Community wide approaches in STH control: report from Northwestern Argentina

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Argentina in context

Figure 1.1 Global distribution of soil-transmitted helminth (STH) infections. Proportion of children requiring preventive chemotherapy for STH in each country.
**Inequality is still the main economic determinant of Argentina and the region.**

Fig. 2. Enterotoxigenic *Escherichia coli* (ETEC) responses among children <6 years old. A multiplex bead assay using a native *E. coli* heat labile toxin β subunit was performed as previously described (Moss et al., 2011) on sera from children from Haiti (*n* = 115), Tanzania (*n* = 31), Argentina (*n* = 86) and the US (*n* = 107). Samples
Operational research project for the evaluation of tools and strategies for the control of STH in areas with high prevalence of *S. stercoralis*.

**Collaborative activity involving:**
- Univ. Nac. de Salta.
- Provincial Primary Care Program
- NGO (Mundo Sano)
Working sites

[Map showing locations in South America with markers for Tartagal, Orán, and Pichanal, labeled with their respective cities.]
Data gathering tools

- Socio-demographic and health information (*F1 forms*).

One cooking site = one form
Main goal

- Describe the prevalence and morbidity of STHs through a baseline cross-sectional study.

- Evaluate the impact and feasibility of a community based MDA program integrated to the public primary health care system.
Materials and Methods

Parasitological diagnosis: Single stool samples were analyzed with 5 methods: sedimentation, McMaster, Agar plate, Baermann and Harada-Mori.

Hematological diagnosis: Hemoglobin (Hb), MCV and eosinophilia were measured with a SYSMEX automated hematology analyzer.

Serological diagnosis: IgG antibody titers against recombinant antigen NIE-ELISA for Stst.

Intervention: Albendazole (400 mg) and ivermectin (200 ug/Kg) were administered to the entire eligible population in a community house-to-house approach.

Pharmacovigilance activities were carried post-MDA.
Rationale for ivermectin/albendazole combination

- **Wider anti-parasitary spectrum.**
  
  All traditional STH plus *S. stercoralis*, scabies and head lice.

- **Improved efficacy against *T. trichiura*.**
  
  Of particular interest due to the low efficacy of ALB and MEB.

- **Less likely to promote the selection of resistance.**

- **Already in use in Oncho programs.**
## Baseline survey (Tartagal)

![Image of table](image)

### Table: Prevalence of Soil-Transmitted Helminths (STH)

<table>
<thead>
<tr>
<th>Parasite</th>
<th>n</th>
<th>Prevalence</th>
<th>CI95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hookworm</td>
<td>135</td>
<td>34% *</td>
<td>42 – 53</td>
</tr>
<tr>
<td><em>Strongyloides stercoralis</em></td>
<td>104</td>
<td>26%</td>
<td>22 -31</td>
</tr>
<tr>
<td><em>Ascaris lumbricoides</em></td>
<td>15</td>
<td>3,7%</td>
<td>2 - 6</td>
</tr>
<tr>
<td><em>Trichuris trichiura</em></td>
<td>3</td>
<td>0,8%</td>
<td>0,1 – 2</td>
</tr>
<tr>
<td>Any STH</td>
<td>189</td>
<td>48%</td>
<td>42 – 53</td>
</tr>
</tbody>
</table>

*: 85% A. duodenale; 15% N. americanus

*Echazú et al, PLoS NTD - 2017*
Results: Intensity

A. lumbricoides

Hookworm

Baseline distribution of Hookworms species

15%
85%
n = 157
Ascaris lumbricoides

Orally ingested eggs

Trichuris trichiura

Skin penetrating larvae

Strongyloides stercoralis

Hookworm
Is there a species specific epidemiology that conditions WASH related risk factors based on mechanism of entry?
Distribution of water and sanitation

N: 771

Echazu et al, 2015. PlosNTD
Water & sanitation vs Mechanism of entry

Echazu et al, 2015. PlosNTD
Morbidity: anemia
Lapacho alto - Tartagal

- Baseline prevalence: 56.6% (IC 95%: 43 – 68)
- Prevalence after 1 round of MDA: 18.7% (IC 95%: 6.6 – 30.8)

\[ p = 0.0001 \]

<table>
<thead>
<tr>
<th>Category of public health significance</th>
<th>Prevalence of anaemia (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe</td>
<td>&gt; or = 40</td>
</tr>
<tr>
<td>Moderate</td>
<td>20.0 – 39.9</td>
</tr>
<tr>
<td>Mild</td>
<td>5.0 – 19.9</td>
</tr>
<tr>
<td>Normal</td>
<td>&lt; or = 4.9</td>
</tr>
</tbody>
</table>
Morbidity (Tartagal)

