Public Health Practice

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Ascariasis control

The control of ascariasis by sanitary measures is a slow process requiring a base of health education and social and economic development. Chemotherapeutic control can be used to support such measures or may be the main weapon against the disease if sanitation cannot be improved in the short term.

Ascariasis, caused by the roundworm *Ascaris lumbricoides*, affects millions of people in Africa, Asia, and Latin America; the disease can cause malnutrition, pneumonitis, allergic reactions, and abdominal complications; some 20 000 deaths a year are attributed to it (*1*). The economic effect of the disease may be calculated in terms of the cost of hospitalization or ambulatory treatment, food loss, and absence from work. In Kenya, where about 25% of the population is infected, the annual loss has been estimated at US$ 5 000 000 (*2*).

Ascariasis also has indirect social consequences, since infected persons may harbour feelings of inferiority. In south-east Asia the control of ascariasis has been widely welcomed and seems likely to encourage community participation in other important health measures (*3, 4*).

The larvae and adults live exclusively in the human body, whereas the eggs are found in the soil. Thus infected people and contaminated soil are the natural reservoirs of the parasite. The adult worms live in the human small intestine for about a year, each female producing approximately 240 000 eggs a day. In shaded and moist soil, the embryo takes at least 10 days to develop into an invasive larva. The thick-shelled eggs remain viable for up to six years in temperate conditions, but in the tropics the survival time is shorter. They are easily destroyed by high temperature and desiccation, or by fungi. Torrential rain can wash the eggs away from the soil surface. However, soil contamination is usually heavy in areas where the disease is endemic.

Infection is acquired from soil-contaminated hands, fruit, and vegetables and through unhygienic defecation habits, ineffective sanitation, and the use of human faeces as fertilizer; transmission by dust and water is also possible.

About 73% of *Ascaris* infections occur in south-east Asia, where the humid climate and the high population density are significant factors; only about 12% and 8% occur in Africa and Latin America respectively (*5*). Transmission is absent, rare or only seasonal in arid, very isolated, and sandy regions.

Where the disease is highly endemic and transmission takes place throughout the year, people of all ages and both sexes are affected. Where the household type of transmission dominates, owing to indiscriminate defecation by children, ascariasis is most prevalent among those under five and is also common in school-

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children. Much less age stratification occurs where transmission by dust or food predominates. Where endemicity is low the distribution of ascariasis is focal, and the examination of children in a school will usually reveal that most of those infected come from only one small locality or a part of an urban agglomeration where sanitation is deficient: in the latter case it will be common in families with numerous children or where living conditions are bad.

When adult worms are expelled through the anus, mouth, or nose, diagnosis presents no difficulties. Otherwise it depends on the identification of eggs in the faeces, and false negative results can occur if only male, immature, or infertile female worms are present, or if laboratory techniques are inadequate. Because ascariasis cannot always be excluded by stool examination and because treatment is safe, simple, and effective, it is justifiable to give treatment even where infection is merely suspected.

Control Strategies

Eradication is possible only in isolated communities living, for example, on small islands, in mountainous areas, or in jungles. The aim must therefore be to control the disease, using preventive rather than curative measures so that the prevalence and intensity of infection become insignificant from the public health standpoint.

However, since even a single *Ascaris* worm can produce allergic reactions, or complications related to the migration of the adult parasite, the control of ascariasis should be infection-oriented. This is in contrast to, for example, hookworm control, which should be disease-oriented.

There are two major ways of controlling ascariasis: by sanitation and chemotherapy. The introduction of adequate sanitation leads, over a long period of time, to a decline in the disease. For example, improved sanitation and living standards in rural areas around Poznan in Poland lowered the prevalence of ascariasis from 8% to 3% within 15 years (*6*). Anthelmintic measures can supplement sanitary measures or may constitute the basic approach for control where improved sanitation is not feasible.

The intensity of infection can be measured by quantitative microscopic examination or by counting the worms expelled after treatment. If an individual diagnosis is not feasible, information from an epidemiological survey may help to decide which groups of people should be treated.

Several effective and relatively safe single-dose anthelmintics are now available, e.g., piperazine compounds, pyrantel, levamisole, mebendazole, and albendazole. The cost of one treatment ranges from $ 0.05 to $ 1.00, depending on a variety of factors, including whether the drug is locally produced or imported. Unfortunately only piperazine and levamisole, the older anthelmintics, are relatively inexpensive.

Selective treatment can be given to persons shown by laboratory examination to be infected. The treatment of infected individuals in an uncoordinated way has little, if any, impact on the prevalence or intensity of ascariasis in the community. Community-based treatment, on the other hand, gives better results at almost the same cost, but requires community and intersectoral cooperation. It is essential to achieve adequate coverage, proper timing, and the appropriate duration of treatment. Mass treatment of a whole population is justified only when prevalence exceeds 70%. Targeted treatment can be given to groups of people known or considered very likely to be heavily infected on the basis of an epidemiological survey. Community-oriented anthelmintic programmes may start with mass treatment if the local epidemiological situation is appropriate and if the human and financial resources permit.

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least, in order to rid the human reservoir of the parasite; treatment at two-monthly intervals, however, gives the best results (*7*). Where transmission is seasonal, treatment should be given before and after the period when the spread of infection is most intense.

The duration of community-oriented treatment schemes depends on the persistence of *Ascaris* eggs in the environment; the minimum duration is three years. These programmes should be properly monitored, and modified as necessary.

Effective control programmes based on legislation, improved sanitation, and the use of anthelmintics have been implemented in several countries.

In Japan, control was initiated in 1931 by the Parasite Control Act, which banned the use of human faeces as fertilizer. The activities of the Japanese Association for Parasite Control reduced the prevalence of ascariasis from 62.9% in the 1950s to 0.6% in 1973 (*8*).

Similarly in the Republic of Korea, the Night-soil Disposal Prohibition Act was passed in 1969, and a nationwide selective anthelmintic programme was carried out, with the result that the prevalence of ascariasis in students dropped from its former level of 55.4% to 15.1% by 1979 (*9*).

The control of ascariasis in Israel was based mainly on the Safe Vegetables Order of 1949 and the improvement of sanitation. These measures led to a decline in the prevalence of ascariasis among the Jewish population from 40% in 1948 to less than 1% in the 1960s (*10*).

In many countries, however, the problem of ascariasis remains neglected.

Primary Health Care Can Help

Primary health care offers new opportunities for the control of ascariasis, facilitating anthelmintic and sanitation programmes at village level through community participation. Moreover, the prevalence of the disease is a good indicator of sanitary standards, and the subject lends itself as a good example in the teaching of hygiene. Most of the people infected are children, and so there is a special relevance to maternal and child health care. There is also a clear link with the essential drugs programme.

The vertical approach, through independent national or regional anthelmintic programmes, is suitable only where there are few health problems of greater urgency.

The control of the disease can easily be integrated into the basic duties of community health workers. The implementation and supervision of programmes at the community level can be dealt with to greatest effect by the district health officer. Nationally or regionally, a reference centre should have responsibility for epidemiological surveillance, the setting of standards for the diagnosis and treatment of ascariasis and its complications in health centres and hospitals, and the monitoring and evaluation of control programmes. The primary health care approach can help to coordinate control strategies for ascariasis and their implementation with other health activities. It offers the organizational framework within which community-based anthelmintic and sanitary activities can be carried out. □

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