Can Malaria Really Be Eliminated in Rural Africa?

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After a lapse of almost 40 years, malaria eradication is back on the global health agenda. Inspired by the Gates Malaria Forum in October 2007, key organizations are starting to debate the pros and cons of redefining eradication as an explicit goal of malaria control efforts. Attempts to eliminate malaria in southern Africa and Pacific Island states, and WHO’s Global Malaria Programme agenda and field manual for malaria elimination, foreshadow this movement towards...
What causes human malaria?

But . . . Where did the mosquito get the malaria parasites from in the first place?
Do we have the tools to eliminate malaria?
Tools Available to Eliminate Malaria

• Effective drugs to kill malaria parasites in humans
  – Accurate diagnosis
  – Artemisinin combination therapy

• Effective ways to decrease mosquito bites
  – Insecticide treated nets (ITNs); repellants

• Effective ways to decrease mosquito populations
  – Indoor Residual Spraying (IRS); larviciding
What other tools would be helpful?

- Effective malaria vaccine
  - disease prevention
  - transmission blocking

- Medicine that kills parasites in one dose
- Prevent malaria development in mosquitoes
- More effective and non toxic insecticides
- ‘Real-time’ information on malaria infections in populations
What else impacts this disease?

• Lack of knowledge

• Community support for intervention programs

• Accurate diagnosis

• Availability of commodities at grass-roots level
Macha Mission Hospital and Macha Research Trust

Map Source: Malaria Atlas Project  (http://www.map.ox.ac.uk/data/)
Macha - The Early Years

Macha Health Care Work

- 1924 – Health care offered at Macha

- 1957 – Macha Mission Hospital opened
Macha Mission Hospital

- 1960s - community outreach
- 1989 - Malaria research activities began
- 2002 - Partnered with Johns Hopkins Bloomberg School of Public Health
- 2005 – Malaria Institute at Macha (MIAM) officially opened
- 2008 - Renamed Macha Research Trust
So why malaria research?
MACHA HOSPITAL
Out Patients - MALARIA CASES

Over 100% increase
Malaria Incidence Rates, Zambia
1976 to 1999

Source: Zambia National Malaria Control Centre
Malaria Case Fatality Rates, Zambia
1976 to 1994

Source: Zambia National Malaria Control Centre
Macha Hospital - 2000
Causes of Death - All Ages
Total = 596

- Malaria: 25%
- Protein Energy Malnutrition: 14%
- AIDS: 10%
- Pneumonia: 8%
- Anemia: 7%
- Other: 17%
- Meningitis
- Pulmonary TB
- Cardiovascular Disease
- Digestive - non infectious
- Diarrhea
Goals of Malaria Research Efforts at Macha

- Decrease malaria mortality and morbidity in children in the Macha area
- Provide a place where quality research could be carried out, leading to evidence that allows for well-informed policy changes
- Work with the local community to bring about better quality of life
Studies in Macha Community

• Study I: data collected in early 2000
  • 38% (36/94) of community children had asymptomatic malaria infection when first screened

• Study II: data collected in May 2003
  • 43% (151/355) with malaria infection but no symptoms during initial screening of community children

Thuma, unpublished data
Macha – a new hypothesis

Hypotheses:

i. Asymptomatic malaria carriers are a potential reservoir leading to malaria infected mosquitoes in the community

ii. One strategy to reduce malaria transmission is to eliminate these parasites from the asymptomatic carriers

• Artemisinin Combination Therapy (ACT) had become available for malaria and rapidly eliminates parasites from the blood and decreases gametocyte carriage
33 grids mapped with population of 9,375

1,098 households

49% males
25% under 5 years
56% under 15 years

7% had finished high school
Working with the community to reduce malaria burden

• Multiple community meetings over many months
  – traditional chiefs
  – village headmen
  – village elders
  – women’s groups
  – traditional healers
  – church leaders
  – teachers, etc.