Height/age

Height-for-age of children 1 to 15 years old by parasitological result
(n=133)

Baseline Hgb

Baseline hemoglobin distribution by parasitological result
(n=169)

Effect of Poor Access to Water and Sanitation
As Risk Factors for Soil-Transmitted Helminth Infection: Selectiveness by the Infective Route

Echazú, 2017. PLoS NTD
**Strongyloides serology (NIE-ELISA)**

**Pichanal**

ALB/IVM + agua + cloacas

Compared results of patients enrolled for follow-up at G1 (MDA + W and S) and G2 (MDA alone):

<table>
<thead>
<tr>
<th></th>
<th>G1 (N = 33)</th>
<th>G2 (N = 40)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serological cure (OD ratio &lt; 0.6)</td>
<td>72.7% (24/33)</td>
<td>45.0% (18/40)</td>
<td>0.0197</td>
</tr>
</tbody>
</table>

**Vargas et al, AJTMH 2017**

Echazú, 2017. PLoS NTD
Current W&S situation in houses in Argentina

% of houses with unimproved water sources
- 0.0042 - 7.4795
- 0.0042 - 19.0214
- 19.0214 - 59.0000
- 79.0000 - 89.5000
- Departamentos

% of houses with unimproved sanitation facilities
- 0.0042 - 23.5985
- 23.5985 - 41.1378
- 41.1378 - 61.3757
- 61.3757 - 91.0597
- Departamentos

Source: INDEC. National Census 2010
ALIVE project

Co-formulation

ALB/IVM

High dose IVM

FIX dose

Molecular based outcome measurement
Safety and pharmacokinetics of fix dose IVM

n=54 estratificados por peso

1. Misiones
Indigenous village (n = 218)
Poliparasitism – 88.0%
Hookworm – 72.0%
*S. stercoralis* – 11.5%
*A. lumbricoides* – 1.4%
*T. trichiura* – 0.5%

2. Chaco
Peri-urban neighborhood (n = 314)
Poliparasitism – 11.1%
*S. stercoralis* – 2.5%

3. Santiago del Estero
Rural lots and peri-urban neighborhood (n = 470)
Poliparasitism – 4.5%
Hookworm – 0.43%
Hookworm infections were of either light (46.8%) or heavy intensity (41.0%). Heavy intensity was inversely proportional to age.
### STH Projects in Africa

#### 1. Ethiopia

<table>
<thead>
<tr>
<th>Species</th>
<th>Children (n = 396)</th>
<th>Community (n = 792)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. lumbricoides</em></td>
<td>8.6%</td>
<td>2.5%</td>
</tr>
<tr>
<td><em>T. trichiura</em></td>
<td>3.0%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Hookworm</td>
<td>54.5%</td>
<td>78.4%</td>
</tr>
<tr>
<td><em>S. stercoralis</em></td>
<td>20.7%</td>
<td>56.0%</td>
</tr>
<tr>
<td><em>S. mansoni</em></td>
<td>15.7%</td>
<td>6.2%</td>
</tr>
</tbody>
</table>


#### 2. Mozambique

<table>
<thead>
<tr>
<th>Species</th>
<th>Children (n = 235)</th>
<th>Adults &gt;15 (n = 460)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. lumbricoides</em></td>
<td>11.8%</td>
<td>4.4%</td>
</tr>
<tr>
<td><em>T. trichiura</em></td>
<td>12.4%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Hookworm</td>
<td>3.3%</td>
<td>20.2%</td>
</tr>
<tr>
<td><em>S. stercoralis</em></td>
<td>8.0%</td>
<td>1.3%</td>
</tr>
</tbody>
</table>
In Manhiça: ACA and WASH-IT projects

In Argentina:

Global Handwashing Day
Event with children in all our offices

Puerto Iguazú
Treatment together with workshops

https://www.youtube.com/watch?v=0zp1Ch0qAcc&t=18s
Collaborators

August 2018

Amhara Regional Health Bureau
and Regional Education Bureau/
Regional Health and Research
Laboratory Centre of Bahir Dar
Conclusions

• STH is still a public health problem in northern Argentina.
• The use of WHO/PAHO recommendations has served as a minimum set of tools and strategies that can be up scaled and adapted to the local context for improved control.
• The impact of the interventions is measurable in all age groups.
• Public-Private alliances are a key component of the programs, research activities and advocacy.