Intestinal parasitic infections: a soluble public health problem

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Intestinal parasitic helminth and protozoal infections are among the most common infections of humans worldwide. They occur throughout the developing world and are most common in the poorest communities. This ubiquity has led to a tendency to view the infections as a fact of life, or as a problem which is too large to be tackled by public health services.

The public health impact of intestinal helminthic infections has been consistently and considerably underestimated. The mortality rate directly related to Ascaris lumbricoides is low; even so, the absolute number of deaths is fairly high because of the high prevalence of infection in developing countries (WHO, 1987). If the mortality rate were only 2 per 100,000 people infected, it would constitute thousands of deaths when multiplied by the hundreds of millions of people who are infected. In Cape Town, South Africa, surgical ascariasis constituted about 10–15% of all acute abdominal emergencies (LOWE, 1974).

Iron deficiency anaemia, ranging from mild to life-threatening, is an inevitable result of hookworm infection (WHO, 1989). It is possible, and obviously desirable, to reduce losses in the population through chemotherapy, thus keeping the prevalence and severity of hookworm-induced iron deficiency anaemia under control and significantly reducing morbidity and mortality (PAWLOWSKI et al., 1991).

Trichuris trichiura, associated with undernutrition, growth stunting and iron deficiency anaemia in intense infections (COOPER et al., 1990), has more recently been found to have an adverse effect on cognitive function even when infections are only moderately intense (NOAKES et al., 1992). Furthermore, not only the major signs of infection but also the adverse effect of T. trichiura on school performance may be reversed by chemotherapy.

The adverse effect of infection on cognition suggests that helminths may have even greater developmental consequences than was previously thought, since the most intense infections with T. trichiura and A. lumbricoides occur at an age when children are receiving what may be the only education they will ever receive. Further studies are urgently required to determine whether the effect of infection has longer term implications for school achievement.

Over the last decade, several health programmes aimed at improving child survival have resulted in a significant increase in the number of children of school age. However, these measures have had little or no impact on the improvement of the quality of life of this age group. The older child has tended to be a forgotten member of the community and yet improving the health and education of schoolchildren is a crucial investment in the human capital that will determine a nation’s future development.

Efforts to develop an efficient and low cost system to improve the health of school-age children have been given new impetus through the formation of a Partnership for Child Development, with core support for biomedical studies from the United Nations Development Programme, the Rockefeller Foundation and the Edna McConnell Clark Foundation, and from the James S. McDonnell Foundation for studies of cognition and education. This partnership, in collaboration with the World Health Organization, is now working with endemic country partners to develop an efficient, sustainable and low cost strategy of delivering anthelmintics (BERKLEY & JAMISON, 1991; BUNDY & HALL, 1992).

Chemotherapy directed against A. lumbricoides, the hookworms and T. trichiura and targeted at school-age children is a feasible and effective approach to worm control. Single oral dose treatment with mebendazole (500 mg) or albendazole (400 mg) is very effective, safe and inexpensive. In Bangladesh an approach using repeated mass treatment has been proposed as a feasible approach to control intensity of A. lumbricoides rather than the selective treatment of heavily infected individuals (HALL et al., 1992). Albendazole may be purchased at less than 10 US cents for each single 500 mg dose.

The claim that therapy is irrelevant to the control of helmhitm disease, because children become reinfected, cannot be sustained in the face of the remarkable improvement in health achieved after treatment (WHO, 1990). In Kenya treatment for hookworm, T. trichiura and A. lumbricoides in undernourished schoolboys improved physical fitness only 7 weeks after treatment, despite continual exposure to reinfection and some incomplete cures (STEPHENS et al., 1990). In the Republic of Korea, where a national control programme targeted at schoolchildren has reduced infection prevalence from 60% to 1% since 1969, the incidence of surgical complications has decreased proportionally to the national figures (LEE et al., 1991).

