



School Deworming



at a glance

Worms infect more than one third of the world's population, with the most intense infections in children and the poor. In the poorest countries, children are likely to be infected from the time they stop breast-feeding, and to be continually infected and re-infected for the rest of their lives. Only rarely does infection have acute consequences for children. Instead, the infection is long-term and chronic, and can negatively affect all aspects of a child's development: health, nutrition, cognitive development, learning and educational access and achievement.

Deworming is safe, easy and cheap

All the common worm infections in school-age children can be treated effectively with two single-dose pills: one for all the common intestinal worms (hookworms, roundworms, and whipworms) and the other for schistosomiasis (bilharzia).¹ The treatment is safe, even when given to uninfected children.

The most commonly used drugs for the treatment of common intestinal worms are albendazole (400 mg) or mebendazole (500 mg). They are administered as a single tablet to all children, regardless of size or age. One pill can cost as little as US\$0.02 and only in the most highly infected communities is treatment required more than once a year.

Praziquantel, the drug of choice to treat schistosomiasis, is slightly more expensive – on average US\$0.20 per treatment for a school aged child. Treatment once a year is sufficient even in the most infected communities. Praziquantel is given as a single dose, but the number of pills has to be adjusted to the size of the child. The preferred method for schoolchildren is an inexpensive “dose-pole” that uses the height of the child to estimate the dosage.

Deworming pills are heat-stable and require no cold chain for delivery. With a shelf life of up to four years, they can be purchased in bulk to reduce costs and to ensure uninterrupted supply.

In communities where infection is common all children should be offered treatment. The need for mass treatment of schoolchildren can be determined by simple and low cost survey techniques that identify whether

the school is in an area of significant risk of infection. There is no need to examine each child for the presence of worms. Individual screening offers no safety benefits. And it is not cost-effective; it costs four to ten times more than the treatment itself.

Regular deworming will help children avoid the worst effects of infection even if there is no improvement in sanitation.

Why deworming in schools?

School-age children typically have the highest intensity of worm infection of any age group. In addition, the most cost-effective way to deliver deworming pills regularly to children is through schools because schools offer a readily available, extensive and sustained infrastructure with a skilled workforce that is in close contact with the community.

With support from the local health system, teachers can deliver the drugs safely. Teachers need only a few hours training to understand the rationale for deworming, and to learn how to give out the pills and keep a record of their distribution.

Regular deworming contributes to good health and nutrition for children of school age, which in turn leads to increased enrolment and attendance, reduced class repetition, and increased educational attainment. The most disadvantaged children – such as girls and the poor – often suffer most from ill health and malnutrition, and gain the most benefit from deworming.

School-based deworming has its full impact when delivered within an integrated school health program that includes the following key elements of the FRESH (Focus Resources on Effective School Health) framework:

1. Health policies in schools that advocate the role of teachers in health promotion and delivery;
2. Adequate sanitation and access to safe water to reduce worm transmission in the school environment;
3. Skills-based health education that promotes good hygiene to avoid worm infection;
4. Basic health and nutrition services that include regular deworming.

¹Any one of the following can be used to treat common intestinal worms: albendazole, mebendazole, levamisole or pyrantel. The drug of choice for the treatment of schistosomiasis is praziquantel.

How to get started ?

1. Determine whether the school is at risk of infection

- WHO, with its partners, keeps track of epidemiological information on the distribution of worm infection for most countries, and uses GIS technology to develop maps indicating the areas at risk of infection. If the target school is located in one of these areas then mass treatment is indicated.
- If information is not available, use WHO guidelines to conduct a rapid epidemiological assessment to determine whether the school is in an area of high prevalence of infection.

2. Determine the strategy for mass treatment based on WHO recommendations

- Treatment should be offered to all children in schools where more than half the children are believed to be infected with intestinal worms or where any child passes blood in their urine as a result of schistosomiasis. Treatment should be offered at least once each year for intestinal worms and at least every two years for schistosomiasis. If infection is particularly common, the frequency of treatment may be increased to twice a year for intestinal worms and once a year for schistosomiasis.
- Other schools should not require routine treatment programs; instead children should be encouraged to seek treatment at a health center if they suspect they are infected. One important exception is if the school is in an area of low (less than 10%) but persistent schistosomiasis infection, in which case children should be offered treatment twice during their primary schooling: once at entry, and once when leaving school.
- Individual diagnosis has no role in school-based mass treatment programs. It is complicated, and it is neither cost-effective nor necessary as the treatment is safe even for those children who are uninfected.

