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Accelerating to 2030: Building Resilient NTD Programmes in a Changing World

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Virtual Event

8th – 10th September 2020

Billy Weeks (2016, Chikwawa, Malawi)
Can deworming at prenatal clinics prevent morbidity from infections with soil-transmitted helminths in women of reproductive age?

Carolin Vegvari on behalf of the NTD Modelling Consortium STH team
Contents

• Soil-transmitted helminths and epidemiology and morbidity
• WHO 2030 goals for soil-transmitted helminths
• Research question:
  – Can deworming during HPV vaccination and at prenatal and maternity clinics prevent morbidity from STH infections in WRA?
• Study design
• Results
• Conclusions
Morbidity from STH infections

• ~ 1.5 billion people are infected with STH worldwide
• Morbidity is associated with moderate-to-heavy intensity (MHI) infections
• Morbidity manifests as diarrhoea, abdominal pain, malnutrition, physical weakness, and impaired growth and development
• Morbidity from hookworm infections is associated with anaemia
  – Can lead to adverse pregnancy outcomes including premature births, low birth weight, and impaired lactation

How can we strengthen the connection between research and programming to beat STH?
WHO 2030 goals for STH and treatment strategies

Target 1: Achieve and maintain elimination of STH morbidity in pre-school and school age children

**Target 2: Establish an efficient STH control programme in adolescent, pregnant and lactating women**

### Current treatment strategy:

- School-based deworming of preSAC and SAC
  - Moderate prevalence: Deworm 1x per year
  - High prevalence: Deworm 2x per year

### Additional treatment of WRA:

- Deworming of adolescent girls at HPV vaccination
- Deworming of WRA at prenatal and maternity clinics
Research question

Can deworming during HPV vaccination and at prenatal and maternity clinics prevent morbidity from hookworm infections in WRA?
Study design

- Cohort model follows girls/women from birth to age 70
- External force of infection derived from two stochastic individual-based models of hookworm transmission and treatment
- Models differ in assumptions on age-intensity profile of infection and density-dependent fecundity of female worms
- Morbidity is measured in terms of prevalence of MHI infections

Treatment scenarios:

Scenario 1: Moderate prevalence setting
School-based deworming 1x per year
With/without deworming of WRA according to new recommendations

Scenario 2: Moderate prevalence setting
School-based deworming 2x per year
With/without deworming of WRA according to new recommendations

Scenario 3: High prevalence setting
School-based deworming 2x per year
With/without deworming of WRA according to new recommendations
Results: Moderate prevalence, treat 1x per year

Force of infection from Model 1 (Imperial College London)

Force of infection from Model 2 (Erasmus MC)
Results: High prevalence, treat 2x per year

Force of infection from Model 1 (Imperial College London)

Force of infection from Model 2 (Erasmus MC)
# Reasons for differences in model predictions

<table>
<thead>
<tr>
<th></th>
<th>Model 1 (Imperial College London)</th>
<th>Model 2 (Erasmus MC)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age-intensity profile</td>
<td>Uniform across all age classes</td>
<td>Higher intensity in adults than in SAC</td>
<td>Stronger effect of school-based treatment in Model 1</td>
</tr>
<tr>
<td>Density dependent fecundity of worms</td>
<td>Exponential saturation</td>
<td>Hyperbolic saturation</td>
<td>Stronger effect of treatment in high-prevalence settings in Model 2</td>
</tr>
<tr>
<td>Distribution of worm lifespan</td>
<td>Exponential</td>
<td>Weibull</td>
<td>Worm population is more robust to extinction by treatment in Model 2</td>
</tr>
</tbody>
</table>
Conclusion

Our quantitative analysis shows how research can improve programming for STH.

**Deworming of WRA** during HPV vaccination and at prenatal and maternity clinics can reduce morbidity over the reproductive lifespan by about 20%.

