Outdoor Transmission Work Stream

7th meeting

Needs and opportunities

Co-chairs:
Marc Coosemans
Chusak Prasittisuk
Outdoor transmission needs: Human ecology
Outdoor Transmission needs: vector ecology

An. arabiensis (bottom, green bars)


Geissbühler et al 2007
Formation of the Outdoor Transmission Workstream

initial focus on personal protection for mobile populations in the Mekong, where emerging artemisinin resistance poses the other great threat to global malaria control efforts.

The work stream brings together the commercial sector, academia, and national programs to inventory resources, and create common protocols for examining efficacy and community acceptability to adapt repellents and other treated materials that could supplement current vector control tools.
Outdoor transmission Work Stream Progress

The Fourth Work Stream Meeting on Outdoor Malaria Transmission (OMT) in Mekong Countries

Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand,
12-13 March 2012

Objectives:

- To review current malaria control and research activities related to malaria outdoor transmission in the Mekong countries
- To discuss the strategic direction for research and development along the lines of entomological efficacy and community acceptability
- Establish institution and research networks for technical support and information exchange
Partner initiatives on outdoor transmission

- PMI Mekong Operations Research
- WHO/BMGF O.R. for Artemisinin resistance containment (including ivermectin)
- IVCC ESAC3 ‘New Paradigms’
- Armed Forces Pest Management Board
Science on outdoor transmission

L. Durnez & M. Coosemans (2013) Residual transmission of malaria: an old issue for new approaches. In “Anopheles mosquitoes – New insights into malaria vectors” Editor Sylvie Manguin; Publisher Intech (open access) http://www.intechopen.com/books (publication foreseen in March 2013)

Residual Transmission of Malaria: An Old Issue for New Approaches

Lies Durnez¹ and Marc Coosemans¹, ²
RESIDUAL TRANSMISSION, A CHALLENGE FOR MALARIA ELIMINATION

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OUTDOOR RESTING & OUTDOOR AND EARLY BITING MALARIA VECTORS HAVE BEEN SELECTED FOR BY VECTOR CONTROL, LEADING TO RESIDUAL MALARIA TRANSMISSION

Vector control is a key element in the worldwide malaria decline, with Insecticide Treated Nets (ITNs) and Indoor Residual Spraying (IRS) contributing significantly.

Some mosquito populations can escape from this indoor insecticide use by their exophagic, exophilic, zoonophilic or early biting behaviour (Figure 1).

- Behavioural shifts observed after widespread use of ITNs and IRS show that this behavioural resistance can be selected for (Table 1).
- Due to this Protection Gap, malaria transmission persists (Figure 2).

NOW WE NEED TO OUTSMART THESE ESCAPING MALARIA VECTORS AND CLOSE THE GAP!

CONCEPT: CLOSING THE GAP BY ADDITIONAL REPELLENT USE

MAL Rafis tournament

Cambodia

Field test: entomological efficacy of DEET & Picardin

Human landing collections according to a 5x5x5 Graeco-latin square (230 survey days):
- 5 persons
- 5 hours (5-10pm)
- 5 collection days/test
- 5 treatments: 2 negative controls, DEET 20%, Picardin 20%, Picardin 10%

RESULTS: HETEROGENEITY IN REPELLENT SENSITIVITY

- Picardin 10% repelled less mosquitoes than Picardin 20% & DEET 20%
- Anopheles & Aedes spp. were less repelled than Culex & Mansonia spp.
- For Picardin, differences in % Repellency occurred between vector species: Aedes aegypti was the most repelled, Anopheles barbicornis the least.

% Repellency = (C-T/C)*100 (C= average number of mosquitoes collected on control legs; T= number of mosquitoes collected on repellent treated legs).

This heterogeneity in repellent sensitivity might result in a geographically heterogeneous epidemiological impact of repellent use for malaria control.
Large-scale evaluation of mosquito repellent as an additional control measure in tackling malaria in pre-elimination areas

**MalaRest**: We aim to tackle MALaria RESidual Transmission

Outdoor and/or early-biting malaria vectors potentially expose persons to a transmission window which is not covered by a widespread distribution of insecticide treated beds. Massive use of topical repellents may protect against this residual malaria transmission. The MalaRest project aims to provide a proof of principle for the use of repellents as an additional control measure by conducting a large scale field survey with three objectives:

- **Epidemiology:** To assess the epidemiological efficacy of repellents on the prevalence of malaria carriers and malaria incidence.
- **Entomology:** See poster 1027
- **Anthropology:** To assess the acceptability and adherence of topical repellents in the communities.

**Study Area**

The epidemiological efficacy of the massive use of repellents was evaluated in a community based randomized study covering a population of 40,000 inhabitants in the province of Ratanakiri, Cambodia (Fig 1). Following a pre-trial survey, 98 clusters were randomly divided in two arms (Fig 2): a control (LLIN™) and intervention arm (LLIN + topical repellent). The principal indicator is the prevalence of parasite carriers measured by PCR techniques using a mobile lab in the field (Fig 3) (Cavender et al., Malaria Journal, 2013, 12:409).

**Summary statistics**

<table>
<thead>
<tr>
<th>Arm</th>
<th>Village</th>
<th>Cluster</th>
<th>Malaria carriers</th>
<th>Malaria incidence</th>
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<tbody>
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<td>Control</td>
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<td>1</td>
<td>123</td>
<td>45</td>
</tr>
<tr>
<td>Intervention</td>
<td>B</td>
<td>1</td>
<td>123</td>
<td>45</td>
</tr>
</tbody>
</table>

**Statistical analysis**

**Prevalence data**

This study did not reveal a significant reduction in the malaria prevalence in the intervention arm as compared to the control arm. Preliminary data indicate the repellent coverage (measured through a two-weekly bottle exchange program) to be reasonably high (80% exchange > 4 times). Self-reported repellent use in the intervention arm is in the range of 70-80% and people indicated to use more repellent in forested sites. However, the overall prevalence of the study is lower than initially expected—please await the results of multiple serological tests and passive case detection to draw final conclusions in this project.
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The need is there, the partners are there, the science is there.

Whither* or Wither** the Outdoor Transmission Work Stream?

* Whither: to what place? Where?

** Wither: to shrivel; fade; decay