Deworming
for Health and Development

World Health Organization

Front cover: original painting by D.W.T. Crompton

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Report of the third global meeting of the partners for parasite control

Deworming for Health and Development

Geneva, 29–30 November 2004

World Health Organization
Geneva, 2005

Strategy Development and Monitoring for Parasitic Diseases
and Vector Control
Communicable Diseases Control, Prevention and Eradication
Communicable Diseases

http://www.who.int/wormcontrol

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Acknowledgements

The Organization thanks all those who contributed towards the successful outcome of the Third Global Meeting of the Partners for Parasite Control, and in particular to the Bill and Melinda Gates Foundation which is contributing to the work of the Secretariat.

A tribute

A tribute paid by **Arlene Mitchell**
World Food Programme, Rome
during the opening ceremony of the Meeting of the Partners for Parasite Control
Geneva, 29 November 2004

"We would like to take this moment to reflect on the thousands of people involved in carrying out deworming campaigns, and the challenges and dangers they face. We ask you now to join us in honouring a fallen Afghan colleague, Mr Najibullah Zulfaqar.

Mr Zulfaqar was a teacher for the Department of Education in Uruzgan. On 24th June 2004 he was on a bus and was taking Ministry of Education forms for a deworming campaign to 40 schools, two madrasas and one home school when the bus was attacked by anti-government people. Another teacher with him managed to escape, but Mr Zulfaqar and 15 others lost their lives in this incident.

Mr Zulfaqar leaves a family of 12. His oldest son has had to leave school to earn a living in an effort to support the family."

Message from the Director-General of WHO

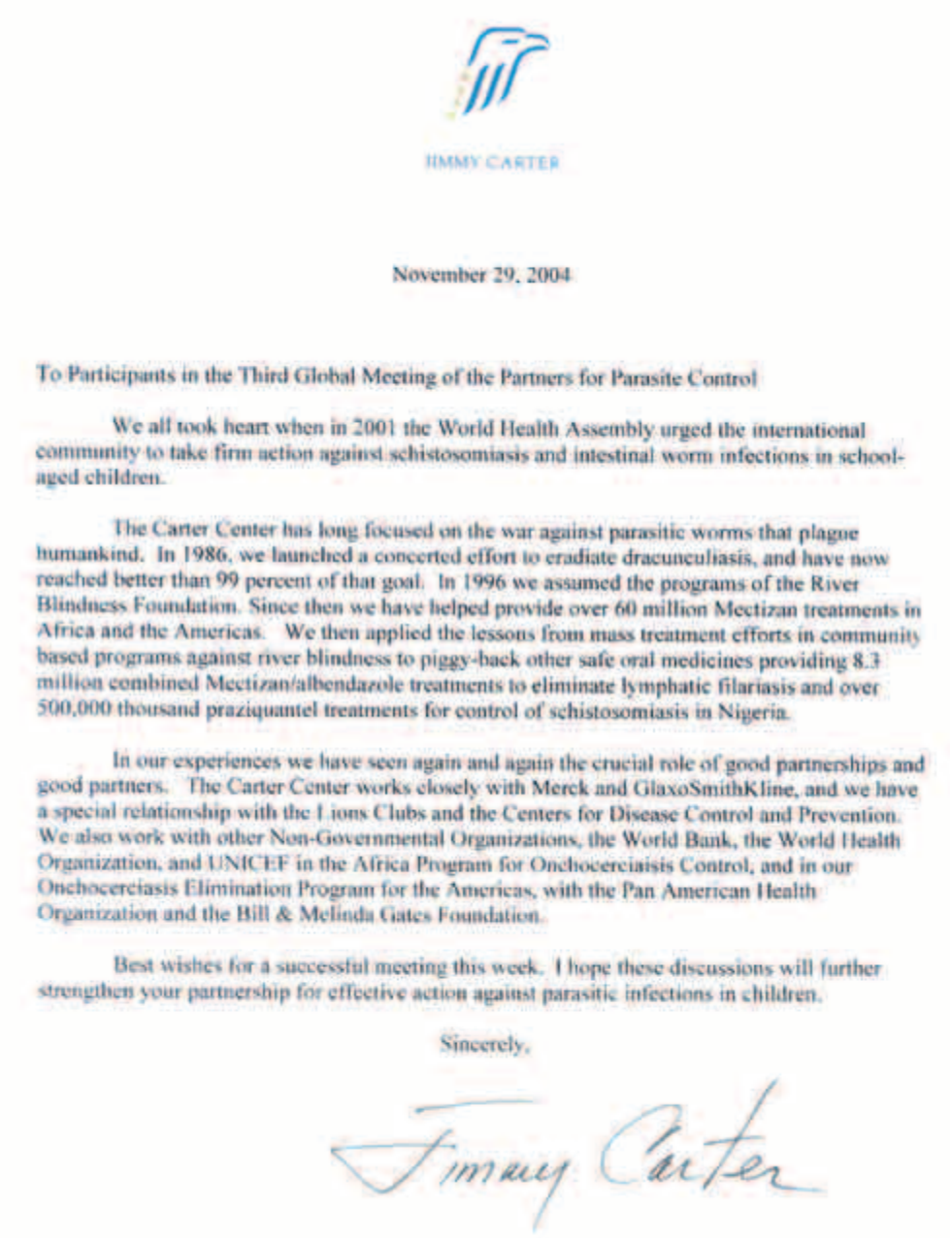
Dr LEE Jong-wook
Director-General
World Health Organization

More than two billion people around the world live with unrelenting illness due to intestinal parasites. Parasitic infections deprive the poorest of the poor of health and well-being, slow their economic progress and contribute to social marginalization. However, this situation need not continue. The optimum use of safety-tested anthelminthic drugs that are now of low cost and high quality means that we can reduce and control worm-induced illness. The 54th World Health Assembly (WHA) recognized that tools are available so that health professionals can prevent and treat these infections. New policies have emerged since that resolution was adopted in May 2001, recognizing that regular treatment of high risk groups is the best means of saving lives, preventing illness and improving the health and development of infected communities. This strategy is now showing clear signs of success. The health benefits of treating school-age children, preschool children as young as 12 months, and pregnant women with anthelminthic drugs greatly outweigh the risks of possible minor side effects.

The scale of the challenge posed by intestinal parasites is formidable. The governments of low-income countries do not have the necessary resources to manage alone. Partnerships provide the best approach for applying the knowledge, skills and resources needed to achieve short-term success in the endeavour to reduce and control morbidity. Impoverished countries clearly need the support of partnerships.

On behalf of the World Health Organization, I thank the representatives of the Partners for Parasite Control for attending this meeting at our headquarters in Geneva. WHO is pleased to serve as the executive secretariat to your contribution to the intensified control of tropical diseases. There can be no doubt that what you have set out to do will strengthen our effort to achieve the Millennium Development Goals.

1 Letter from President Jimmy Carter



JIMMY CARTER

November 29, 2004

To Participants in the Third Global Meeting of the Partners for Parasite Control

We all took heart when in 2001 the World Health Assembly urged the international community to take firm action against schistosomiasis and intestinal worm infections in school-aged children.

The Carter Center has long focused on the war against parasitic worms that plague humankind. In 1986, we launched a concerted effort to eradiate dracunculiasis, and have now reached better than 99 percent of that goal. In 1996 we assumed the programs of the River Blindness Foundation. Since then we have helped provide over 60 million Mectizan treatments in Africa and the Americas. We then applied the lessons from mass treatment efforts in community based programs against river blindness to piggy-back other safe oral medicines providing 8.3 million combined Mectizan/albendazole treatments to eliminate lymphatic filariasis and over 500,000 thousand praziquantel treatments for control of schistosomiasis in Nigeria.

In our experiences we have seen again and again the crucial role of good partnerships and good partners. The Carter Center works closely with Merck and GlaxoSmithKline, and we have a special relationship with the Lions Clubs and the Centers for Disease Control and Prevention. We also work with other Non-Governmental Organizations, the World Bank, the World Health Organization, and UNICEF in the Africa Program for Onchocerciasis Control, and in our Onchocerciasis Elimination Program for the Americas, with the Pan American Health Organization and the Bill & Melinda Gates Foundation.

Best wishes for a successful meeting this week. I hope these discussions will further strengthen your partnership for effective action against parasitic infections in children.

Sincerely,

Jimmy Carter

2 By way of explanation .....

The PPC was formed in 2001. The partners include governments of Member States where worm infections are endemic, governments of Member States with commitment to reduce poverty in low-income countries, United Nations (UN) agencies [United Nations Children's Fund (UNICEF), World Health Organization (WHO), World Food Programme (WFP), Office of the United Nations High Commissioner for Refugees (UNHCR), World Bank, nongovernmental organizations (NGOs)], universities, philanthropic foundations and pharmaceutical companies. Organizations with concern for disease due to worm infections are welcome to join the Partners for Parasites Control (PPC). WHO serves as executive secretariat to the PPC.