The reduction is not massive but significant and can be achieved in current healthcare settings even in low-income countries at very little or no additional cost.
Acknowledgements

**Imperial College London:**
Sumali Bajaj, James Truscott, Robert Hardwick, Roy Anderson

**Erasmus MC:**
Federica Giardina, Luc Coffeng, Veronica Malizia, Sake de Vlas

**WHO:**
Antonio Montresor

**University of Oxford:**
Deirdre Hollingsworth

**Funders:**
Bill and Melinda Gates Foundation
DeWorm3 Grant, Natural History Museum
UK Medical Research Council
Results: Moderate prevalence, treat 2x per year

![Graphs showing the percentage of women with MHI over different age groups for various scenarios.](ntd-ngonetwork.org)
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Evaluating the impact of biannual school-based and community-wide treatment on urogenital schistosomiasis in Niger

Anna Phillips, Zilahatou Tohon, Neerav Dhanani, Boubacar Sofo, Issa Gnandou, Boubacar Sidikou, Adamou Garba Noma, Bassirou Madougou, Oumarou Alto, Hannatou Sebangou, Kader Halilou, Roumanatou Andia, Amadou Garba, Alan Fenwick, Amina Hamidou

8th – 10th September 2020
Background

- Human schistosomiasis is a chronic, water-associated parasitic disease.
- Approx. 3.2 million people are infected with schistosomiasis in Niger alone.

- The main species is urogenital schistosomiasis (*Schistosoma haematobium*) in all regions of Niger.
- The main control strategy against schistosomiasis is school-based treatment (SBT) with praziquantel (PZQ).
- There is growing evidence of infection in pre-school-aged children (SAC) adults and their potential role in sustaining transmission.
- There is also debate around the optimal frequency of PZQ treatment.
Study design

- A cluster-randomised trial: Six possible combinations of annual and biannual community-wide treatment (CWT), SBT, and treatment holidays.
- A total of 225 communities were surveyed over five years with 100 children aged 9-12 years sampled each year.
- In addition, 100 children aged 5-to-8 years in their first year of school and 50 adults (aged 20-to-55 years) were tested in the first and final year.
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![Study design diagram]

- **Year 1**: Baseline
  - SBT (x1)
  - CWT (x1)

- **Year 2**: Test/Refer
  - SBT (x1)
  - CWT (x1)

- **Year 3**: Group A1
  - SBTx1
  - SBTx2
  - CWTx1
  - CWTx2

- **Year 4**: Group A2
  - SBTx1
  - SBTx2
  - CWTx1
  - CWTx2

- **Group A1**: 3x SBT in **MODERATE** endemic areas
- **Group A2**: Annual SBT in **HIGH** endemic areas
- **Group B1**: Bi/Annual CWT in **HIGH** endemic areas
- **Group B2**: Bi/Annual CWT in **HIGH** endemic areas
- **Group C1**: Bi/Annual CWT in **HIGH** endemic areas
- **Group C2**: Bi/Annual CWT in **HIGH** endemic areas
Map of the study zone

Treatments:
- Sh1: SBT/ SBT/ SBT once
- Sh1: SBT/ SBT/ SBT twice
- Sh1: SBT/ HOL/ SBT once
- Sh1: SBT/ HOL/ SBT twice
- Sh2: CWT/ CWT/ CWT once
- Sh2: CWT/ CWT/ CWT twice
- Sh2: SBT/ SBT/ SBT once
- Sh2: SBT/ SBT/ SBT twice
- Sh2: SBT/ HOL/ SBT once
- Sh2: SBT/ HOL/ SBT twice
### Sample characteristics by study year

<table>
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<tbody>
<tr>
<td><strong>5-8 years</strong></td>
<td></td>
<td></td>
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<tr>
<td>No. of individuals sampled</td>
<td>20,220</td>
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<td></td>
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<td>22,364</td>
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<tr>
<td>Proportion infected with <em>S.haematobium</em> %</td>
<td>17.2</td>
<td>9.54</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Proportion heavy intensity infection %</td>
<td>1.93</td>
<td></td>
<td></td>
<td>1.07</td>
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<tr>
<td>Arithmetic mean*</td>
<td>1.08</td>
<td></td>
<td></td>
<td>0.62</td>
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<tr>
<td><strong>9-12 years</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>No. of individuals sampled</td>
<td>20,931</td>
<td>21,833</td>
<td>21,620</td>
<td>21,715</td>
<td>22,132</td>
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<tr>
<td>Proportion infected with <em>S.haematobium</em> %</td>
<td>15.8</td>
<td>9.57</td>
<td>17.6</td>
<td>8.26</td>
<td>9.89</td>
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<tr>
<td>Proportion heavy intensity infection %</td>
<td>1.32</td>
<td>0.45</td>
<td>1.35</td>
<td>0.67</td>
<td>0.66</td>
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<tr>
<td>Arithmetic mean egg count*</td>
<td>3.05</td>
<td>1.27</td>
<td>3.27</td>
<td>1.42</td>
<td>1.45</td>
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<tr>
<td><strong>Adults (20-55 years)</strong></td>
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<td></td>
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<tr>
<td>No. of individuals sampled</td>
<td>7,041</td>
<td></td>
<td></td>
<td></td>
<td>9,955</td>
</tr>
<tr>
<td>Proportion infected with <em>S.haematobium</em> %</td>
<td>11.3</td>
<td></td>
<td></td>
<td>4.95</td>
<td></td>
</tr>
<tr>
<td>Proportion heavy intensity infection %</td>
<td>0.50</td>
<td></td>
<td></td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>Arithmetic mean*</td>
<td>4.61</td>
<td></td>
<td></td>
<td>2.05</td>
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</table>
9- to- 12- year olds cross-section
### Summary of infection change in 9-12 year olds

