UNIVERSITY of MARYLAND SCHOOL OF MEDICINE
INSTITUTE FOR GLOBAL HEALTH

ASTMH

Science and politics of malaria elimination in the Greater Mekong Subregion

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Joint International Tropical Medicine Meeting

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Bangkok
7 December 2016

Malaria elimination will require…

…New tools

…New partnerships

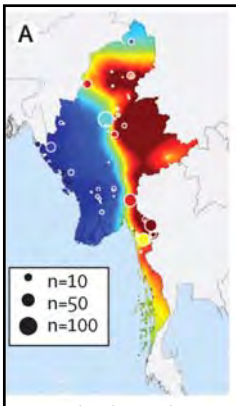
…New ways of thinking

ACT treatment failure 46% in Western Cambodia

Amaratunga *et al. Lancet Inf Dis* 2016

"This artemisinin resistance—is it popping, or is it jumping?"

Professor Pe Thet Khin, former Minister of Health, Myanmar
Nay Pyi Taw
April 2014

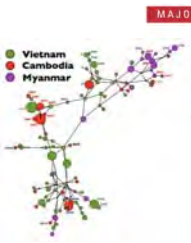


A wave of artemisinin resistance?

K13 molecular marker map

Woodrow et al. Lancet Inf Dis 2015

Artemisinin resistance "paternity testing" using K13 molecular marker



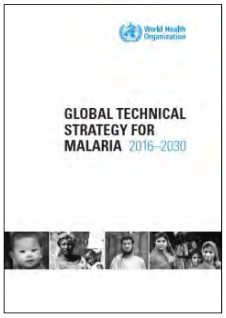
MAJOR ARTICLE

JID 2015:211 (1 March) • Takala-Harrison et al

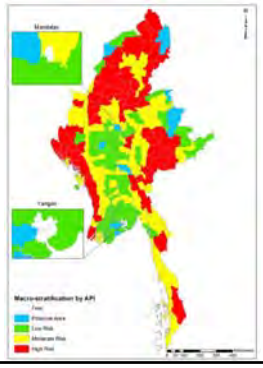
Independent Emergence of Artemisinin Resistance Mutations Among *Plasmodium falciparum* in Southeast Asia

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**



Need better tools to stratify and forecast malaria risk

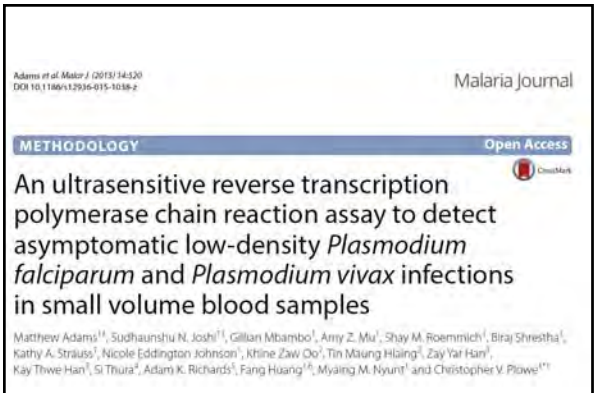


- Myanmar National Malaria Control Program seeks to "microstratify" malaria risk at village level
- Local transmission vs. importation?
- Sources vs. sinks of transmission?

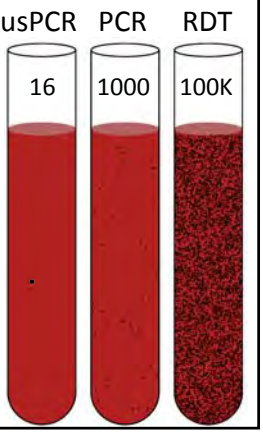
WHO recommendations:

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



P. falciparum and *P. vivax* in human blood samples

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

>30,000 samples analyzed in 2016

Department of Medical Research, Myanmar Ministry of Health

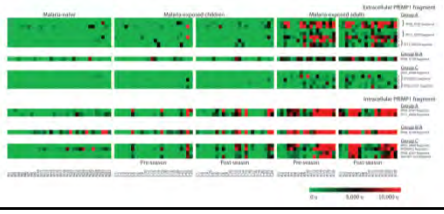
The Journal of Infectious Diseases 2013;208:1514–9

Seroreactivity to *Plasmodium falciparum* Erythrocyte Membrane Protein 1 Intracellular Domain in Malaria-Exposed Children and Adults

Mark A. Travassos,[1] Amadou Niangaly,[2] Jason A. Bailey,[1] Amed Ouattara,[1] Drissa Coulibaly,[2] Matthew B. Laurens,[1] Jozelyn Pablo,[2] Algis Jasinskas,[3] Rie Nakajima-Sasaki,[3] Andrea A. Berry,[1] Shannon Takala-Harrison,[1] Bourema Kouriba,[2] J. Alexandra Rowe,[4] Kirsten E. Lyke,[1] Ogobara K. Doumbo,[2] Mahamadou A. Thera,[2] Philip L. Felgner,[3] and Christopher V. Plowe[1]

Serology

Antibodies to diverse malaria antigens

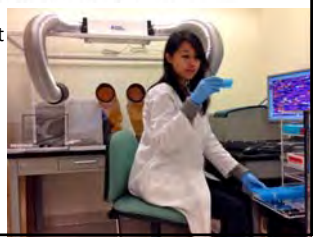


Short Report: Seroreactivity to a Large Panel of Field-Derived *Plasmodium falciparum* Apical Membrane Antigen 1 and Merozoite Surface Protein 1 Variants Reflects Seasonal and Lifetime Acquired Responses to Malaria

