Deworming and immunization synergies and opportunities
- Brief introduction about worms

- Health damages of worm infections and the benefit of deworming

- Advantages of including deworming in vaccination and vitamin A distribution programmes
Main worms in children

Ascaris lumbricoides (roundworms)

Trichuris trichiura (whipworms)

Ancylostoma duodenale and Necator americanus (hookworms)

Worm infections are the most widespread infections worldwide (>2 billion people)

The adult worms measure between 1 cm (hookworm) to 20 cm (roundworms).
Worm cycle

Worms do not reproduce in the human body but produce eggs that are contaminating the environment and infecting other persons.

Children are particularly susceptible to worm infections.
Individuals in a period of intense physical and intellectual growth are particularly at risk

- *A. lumbricoides* - REDUCED GROWTH RATE
- *T. trichiura* - reduced growth rate - iron deficiency - COGNITION DEFICIT
- Hookworm IRON DEFICIENCY - ANAEMIA

The dose of anthelminthic is the same for all age groups (1 tablet) except for the children between 1 and 2 years (1/2 tablet)

Crompton and Nesheim Annu Rev Nutr 2002 35-59
We can recognize an infected child by examining microscopically the stool for the presence of worm eggs.
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A child can be infected by few worms and will have few worm eggs by gram of faeces, or by several worms and will have several thousands of eggs by gram of faeces.
Treatment intervals

Individual diagnosis is much more expensive than treatment.

WHO recommends to treat all the children when a survey show that more than 20% of the children in that area is infected.

If the prevalence is over 50%, two treatments a year are recommended.
Which are the health damages caused by worms?
Worm infections cause blood loss

For example, in Vietnam 85% of children are infected by worm, 20% of which with heavy infection. (Montresor et al 2004)

In large areas of Tanzania 95% of the children is infected by worms, 25% of which with heavy infection. (Albonico et al 1997)

In several large areas of Bolivia over 75% of the children is infected. (MoH 2008)
Worm infections are associated with anaemia

Prevalence of Anaemia

No inf  Low  Moderate  High

Intensity of hookworm infection

Yip, R., 1996  UNICEF, Viet Nam
The provision of periodic anthelminthic treatment as a part of child health services in Uganda resulted in an increase in weight gain of about 10% (166 g per child per year) above the expected weight gain.
Control worm infection can result in an increase of the haemoglobin of 2 g/dl

Mean Hb for cohort participants

- All follow-ups
- Baseline Hb >= 12
- Baseline Hb < 12
Worm infections affect language and memory development

Lesson from the veterinary field

These animals are of the same specie, sex and age

Periodically dewormed

Not receiving deworming
QUIZ: How much cost a tablet of albendazole?
A- 2 USD
(With 10 USD we can deworm 5 children)

B- 0.2 USD
(With 10 USD we can deworm 50 children)

C- 0.02 USD
(With 10 USD we can deworm 500 children)

D- 0.002 USD
(With 10 USD we can deworm 5000 children)
The deworming tablet is practically not absorbed by the intestine. 99.5% of the tablet remains in the intestinal lumen, where it reaches and kills the worms. Some "discomfort" could be felt by the child but is due to the dying worms.
Which are the additional advantages of deworming?
Synergy with other programmes

The combination of different interventions increases the health benefits at marginal cost
Deworming is popular and can increase programme coverage

Frequently, expelled worms are observed in the child faeces by the mother in the day following deworming. This reinforce the trust in the health services.
Deworming increases vitamin A absorption

Possible mechanisms involved:

• worms in the intestine compete for vitamin A rich food

• worm induce malabsorption (reduction of the capacity to absorb vitamin A of the intestine)

Animal and human studies suggested that worm infection has an impact on immunity

Pigs infected with *Ascaris suum* present reduced immune-response to vaccine for pneumonia

Mice infected with worms respond less efficiently to vaccination during tests of the malaria vaccine

Tuberculin reaction after BCG is more evident in individuals receiving deworming at vaccination
To ensure their survival in the host for years, worms induce particular immuno-modulatory and –regulatory mechanisms in the host’s immune system:

- Immune activation
- Biased Th2 response
- Down regulation of Th1 and CTL activity.

These changes impair the immunological response to pathogens and vaccines.
Administration of deworming is very simple

Cold chain

Sterilization of equipment

Training of personnel

The administration of a single tablet of albendazole to each child presenting for vaccination or vitamin A supplement is so simple, that a simple printed page is normally sufficient to explain the procedure to the staff.
Precautions

Only two precautions should be taken by the health workers:

1- do not force any child that is refusing the tablet

2- crash the tablet before administering it to small children (from 1 to 2 year of age)
Conclusions

- Deworming has significant health impact
- Deworming is cheap
- Deworming is simple
- Deworming is safe
- Deworming is synergic with immunization and vitamin A distribution campaigns
- Deworming improve increase immunization and vitamin A distribution campaigns coverage
Worm are intensely transmitted in almost all the tropical and sub tropical countries

Countries where intestinal helminths are a public health problem
Countries where intestinal helminths are transmitted
WHO can provide a detailed epidemiological situation of worms for almost all the endemic countries.
Helminth control strategy

Inclusion of deworming into existing delivery channels
WHO offers technical support to all Vaccination or vitamin A programmes intending to include deworming

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Please visit our websites

- The WHO Department of Control of Neglected Tropical Diseases:
  http://www.who.int/neglected_diseases/en/

- For documents and publications:
  http://www.who.int/wormcontrol/documents/en/

- For the newsletter "Action against Worms":