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A1</td>
</tr>
<tr>
<td>No. of villages sampled</td>
<td>38</td>
</tr>
<tr>
<td>Prevalence at baseline (%)</td>
<td>3.7</td>
</tr>
<tr>
<td>Prevalence of heavy infection at baseline (%)</td>
<td>0.29</td>
</tr>
<tr>
<td>Prevalence at Year 5 (%)</td>
<td>0.6</td>
</tr>
<tr>
<td>Prevalence of heavy infection at Year 5 (%)</td>
<td>0.13</td>
</tr>
<tr>
<td>Absolute difference prevalence at Year 5 and baseline</td>
<td>-3.1</td>
</tr>
<tr>
<td>Relative difference in prevalence at Year 5 and baseline (% change)</td>
<td>-83.8</td>
</tr>
<tr>
<td>Egg reduction rate (1-Year 5 intensity/baseline)</td>
<td>0.82</td>
</tr>
</tbody>
</table>
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</tr>
</tbody>
</table>
Infection status by treatment group baseline to Year 5

Year 1/Baseline

Year 5
Prevalence (a) and intensity (b) by study arm over time (9-12 year olds only)
Prevalence by gender (blue=boys and red=girls) over time
First Year students (5-8 years old)
Infection in first-year students at baseline & Year 5 by study arm

Prevalence of *S. haematobium* in 5 to 8 year olds

Mean intensity of *S. haematobium* in 5 to 8 year olds
Adults (20-55 years old)
Infection in adults at baseline & Year 5 by study arm
Take home messages

• No statistically significant difference between arms with once or twice years treatment (community or school-based) in areas with low endemicity

• Significant impact on infection reduction from biannual vs. annual treatment in areas of moderate to high infection

• Prevalence decreased among adults in SBT areas, implying the rate of transmission in the whole community has been reduced.
## Strengthening the connection between research and programming to beat NTDs

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<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current 2020 WHO Goal</strong></td>
<td>Morbidity control: &lt;5% prevalence of heavy intensity infections in SAC</td>
</tr>
<tr>
<td><strong>Proposed 2030 WHO Goal</strong></td>
<td>Elimination as a public health problem (EPHP): &lt;1% prevalence of heavy intensity infections in SAC</td>
</tr>
<tr>
<td><strong>How does this research move us towards the WHO road map targets?</strong></td>
<td>Heavy infections were &lt;1% in all arms at Year 5 in this study.</td>
</tr>
<tr>
<td><strong>How can this research be used by implementors to strengthen health systems?</strong></td>
<td>Prevalence and intensity of infections across all age groups (full age profile) remains poorly researched.</td>
</tr>
<tr>
<td><strong>What further research is required to achieve shared goal?</strong></td>
<td>Stopping treatment after achieving EPHP will likely lead to resurgence of infection. Elimination of transmission remains to be defined. Levels of systematic non-adherence to treatment remains unknown as well as ideal size of implementation unit.</td>
</tr>
<tr>
<td><strong>How can research and programming better support one another?</strong></td>
<td>Research Compliance: Understand and comply with WHO/governmental regulations governing research. Data Management: Manage research data effectively and transparently throughout the research-including providing open access to research data, models, and code. Communication: Be transparent when communicating with other researchers and policy makers.</td>
</tr>
</tbody>
</table>
With thanks

- **Schistosomiasis Control Initiative**: Neerav Dhanani, Wendy Harrison, Alan Fenwick
- **University of Georgia/SCORE**: Dan Colley, Sue Binder, Carl Campbell, Charlie King
- The laboratory technicians for all their support and hard work in the field.
- The health, education and village authorities of all communities.
- Finally, we thank all the children, parents, teachers and village leaders who participated in this study.