3. Train teachers and inform the community

- Train teachers to understand the benefits of deworming in schools, and to distribute the pills and keep records. A group of 40-50 teachers can be trained in less than one day.
- Communicate with parents, community leaders and local health agents about the objectives of the deworming in schools and what they should expect.

- Explain that heavily infected children may experience mild side effects when the treatment expels their worms, and that the complaints of one child often trigger other schoolchildren to claim similar symptoms.

4. Procure drugs and materials

- Use established systems, such as national pharmacies, to procure drugs of assured quality. Involve the health services in the proper storage of drugs in health clinics, and in delivery to schools. In addition to the pills, stationery for record keeping and a dose pole for the administration of praziquantel are all that is required to deliver treatment in schools.

5. Treat children

- Schools and health personnel should work together to decide on a treatment day for delivering deworming and the other health and nutrition services of the FRESH package. Health personnel should be aware of any drug distribution by teachers, and should be ready to provide support and supervision for any side effects.

6. Monitoring and Evaluation

- Routine monitoring of deworming involves the recording of basic process indicators: the number (or %) of children treated and the quantity of drugs used. This assists in routine planning, and also helps reduce inappropriate use of drugs. If a more detailed evaluation is required, the program impact can be assessed by an epidemiological survey.

Contact wormcontrol@who.int to obtain:

1. WHO Expert Committee Reports
2. WHO Guidelines for Managers of School Health Programs
3. WHO Partners for Parasite Control data base of country maps
4. Deworming and health education training materials

Evidence that school deworming is beneficial and cost-effective

Deworming contributes to Education for All

Studies in low-income countries of Africa, South America and Asia confirm that children with intense worm infections perform poorly in learning ability tests, cognitive function and educational achievement. Differences in test performance equivalent to a six-month delay in development can typically be attributed to heavier infections of the sort experienced by around 60 million school age children [1]. Absenteeism is more frequent among infected than uninfected children: the heavier the intensity of infection, the greater the absenteeism, to the extent that some infected children attend school half as much as their uninfected peers [2]. Deworming can benefit children's learning [3] and substantially increase primary school attendance and significantly increase a child's ability to learn in school [4].

Deworming is an exceptionally low cost intervention

Operational research in Ghana and Tanzania has demonstrated that for the first five years of intervention, the average yearly cost of delivered treatment – taking into account current drug prices – is typically less than US\$0.50 per child in an area where both schistosomiasis and the common intestinal worms are present, and less than US\$0.25 per child in an area where only the latter are present. This is the total cost which includes training of teachers, as well as the procurement and distribution of drugs to students [5].

Deworming gives a high return to education and labor income

A randomized evaluation of school-based mass deworming for schistosomiasis and intestinal worms in Kenya reduced absenteeism by one-quarter. Deworming was the most cost-effective method of improving school participation among a series of educational interventions. An extra year of primary schooling was gained

for an investment of US\$4 in deworming, as compared to US\$38 to US\$99 for other interventions. [4] The Rockefeller hookworm control program early in the 20th century in the Southern USA achieved a similar reduction in absenteeism (23%) and long-run effects on labor income suggest the benefit of a hookworm-free childhood to be around 45% of adult wages [6]. Deworming is therefore an efficient investment in human capital.

Deworming has major externalities for untreated children and the whole community

By reducing the transmission of infection in the community as a whole, deworming substantially improves health and school participation for both treated and untreated children, in treatment schools and in neighboring schools. As a result, treating only school age children can reduce the total burden of disease due to intestinal worm infections by 70% in the community as a whole [7]. These externalities are large enough to justify fully subsidizing treatment. They also explain why deworming is beneficial even without improvements in sanitation.

Deworming targets one of the most common, long-term infections of children in low-income countries.

For girls and boys aged 5 to 14 years in low-income countries, intestinal worms account for an estimated 11 and 12 percent, respectively, of the total disease burden, and represent the single largest contributor to the disease burden of this group. An estimated 20 percent of disability adjusted life years lost because of communicable disease among school children is a direct result of intestinal worms.

The table shows the global number of cases and prevalence of major worm infections among school-age children.

Infection	Number of Cases (millions)	Prevalence
Roundworm (<i>Ascaris</i>)	320	35%
Whipworm (<i>Trichuris</i>)	233	25%
Hookworm (<i>Necator/Ancylostoma</i>)	239	26%
<i>Schistosoma haematobium</i>	56 (Africa only)	33.3% (Africa only)
<i>Schistosoma mansoni</i>	25 (Africa only)	16.4% (Africa only)

Sources: Bundy, D.A.P. et al. (1997) *Intestinal nematode infections, in Health Priorities and Burden of Disease Analysis: Methods and Applications from Global, National and Sub-national Studies* (Murray, C.J.L. and Lopez, A.D., eds), Harvard University Press for the World Health Organization and the World Bank. Van der Werf, M.J. et al. (2003) *Quantification of clinical morbidity associated with schistosome infection in sub-Saharan Africa. Acta Tropica* (in press).