The partners work towards delivering permanent relief from worm-induced disease for millions of poor people. The principal effort has been made against schistosomiasis and soil-transmitted helminthiasis but the PPC is ready to promote control of other worm-induced diseases according to national needs and priorities. Effective control measures have been developed and tested. The major challenge is the scale of the problem. How can deworming be extended to embrace all the desperately poor people in need of this health-giving endeavour? Deworming is defined as the delivery of safety-tested, single dose, oral anthelminthic drugs for the reduction of both the subtle and the overt morbidity that accompanies worm infections.

This report from the third meeting of the PPC

- summarizes successes achieved in worm control
- explains why deworming is such a highly cost-effective investment for health
- proposes that deworming become part of a wider multidisease approach for improving the health and well-being of poor people
- shows how deworming will contribute to meeting the Millennium Development Goals (MDGs)

..... now read on

3 Resolution

Resolution of the Third Global Meeting of the Partners for Parasite Control, WHO, Geneva, 29-30 November 2004

The partners agree that while worm-induced disease may not have such an obvious impact on the well-being of people as Tuberculosis (TB), malaria and human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), it is nevertheless a relentless drain on the health, development, education and economy of socially-marginalized poor people in low-income countries.

> The partners **PROPOSE** that the control of parasitic worm infections (cestodiasis, dracunculiasis, lymphatic filariasis, onchocerciasis, schistosomiasis, soil-transmitted helminthiasis, strongyloidiasis and trematodiasis) should be effectively incorporated into a multidisease control approach together with TB, malaria and HIV/AIDS.

This strategy will contribute significantly to the attainment of most of the eight MDGs. In fact, without action to control worm-induced disease, measures to bring relief from TB, malaria and HIV/AIDS are incomplete and may be compromised.

4 Deworming for health and development

Dr Anarfi Asamoa-Baah
Assistant Director-General
Communicable Diseases

Hundreds of millions of people do not enjoy a healthy, productive life because they are debilitated and unable to achieve their full potential. Parasitic infections contribute significantly to this widespread deprivation. This assemblage of heterogeneous infections has poverty as its common denominator. Control of communicable diseases has always been a challenge for WHO. Although focus has been on malaria, TB and HIV in the last two years the attention to other tropical diseases has been expanded. The PPC is aware that those suffering the most from parasitic diseases live in resource-poor communities: they have little political influence, and they often live in remote areas, in conflict zones or urban slums where there is minimal or even no access to health care and other services. Parasitic infections are the hallmark of poverty and underdevelopment.

Soil-transmitted helminths and schistosomes are the most common infections worldwide. Some two billion people are chronically infected with soil-transmitted helminths and schistosomes, many suffer from severe morbidity, and others from more hidden manifestations of disease. Almost all cases occur in areas of poverty in low-income countries in the tropics and subtropics.

The control of morbidity due to soil-transmitted helminthiasis and schistosomiasis in poor communities is now a realistic possibility because low-cost, safety-tested drugs are widely available. Importantly, these drugs should be given regularly and can be given concomitantly in integrated control programmes. In 2001 this innovative strategic approach was endorsed by the WHA at its 54th Session and it is now being implemented in many endemic countries.

At the same time, WHO was requested to promote a new partnership to steer and implement this control strategy. The PPC, launched in June 2001, is a planning and management forum that retains an informal structure. But informal does not stand for uncommitted. The PPC has already demonstrated that different institutions can work together with the common aim of parasite control. Public health issues such as parasite control will not succeed without multifaceted collaboration.

The key intervention adopted by the PPC is morbidity control based on the delivery of regular anthelminthic treatment to high-risk groups. Periodic administration of anthelminthic tablets to school-age children is now part of the policy of many well-designed school health programmes in endemic countries. This intervention is expanding all over the world towards the 75% global coverage target.

WHO's target

*Regular treatment of at least **75%** of all **school-age** children at risk of morbidity for schistosomiasis and soil-transmitted helminth infections by 2010*

There is evidence that anthelminthic treatment of women during pregnancy improves maternal health, increases birth weight and reduces infant mortality. Anthelminthic treatment is also recommended for children as young as 12 months because this improves their health. These health benefits should significantly change the way people at risk of parasitic infections are treated and enable an even wider coverage.

The WHA in 2001 encouraged the organizations of the UN system, bilateral agencies and NGOs to take advantage of a combined action linked to existing initiatives for the prevention, control and elimination of other communicable diseases when combating schistosomiasis and soil-transmitted helminthiasis.

Massive progress has been witnessed in the drive to eradicate dracunculiasis. Progress is taking place towards the elimination of lymphatic filariasis as a public health problem by the year 2020. The WHO, NGOs, governments, and pharmaceutical industries are collaborating closely to ensure the success of these and similar initiatives.

The PPC now has to investigate how this wealth of experience, skill, knowledge and resource can be harnessed to work at country level to reduce delivery costs and ensure sustainability. The PPC must promote the intensified control of tropical disease, including all forms of helminthiasis, as a most worthwhile contribution to development and to the reduction of poverty.

5 Hitching a lift

Deworming can be effectively added to ongoing public health programmes

Implementation of any helminth control programme at country level requires strong links with existing interventions that are already in place to reach women and children.

Worm-free children have a better vitamin A status

A most striking example is the simultaneous delivery of deworming tablets with vitamin A supplements. One of its unmistakable advantages is the coverage opportunity: over 167 million children are reached yearly by vitamin A supplementation programmes worldwide and more than 50 countries report more than 70% coverage. Worms and vitamin A deficiency thrive in poor communities and the two problems often coexist. Delivering deworming by using the vitamin A distribution infrastructure (1) reduces delivery costs and (2) enables remote communities to be included. Deworming drugs are safe and can be delivered by non-health staff such as community volunteers after simple training.

In addition, deworming is popular and increases vitamin A supplementation coverage. Nepal is successfully pioneering this approach and is making deworming happen in children under five by using existing resources and boosting the success of the vitamin A distribution campaign (see section 11).

Deworming can be added to Integrated Management of Childhood Illness (IMCI) including community IMCI; school health programmes; maternal and child health; Roll Back Malaria, reproductive health - including Making Pregnancy Safer; distribution of bednets and/or micronutrients; and vaccination programmes

Deworming may also hitch a lift from the National Child Health Days, a way of giving children a health package including immunization, vitamin A supplements and deworming. This intervention is successful in the Democratic People's Republic of Korea and in several other countries.

In Cambodia the Ministry of Health uses monthly outreach services to deliver effectively a minimum package of activities through health centres (immunization, antenatal care, health education, family planning, tuberculosis and leprosy care), and has effectively included vitamin A distribution and deworming.

6 Deworming is building better lives

Deworming has made remarkable advances in the realm of public health. Millions of people, especially school-age children, have gained access to affordable, effective anthelminthic drugs; health and well-being have improved. Such has been the progress that in May 2001 the 54th Session of the WHA adopted Resolution WHA54.19. The prevailing deworming strategy was endorsed, Member States were urged to intensify control activities, and UN organizations and bilateral agencies were encouraged to intensify support for control activities. The Resolution also asked the Director-General of WHO to expedite the formation and work of partnerships for the control of schistosomiasis and soil-transmitted helminthiasis.

Deworming success rests on knowledge and experience from controlled operational research, extensive trials and powerful advocacy. The results have laid the following foundation:

- Concurrent use of anthelminthic drugs for schistosomiasis and soil-transmitted helminthiasis
- Considerable coverage of primary school-age children through schools
- Extension of deworming to pregnant and lactating women
- Inclusion of preschool children as young as 12 months in deworming activities
- Deworming can be combined with other health interventions
- Deworming can increase community health awareness and compliance
- Deworming serves as an entry point into health care systems
- Deworming represents a high return for low investment
- Benefits for participating communities include increases in growth rates of children, better school attendance and performance, improved iron status, decline in anaemia rates, healthier pregnancies and birth outcomes, greater adult productivity

7 WHO and the partners at work

Resolution WHA54.19 in May 2001 endorsed a strategy for the control of schistosomiasis and soil-transmitted helminths in high transmission areas.