This research was financially supported by the Bill & Melinda Gates Foundation (BMGF) through the Schistosomiasis Consortium for Operational Research and Evaluation (SCORE) based at the University of Georgia in Athens (UGA). Praziquantel tablets for schistosomiasis treatment were donated by DFID through the Schistosomiasis Control Initiative Foundation (SCIF).
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What tools are needed for schistosomiasis transmission monitoring as we move towards elimination?

Diagnostics

Bonnie Webster

Xenomonitoring
• Complexed life-cycle that makes control difficult
• Current control is via MDA but to reach and maintain elimination other interventions are vital

• >200 million infected
• Disease is chronic with morbidity associated in intensity of infection
We need to strengthen the connection between research and programming to support schistosomiasis elimination?
Human Diagnostics

Different diagnostics are needed at different levels of NTD disease and/or phases of control

- **Pre-control**
  - Disease Level: High
  - Control Focus: Mapping
  - Main Diagnostic Characteristics Needed: Cheap, High-throughput

- **Control**
  - Disease Level: High
  - Control Focus: Morbidity
  - Main Diagnostic Characteristics Needed: Cheap, Quantitative, High-throughput

- **Elimination**
  - Disease Level: Low
  - Control Focus: Infection
  - Main Diagnostic Characteristics Needed: Sensitive, Specific, High-throughput

- **Transmission Interruption**
  - Disease Level: Low
  - Control Focus: Transmission
  - Main Diagnostic Characteristics Needed: Sensitive, Specific, Point-of-Need

- **Post-elimination**
  - Disease Level: Low
  - Control Focus: Resurgence
  - Main Diagnostic Characteristics Needed: Sensitive, Specific, Point-of-Need

Adapted from Utzinger et al., 2015

- cost, infrastructure/resource needs, simplicity, reproducibility
Medical Schistosomiasis

Intestinal schistosomiasis
(mainly *S. mansoni*, *S. japonicum*
*S. intercalatum*, *S. guineensis*, *S. mekongi*)

Morbidity:
- liver and intestinal fibrosis
- hepatosplenomegaly
- portal hypertension
- genital disease

Urogenital schistosomiasis
(*S. haematobium*
*S. haematobium* group hybrids)

Morbidity:
- haematuria
- bladder wall and kidney pathology
- hydronephrosis
- genital disease (infertility, ectopic pregnancy, HIV, STI, etc.)
To achieve and maintain elimination advanced diagnostics are needed.

Infections are hard to detect

MDA fatigue

Eggs hard to detect (? egg negative)
Available Diagnostics

<table>
<thead>
<tr>
<th>Diagnostic</th>
<th>Detection</th>
<th>SEN</th>
<th>SPE</th>
<th>PON</th>
<th>Cost</th>
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<td>Eggs</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Reagent strip</td>
<td>Blood</td>
<td>✓</td>
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<td>✓✓✓</td>
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<tr>
<td>Elisa</td>
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<tr>
<td>CCA and CAA</td>
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Molecular

<table>
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<th>Cost</th>
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<tbody>
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<td>✓</td>
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<tr>
<td>LAMP</td>
<td>DNA</td>
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<tr>
<td>RPA</td>
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<td>?</td>
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</tbody>
</table>

POC-CCA

S. mansoni

S. haematobium

UCP-LF-CAA

Pre-control       Control       Elimination       Transmission Interruption       Post-elimination

High Disease Level Low

Cheap High-throughput

Sensitive Specific High-throughput

Sensitive Specific Point-Of-Need

Sensitive Specific Point-Of-Need

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# Available Diagnostics

<table>
<thead>
<tr>
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<td>✓✓</td>
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<td>Reagent strip</td>
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<td>✓✓✓</td>
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</tbody>
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- **Pre-control**
  - High Disease Level
  - Cheap High-throughput

- **Control**
  - Cheap Quantitative High-throughput

- **Elimination**
  - Sensitive High-throughput

- **Transmission Interruption**
  - Sensitive Specific Point-Of-Need

- **Post-elimination**
  - Sensitive Specific Point-Of-Need
Elimination of *S. haematobium* in Zanzibar (2012-2019)

Dr Steffi Knopp  
Prof David Rollinson

**Interventions:** biannual MDA, snail control, behaviour change

- In 2019: prevalence <2%
- In 2019: heavy intensity infections <1%

By single urine filtration microscopy...