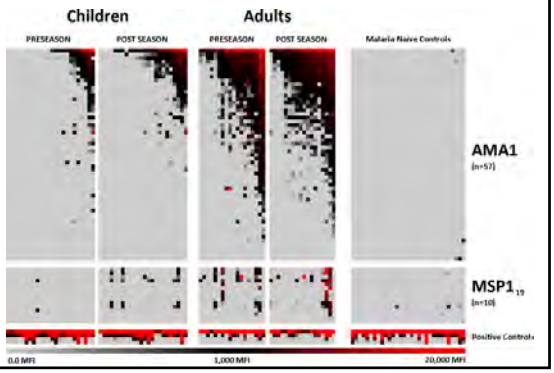
Jason A. Bailey, Jozelyn Pablo, Amadou Niangaly, Mark A. Travassos, Amed Ouattara, Drissa Coulibaly, Matthew B. Laurens, Shannon L. Takala-Harrison, Kirsten E. Lyke, Jeff Skinner, Andrea A. Berry, Algis Jasinskas, Rie Nakajima-Sasaki, Bourema Kouriba, Mahamadou A. Thera, Philip L. Felgner, Ogobara K. Doumbo, and Christopher V. Plowe

Howard Hughes Medical Institute/Centre for Vaccine Development, University of Maryland School of Medicine, Baltimore, Maryland; Division of Infectious Diseases, Department of Medicine, University of California, Irvine, California; Laboratory of Immunogenetics, National Institutes of Health, Bethesda, Maryland; Malaria Research and Training Center, Department of Epidemiology of Parasitic Diseases, University of Sciences, Techniques and Technology, Bamako, Mali

- Extremely high throughput
  - Thousands of antibody assays on a single microarray the size of a microscope slide
- Cost of equipment decreasing ten-fold



Serology for malaria surveillance



Array Cam microarray reader

Science
AAAS

THE UNLIKELY DIPLOMAT

Myaing Myaing Nyunt fled Myanmar in 1988; now she is back, forging alliances against malaria

By Leslie Roberts

On a blistering hot October day last year, the air thick with impending rain, Myaing Myaing Nyunt and I lurch in a wooden oxcart toward Sa-ka-pin, a small village in the rich agricultural lowlands about 20 kilometers northeast of Mandalay, Myanmar. We grip the splintery sides of the cart as the animals plunge chest deep in the muck; when they swish their tails, mud splatters everywhere. It's 1 month before Myanmar's historic election, and with us in the back is a young doctor with "NLD," the initials of Aung San Suu Kyi's opposition party, the National League for Democracy, shaved into his close-cropped hair. A second cart carrying township medical officers follows close behind. We stop at a wide, shallow river, where a man in a dugout canoe ferries us across. Two more carts are waiting for us.

Nyunt, a malariologist at the University of Maryland School of Medicine (UMD) in Baltimore, is visiting Sa-ka-pin to assess the extent of one of the biggest problems facing an ambitious campaign to wipe out malaria from the Mekong region (see main story, p. 398): the number of people infected with malaria who have no symptoms. It's part of a unique collaboration led by Nyunt and her husband, molecular epidemiologist and malariologist Chris Plowe, who heads the Institute for Global Health

Myaing Myaing Nyunt

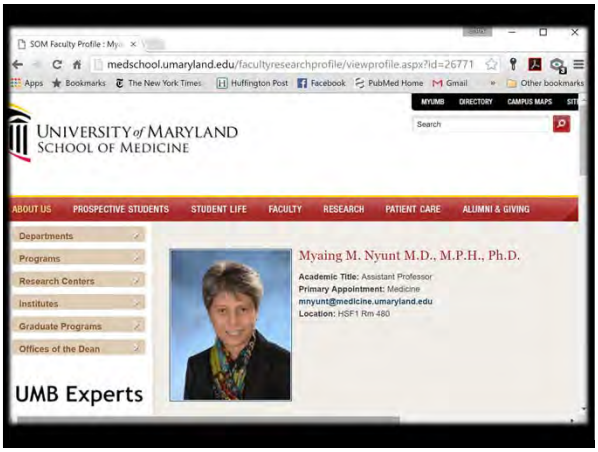
Published by AAAS

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

USAID

The Global Fund

NIH National Institute of Allergy and Infectious Diseases

BILL & MELINDA GATES foundation

Malaria as a catalyst for social change

ASTMH #TropMed14

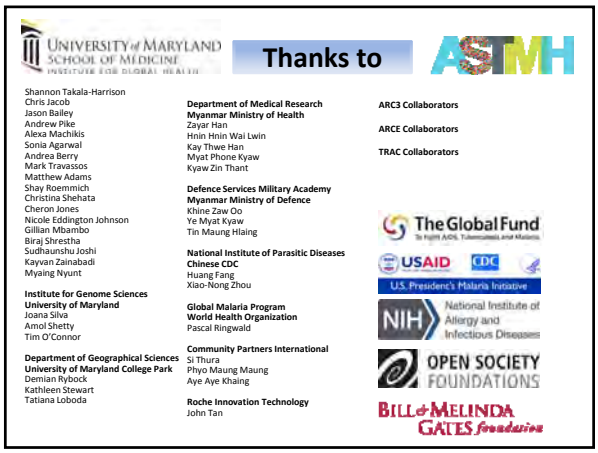
63rd Annual Meeting November 2–6, 2014 New Orleans, LA USA

Gates Foundation Partners Meeting
Nay Pyi Taw, Myanmar
December 2014

ASTMH UNIVERSITY of MARYLAND SCHOOL OF MEDICINE INSTITUTE FOR GLOBAL HEALTH CSIS CENTER FOR STRATEGIC & INTERNATIONAL STUDIES

Washington DC August 2015

BILL & MELINDA GATES foundation OPEN SOCIETY FOUNDATIONS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