In the short-term, morbidity will be reduced by

- access to drugs (PZQ + broad-spectrum anthelminthics) and good case management in all health services
- regular treatment of at least 75% of school-age children by 2010
- targeting other high risk groups (young children, women of childbearing age, occupational groups) through existing public health programmes and channels

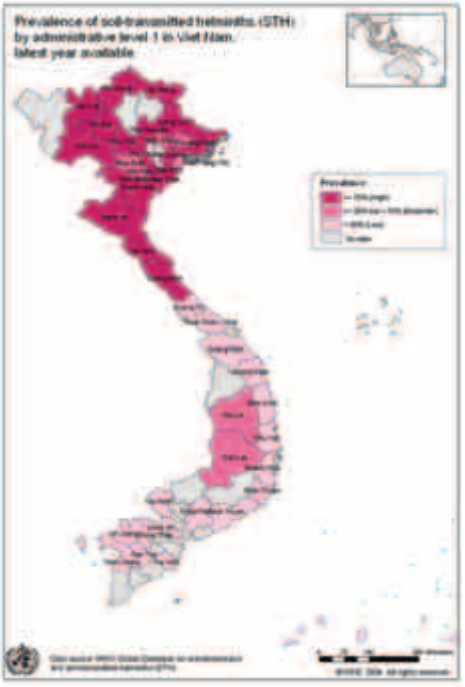
For long-term sustainability, environmental health aspects will be required, including

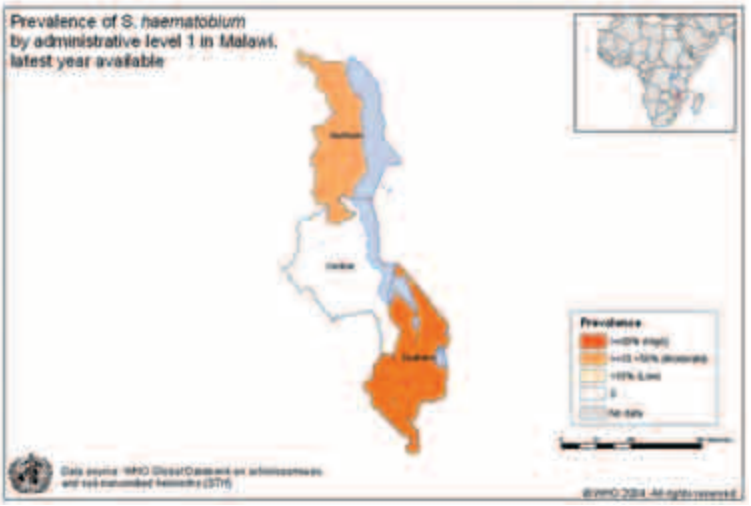
- improving access to safe water and sanitation
- improved hygiene behaviour through health education

Following the 2001 WHA resolution, WHO was requested to set up a system to monitor each endemic country's progress towards the 2010 target. The global PPC databank has been established and tracks the number of children who are treated each year for soil-transmitted helminths and schistosomiasis.

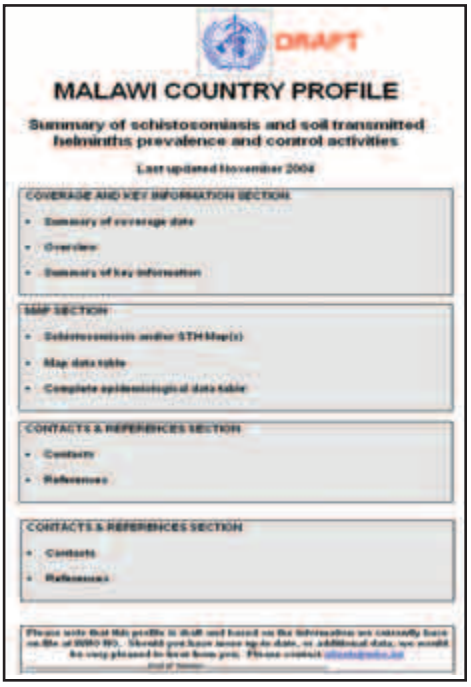
For further information, please refer to web site: ***http://www.who.int/wormcontrol***
Enquiries to Email: ***wormcontrol@who.int***

Epidemiological maps are being created; these describe the soil-transmitted helminths and/or schistosomiasis situation according to the latest data available for district level.





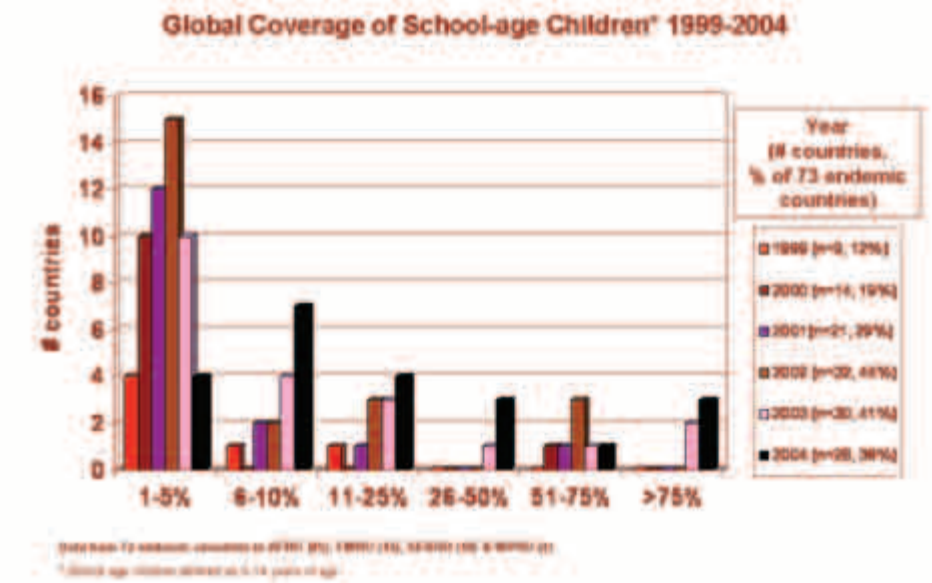
Country profiles, including information on coverage data, plans of action, and anthelminthic drugs on the Model List of Essential Medicines and their cost are collected through questionnaires and extensive liaison with other partners, regional colleagues, and national programme managers.



Global progress in coverage of school-age children from 1999 to 2004 is reported from 73 out of 104 endemic countries. Although data are awaited from 26 countries in the Americas, India and China, there has been a steady increase in coverage over time. Thirty of the 73 countries are known to be expanding control activities.

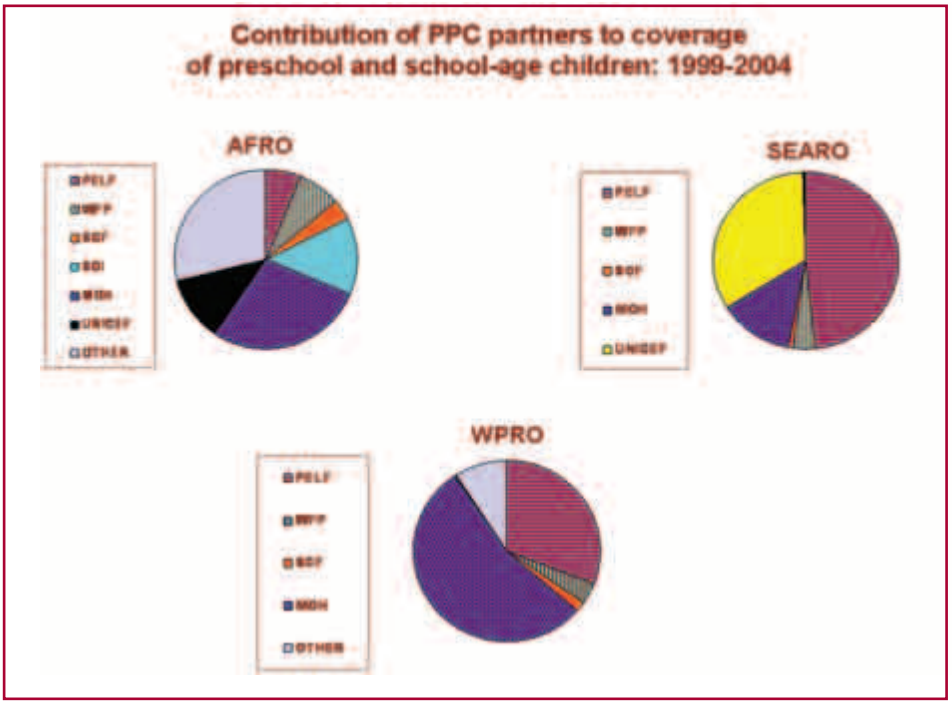
*The progress of WHO and other partners is illustrated in issues of the **PPC Newsletter** which are available online at **www.who.int/wormcontrol** and are widely distributed*

Preschool children are also being treated and coverage is building up. UNICEF is planning to use the momentum generated by National Immunization Days (NIDs) and vitamin A supplementation programmes to deliver deworming to preschool children in some countries.



Progress in deworming these groups of children depends on the work of the partners, each of whom brings a unique skill to the partnership: some excel at training, others are better positioned to produce advocacy materials. The provision of drugs falls under the remit of some agencies and outreach is one of the most valuable resources of the NGOs.

Each partner has contributed in their own individual way to the global activities during the period 1999-2004. For example, UNICEF often buys and delivers drugs for treating preschool-age children. However the programme remains under the jurisdiction of the Ministries of Health (MOH). Similarly, WHO and the Programme to Eliminate Lymphatic Filariasis (PELF) have bought drugs for MOH activities.