~ 9000 samples / year

~ 4500 samples / year
Reading the same urine filtration (UF) slides twice

False-negative result in either of the two readings:

- 71% with eggs counts 1-4
- 17% with egg counts 5-10
- 8% with egg counts 11-49

UF microscopy becomes insensitive particularly at egg counts <5 eggs / 10mls

Dr Steffi Knopp

https://doi.org/10.1186/s13071-018-3136-6
Urine filtration (UF) microscopy versus UCP-CAA2000

- UF microscopy underestimates the prevalence
- Prevalence in (elimination) settings is higher than assumed?

Refined, improved and/or new diagnostics are needed for schistosomiasis elimination.

We need to facilitate test and treat scenarios in the Zanzibar elimination setting – target hotspots and the few individuals maintaining transmission (CAA and/or PON molecular tests).
**S. haematobium** real time fluorescent RPA in the field

- 200 samples with eggs counts from 0-500 eggs /per 10ml
- Crude DNA prep.
- Dried formulation
- Small Portable Detection Devices

![Diagram showing the process](image)

- 6 mins
- 500 eggs / 10ml
- 3 eggs / 10ml
- -ve control

**FAM fluorescence**

(ntd-ngonetwork.org)
**S. haematobium** real time fluorescent RPA versus microscopy (Zanzibar)

<table>
<thead>
<tr>
<th>RPA versus microscopy</th>
<th>Ultra-high (&gt;400 eggs/10 ml)</th>
<th>High (50-399 eggs/10 ml)</th>
<th>Low (10-49 eggs/10 ml)</th>
<th>Ultra-low (1-9 eggs/10 ml)</th>
<th>Low &amp; Ultra-low (1-40 eggs/10 ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of samples within egg-count category</td>
<td>9</td>
<td>27</td>
<td>52</td>
<td>70</td>
<td>122</td>
</tr>
<tr>
<td>Sensitivity % (± 95% CI)</td>
<td>100 (66.4–1)</td>
<td>96.3 (81–99.9)</td>
<td>94.2 (84.1–98.8)</td>
<td>91.4 (82.2–96.8)</td>
<td>92.6 (86.5–96.6)</td>
</tr>
<tr>
<td>Negative Predictive Value % (± 95% CI)</td>
<td>100 (69.2–100)</td>
<td>90.9 (58.7–99.8)</td>
<td>76.9 (64.2–95)</td>
<td>62.5 (35.4–84.8)</td>
<td>52.6 (28.9–75.6)</td>
</tr>
</tbody>
</table>

- There are many research steps to move these types of diagnostics forward into validated tests. This takes time and funding.
- There is often a push for integrated diagnostics for multiple diseases and setting but sometimes this is not possible. Diagnostics may need to be targeted to specific diseases and settings.
- We need to strengthen the connection between research and programming

Archer et al., 2020 (under review)
Snail Xenomonitoring is used to inform on transmission, to certify transmission interruption and surveillance

Identify transmission sites
Map snail distribution and risk of transmission
Enable targeted snail control

African Human Schistosomiasis
Due to the focus on human schistosomiasis snails are often assumed to be shedding human schistosomes.
Snail surveys and collections

- Ponds and lakes
- Streams, Rivers and Paddies
- Springs
- Dry sites recorded (seasonal)
- Water contact recorded
- Sites mapped
Cercariae identification

All snails checked individually for shedding

Cercariae stored for molecular identification
Can we detect transmission in low prevalence areas?

4 surveys 2016-2017; ~9000 *Biomphalaria* and ~2000 *Bulinus* were collected from 46 HWC
Tanzania, Mwanza Xenomonitoring

~9000 *Biomphalaria*; 11 were infected

- 3 shedding *S. rodhaini*
- 8 shedding *S. mansoni*

~2000 *Bulinus*; 4 were infected

- 1 shedding *S. kisumuensis*  
  (Only been found in Kenya before)
- 3 shedding *S. haematobium*
Niger Xenomonitoring

B. truncatus

B. forskalii

B. globosus

>10,000 snails collected 116 were infected
Niger Xenomonitoring

- Schistosome species
- Hybrid schistosomes
- Schistosoma bovis
- Schistosoma haematobium

Legend

S. bovis (92)
S. haematobium-bovis hybrids (18)
S. haematobium (6)

B. truncatus
B. forskalii
B. globosus
Development of a molecular toolkit for the detection of pre-patent snail infections – *increases sensitivity for transmission monitoring*

Molecular analysis of the snail tissue can identify infections within hours of miracidial penetration.
Development of a molecular toolkit for the detection of pre-patent snail infections — increases sensitivity for transmission monitoring.