References:

- Partnership for Child Development. Heavy schistosomiasis associated with poor short-term memory and slower reaction times in Tanzanian schoolchildren. *Tropical Medicine and International Health*, 2002, 7:104-117
- Nokes C, Bundy D. Compliance and absenteeism in schoolchildren: implications for helminth control. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 1993, 87:148-1521.
- Grigorenko, E., Sternberg, R., Ngorosho, D., Nokes, C., Jukes, M., & Bundy, D. (submitted). Effects of Antiparasitic Treatment on Dynamically-Assessed Cognitive Skills.
- Miguel E. & Kremer M. (2002) Worms: Identifying Impacts on Health and Education in the Presence of Treatment Externalities. <http://post.economics.harvard.edu/faculty/kremer/>
- Partnership for Child Development. The cost of large-scale school health programmes which deliver anthelmintics to children in Ghana and Tanzania. *Acta Tropica*, 1999, 73: 183-204.
- Bleakley, H (2002) Disease and Development: Evidence from hookworm eradication in the American South. Report of the Rockefeller Sanitary Commission. <http://web.mit.edu/hoyt>
- Bundy DAP, Wong MS, Lewis LL & Horton J. Control of geohelminths by delivery of targeted chemotherapy through schools. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 1990, 84: 115-120.

Do's and don'ts in school deworming

Do...

Do make deworming an integral component of a school health program using the FRESH framework. Combine deworming with iron and other micronutrient supplements.

Do ensure that teachers and health agents work together at all stages of the program and identify their different roles.

Do help teachers understand the benefits of deworming, so that they are supportive and recognize that their investment of time in deworming is an important contribution to education.

Do ensure that local health personnel make careful plans to manage possible side effects. Improper management of side effects can ruin the future of the program.

Do make sure that treatment is provided for both intestinal worms and schistosomiasis where needed. Effective deworming requires both treatments.

Do make sure that treatment is given regularly and sustained.

Do protect children throughout their development by starting treatment early (e.g. with Early Child Development programs) and continuing treatment throughout primary school.

Do reach out to non-enrolled school aged children. This not only enhances the public health impact of your intervention, but also encourages children, especially girls, to attend school.

Don't...

Don't waste time and resources trying to examine each school or child. Deworming drugs are safe and can be given to uninfected children. No individual diagnosis, or assessment of each school is needed.

Don't exclude adolescent girls from systematic treatment. The drugs are safe, even in pregnancy.

Don't be afraid to give a single dose tablet of albendazole or mebendazole even to children of small stature. The pills are safe for children over 1 year of age, regardless of their size or weight.

Don't hesitate to use a dose pole instead of a scale to decide the appropriate dose of praziquantel. It accurately calculates the dosages for school age children and may – in the long-term – be more reliable than deteriorating scales.

Don't wait for sanitation to improve before starting deworming – regular treatment will help all children avoid the worst effects of infection.

Key references

Prevention and control of schistosomiasis and soil-transmitted helminthiasis. Report of a WHO Expert Committee. World Health Organization, Geneva, 2002 (WHO Technical Report Series, No. 912).

Helminth control in school-age children. A guide for managers of control programmes. ISBN 92 4 154556 9, World Health Organization, Geneva, 2002.

The FRESH Toolkit, Focusing Resources on Effective School Health. World Bank, Washington DC, 2002.

School Health at a Glance, World Bank, Washington DC, 2002.

The Partnership for Child Development. *Better Health, nutrition and education for the school-aged child.* Leading article, *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 1997, 91: 1-2.

Montresor A *et al.* *Development and validation of a 'tablet pole' for the administration of praziquantel in sub-Saharan Africa.* *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 2001, 95:542-544.

The "Partners for Parasite Control": PPC Newsletter (www.who.int/wormcontrol)

Web sites

www.who.int/wormcontrol
www.unicef.org
www.schoolsandhealth.org
www.sci.org
www.worldbank.org

For further information, please contact Don Bundy at eservice@worldbank.org or Lorenzo Savioli at wormcontrol@who.int

Expanded versions of the "at a glance" series, with e-linkages to resources and more information, are available on the World Bank Health-Nutrition-Population web site: www.worldbank.org/hnp