The Six Diseases of WHO

Onchocerciasis

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Onchocerciasis is a disease of the skin and eye that follows infection with the filarial worm *Onchocerca volvulus*. It is transmitted by the bites of female black-flies of the genus *Simulium*.

Epidemiology

A rough estimate is that 20-40 million people are infected with *O. volvulus*. The disease may be acquired over most of tropical Africa south of the Sahara. There are small foci in Yemen and Saudi Arabia; and in the New World it is found in parts of Mexico, Guatemala, Venezuela, Brazil, Colombia, and Ecuador.

Within the endemic areas transmission occurs mainly in the vicinity of the fast-flowing watercourse where *Simulium* breed. In areas of heavy transmission nearly all the people may be infected; and, since infections with *O. volvulus* are cumulative, intense infections tend to build up from repeated inoculation of infective larvae. Heavily infected individuals are at high risk of developing severe eye lesions and, in the worst affected villages in the African savanna region, blindness rates as high as 15% may be found. From this comes the popular name "river blindness," which can disrupt the socioeconomic life of affected communities as the people are eventually forced to desert their villages and set up elsewhere, further from the infested rivers and often on less fertile land.

The parasite

After the bite of an infective *Simulium*, infective larvae of *O. volvulus* enter the human host. There is then a long prepatent interval, usually some 9 to 18 months, during which the parasites

grow into adult worms, mate, and start to produce microfilariae. The adult worms live coiled up in fibrous nodules. Some of these lie deep and inaccessible near the muscles, bones, and joint capsules. Others may be felt under the skin over the bony prominences, particularly the knees, trochanters, iliac crests, ribs, scapulae, and head. The females live for as long as 15 years, during which period each may produce several thousand microfilariae a day. The microfilariae are relatively large (about 300 microns in length) and have a life-span in the human host of some one to two years. Only if they are ingested by a feeding vector simuliid may they develop over six to nine days into infective larvae, which can then be transmitted to a new host when the fly bites again.

The pathology of onchocerciasis centres on the inflammatory and fibrotic processes that accompany the death of microfilariae in the skin, eye, and lymphatic tissues.

Clinical picture

The clinical picture of the disease varies greatly according to the intensity of infection, the age at which infection is first acquired, and the immune responsiveness of the host. Heavily infected patients with large numbers of microfilariae in the skin and eye and with severe ocular lesions (sclerosing keratitis, iridocyclitis, choroidoretinal lesions, or optic atrophy) or gross skin lesions (atrophy, depigmentation, etc), or a combination of these, may be common among those born and bred in hyper-endemic areas. But the clinical picture that usually presents to doctors in Britain is of a patient with a light infection, recently acquired, normally in adult life, during a relatively brief exposure in the endemic area. This type of patient usually complains of itching, with or without a reddish papular rash that often has a characteristic lop-sided distribution. It may be largely confined to one leg but reaching across to the other buttock and up the back; or mainly confined to one arm and across to the other shoulder and up the neck. In such cases an adult worm or worms is situated near the limb girdle on the affected side, and, although the nodule is usually impalpable,

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microfilariae from it invade the skin of the affected quarter causing the itching and the rash. The skin may be thickened over the affected parts; the draining lymph nodes may be slightly enlarged; and there may be deep aches and pains in the limb concerned.

Patients of this type sometimes have a few microfilariae in the eye, and may thus develop a mild punctate keratitis made up of "fluffy" or "snowflake" opacities around microfilariae that have died in the cornea. With the aid of a slit-lamp a few microfilariae may also be seen in the anterior chamber; but it is rare for such patients to develop any severe lesion of ocular onchocerciasis, and the punctate keratitis responds well to treatment.

The diagnosis often has to be made solely from the history and the clinical picture. It may be confirmed by finding microfilariae in the skin. A small shaving (or "snip") of skin is taken from over the affected part, placed in physiological saline, and examined for microfilariae after 30 minutes. If a tolerable number of snips fails to show microfilariae, which often happens in those lightly infected, their presence may be detected by the Mazzotti test. The patient is given a test dose of 50 mg diethyl-carbamazine citrate (DEC-C). If positive the itching and rash over the affected area will be exacerbated within 30 minutes to 24 hours.

Currently treatment is by careful dosage with DEC-C to kill the microfilariae, while endeavouring to damp down the often violent local and systemic reactions that may result from their death. This is followed by a course of suramin injections to kill the adult worms, and then more DEC-C to kill the residual microfilariae. The whole treatment may last two to three months, is not without unpleasant side effects for the patient, and requires practised medical supervision. For details the reader is referred to modern textbooks on tropical medicine.