The direct benefit of chemotherapy is that the worm burden is removed, which immediately alleviates morbidity and may reduce the rate of transmission. Repeated treatment ensures that even if reinfection occurs the worm burdens are maintained below the level associated with morbidity. Thus the aim of repeated chemotherapy is to eradicate or prevent infection at levels of infection are below those associated with morbidity. This approach is likely to make a major contribution to, for example, the prevention of protein energy malnutrition and iron deficiency anaemia, estimated to affect globally 500 million children and 800–900 million adults (WHO, 1990).

Chemotherapy may also have indirect benefits. Ascariasis, and such protozoan infections as giardiasis (see below), may cause malabsorption of vitamin A (MAHA-LANABIS et al., 1979). This argues that nutritional supplementation programmes need to be supported by anthelmintic chemotherapy (TOMKINS & WATSON, 1989).

Control of worm infections through chemotherapy in school-age children may also have broader influences by generating a beneficial collaboration between Ministries of Health and Ministries of Education in endemic countries. The personnel of the peripheral health care system and the schoolteachers may successfully collaborate to deliver health care, in partnership with parents.

The potential impact on multiple disease control is illustrated by the experience of Zanzibar, where treatment against schistosomiasis has been successfully administered on a regular basis since November 1986 by schoolteachers (SAVIOLI et al., 1989). Control of morbidity due to intestinal helminths has now been added to this pro-
programme as a natural process of progressively integrating the control of other communicable diseases (ZANZIBAR, 1991).

Health improvement and cost-effectiveness of chemotherapy against helminths can be monitored in school-age children (SAVIOLI et al., 1989; BUNDY et al., 1992). From the evaluation of these types of programmes, models may be developed to help in predicting resource requirements for control.

The school-based approach is only one of a range of strategies for control. Helminth control at the community level can be easily integrated into the existing health care systems or into current health programmes such as maternal and child health, family planning, water supply and sanitation, and health education. In Sri Lanka an integrated project has used intestinal parasite control as an entry point for promoting nutrition and family planning (PEREIRA, 1985). Alternatively, worm control may become a prime mover towards an integrated approach for the control of other diseases. Planning, management and programme operation will vary in each country but few health administrations exist without the infrastructure capable of introducing and sustaining the very simple technology involved (WHO, 1990).

Programmes to control intestinal protozoal infections are at an earlier stage of development. The problems are also rather different. Entamoeba histolytica, Giardia duodenalis (=G. intestinalis) and Cryptosporidium parvum are found both in industrialized and developing countries. However, the epidemiology of these infections differs in these settings as do the resources available for treatment and control. Deprived communities in the developed world may experience problems caused by intestinal protozoa in a similar manner and intensity to developing countries (WHO, 1992).

E. histolytica is one of the 10 most common infections in the world today. In 1981 it was estimated that at least 40 000–100 000 deaths every year were caused by this infection (WALSH, 1988). Compelling evidence now indicates that what is currently identified as E. histolytica actually comprises 2 morphologically identical species, differing genetically and in their capacity to cause disease (WHO, 1992). The proportion of infections which produces disease may then simply reflect the proportion of infections with 'invasive' E. histolytica or (more likely) the relationship may be more complex. New approaches to both epidemiological research and control strategies will clearly be necessary.

In some developing countries studies have shown that virtually all children have been infected with G. duodenalis by 3 years of age. On the other hand, in the United States of America, G. duodenalis is the leading cause of diarrhoeal disease outbreaks associated with drinking water and is responsible for an estimated minimum of 4000 hospital admissions per year (WHO, 1992). Infection can cause weight loss, malabsorption and vitamin A deficiency, and is an important cause of growth faltering in children in industrialized countries. The effect on the nutritional status and growth of children in developing countries is difficult to evaluate because of the presence of multiple pathogens that could also explain differences in growth (TOMKINS & WATSON, 1989). The impact of G. duodenalis infection and disease on nutritional status and growth in children in developing countries needs further study and evaluation.

There is now overwhelming evidence that the disease caused by intestinal helminth and protozoan infections is a pervasive public health problem. There is also good evidence from pilot studies, for helminthiases at least, that the problem is amenable to solution. Current efforts are needed to improve sanitation and water supplies, but are not sufficient. The challenge is to develop affordable and sustainable solutions which are appropriate to the scale of the problem.

References


