness. In addition, there has been tremendous socio-economic gain in the resettlements of new communities in the previously infested areas – some 250,000 km^2 of 'new' land has been resettled and is now being cultivated. New agricultural and other development schemes in these onchocerciasis-freed areas have contributed to an Economic Return Rate of around 18%, which is significant. OCP is now preparing for its closing down by the end of 2002, although surveillance activities for possible recrudescence of disease will continue.[4] Much work has also been done to transfer the necessary capability to Ministries of Health in member countries.

In parallel with the OCP developments, making use of ivermectin, new control programmes were also planned. In Latin America, where onchocerciasis is endemic in six countries (but with less blinding potential) a new project was created – the Onchocerciasis Elimination Programme in the Americas (OEPA). In that setting, with different and less 'effective' vector flies, the regular dosing of populations by means of ivermectin is likely to lead to complete interruption of transmission. The total elimination of the disease is possible, and good progress is being made in this direction. In Africa, a new African Programme for Onchocerciasis Control (APOC) was established in 1995, creating a partnership with a group of dedicated non-governmental organizations, in addition to the agencies already involved in OCP. APOC covers onchocerciasis in the remaining 19 endemic countries in Africa, in addition to the 11 OCP countries. APOC has made rapid progress in implementing Community Directed Treatment with Ivermectin (CDTI), through national task forces in all participating countries. The CDTI strategy promotes cost-effective and large-scale

ivermectin distribution to populations in need in endemic areas. Thus, the present estimated annual treatments are in the order of 15 million cases in the OCP and APOC areas.

It can be safely stated today that the elimination of onchocerciasis as a public health problem is now within reach. The ongoing and planned operations in the three control programmes (OCP, OEPA and APOC) will cover all disease foci, where intervention is necessary. Thus, by the year 2010, it will be possible to conclude that visual loss due to this dreadful disease will disappear. This would be one of the major achievements within the Global Initiative for Elimination of Avoidable Blindness, launched in 1999 by WHO in collaboration with a dedicated group of non-governmental development organizations, under the theme of 'Vision 2020: The Right to Sight'. The Initiative, which focuses on five major causes of avoidable blindness, is an outstanding effort for global action and partnership in the prevention of blindness. The possibility of eliminating onchocerciasis as a public health and socio-economic obstacle to development, is perhaps the first victory in sight for the 'Vision 2020' Global Initiative.

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Review Article

Vision 2020: Update on Onchocerciasis

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Onchocerciasis, also known as 'river blindness', is an insect-borne disease, caused by a nematode worm, *Onchorcerca volvulus*. It is the world's second leading infectious cause of blindness. In most of these countries it constitutes a public health problem and a serious obstacle to socio-economic development.

Disease Prevalence and Burden

- About 125 million people world-wide are estimated at risk of onchocerciasis, and, of these, 96% are in Africa.
- Of the 37 countries where the disease is endemic, 30 are in sub-Saharan Africa, six are in the Americas and one is in the Arabian Peninsula.
- A total of 18 million people are infected with the disease, of whom 99% live in Africa and at least one million are either blind or severely visually disabled. To these are added each year an estimated 40,000 new blind.

As the name 'river blindness' suggests, onchocerciasis is essentially a focal disease. However, where it exists, its impact on affected communities may be quite extensive and devastating. Thus, in many hyperendemic areas 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.

Recent studies in Ethiopia, Nigeria and Sudan have also shown that onchocerciasis is responsible for poor school performance and a higher drop out rate among infected children (due to itching, lack of sleep, etc.), while low productivity, low income and higher health-related costs are found among infected adults.

Disease Transmission

The parasite. *Onchocerca volvulus*, the causal agent of onchocerciasis is one of a large group of nematodes. The adult worms live encysted in fibrous nodules. Each nodule contains between 2-3 female worms lying in a twisted, tangled mass, hence the term *volvulus*. Adult female worms have a life span of 8 to 10 years but may live up to 15 years, during which time each releases millions of first-stage larvae, also known as microfilariae. In hyperendemic areas, the total microfilaria load in the body of affected individuals may be as high as 150 million.

The vector. Onchocerciasis is transmitted from one individual to another by a black fly of the genus *Simulium*. The blackfly 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 produce/lay eggs, and it is during this meal that they may transmit or receive the onchocercal infection.

Cycle of infection. Microfilariae enter a female blackfly when she bites an infected person. A small percentage of these reach the insect's thoracic muscles where after several moults, they become third-stage infective larvae. They then migrate to the insect's salivary glands and are ready to be transferred during the next blood meal.

After entering the skin of the human host through the bite of an infected blackfly, the infective larvae (usually two to six) migrate through the subcutaneous tissues. Here, over the next 12 months, each larva will mature into an adult male or female worm. Before a heavy load of adult worms and pathogenic microfilariae builds up in the human host, this sequence has to be repeated many times over, and many years of exposure are usually required.

Clinical Manifestations

The people most at risk from onchocerciasis are those who for reasons of occupation (e.g., fishermen, farmers, sand diggers) have spent long hours or live nearer to the breeding sites. Early manifestations of the disease in infected persons usually appear one to three years after the injection of infective larvae. Nearly all the lesions of onchocerciasis including those in the eye, are directly or indirectly related to local death of microfilariae. Generally, live microfilariae stimulate very little inflammatory response and the mechanisms that protect them from the host's immune response are still largely unknown.

Box 1: Non-Ocular Manifestations

- **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 thedistress ofsocial stigma, psychological and sleep disorders
- **Lymphatic:** lymphadenopathy, hanging groin
- **Unproven but suspected associations:** hyposexual dwarfism, higher prevalence of epilepsy