Individual or Pooling (X10) snails makes this cheaper and faster.

The molecular tools need to be species specific.

Pennance et al., 2020
Strengthening the connection between research and programming to beat NTDs (schistosomiasis elimination)

• Advanced diagnostics that are:
  • Highly sensitive
  • Tailored to specific setting / foci
  • Can support test and treat and enable more targeted treatment strategies

• Snail Xenomonitoring methodologies that are:
  • Highly sensitive and specific
  • Tailored to specific settings / foci
  • Can determine ongoing transmission or transmission interruption
  • Can support snail control strategies and risk mapping of transmission sites

• Monitoring of infections in zoonotic reservoirs in Africa e.g. rodents and non-human primates for *S. mansoni*

• However, significant research is needed to advance these tools so that they are feasible and can be implemented in the endemic setting.
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Accelerating to 2030: Building Resilient NTD Programmes in a Changing World

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Virtual Event

8th – 10th September 2020

ntd-ngonetwork.org
Patient Pathways and Barriers to Treatment for Visceral Leishmaniasis in Bangladesh, India, Ethiopia and Sudan

Lucy Paintain, Lydia Boudarène, Jayne Webster (LSHTM) on behalf of the KalaCORE M&E Task Team & partners
Background

• Visceral leishmaniasis (VL) is characterised by prolonged fever, substantial weight loss & anaemia, disabling patients from usual activities and requiring substantial caring support; 100% fatal within 2 years without treatment.
• Estimated 50,000 to 90,000 new cases of VL occur worldwide each year (latest WHO estimates).
• Effective case management is a cornerstone of VL control & elimination efforts.
• Earlier detection and treatment means that cases can be treated before the disease becomes severe, and the economic impact on families and on productive time is reduced
Study design & setting

• 7 cross-sectional surveys with 1,686 VL patients in Bangladesh, India, Ethiopia & Sudan (2016, 2018)
  – Patients recruited from public treatment facilities
  – Data collected on the treatment pathway and reported financial & economic cost to the household of the recent VL illness episode.

• In-depth interviews (IDIs) with recent VL patients in India and Bangladesh
  – Bangladesh: all new VL patients (15) treated in SKKRC in the previous 3 months
  – India: 25 respondents from endline survey purposively selected to get a range of experiences from VL patients

• Interventions were conducted in each country between surveys, supported by the DFID-funded KalaCORE Programme (www.kalacore.org)

• First-line treatment is one-day AmBisome (Bangladesh, India) versus 17-day SSG/PM (Ethiopia, Sudan)

• Target of elimination as a public health problem (Bangladesh, India) versus control (Ethiopia, Sudan)
Survey and in-depth interview findings

- Variable epidemiology by country e.g. age, gender of patients
- Variable treatment seeking practices e.g. number of providers, use of private sector
- Variable length of treatment pathway and time taken for each stage (symptoms to any care seeking; care seeking to first VL diagnosis; first diagnosis to start of treatment)
- Beyond the numbers... IDIs in India & Bangladesh brought out the increasing desperation of trying to get a diagnosis, and the economic impact of the illness on the household.
- Manuscripts with detailed quantitative & qualitative results are in process and will be published soon
Strengthening the connection between research and programming to beat NTDs

• To achieve effective case management of VL and reduce the economic burden, consider patient pathways to treatment.
  – Where are the biggest delays/barriers?
  – Breaking down the treatment pathway into stages can help translate research findings into interventions with the potential to achieve the greatest impact:
    ▪ Symptoms to care seeking: patient behaviour change
    ▪ Care seeking to first diagnosis: training of health staff and capacity of health system
    ▪ Diagnosis to treatment: capacity of health system to respond
  • Clear differences in treatment pathways in each country
    – Importance of context in understanding the data and tailoring interventions (epidemiology; treatment policy; health system)
  • Are there similar patterns with other NTDs that could facilitate integration?
  • Qualitative data adds depth & detail, telling the human side of the story which can be masked by numbers & percentages – powerful for advocacy
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