There is no chemoprophylactic for *O. volvulus*. Prevention of infection during short visits to endemic areas must therefore be by avoiding, so far as possible, those places where *Simulium* are biting; and by wearing clothing, such as long trousers, shoes, and socks, which, in Africa, protect against the bites of *S. damnosum* and *S. neavei*.

New advances

The most important advance in controlling onchocerciasis over the past 30 years has been the demonstration that control of *Simulium* is feasible with organic chemical larvicides and that, by interrupting transmission in this way, the parasite will slowly die out of human population and the disease will thus disappear. This was first demonstrated in the Kodera "valley of the blind" in Kenya, where *S. neavei*, a slowly reproducing vector whose larvae live on crabs, was eradicated from this isolated focus by thorough larvicidal treatment with DDT.

This success has led on to the multi-million dollar joint Food and Agriculture Organisation/United Nations Development Programme/World Bank/World Health Organisation Onchocerciasis Control Programme in the Volta River basin in West Africa. Here, aerial application of the rapidly biodegradable organophosphorous compound temephos (Abate) is being used as a larvicide against the *S. damnosum* complex over an area of West African savanna that covers nearly 1 million km², includes seven countries (Benin, Ghana, Ivory Coast, Mali, Niger, Togo, and Upper Volta), and aims at providing protection from onchocerciasis for over 10 million people. This long-term programme is designed to keep *S. damnosum* out of the control area for 15-20 years, thus interrupting transmission over a period long enough for the parasite and the disease to die out in the human population. In the first seven years of operation a satisfactory and, in most places, complete control of transmission has been achieved; children born since the programme started have remained uninfected; the intensity and prevalence of infection in the older age groups is beginning to decline; and the eye lesions of those already afflicted have progressed little.

The problems now are how to maintain a satisfactory degree

of vector control at the lowest operational cost; and to decide how long some degree of *Simulium* control will need to be maintained.

Progress in the future

The outstanding problem in onchocerciasis remains the treatment of patients, particularly those whose eyes are at risk. We are still dependent on two drugs, DEC-C and suramin, whose actions were discovered more than 30 years ago and which are far from satisfactory in use.

That new drugs for onchocerciasis have not appeared in recent years is in part an expression of the generally declining interest shown by the pharmaceutical industry for research into new drugs for use against tropical parasitic diseases—an area where the market is unlikely to be profitable.

What is now needed above all is a non-toxic drug, which has a convenient dosage schedule and which can kill or permanently sterilise the adult worms of *O. volvulus* without producing a microfilaricidal reaction.

For this reason one of the main goals of the recently established UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases is to find and develop new filaricidal drugs effective against *O. volvulus*. To this end a long-term programme has been set up including filaricide screening, lead-directed chemical synthesis, studies on filarial metabolism, and facilities for clinical trials. It works in close association with those elements of the pharmaceutical industry that are still interested in tropical diseases. Given adequate funds, sufficient brains, patience, and some luck, it is hoped that this programme may pay off within the next 10-15 years by developing a new drug to improve the prospects of treatment for those threatened with or suffering from ocular onchocerciasis.

Is there any known association between body odour and stress? How should I advise a patient with this problem?

Body odour is a combination of several factors. Two main ones are sweat and bacterial modification of that sweat to produce chemical odiferants. Sweating does occur in relation to stress, mainly on the palms, soles, and axillae. Some people are particularly prone to this form of stimulus, which is mediated by the cholinergic sympathetic system. Sweating also occurs under adrenergic control, the secretions being produced by specialised apocrine glands in the axillae, groins, and, in women, mammary glands. Both types of sweat may be modified by bacteria on the surface of the skin, in particular *Staphylococcus epidermidis*.

The approach to treatment of body odour due to sweating and stress appears logical, but it is often difficult to obtain satisfactory results.

(1) *Reduction of stress*.—The doses of psychotherapeutic drugs needed to reduce sweating produce drowsiness and are therefore unacceptable.

(2) *Reduction of sympathetic drive*.—The doses of anticholinergics, such as propantheline, produce impaired vision and dry mouth before reducing sweating, though they are worth trying.

(3) *Direct reduction of sweat secretion*.—Topical application of aluminium chloride hexahydrate to the axillae is the most helpful and may be the most successful treatment. It is best applied last thing at night but has the disadvantage of local irritation. Surgery may be local, by excision of axillary skin bearing the glands, or general, by cervical or lumbar sympathectomy to reduce sweating in the appropriate limbs. Obviously the latter operations are not undertaken lightly.

(4) *Reduction of bacterial population*.—This is best done by topical application of broad-spectrum antibacterial substances such as hibitane or hexachlorophene. Probably the best plan of management is to combine the washes with propantheline and sedatives, then apply aluminium chloride hexahydrate, and then resort to surgery.—w J CUNLIFFE, consultant dermatologist, Leeds.