Control of Neglected Tropical Diseases

principles and example from Cambodia
3. Good Health and Well-being

Ensure healthy lives and promote well-being for all at all ages.
Mainly prevalent in tropical and subtropical areas in Africa, Asia and South America.

Mainly affect populations who are living in poverty, in areas where sanitation is lacking and who have close contact with infectious vectors and infected animals.

NTDs: 20 diseases:
- Not malaria, TB, HIV/AIDS
- Not epidemic-prone diseases of global concern
- Not vaccine-preventable diseases
20 Neglected Tropical Diseases

**Helminth infections**
- Soil-transmitted helminth infections (ascariasis-trichuriasis-Hookworm-strongyloidiasis)
- Lymphatic filariasis
- Onchocerciasis
- Schistosomiasis
- Dracunculiasis (guinea-worm disease)
- Cysticercosis
- Echinococcosis
- Foodborne trematodes infections

**Protozoan infections**
- Leishmaniasis
- Sleeping sickness
- Chagas disease

**Bacterial infections**
- Leprosy
- Trachoma
- Buruli ulcer
- Endemic treponematoses

**Viral infections**
- Dengue
- Rabies

**New ones!**
- Mycetoma, chromoblastomycosis and other deep mycoses
- Scabies and other ectoparasites
- Snakebite envenoming
Recommended interventions

Preventive chemotherapy
- lymphatic filariasis,
- onchocerciasis,
- schistosomiasis,
- soil-transmitted helminthiases

Safe and easy-to-administer drugs
Low-cost and feasible community diagnosis
Individual-level diagnosis and treatment
NOT NECESSARY

Community-based approach
"Preventive treatment" of individuals living in endemic areas, at regular intervals, through schoolteachers or community volunteers

Intensified disease management
- leishmaniasis, human African trypanosomiasis,
- Chagas' disease,
- Buruli ulcer

Unsafe drugs, complex diagnostic and therapeutic protocols
Individual diagnosis and treatment
NECESSARY

Individual case-management
Decentralized diagnosis and treatment offered to patients by specialized personnel
Helminth infections

Lymphatic filariasis
Helminth infections

Soil-transmitted helminthiasis

Schematic life-cycle of soil-transmitted helminths

An infected individual contaminates soil with faeces containing helminth eggs. Eggs develop in the soil.

In an infected individual, eggs or larvae develop into adult worms, which produce eggs.

Other individuals are infected by eggs ingested through food or dirty hands, or by larvae penetrating the skin.
Helminth infections

Onchocerciasis

Zyklus Onchocerca volvulus (Onchozerkose) in Afrika
Helminth infections

Schistosomiasis

Schematic life-cycle of schistosomes

Infected individuals contaminate fresh water with urine or feces containing schistosome eggs.

Cercariae infect individuals in contact with fresh water.

In water, the miracidia hatch from eggs and contaminate snails (intermediate host). Snails later release large numbers of cercariae.
Preventive chemotherapy. Definition

Preventive chemotherapy in human helminthiasis is

"the use of anthelminthic drugs, either alone or in combination, as a public health tool against helminth infections"

PC interventions are characterised by administration to humans of:

- a single administration of anthelminthic drugs;
- at regular intervals;
- through a population-based delivery approach
Preventive chemotherapy: Objectives

The first objective of PC is to control morbidity due to helminthic diseases, through the reduction of the number of parasites infecting an individual.

In specific situations, PC can also have a second objective: the reduction and eventually the interruption of transmission through the reduction of the number of infected individuals that contaminate the environment, vectors or intermediate hosts.
Preventive chemotherapy: modalities

There are three modalities by which PC can be applied

- **Mass drug administration (MDA),** when the entire population of an administrative setting (e.g. region, province, district, village) is administered anthelminthics.

- **Targeted Chemotherapy,** when specific risk-groups in the population, defined by age, sex or other social characteristics such as the profession (e.g. school-age children, fishermen) are administered anthelminthics.

- **Selective chemotherapy:** when, as a result of a screening in a suspect community, all individuals found to be infected are administered anthelminthics.
Cost of preventive chemotherapy

All drug are donated:
- Albendazole
- Diethylcarbamazine
- Ivermectin
- Mebendazole
- Praziquantel

An efficient school platform is in place in almost all endemic countries

How much do you think it costs to treat a school age children?

2 $  \quad 0.2 $  \quad 0.02 $

With 2 $ is possible to treat 100 children
# Global status of preventive chemotherapy

<table>
<thead>
<tr>
<th>PC implementation</th>
<th>LF</th>
<th>ONCHO</th>
<th>STH</th>
<th>SCH</th>
<th>TRA</th>
<th>PC²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of countries requiring PC¹</td>
<td>53</td>
<td>31</td>
<td>103</td>
<td>52</td>
<td>39</td>
<td>112</td>
</tr>
<tr>
<td>Number of people requiring PC</td>
<td>856.4M</td>
<td>198.1M</td>
<td>267.5M</td>
<td>568.8M</td>
<td>111.2M</td>
<td>95.1M</td>
</tr>
<tr>
<td>Number of countries implemented and reported</td>
<td>41</td>
<td>26</td>
<td>59</td>
<td>77</td>
<td>38</td>
<td>23</td>
</tr>
<tr>
<td>Proportion (%) of districts implemented PC²</td>
<td>72.7</td>
<td>88.2</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>46.0</td>
</tr>
<tr>
<td>Proportion (%) of districts achieving effective coverage³</td>
<td>78.8</td>
<td>85.9</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>85.0</td>
</tr>
<tr>
<td>Number of people treated</td>
<td>496.3M</td>
<td>132.9M</td>
<td>166.8M</td>
<td>471.8M</td>
<td>70.9M</td>
<td>18.3M</td>
</tr>
<tr>
<td>Coverage (%)⁴</td>
<td>58.0</td>
<td>67.1</td>
<td>69.5</td>
<td>14.3</td>
<td>44.8</td>
<td>62.6</td>
</tr>
</tbody>
</table>

¹ Number of endemic countries moved to post-treatment surveillance stage is not included in total.
² Proportion of known endemic districts implementing PC in countries that reported on PC interventions.
³ Proportion of districts implementing PC achieving the defined effective coverage for the disease ≥65% for LF and ONCHO, ≥75% for STH and SCH, and ≥80% for TRA.
⁴ Coverage is calculated as the number of people in need of PC and treated out of population requiring PC.
⁵ For calculation of PC coverage for at least one disease TRA data is included starting from 2015.