8 Making it happen in Uganda

In a keynote address The Hon. Jim K. Muhwezi, MP, Maj. Gen.(rtd), Minister of Health of Uganda, explained how the Ugandan government had established and implemented a national programme for the control of schistosomiasis and soil-transmitted helminthiasis in addition to its efforts to control malaria, TB and HIV/AIDs. Six factors had combined to facilitate the deworming programme.

The Hon. Jim K. Muhwezi, MP, Maj. Gen.(rtd) Minister of Health of Uganda

- The availability of highly efficacious low-cost drugs which have been given to millions of individuals. The health benefits for these people far outweigh any role of minor side effects.
- Political commitment to redirect existing services towards primary health care with the involvement of both the public and private sectors.
- Decentralization allowing districts to make decisions to suit local needs.
- The government's PEAP (poverty eradication action plan) which aims to eradicate absolute poverty in Uganda by 2017.
- Health care reforms based on a sector-wide approach for funding health care development.
- The readiness of willing partners to provide financial and technical resources.

The programme began in 2003 in a phased manner and is much appreciated by the people in the 18 districts that are now involved. The government is convinced that better coverage and greater impact will be achieved if a plan to incorporate deworming into a multidisease control approach is adopted. The government also expects that deworming must be seen as a priority if MDGs are to be achieved.

9 Feed the kids, not the worms

School feeding helps to break the interrelated cycles of hunger, illiteracy, poverty and disease, and serves as a platform for deworming and other interventions. In 2003, the WFP reached 15.2 million children in 69 countries. The goal is to reach 50 million children by 2008.

WFP works with communities, governments, NGOs and other agencies - especially UNICEF, WHO and FAO - in schools to train food preparers, carry out deworming, provide clean water and latrine facilities for girls and boys, promote HIV prevention, and more.

The deworming component has evolved, and by the 1990s various efforts were under way. An evaluation of a WHO-WFP programme in Nepal in 2000 showed very positive results within two years. WHO and WFP then began a major effort in Africa in 2001, training country teams of officials from WFP and from the Ministries of Health and Education to organize deworming campaigns for primary schools. Since 2001, WFP and WHO have held five workshops in Africa with support from the Canadian International Development Agency (CIDA) and World Bank; and 36 country teams (over 100 officials) were trained. In turn, over 10,000 African teachers were trained in 2002, almost 12,000 in 2003, and over 22,000 in 2004.

Thirty countries worldwide now report active deworming and school feeding programmes

These programmes reached almost 2 million children in 2002, nearly 3 million in 2003 and 7 million in 2004.

The average cost per child per year is 59 cents: 4 cents for mebendazole, 25 cents for praziquantel, and 30 cents for all other costs (training, monitoring, educational materials)

Why would one want to feed worms as well as kids? Nobody would want to fill a leaking bucket with water. Feeding children and combating worms is a successful recipe for improving their nutrition, achieving better education and developing them into fully healthy adults.

10 A world fit for children

Carol Bellamy, UNICEF's Executive Director, wrote that it is incredible that in an age of technology and medical marvels, child survival, growth and development is still so tenuous in so many places, especially for the poor and marginalized. In the report of a UN special session held in May 2002 entitled "A World Fit for Children", world leaders committed themselves to reduce infection with intestinal parasites by 2010.

UNICEF advocates that this urgently needed control of worm infections can be achieved by scaling-up deworming, particularly by including the process in programmes for the IMCI and in Child Health Days. The success of deworming needs to be sustained. Interventions should be encouraged to build a culture of good hygiene practice at school. Equally important is to make sure that all schools have latrines and that these are used properly and are maintained in good condition.

The inclusion of sanitation and hygiene in the curricula for teacher training colleges and schools represents an investment for home and community environments as well as for schools. The PPC must recognize that resources earmarked for sanitation and health education are as important as those directed at deworming. The pledge to reduce infection with intestinal parasites by 2010 is more likely to be achieved if the effort includes the establishment of appropriate sanitation and health education in every school.

Source: UNICEF, 2000

11 Making it happen in Nepal

The mountainous, landlocked country of Nepal is home to 25 million people, most of whom live in the countryside. Nepal has been designated as a least developed country; the gross national income in 2003 was US$ 230 per capita and 38% of the population live on less than US$ 1 per day (adjusted for purchasing power parity). Nevertheless Nepal has made it happen. The achievements of three projects show how successful deworming improves the health and well-being of school-age children, pregnant women and infants.

Nutritional improvement and deworming go hand in hand

Between 1998 and 2001, the Nepalese Ministries of Health and Education, in partnership with WHO and WFP, and with financial support from the Canadian Women's Health and Micronutrient Facility, embarked on a scheme of integrated nutrition and deworming. Some 250,000 primary school children were given a nutritious meal during the school day and were also offered two doses of albendazole (manufactured in Nepal) during the school year. Significant nutritional improvements were found in the children and there were significant falls in the prevalences and intensities of soil-transmitted helminth infections. The success of this initiative triggered the political will which is now urging that the deworming programme in schoolchildren be extended to national scale.

A second example of improving child health and involving deworming integration is the experience with vitamin A supplementation in pre-school children. In Nepal vitamin A distribution is made twice yearly and in 2004 was scaled up to all 75 districts, reaching up to 2 million children under 5 years of age. The programme is funded by UNICEF but the system used is a capillary distribution at village level with the aid of community health volunteers. Since 2001 deworming has been added with no additional distribution cost, the albendazole being purchased by the MOH. Extremely high coverage (over 95%) led to the outstanding result of reduction in anaemia by 77% in one year, in addition to a reduction in soil-transmitted helminth infections.

Regular deworming in Nepal has reduced anaemia by 77 %

A recent research study undertaken in an area of rural Nepal has demonstrated in a most convincing and controlled fashion that deworming greatly improves the health of pregnant women and the birth weight and survival of their babies (see section 17). This work in Nepal confirms that antenatal deworming surely deserves more attention and implementation when appropriate circumstances prevail.

12 Deworming enhances education

A nation's children are that nation's future

Deworming undoubtedly makes a significant contribution to the education of children, and in so doing to a nation's development. Not surprisingly, children experiencing the debilitating effects of worm infections spend fewer days in school compared with those who are free from infection. For example, children enduring intense infections with whipworm miss twice as many school days as their infection-free peers. This result has been demonstrated convincingly in Jamaica and in Kenya.

That deworming increases attendance at school is to be welcomed. What is more important and encouraging is that children who have been treated gain much more from their increased time at school, not only because they are free from illness but also because their cognitive performance improves and they learn significantly better. Tests have shown that a child's short-term memory, long-term memory, executive function, language, problem solving and attention respond positively to deworming. Interestingly, girls display greater improvements than boys.

Deworming enhances and enriches education

Estimates have been made of the quantitative costs of worm infections to cognition and education. The total lost years of schooling due to worm-associated absenteeism amounts to over 200 million years; almost all this loss occurs in low- and middle-income countries. The average IQ loss per worm infection is 3.75 points, amounting to a total IQ loss of 633 million points for the world's low-income countries.

13 Scaling-up deworming

The 3 key issues for scaling-up deworming are: (1) assist endemic countries to implement national control programmes; (2) develop a demand for treatment and monitor and evaluate the programmes; and (3) encourage operational research.

These are the objectives of the Schistosomiasis Control Initiative (SCI), Imperial College, London, UK, which is working with Burkina Faso, Mali, Niger, Tanzania (including Zanzibar), Uganda and Zambia. By the end of 2004 approximately 5.25 million treatments with praziquantel and albendazole were dispensed in these countries.

In Uganda, 1.4 million school-age children and adults in highly endemic areas have been treated and a reduction in the prevalence and intensity of schistosomiasis and soil-transmitted helminthiasis has been demonstrated. In addition, an increase in knowledge of schistosomiasis and reduction in pathology have been achieved.

Mainland Tanzania is also decreeing a National Schistosomiasis Day in 2005, targeting over 4 million school-age children.

One of the merits of SCI is to facilitate integration of other deworming programmes at the national level, the synergistic deworming in collaboration with PELF being an example.

SCI has worked to develop partnerships at international and country levels between the Ministries of Health and Education in the 6 countries, WHO, WFP, the United States Agency for International Development (USAID), the United Kingdom Department for International Development (DFID), the Danish Bilharziasis Laboratory (DBL), and the Wellcome Trust. SCI has allocated funds given by the Bill and Melinda Gates Foundation (US$ 30 million) and will approach other donors for funding to meet new requests. An initial success has been achieved with a pharmaceutical company, MedPharm, which donated over 14 million tablets of praziquantel and one million tablets of albendazole in 2004.

Boosting local capacity for drug procurement

SCI has met the big challenge of drug procurement by facilitating registration of drug products in each country, promoting local production by national pharmaceutical companies, and assisting and strengthening procurement agencies at country level according to local needs.

