Malaria elimination will require...

...New tools

...New partnerships

...New ways of thinking

“Artemisinin resistance—is it popping, or is it jumping?”

Professor Pe Thet Khin, former Minister of Health, Myanmar

Nay Pyi Taw

April 2014

A wave of artemisinin resistance?

K13 molecular marker map

Woodrow et al. Lancet Inf Dis 2015
K13 migration: Implications

• Many different K13 mutations arose independently on many different genetic backgrounds
• Several resistance mutations have spread between countries in the Greater Mekong Subregion (GMS)
• Based on this result, 2015 WHO recommendation:
  – Containment is not possible
  – Falciparum elimination is imperative for the GMS

WHO recommendations:
Mass drug administration (MDA) for GMS …but not screen-and-treat (need better diagnostic tests)

http://www.who.int/malaria/publications/atoz/role-of-mda-for-malaria.pdf

Limits of detection

<table>
<thead>
<tr>
<th>Parasites/mL</th>
<th>usPCR</th>
<th>PCR</th>
<th>RDT</th>
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<tbody>
<tr>
<td></td>
<td>16</td>
<td>1000</td>
<td>100K</td>
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P. falciparum and P. vivax in human blood samples

Need better tools to stratify and forecast malaria risk

• Myanmar National Malaria Control Program seeks to “microstratify” malaria risk at village level
• Local transmission vs. importation?
• Sources vs. sinks of transmission?

Mapping the subclinical malaria reservoir

• Ultrasensitive low-volume Reverse Transcriptase PCR
  – Sensitivity: 16 parasites/mL & can detect both Pf & Pv simultaneously
• Field scalable: No sample processing, no cold chain x 14 days
• High throughput pipeline in Yangon: >20,000 samples since 2015
• Concordant with high volume PCR from frozen venous blood
• Now achieving same lower limit of detection from dried blood spots
  – Better, cheaper, faster

Adams et al. Malaria Journal 2015
Zainabadi et al. in preparation
Extremely high throughput
- Thousands of antibody assays on a single microarray the size of a microscope slide
- Cost of equipment decreasing ten-fold
Rangoon University medical students 1987

Burma 1988

Rangoon University medical students 1988

Rangoon University medical students 1989

Myanmar 2011
Building political will and ownership through capacity strengthening in the lab and the field

First ever NIH grant in Myanmar

Malaria as a catalyst for social change

Gates Foundation Partners Meeting
Nay Pyi Taw, Myanmar
December 2014

Washington DC August 2015