Onchocerciasis
A neglected disease

Linda Hoevenaren

Nigeria. Daren is a 54-year old woman suffering from severe skin lesions covering her whole body, causing an uncontrollable itching. Her sight is almost gone and therefore her six-year-old granddaughter leads her around the village during the day. This is not the village where she was born. That place was abandoned a few years ago after many people started to develop the same symptoms she has. Daren lives with her son now and cannot take care of herself anymore. Neither can she contribute to the household. She feels useless and suffers from depression. Daren has onchocerciasis.

Pathogenesis and transmission
Onchocerciasis is caused by the nematode Onchocerca volvulus and its endosymbiont, the bacteria Wolbachia pipientis. Onchocerca volvulus is transmitted to humans through the bite of the black fly Simulium damnosum. Within the human body the parasitic worm is encapsulated in fibrous tissue where the female worm produces millions of microfilariae during her lifespan of eight up to fifteen years. The microfilariae migrate into the skin and may enter the eye. When they die, their Wolbachia endosymbionts are released, triggering a severe inflammatory response that causes the dermal manifestations of onchocerciasis and can destroy nearby tissue, such as the eye. Microfilariae may be ingested by black flies during a blood-meal. Within the vector they develop into infectious stages and are transmitted to the next human during subsequent bites. Humans are the only definitive host.

Clinical manifestations and diagnosis
Clinically, infection with Onchocerca volvulus presents one to three years after injection of larvae and consists of painless subcutaneous nodules containing adult worms, dermatitis with severe pruritus, lymphadenopathy, and ocular infection. After years of exposure to the parasites, irreversible blindness and severe disfiguring skin disease may occur. The skin thickens, and then loses its elasticity and atrophies, taking on the aspect of a ‘lizard skin’. Depigmentation can also occur, resulting in a so called ‘leopard skin’ ap-
pearance. The affected and often scratched skin has a high risk for secondary bacterial infections. Ocular infection may involve any part of the eye except the lens. If the infection is chronic, sclerosing keratitis can occur, leading to blindness. Confirmation of the disease can be achieved by finding microfilariae in skin snips or the eye.

Impact of disease
As the name river blindness suggests, onchocerciasis is mainly a focal disease, but where it exists, its impact on communities is extensive. In many hyper-endemic regions nearly everyone will be infected and half of the population becomes blinded by the disease before they die. Onchocerciasis is not a deadly disease, however once blind, affected individuals have a life expectancy of only one third that of the non-blind. Most blinded patients die within ten years, because they become completely dependent on other people, which can be deadly in many developing countries, and also because the infection reduces their immunity to other diseases. Onchocerciasis is the world’s fourth leading cause of preventable blindness after cataract, glaucoma and trachoma. Together with the severe skin manifestations this has an important socio-cultural and economic impact on endemic countries. It causes low self-esteem, social isolation and stigmatization. Itching, lack of sleep and tending after blind family, are responsible for poor school performance and a higher dropout rate among affected children, while low productivity, low income and higher health-related costs are found.

Epidemiology
Onchocerciasis distribution is linked to the location of the black fly vector, which is naturally found close to fast-running streams and rivers in tropical countries, hence the name ‘river blindness.’ Related to the habitat of the vector an estimated 125 million people worldwide are at risk of infection with onchocerciasis, and of these, 96% live in sub-Saharan Africa. The remaining 4% live in Latin America and Yemen. A total of 18 million people are infected with the disease, of whom 99% live in Africa, and at least one million people have been blinded or visually disabled by it. Each year there are 40,000 new cases of blindness due to river blindness. Travellers from non-infected regions of the world have little risk, since development of the disease requires prolonged exposure to fly bites and parasite introduction.

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The Mectizan Donation Programme
After Merck developed ivermectin, it became clear that even at a discounted price of $1.50 per treatment, the drug would be out of reach of the developing countries needing it the most. After completing the whole development process, abandoning the drug was unattractive, and therefore Merck was eager to donate it. Two economic factors that aided this decision are the U.S. tax benefits that reduce the net cost of the programme and successful marketing of the drug in the veterinary field. The company’s statement to donate ivermectin to anyone who needed it, for as long as it was needed, launched the world’s longest ongoing medical donation.
among infected adults. In some West African communities, blindness has affected up to 50% of adults and people fled from the fertile river valleys in fear of contracting the disease. The socio-economic impact of this migration was severe and still Onchocerciasis remains a major obstacle for economic development.

**Treatment**

Ivermectin, a broad spectrum antiparasitic agent, is a safe and effective drug against microfilariae. It does not need to be refrigerated and can be given by minimally trained community health workers. Ivermectin is used for treatment of infected individuals as well as for community-mass treatment, where entire communities are treated to reduce the transmission of the parasite. The drug has been donated from 1988 onwards by Merck, a pharmaceutical company, through the Mectizan Donation Programme (see Box), that will continue for those who need it in endemic regions for as long as necessary.

However, Ivermectin has its limitations. It does not kill adult worms and therefore repeated treatments are required for a long period of time since microfilariae producing adults can persist in the human host for over 10 years. In Africa, onchocerciasis endemic regions typically have high rates of co-infection with both *L. loa* and *O. volvulus*, two other filarial diseases. People with a co-infection cannot receive ivermectin,
Onchocerciasis has an important socio-cultural and economic impact on endemic countries

Control

The socio-economic impact of the disease was the main reason for creation of the Onchocerciasis Control Programme (OCP) in Western Africa in 1974. The OCP operated through the use of larvicide spraying to control black fly populations. From 1988 onwards, with the donation of ivermectin by Merck, they started community-directed treatment programmes with ivermectin. The programme was successful, and closed in 2002 after virtually stopping transmission of the disease in all eleven participating countries, except Sierra Leone due to a civil war. Continued monitoring ensures that onchocerciasis cannot re-invade the area of the OCP. In 1992 the Onchocerciasis Elimination Programme for the Americas was launched, and in 1995 the African Programme for Onchocerciasis Control began covering another nineteen countries in Africa that had not been included in the OCP programme. In 1999, Vision 2020, the global initiative for the elimination of avoidable blindness, was founded. Onchocerciasis is one of their target diseases and their aim is to eliminate blindness due to this disease by the year 2020. All three programmes work by mass distribution of ivermectin at community level and local vector control. Progress has been made in reaching treatment goals in many countries, although political unrest, lack of political support and insufficient resources cause low therapeutic coverage in several countries. The reliance on the single drug ivermectin as a control tool of onchocerciasis has led to interest in vaccination as a potentially complementary strategy. A vaccine trial in Western Africa of Onchocerca ochengi in cattle indicated that vaccination to prevent disease may be an achievable goal. Much research will be required to find a clinical vaccine candidate. There are many success stories for onchocerciasis but the elimination of the disease is far from being met. The collaboration of different health programmes, all with the aim of eradicating onchocerciasis, shows the importance of partnership in health and development in the fight against neglected diseases.

About the author

Linda Hoevenaren is a fifth year medical student at the University of Amsterdam.

Further reading


Global Medicine presents Neglected Diseases

About one billion people in the world are affected by one or more neglected tropical diseases (NTDs). Neglected, because these diseases persist exclusively in the poorest and the most marginalized communities, and have been largely eliminated and thus forgotten in wealthier places. www.who.int/neglected_diseases

This is the eighth article in a series on neglected diseases. For more information check www.globalmedicine.nl