14 NGOs facilitate deworming

School health and nutrition programmes need a deworming component

NGOs play a crucial role in advancing and improving the effectiveness of deworming in the context of School Health and Nutrition (SHN) programmes. With experienced staff, technical expertise and strong local and national links, NGOs are able to pilot and scale-up model SHN programmes (including deworming) and carry out operational research. NGOs also influence national policy and advocate for and support the development and implementation of national SHN programmes.

In Burkina Faso, Save the Children/USA piloted and evaluated an SHN programme in Bazega Province, and used the results to raise funds, scale-up the programme and advocate for a national SHN programme. Six years later, the national SHN programme has been developed and Save the Children/USA is one of three NGOs (along with Catholic Relief Services and Helen Keller International) to be contracted by the Ministry of Education to implement the programme.

Save the Children/USA supports SHN programmes in 11 countries in Africa, Asia, the Middle East and Latin America. The programmes aim to achieve education for all by addressing children's health and nutrition problems, using the four main strategies supported by the FRESH initiative (Focusing Resources on Effective School Health): 1) school-based health and nutrition services (including deworming); 2) safe water and sanitation; 3) promotion of healthy behaviours; and 4) school health-related policies.

Governments liaise with nongovernmental organizations

NGOs (international and national) have resources and expertise for parasite control. Governments should be encouraged to liaise more with international NGOs that play a major role in advocacy and with local NGOs which may have a deep knowledge and trust within the community and could effectively assist in the implementation of deworming programmes.

15 Deworming as an investment for health and development

The World Development Report for 1993 entitled *Investing in Health* revealed that common soil-transmitted helminth infections caused the greatest burden of infectious disease in children aged between 5 and 14 years in countries with developing economies. Now that safety-tested, effective anthelminthic drugs cost no more than a few cents per dose, this means that deworming school-age children is probably the most economically efficient public health activity that can be implemented in any low-income country where such infections are endemic.

The contribution of subtle morbidity to chronic disability should not be overlooked

An often-overlooked aspect in public health expenditure is the cost of infrastructure and institutional capacity to implement the desired interventions. Deworming is a particularly effective intervention because the capacity costs are negligible.

High death rates are not obviously associated with disease due to schistosomiasis and soil-transmitted helminthiasis. Recent re-analysis has found, however, that the costs of subtle morbidity are far higher than was previously thought. For example, seemingly uncomplicated schistosomiasis is far from benign and is linked to anaemia, body weight and energy deficits, chronic pain, fatigue and exercise intolerance. On average, schistosomiasis causes a haemoglobin reduction of 4g/l that relates to reduced work output and to as much as a 60% reduction in peak workload capacity. It is now possible to predict that the average disease burden for a schistosomiasis-infected person ranges from 2-15% chronic disability. Programmes that succeed in controlling disease due to worm infections contribute not only to the health and well-being of individuals but also to the economic development and progress of the nation.

Chronic disability costs more in development terms than death

Chart 1. Mechanisms through which Health influences GDP

Source: Dean Jamison, University of California, Los Angeles, USA, 2004

16 Making it happen in Ecuador

High coverage was obtained thanks to the contribution of numerous volunteers working for INNFA

The National Institute of the Child and the Family (INNFA) is a private organization dedicated to social development in Ecuador. One area of health intervention to which INNFA gives high priority is deworming of children. INNFA has formed a successful alliance with the MOH in Ecuador, MedPharm and volunteers who assist with the programme. Dr Ximena Bohorquez de Gutierrez, the First Lady of the Republic of Ecuador, is the Chair and President of INNFA.

Dr Ximena Bohorquez de Gutierrez
First Lady of the Republic of Ecuador

There can be no doubt that the daily commitment of such a high profile person to deworming has manifestly increased the compliance with and support for deworming in Ecuador.

The alliance between INFFA, MedPharm and its philanthropic partners and the Government of Ecuador is making deworming happen in Ecuador

Between 1999 and 2003 over 500,000 people were treated annually with the appropriate dose of albendazole. During the first part of 2004, coverage with this treatment rose to 1.2 million people. Albendazole tablets (400mg) were made available at 1046 locations such as schools, INNFA's community centres and shopping markets. This degree of coverage depends on the work of both paid and volunteer agents trained by INNFA. It is planned that the next round of treatment will reach 2 million people.

Without a robust and secure supply of quality albendazole this ambitious deworming programme would falter. MedPharm has generously helped to cover the cost of the drug and arranged additional donor support for the same purpose.

17 Deworming for healthier mothers and infants

Anthelminthic treatment after the first trimester of pregnancy benefits mothers and infants

Hookworm and other helminth infections have long been known to have adverse effects on maternal health and pregnancy outcomes. When widely-used, safety-tested anthelminthic drugs became available, a significant policy change was implemented. In areas endemic for hookworm infection, deworming after the first trimester of pregnancy has been demonstrated to be safe and results in improvements in maternal health, in birth weight and in infant survival.

A randomized trial in Sierra Leone demonstrated the additive effect of iron and albendazole treatment in the improvement of haemoglobin concentration in the third trimester of pregnancy. This was followed by a major study in rural Nepal that demonstrated in a most convincing and controlled fashion that deworming greatly improves the health of all pregnant women and the birth weight and survival of their infants. The study was carried out in the district of Sarlahi where three quarters of all pregnant women were infected with hookworm. Several thousand expectant mothers were registered in the study; most received micronutrient supplements and were given a dose of albendazole in the second trimester and another dose in the third trimester. The researchers demonstrated that receipt of albendazole in the second trimester was associated with a significant decrease in the prevalence of severe anaemia in treated mothers, that the birth weight of babies from mothers given two doses of albendazole rose on average by 59g, and that the infant mortality rate at 6 months had fallen by 41%.

A recent review also suggests that pregnant women and their newborn fetuses can suffer from the adverse effects of schistosomiasis. Praziquantel can be safely given during pregnancy and should therefore be included in routine deworming during antenatal care.

This work confirms that deworming as part of routine antenatal care is a cost-effective strategy for reducing maternal anaemia that in turn has broader health benefits related to birth outcomes. Where anthelminthics are used in pregnancy, efforts should be made to set up a system of pharmacovigilance for reporting any possible side effect on pregnancy outcome.

18 Don't forget the preschool children

Morbidity is directly related to worm burden. School-age children with the greatest number of worms are assumed to be at greatest risk and are expected to benefit most from deworming. Preschool children, whose worm burdens are housed in smaller bodies, are just as much at risk of disease and more at risk of death.

In young rural African children with prevalent helminth infections and malnutrition, a placebo-randomized trial was conducted to measure the effects of low-dose daily iron and/or 3-monthly deworming on growth, iron status and anemia, and development. Results showed that periodic deworming after 12 months

- reduced mild wasting malnutrition by 62%
- reduced the prevalence of small arm circumference by 71% in children < 30 months
- reduced moderate anaemia (Hb < 9 g/dl) by 59% in children < 24 months
- improved appetite by 48% in all children

In addition, periodic mebendazole had a positive effect on children's motor and language development.

Preschool children deserve to be dewormed

Young children are at higher risk of anaemia and wasting malnutrition and thus might be most vulnerable to the detrimental effects of worms. This unexpected significant reduction in wasting malnutrition and anaemia in children with light infections suggests that incident helminth infections in a non-immune population may stimulate immune responses that have deleterious effects on protein metabolism, appetite and erythropoiesis. These effects are large and potentially important to the development and survival of young children and are presently being confirmed in a larger trial.

The benefits of deworming on malnutrition and anaemia in preschool children have been demonstrated in recent studies from India and Nepal. The evidence calls for including young children also in control programmes where helminth infections are endemic. It is worth noting that these trials have further confirmed the safety of deworming treatment in this age group.

19 Making it happen in Brazil

Recife is the capital city of Pernambuco State and is a port located on the north-eastern coast of Brazil. About 1.5 million people live in the city and a further 1.5 million in the metropolitan area. Many waterways divide the city, which has become known as the Venice of the Americas, into distinct districts. Some of these districts have become pockets of severe urban poverty where households have to endure frequent episodes of flooding. Despite the abundance of water around Recife many people have restricted access to drinking water that may be available on only one day in three.

The Brazilian constitution declares that health is a right for all its citizens. Health is a government priority and the national health budget has been increased significantly in recent years. In Recife, the municipal authorities have concluded that improving the quality of the urban environment is essential if public health problems are to be resolved. A holistic approach has been adopted for dealing with environmental issues and for providing health care to reduce poverty-related diseases such as lymphatic filariasis and leptospirosis. Deworming features prominently in this integrated drive to control disease and improve the environment for poor people in Recife.

The family health programme must go hand in hand with the environmental health programme if benefits are to be gained and sustained. The zero hunger programme has proved to be a good entry point for delivering a health care package for the poorest families suffering from parasitic diseases.

Source: Dr Tereza Maciel Lyra, Diretoria de Epidemiologia e Vigilância a Saúde, Secretaria Municipal de Saúdes, Recife, Brasil, 2004.