• Once the community clearly understood the purpose of the study, we commenced screening and treatment of those found malaria positive, whether or not they had symptoms
Children’s Ward Malaria Discharges at Macha Hospital (under 6 yrs)

<table>
<thead>
<tr>
<th>Year</th>
<th>Malaria Discharges</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>431*</td>
</tr>
<tr>
<td>1995</td>
<td>707</td>
</tr>
<tr>
<td>2000</td>
<td>1,449</td>
</tr>
<tr>
<td>2001</td>
<td>1,778</td>
</tr>
<tr>
<td>2002</td>
<td>1,294</td>
</tr>
<tr>
<td>2003</td>
<td>1,418</td>
</tr>
<tr>
<td>2004</td>
<td>423</td>
</tr>
<tr>
<td>2005</td>
<td>123</td>
</tr>
</tbody>
</table>

* = ages 0 – 14 yrs
### Children’s Ward Malaria Deaths at Macha Hospital (under 6 yrs)

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<tr>
<th>Year</th>
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<tr>
<td>2000</td>
<td>106</td>
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<tr>
<td>2001</td>
<td>65</td>
</tr>
<tr>
<td>2002</td>
<td>32</td>
</tr>
<tr>
<td>2003</td>
<td>34</td>
</tr>
<tr>
<td>2004</td>
<td>18</td>
</tr>
<tr>
<td>2005</td>
<td>6</td>
</tr>
</tbody>
</table>
Macha Hospital Children’s Ward - Malaria Discharge

From 1,449 cases in 2000 to only 50 cases in 2010 = 97% reduction

Coartem Available
Coartem out of stock
Bednets Distributed

Village Screening and Treatment

Drought

1,449 annual cases:
1,778
1,294
1,418
423
123
565
336
52
46
50

From 1,449 cases in 2000 to only 50 cases in 2010 = 97% reduction
Observations

• We witnessed a remarkable reduction in malaria morbidity and mortality in the Macha area, but malaria is still not eliminated

• What will it take to eliminate or actually eradicate malaria in the Macha area?
### Steps to Accelerate Elimination

<table>
<thead>
<tr>
<th>Parasite Prevalence</th>
<th>30 - 60%</th>
<th>10 - 30%</th>
<th>1 - 10%</th>
<th>&lt;0.2%</th>
<th>&lt;0.3%</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Facility Cases per week</td>
<td>150 - 300</td>
<td>20 - 40</td>
<td>5 - 15</td>
<td>1 - 5</td>
<td>&lt;1</td>
<td>0</td>
</tr>
</tbody>
</table>

#### A. ACCELERATE Scale up for impact
- Prevention: Vector control (ITNs, IRS, etc.); prevention in pregnancy (IPTp, ITNs);
- Case Management: diagnostic confirmation and treatment with ACTs; M&E and surveillance

#### B. BUILD Information systems for action
For timely and quality reporting of infections and intervention commodities with increasing granularity

#### C. COMMUNITY CLEARANCE of malaria parasites
Introduces new tools and strategies including drugs (mass test and treat / mass drug administration); vaccines (pre-erythrocytic and transmission-blocking); additional vector control (ITNs + IRS + others); etc.

#### D. DETECT & DRIVE OUT parasites from individuals
Case investigation & focal screen / test and treat

#### E. ELIMINATE Document and maintain zero

**Communtiy Clearance of Malaria Parasites**

Introduces new tools and strategies including drugs (mass test and treat / mass drug administration); vaccines (pre-erythrocytic and transmission-blocking); additional vector control (ITNs + IRS + others); etc.

**Detect & Drive Out parasites from individuals**

Case investigation & focal screen / test and treat

**Eliminate**

Document and maintain zero
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New tools are required:

• Vaccines for prevention / disease / transmission blocking
• New insecticides
• New methods of controlling mosquito bites
• New methods to manipulate the parasite life cycle
• Better diagnostics to find low level parasite carriers

• But always, active community engagement
So YES, I believe malaria can be eliminated

BUT . . .

We need new tools

AND

there is a lot of work to be done
“Let us not become weary in doing good, for at the proper time we will reap a harvest if we do not give up”

Galatians 6:9 (NIV)