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LF – lymphatic filariasis; ONCHO – onchocerciasis; STH – soil-transmitted helminthiases; SCH – schistosomiasis; TRA – trachoma
PreSAC – preschool-aged children (1–4 years); SAC – school-aged children (5–14 years); Adults – people aged ≥15 years

Source: WHO/NTD
Preventive chemotherapy

unprecedented

1.217 billion treatments in 2017
Control of schistosomiasis in Cambodia
Schistosomiasis in Cambodia

Between 1994 and 1995 several severe cases of schistosomiasis were diagnosed in villages in Kratie Province and Stung Treng Province.

The total population at risk was estimated at 80,000 individuals living in 110 villages.
Schistosomiasis in Cambodia

The prevalence of infection in the two provinces has been estimated between 75% and 80%.

Extremely severe cases were common among the adult and young population (total estimated number of very severe cases 250/year)
Principle of Preventive chemotherapy for schistosomiasis control

a) Natural progress of Schistosomiasis

Negative → Light intensity → Moderate high intensity → Severe cases → Death

b) Schistosomiasis progress during regular pharmacological intervention

Negative → Light intensity
Control intervention

Mass drug administration (praziquantel 40-60 mg/Kg) to the entire population in the two provinces once a year.
## Control activities

<table>
<thead>
<tr>
<th>Year</th>
<th>Province covered</th>
<th>Organizing institution</th>
<th>Approximate target population</th>
<th>Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995¹</td>
<td>Kratie</td>
<td>MoH - MSF</td>
<td>45,000</td>
<td>NA</td>
</tr>
<tr>
<td>1996</td>
<td>Kratie</td>
<td>MoH - MSF</td>
<td>45,000</td>
<td>NA</td>
</tr>
<tr>
<td>1997</td>
<td>Kratie and Stung Treng</td>
<td>CNM-MSF</td>
<td>60,000</td>
<td>64%</td>
</tr>
<tr>
<td>1998</td>
<td>Kratie and Stung Treng</td>
<td>No MDA ²</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>1999</td>
<td>Kratie and Stung Treng</td>
<td>CNM-MSF</td>
<td>60,000</td>
<td>63%</td>
</tr>
<tr>
<td>2000</td>
<td>Kratie and Stung Treng</td>
<td>CNM-MSF- WHO</td>
<td>70,000</td>
<td>64%</td>
</tr>
<tr>
<td>2001</td>
<td>Kratie and Stung Treng</td>
<td>CNM-WHO</td>
<td>80,000</td>
<td>67%</td>
</tr>
<tr>
<td>2002</td>
<td>Kratie and Stung Treng</td>
<td>CNM-WHO</td>
<td>80,000</td>
<td>62%</td>
</tr>
<tr>
<td>2003</td>
<td>Kratie and Stung Treng</td>
<td>CNM-WHO</td>
<td>80,000</td>
<td>No survey ²</td>
</tr>
<tr>
<td>2004</td>
<td>Kratie and Stung Treng</td>
<td>CNM-WHO</td>
<td>80,000</td>
<td>84%</td>
</tr>
<tr>
<td>2005</td>
<td>Kratie and Stung Treng</td>
<td>CNM-WHO</td>
<td>80,000</td>
<td>82%</td>
</tr>
<tr>
<td>2006</td>
<td>Kratie and Stung Treng</td>
<td>CNM-WHO</td>
<td>80,000</td>
<td>80%</td>
</tr>
<tr>
<td>2007</td>
<td>Kratie and Stung Treng</td>
<td>CNM-WHO</td>
<td>80,000</td>
<td>80%</td>
</tr>
</tbody>
</table>

1: Activities started in December 2004  
2: Activity not conducted because of lack of funds
Reduction in prevalence obtained
Morbidity before and after intervention

20 000 Uninfected individuals
No health consequences

16 000 Infection of light intensity
No immediate health consequences

32 000 Moderate/High intensity infections
1 000 outpatient consultation/year

12 000 severe cases
Every year:
- 250 hospital admissions needed
- 25 deaths

* No positive cases have been found in the last survey. The 400 cases are estimated from the confidence interval of the survey.
Cost effectiveness (MoH perspective)

0.60 USD/year per individual treated

9.59 USD per case of infection averted

61.50 USD per case of severe infection averted

6,531 USD per averted death

As Comparison: Cost effectiveness vaccination campaign for measles in 1997 was estimated at 6 284 USD in South Africa (Uzicanin et al) per death averted.
Cost effectiveness (societal perspective)

Over 14,500 years or productivity were gained due to individuals recovered from severe infections and over 3,500 years of productivity were gained due to averted deaths.

The total gain in productivity corresponds to 3.8 million USD at a cost of approximately 736,000 USD.

For each dollar invested the return is over 4 USD.

Additional advantages like, increased school attendances, school performances and nutritional status were difficult to estimate precisely and therefore have not been valuated.
That's all Folks!