20 A pro-poor strategy

Development is an optimistic word that evokes progress towards the permanent release of poor people from poverty. The MDGs have been devised to stimulate and guide efforts to reduce the never-ending daily reality of poverty. The response of institutions established to eradicate poverty involves planning and implementing a diverse set of programmes, including those for improving the health of the poor. Excellent advocacy has raised awareness of malaria, TB and HIV/AIDS and ensured that these devastating diseases have attracted a major share of health resources.

	Economic Rates of Return	Unit Costs per Treatment	No. targeted/ current estimated treated coverage
Onchocerciasis	17-20%	$0.10 - $0.20	20 million
Lymphatic Filariasis	>20%	$0.03-$1.50	120 million (2003)
Guinea Worm	29%	N/A	All infected villages
Soil-transmitted Helminths		$0.02	36 million (2003)
Chagas Disease	30%	N/A	N/A
Trachoma	N/A	$0.30	2.8 million (2002)
Schistosomiasis		$0.20 - $0.30	10 million (2004)
Vitamin A		$0.02	167.8 million children 70%coverage in 44 countries
Total estimated range of chemotherapy package per annual treatment/s for all above diseases		Circa $0.90 - $2.40	

Source: Molyneux, DH, Liverpool School of Tropical Medicine, 2004

The cost of treatments per patient for these three killer diseases contrasts dramatically with the cost of treatments per patient for worm-induced disease. Calculations indicate that a bundle of diseases, including schistosomiasis, soil-transmitted helminthiasis, onchocerciasis, lymphatic filariasis, trachoma and vitamin A deficiency, can be controlled at costs ranging from about US$ 1 to US$ 2.50 per patient. The infrastructure for the delivery of such a package of health care to millions of poor people already exists in many endemic areas through primary health care provision, public and private schools, faith-based organizations and social institutions such as the scout movement.

Adopting a multidisease control approach on the scale that is needed requires good partners to emerge and work together. In addition to securing resources for disease control, partners should attend to five key features of this pro-poor strategy:

- networking needs to be strengthened between compatible partners
- proposals should be developed for integrated action where geographically and technically appropriate
- evidence for the cost-benefits of infectious disease control needs to be increased and circulated
- interaction between programmes at the country level should be encouraged
- the contribution that controlling infectious disease can make to the attainment of MDGs should be promoted

21 Deworming helps meet the Millennium Development Goals

Deworming

The Millennium Development Goals

The evidence is in: deworming helps meet the Millennium Development Goals

Schistosomes and soil-transmitted helminths have few rivals in terms of prevalence. They occur throughout the developing world, but are most commonly seen in the poorest communities. WHO estimates that around 2 billion people are currently infected. Of these, some 300 million suffer severe and permanent impairments as a result.

While these figures are not reflected in huge numbers of deaths, the consequences for health and development are enormous. Apart from permanent organ damage, worm infections cause anaemia, poor physical growth, poor intellectual development and impaired cognitive function. They do so at a critical time in life: infection reaches maximum intensity in the age range of 5 to 14 years.

Today, control of these infections can be achieved through regular treatment with inexpensive, single-dose and highly effective drugs so safe they can be given to all groups at risk. Deworming drugs are almost irresistibly affordable. A dose of benzimidazoles costs US$ 0.02. US$ 0.20 buy an average dose of praziquantel.

While schoolchildren have been targeted as a priority group for treatment, recent evidence indicates that preschool children and pregnant women likewise benefit greatly from regular deworming. Technical problems associated with large-scale chemotherapy campaigns have been solved, and control in all settings is now feasible. Few other conditions, associated with poverty and perpetuating poverty, can be so easily alleviated, for a fistful of pennies per person.

Goal 1: Eradicate extreme poverty and hunger

Deworming boosts the prospects of school-age children to earn their way out of poverty. The improvements in intellectual development and cognition that follow deworming have been shown to have a substantial impact on professional income later in life. Studies conducted in the USA estimated the benefits of a hookworm-free childhood at around 45% of adult wages. When these estimates are applied to a developing country like Kenya, studies show that deworming could raise per capita income from the present US$ 33.7 per person to approximately US$ 490 per person. In Japan, successful deworming programmes in the 1950s are considered one reason for the country's subsequent economic boom.

The impact of inadequate nutrient intake is amplified by worm infections, which interfere with nutrient uptake and are a major cause of anaemia. Malnourished children become more malnourished when infected with worms. The effects of deworming are dramatic, as illustrated by a large study conducted in India. Six-monthly deworming was able – within two years – to prevent 82% of the stunting that occurs without intervention; dewormed children showed a 35% greater weight gain.

Goal 2: Achieve universal primary education

In 2003, a report to the United States Congress on the world economic situation concluded that in developing countries treatment of schoolchildren with deworming drugs can reduce primary school absenteeism by 25%, leading ultimately to higher wages. This finding agrees with data on United States schoolchildren, which showed a 23% drop in school attendance in children infected with hookworm. Moreover, when compared with other measures for improving school attendance, deworming was ranked as by far the most cost effective.

The evidence is most compelling when viewed at the global level. Of the estimated 562 million school-aged children in the developing world, worm infections are estimated to cause around 16 million cases of mental retardation in primary school children and 200 million years of lost primary schooling.

Goal 3: Promote gender equality and empower women

A girl's best head-start in life is a good education. It is also her best chance of finding employment outside the agricultural sector. Although the gender gap in education is slowly closing in the developing world, the percentage of boys in schools still outnumbers that of girls. Deworming programmes, especially when associated with other simple measures such as school meals and take-home rations, have been shown to contribute to school

The evidence is in: [illegible] *the Millennium Development Goals*

Nepali girls in school

enrolment by girls and to improve their drop-out and retention rates. In 2000 a pilot project in Nepali schools, involving deworming tablets, a hot noon meal and food gifts for girls to take home, resulted in a 43% growth in school enrolment by girls. In addition, anaemia vanished.

Goals 4, 5: Reduce child mortality, improve maternal health

Worm infection weakens very young children in ways that increase their vulnerability to infectious diseases. Recent studies conducted in areas where malaria is a major childhood killer show that deworming and the resulting reductions in anaemia improve the chances of surviving severe malaria. The large reductions in wasting malnutrition and anaemia that followed deworming contributed to the survival as well as development of these children.

Poor nutrition in general and anaemia in particular are the main underlying causes of poor pregnancy outcomes in the developing world. By reducing anaemia, deworming drugs – which can be safely administered during pregnancy – contribute directly to maternal survival. In anaemic women, the risk of dying during pregnancy or childbirth is up to 3.5 times higher than in non-anaemic women. Abundant evidence shows that regular deworming reduces anaemia in adolescent girls and women of childbearing age, thus preparing them for a healthier pregnancy. A large study of pregnant women in Nepal has shown that women given a deworming drug (albendazole, for treatment of soil-transmitted helminths) in the second trimester of pregnancy had a lower rate of severe anaemia during the third trimester.

Deworming also improves birth outcome. In 1989, a large study in Guatemala involving some 15 000 pregnant women found a clear link between worm infection and retarded fetal growth. In the Nepal study, birth weight of infants born to women receiving two doses of albendazole rose by 59 g. More important, infant mortality at 6 months fell by 41%. In Sri Lanka, a study showed that deworming during pregnancy resulted in a 42% reduction in the proportions of stillbirths and perinatal deaths and a 52% reduction in low-birth-weight babies.

The evidence is even more compelling for schistosomiasis, which affects an estimated 10 million pregnant women in Africa alone. Recent studies show that half of these women suffer from anaemia. These figures demonstrate the enormous scale of the impact that deworming can have on the survival of both pregnant women and their babies. Fortunately, praziquantel, the drug of choice for schistosomiasis, can be safely given to women at any time during their pregnancy.

Goal 6: Combat HIV/AIDS, malaria and other diseases

While worm infections do not cause the same high mortality as that of AIDS and malaria, they do number among the "other diseases" that impair the health, physical and mental development, and productivity of huge numbers of the poor. In so doing, they anchor large populations in poverty. Reducing worm infections and other ancient companions of poverty builds the very foundation for good health and – in the spirit of the Millennium Development Goals – contributes to human progress.

Evidence that worm infections may influence the clinical burden of AIDS and malaria is just beginning to emerge. One recent study indicates that worm infections disrupt the immune response in ways that could hasten the progression from HIV infection to AIDS. The impact of deworming on improved educational outcome also contributes to the "social vaccination" against HIV infection. Another recent study found that malaria attacks were more frequent in persons infected with intestinal worms. While these studies need to be confirmed, the role of deworming in building good health during a critical period of life has been amply demonstrated.

Goal 8: Develop a global partnership for development

This goal includes a target, to be achieved in cooperation with pharmaceutical companies, of access to affordable, essential drugs in developing countries. For worm infections, many studies have clearly shown that morbidity can be significantly reduced through repeated and regular treatment with single-dose drugs delivered through school health programmes. The drugs are safe, inexpensive and simple to administer, and thus ideally suited for mass administration.

Because such huge numbers are affected, the benefits of bringing these drugs to the masses in need is likewise huge. Systematic delivery of deworming drugs in sustainable ways is a pro-poor strategy with great potential for development. That potential is further amplified by its suitability for integration with other mass-treatment programmes for diseases of the poor – onchocerciasis, lymphatic filariasis, blinding trachoma, and the foodborne trematode infections. As these are diseases of the poor, they frequently overlap, thriving under the conditions of poor hygiene and sanitation seen throughout the developing world. The challenge now is to rationalize existing control programmes through integrated approaches that streamline delivery and bring down costs, thus allowing more of the world's poor to benefit from essential drugs for ancient diseases.

World Health Organization

22 New technology for sustaining deworming

Preparation to safeguard anthelminthic efficacy

Periodic chemotherapy with single dose anthelminthic drugs will be the mainstay for helminth control in developing countries for some time. Until new drugs have been developed, tested and registered, it is essential to make the best use of existing products. This is particularly important in light of the increasing drug resistance of nematodes of livestock to anthelminthic products. Recent evidence suggests reduced efficacy of benzimidazoles against hookworm infections in humans after 13 rounds of treatments.

Provision of tools to detect and monitor drug resistance

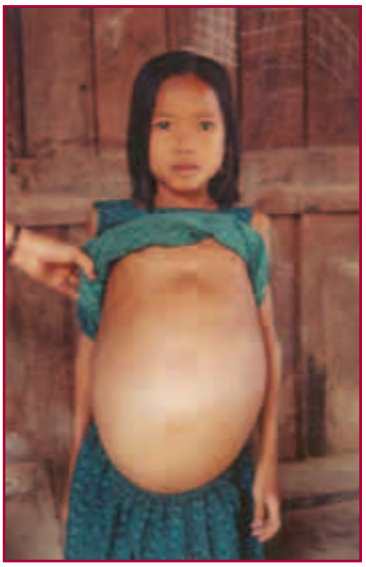
Assessment and monitoring of efficacy of anthelminthic drugs in areas where they are commonly used should be performed in a standard way so as to warn of possible treatment failures. In addition to the available measurement of reduction in faecal egg count following treatment, tests such as the Egg Hatch Assay have been developed to monitor benzimidazole efficacy against human hookworms. A far more sensitive technique for drug efficacy monitoring would be the development of molecular probes with polymerase chain reaction (PCR) techniques. Desirable research studies to identify sensitive and resistant genes in worm populations are at an early stage.

The creation of a global network for monitoring anthelminthic drug efficacy/resistance is a much needed response to this emerging threat. Such a network will depend on action by different partners with dedicated funding. A successful example is the concerted action on the use of praziquantel for the treatment of schistosomiasis that is funded by the European Union and involves a forum of scientists and public health planners. In the praziquantel initiative, the operational research component is tailored to health policy issues in endemic countries.

A human hookworm vaccine is being developed and tested by the Human Hookworm Vaccine Initiative. This public partnership consists of The George Washington University (Washington, DC), London School of Hygiene and Tropical Medicine, and Oswaldo Cruz Foundation (Brazil) with programme management sponsored by the Sabin Vaccine Institute (Washington, DC). The lead candidate for the vaccine is ASP-2, an antigen from infective larvae that has been selected for product development and clinical testing. It is expected that Phase 1 clinical trials for safety and immunogenicity will begin in the first quarter of 2005. Ultimately, proof-of-concept for the efficacy of the *Na*-ASP-2 Hookworm Vaccine to reduce hookworm burden and intestinal blood loss will be evaluated in a Phase 2b clinical trial in Minas Gerais State, Brazil.

23 Making it happen in Cambodia

Political will drives deworming



Cambodia is one of the least developed countries and has an under-five mortality rate of 138/1000. Five years ago more than 70% of Cambodian children were infected with intestinal worms. In July 2004 Cambodia became the first country to protect three out of four school-age children (nearly three million) with regular anthelminthic treatment against intestinal worms and reach WHO's 2010 target six years ahead of schedule. Cambodia has made it happen.

Drugs are distributed across 24 Provinces by thousands of teachers. The campaigns were conducted by the Cambodian Ministry of Health, Education and Sport, with the support of WHO, together with UNICEF, the Japanese Government and the Sasakawa Memorial Health Foundation. The success demonstrates what can be achieved when the political will is there together with financial support from donors and partners.

Deworming in Cambodian schools is promoted by the production and distribution of a school kit, a package that includes deworming pills, health education posters and pamphlets for teachers, games and attractive pictures for children giving simple messages on how to prevent infection. All this is possible at a cost of US$ 0.07 per child treated.

24 Questions needing answers

- Advocacy for sustaining the effort to control helminthiasis will require the latest and best information: the disease burden regularly revised and expressed in terms of the most reliable DALYs available. In this exercise the incorporation of chronic disabilities and coinfections should be considered.

- There is emerging evidence that concurrent worm infections may have synergistic effects on the severity of malaria, the progression of HIV/AIDS, and the development and effects of anaemia. These interactions and potentially important consequences merit more extensive investigation.

- Impressive benefits of deworming on education, poverty reduction and contribution towards the MDGs have been put forward, though they need further quantification and wider dissemination.

- Further research on the possible use of 'packaging' deworming with other programmes is needed to sustain science-based synergy and integration with other programmes such as: PELF, vitamin A distribution campaigns, Child Health Days, malaria, Expanded Programme on Immunization.

- There is inconsistency between WHO recommendations and the drug producers' prescribing information. The WHO recommendations are based on toxicological evidence presented to experts at two informal consultations. The cost of undertaking the extensive process required by regulatory bodies is beyond the resources of WHO at present. Nevertheless, the full-scale toxicological review expected of the pharmaceutical industry should be undertaken. A pressing issue to be addressed is the need to set up a reliable system for pharmacovigilance in community deworming campaigns.

- Sensitive molecular tools to monitor drug efficacy need to be developed. To wait for drug resistance to occur before seeking funds for research on drug efficacy monitoring might be too late an answer if this potential problem emerges.

- The possibility of development of new anthelminthic drugs and the efficacy and safety of available drugs administered in combination should be evaluated.

- Availability of efficient vaccines would make a difference in helminth control. Trials for the development of vaccines against schistosomiasis and hookworms should be supported and collaboration between research and control should be encouraged.

25 WHO at the helm of the PPC

Within the PPC, WHO has the role of technical agency and secretariat. As technical agency, WHO is developing strategies, tools and guidelines for parasite control and gives technical guidance and support for the implementation of these strategies to the partners and countries whenever this is required. WHO is committed to partnership building, with particular emphasis on implementation at country level and in advocacy at all levels. As the secretariat of the PPC, WHO's primary responsibility is to keep track of the global epidemiological situation for parasite control and to monitor progress towards the 2010 goals.

The PPC Newsletter is widely distributed and a website is available from which guidelines and tools can be downloaded. WHO is also building regional and country capacity to strengthen implementation.

A PPC global data bank has been established to track progress towards the 2010 target, and should be sustained with regular reporting of data from the endemic countries. Global data management requires a routine system to transmit the data from the country to regional and global levels. WHO has provided evidence as to how deworming helps to meet the MDGs, and progress towards achieving them should be further documented. WHO, with the help of its Collaborating Centres, is fostering global networking among partners to assist in their varied contributions to promote control, including monitoring anthelminthic drug efficacy and pharmacoviligance for adverse events. Resources are needed from international agencies and public-private donors to make this happen.

At the end of 2004, deworming had reached close to 5-10% of global coverage and PPC partners have been indispensable in this good beginning. The initial burst of activity must be sustained. Expanding and maintaining a high yearly coverage is the major challenge for the future. In order to meet the target of reaching at least 650 million children by 2010, deworming should become part of a multidisease control approach, with sustained political commitment on the part of national authorities.

Web site:
www.who.int/wormcontrol

26 Onwards and upwards

Dr Kazem Behbehani
Assistant Director-General
External Relations and Governing Bodies

A letter from President Jimmy Carter was read at the opening of the meeting with a message of inspirational exhortation to build and strengthen partnerships for advancing the control of worm-induced disease. The resolution passed at the 54th WHA has proved to be a landmark in making it happen.

Progress towards protecting at least three out of every four school-age children from schistosomiasis and soil-transmitted helminthiasis in countries where these diseases are endemic has exceeded the most optimistic expectations. Cambodia has reached its target six years early. Bhutan, Burkina Faso, Mali, Philippines, Sri Lanka, Uganda and Viet Nam are some of the many countries that are firmly set on the path to reach the WHA's target by 2010.

Worm control is succeeding where governments have established legislative and structural support, where intersectoral collaboration is strong and where partners strive to provide and use resources to best effect. There is no universal paradigm or all-embracing plan. The PPC recognize that each country must set its own health priorities and implement its own plans according to prevailing conditions. It accepts that partners must be flexible in their responses to requests for support.

Control of these diseases is certainly moving onwards, but how may it move upwards? How may deworming coverage be expanded and sustained? Perhaps the answer lies in a proposal to adopt a multidisease control approach that includes worms, malaria, TB and HIV/AIDS. Evidence is beginning to suggest that the control and management of malaria, TB and HIV/AIDS may be less effective unless the insidious impact of concurrent worm infections is reduced.

Such infections thrive amongst the poorest of the poor and are a proxy for poverty. WHO must be enabled to build and service partnerships for worm control. Such an effort, particularly if it includes a multidisease approach, will support the drive to achieve the MDGs. This approach deserves high priority because the poorest of the poor deserve it.

27 Action points

Control

1. The partners are convinced that the control of worm-induced disease is a highly effective investment in terms of health, education, poverty reduction and development.

> The partners **RECOMMEND** that this important message should be vigorously promoted to governments, employers and labour organizations.

2. The partners recognized that the significant benefits of deworming for women during the second and third trimesters of pregnancy and their infants merit wide promotion.

> The partners **RECOMMEND** that an informal consultation should be held to review use of anthelminthic drugs throughout pregnancy and to advise on setting-up a system of pharmacovigilance for reporting side effects.

3. The partners acknowledge that while funds for parasite control are available from the World Bank, utilization of these funds at country level is perceived to be complicated and difficult.

> The partners **RECOMMEND** that guidance about how to approach the World Bank for funding for school health programmes should be compiled and distributed and that a focal person be identified to liaise with the World Bank and countries to facilitate utilization of funds for parasite control.

4. The partners recognized that NGOs (international and national) have resources and expertise for parasite control, and that governments could engage more with NGOs in control enterprises.

> The partners **RECOMMEND** that an NGO data file should be compiled to provide governments with information about sources of support for parasite control.

5. The partners accepted that approaches for the control of disease due to cestode and trematode infections and to infection with *Strongyloides stercoralis* are essentially the same as for schistosomiasis and soil-transmitted helminthiasis.

> The partners **RECOMMEND** that measures for the control of cestodiasis, trematodiasis and strongyloidiasis should be included in health packages in places where these diseases are endemic.

Research

1. The partners were concerned with the urgent need to monitor accurately and promptly all aspects of anthelminthic drug efficacy because control of worm-induced disease currently depends on the use of few drugs.

> The partners **RECOMMEND** that every parasite control measure should include systems for
> (a) measuring drug efficacy;
> (b) monitoring for signs of possible drug resistance; and
> (c) reporting results.
>
> Networks for sharing information and experience should be established, and methods for the early detection of drug resistance should be developed.

2. The partners agreed that current DALY values for the health impact of schistosomiasis and soil-transmitted helminthiasis require regular revision to include new information.

> The partners **RECOMMEND** that DALYs for these diseases should be recalculated and the results should be widely circulated.

3. The partners are concerned that concurrent worm infections may have synergistic effects on the development and effects of anaemia, and on the severity and progression of malaria, TB and HIV/AIDS.

> The partners **RECOMMEND** that these potentially important consequences be more extensively investigated.

4. The partners accept that the control of worm-induced disease would benefit from research and development of new control tools.

> The partners **RECOMMEND** that research for the development of anti-worm vaccines and combination therapy including pyrantel and levamisole should be supported and carried out.

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CIDA	Canadian International Development Agency
DALY	Disability-Adjusted Life Year
DBL	Danish Bilharziasis Laboratory
DFID	United Kingdom Department for International Development
FRESH	Focusing Resources on Effective School Health
HIV/AIDS	Human immunodeficiency virus/Acquired immunodeficiency syndrome
IMCI	Integrated Management of Childhood Illness
INNFA	Insituto Nacional de la Ninez y la Familia
MDGs	Millennium Development Goals
MOH	Ministry of Health
NGOs	Nongovernmental organizations
NIDs	National immunization days
PCR	Polymerase chain reaction
PEAP	Poverty eradication action plan
PELF	Programme to Eliminate Lymphatic Filariasis
PPC	Partners for Parasite Control
SCI	Schistosomiasis Control Initiative
SHN	School Health and Nutrition
TB	Tuberculosis
UN	United Nations
UNHCR	Office of the United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WFP	Word Food Programme
WHA	World Health Assembly
WHO	World Health Organization

Annex: *Thinking beyond deworming*

Lancet cover page and article

Editorial

Thinking beyond deworming

Worm control rarely makes the headlines—worms are just not sexy. But at a meeting in Geneva earlier this week, the Partners for Parasite Control (WHO member states, the World Food Programme, UNICEF, the World Bank, research institutes, universities, and non-governmental organisations) presented convincing evidence that helminth control is a crucial, and neglected, step towards improving public health and to reaching several of the Millennium Development Goals.

Schistosomiasis (caused by blood flukes of the genus *Schistosoma* or flatworms; transmitted by contact with water carrying infected snails) and soil-transmitted helminth infections (roundworms, whipworms, or hookworms) occur throughout the developing world, and are most prevalent in the poorest populations. These worms infect more than a third of the world's population, of whom 300 million have severe and permanent ill health as a result. The highest rates of infection are usually in children aged 5–15 years, but those most at risk of severe morbidity are pre-school children (age 2–5 years), school-age children, adolescent girls, and women of childbearing age. For children aged 5–14 years in low-income countries, intestinal worms account for 11–12% of the total disease burden in this age group—their single largest contributor to disease—and are linked to a loss of 20% of disability adjusted life-years. Anaemia, vitamin A deficiency, stunted growth, poor intellectual development, impaired cognitive function, and damage to the liver, intestine, and urinary tract are all sequelae of chronic worm infection.

Yet worm control is possible with cheap and effective drugs, which are safe in pre-school children and in pregnant women in addition to the usually targeted population of schoolchildren. A substantial reduction in the burden of disease associated with schistosomiasis and soil-transmitted helminths can be achieved by regular (once or twice a year) treatment of all high-risk populations. A single tablet of albendazole or mebendazole is effective against the common soil-transmitted worms, and praziquantel for schistosomiasis can be given as a single dose according to height. All these drugs are cheap—albendazole or mebendazole cost around US$0·02 and praziquantel $0·20 for a school-aged child. They are also heat stable, require no cold chain for delivery, and have a shelf-life of up to 4 years, allowing bulk purchase or donation.

Getting the treatment to those who need it can be done through maternal, child-health, and antenatal clinics, and school-health programmes. Specific directed interventions at other at-risk groups, such as adolescent girls, are also needed. In addition to regular treatment, prevention of transmission has to be tackled by provision of safe water supplies, sanitation facilities, and promotion of hygiene measures, such as handwashing, use of latrines, and encouraging footwear.

Beyond these straightforward effects on public health, the emphasis in Geneva was on encouraging thought outside the disease-specific box to what helminth control could contribute to achieving seven of the eight Millennium Development Goals. Take, for example, goal 1—the eradication of extreme poverty and hunger. Deworming in childhood leads to improvements in intellectual development that are related to income in adulthood. Hungry children become more malnourished when infected with worms. The impact on goals 2 and 3—universal primary education and promotion of gender equality—is also clear. An investment of as little as $3·5 per child on helminth control translates to an extra year of schooling gained. School enrolment by girls increases with deworming programmes, and their dropout and retention rates improve. Of the estimated 562 million school-age children in the developing world, worm infections cause about 200 million years of lost primary schooling.

By reducing malnutrition and anaemia, treating worm infections lowers child mortality and improves maternal health—goals 4 and 5—and helps to combat HIV/AIDS and malaria—goal 6. Worm infections increase children's vulnerability to other infectious diseases. For example, there is some evidence that the frequency of malaria attacks is increased in those with worm infections, and that the disruption of immune responses with worm infections hastens the progression from HIV to AIDS. Deworming contributes to the survival and development of children with malaria, and, by reducing anaemia, to maternal survival. Nepalese

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women given albendazole in the second trimester of pregnancy had lower rates of severe anaemia in the third trimester, and their infants had higher birthweights and lower mortality at 6 months, than did those not given deworming treatment. Sri Lankan women given mebendazole during pregnancy had fewer stillbirths and perinatal deaths, and fewer low-birthweight babies than did those not given treatment.

The evidence for substantial public-health benefits and reductions in global burden of disease from deworming is overwhelming. Moreover, there are simple, effective, safe, and cheap treatments already available. The challenge is to get the treatments to those who need them. Goal 8—develop a global partnership for development—could not be more appropriate here. Systematic delivery of deworming drugs in sustainable ways will only be possible with the help of industry and funders to supply the drugs, health and community systems to deliver them, and political will to achieve such partnership. Commitment from WHO together with the Commission for Africa could do much towards reaching goal 8. Maximising the potential links between deworming programmes and other mass-treatment programmes (such as those for onchocerciasis, lymphatic filariasis, measles, trachoma, and malaria) is one way to build a sustainable development strategy for the poor. Thinking beyond deworming is essential for the health of the world's poorest people. ■ *The Lancet*