

RBM Vector Control Working Group

Outdoor Malaria Transmission Work Stream

Progress Against 2011 Work Plan – Prof. Marc Coosemans

A review of the progress made by this work stream during 2011 was presented, including efforts towards information sharing on operations research for outdoor transmission and coordinated entomological monitoring across the Greater Mekong subregion, encompassing Myanmar, Thailand, Lao PDR, Cambodia, Vietnam and Yunnan Province China. The two-day regional meeting planned for November 2011 was postponed to March 2012 due to the flooding Bangkok. A one-day meeting was held in Phnom Penh that reviewed the knowledge base on outdoor transmission and its control in Cambodia and identification of researchers, institutions and on-going studies. Plans for 2012 for the Work Stream include:

- Outdoor Transmission Workshop 12-13 March 2012 organized by the Faculty of Tropical Medicine, Bangkok
- Inventory of institutions and researchers in the Mekong region
- Compilation of regional research
- Review of residual transmission in the Mekong Region and elsewhere (Institute of Tropical Medicine/Antwerp)
- Development of strategies for research and development

Discussion

The role of larviciding in addressing residual and outdoor transmission was discussed. It was noted that in some cases the 'three Fs' criteria (*Few, Fixed and Findable*) are fulfilled. For example, historically, *An. minimus* has been eliminated in some villages in Southeast Asia by installing siphons and improving drains to flush larvae out of the breeding sites. Clearly this approach would not be suitable for other vector species with different larval ecologies such as *An. dirus*. Larviciding and environmental management are potential control mechanisms for countries in North Africa and the Middle East where the breeding sites are limited and where programs are moving towards elimination.

Given that residual transmission or outdoor transmission is emerging as an issue in some northern and southern African countries, particularly those that are aiming for elimination, it was suggested that representatives from these countries be invited to attend the March 2012 meeting.

The importance of human behaviour in relation to outdoor transmission was also discussed. It was noted that in many communities people do not retire until late in the evening; in cases people work away from home or sleep outside in situations where ITN are either impractical or otherwise rarely used. A recent study initiative in Cambodia provided extra nets to households to allow those travelling to the forest or sleeping in the fields access to take a net with them. It was felt that supplying these extra nets was helping to reduce transmission among this population.

Human landing catches is one of the few reliable collection methods available to investigate outdoor transmission. There is however uncertainty among many Research Ethics Committees and Institutional Review Boards, on the ethics and risk/benefit involved. Further guidance from WHO would be useful in this area.

It was acknowledged that despite the importance and complexity of outdoor and residual transmission of malaria, the work stream had been relatively under-financed. As control of “indoor transmission” with LLINs and IRS becomes more successful, particularly in Africa, the relative importance of outdoor transmission may increase and necessitate more operations research and more funding for this area of vector control.

3rd Outdoor Malaria Transmission Work Stream Meeting
Wednesday 8th February 2012
IFRC Auditorium, Geneva, 13:00-15:00

Co-leaders: Prof. Marc Coosemans & Dr. Chusak Prasittusuk
Rapporteur: Dr. John Silver

Current Situation – Prof. Marc Coosemans

Marc Coosemans reviewed the current situation and magnitude of outdoor malaria transmission, and described some of the potential control tools. He reminded participants of the residual transmission that is not currently addressed through the use of IRS and LLINs as a result of early and outdoor biting behaviours of vectors and also human behaviours that increase risk, such as forest work and remaining outdoors until late in the evening. Mosquito behaviour is highly variable within species such that it is not possible to define a species as ‘exophagic’ or endophagic’ or as an early or late biter. There are many examples of where the populations of the same vector species exhibit different biting behaviours from one location to another. Vector control can select species and/or subpopulations that bite early or bite outdoors. Tools available to address the issue of residual transmission include:

- Topical Repellents (DEET, Picaridine (KBR3023), P-Mentane-3,8-diol, IR3535)
- Spatio-repellents (metofluthrin fan vaporizer)
- Insecticide treated hammocks, nets
- Insecticide treated clothing
- Treated Plastic sheeting
- Mosquito Coils/vaporizers
- Others?

The available evidence on the efficacy of topical repellents and also treated hammocks was briefly reviewed.

Raising the Proof of Principle – Prof. Marc Coosemans

Novel PHPs may include new active ingredients as well as new application technologies and some of these new approaches (e.g. spatial or even topical repellents for transmission control) will require epidemiological studies to demonstrate efficacy in reducing malaria transmission and/or disease, and will require new evaluation guidelines and criteria. Study designs can include: individual randomized trials, household randomized trials, and community randomized trials. The advantages of different study designs were reviewed and a specific example of a study design to test topical repellents in addition to LLINs was described.

Discussion

Several issues were raised in relation to the described study of topical repellents, including the following:

Participants felt that the trial would be very useful towards generating proof of concept and hoped that there would be future trials on space repellents, as this would address some of the issues around adherence that are encountered when using topical repellents. Yes, methods to evaluate spatial repellents will vary by product and mode of action.

It was noted that for both personal and spatial repellents, availability of alternative hosts can be very important in determining the ability of a trial to detect a mass effect through entomological monitoring and that this was likely to be the case for many species in SE Asia. It was reported that in the trial described, *An. dirus* is the main vector and only rarely bites animals.

The importance of being able to disentangle individual effects from any community mass effect was also mentioned. This could potentially be achieved through knowledge on the compliance profile of those in the treatment arm. In the trial described, all bottles of repellent are marked and traceable and compliance could be measured by household consumption of repellent. In addition the social science component of the study should also provide information on compliance.

Prevalence of use of household sprays and insecticide coils in the study community was raised. In response it was stated that use of these interventions is low in the study province. However, it was acknowledged that a major challenge to the study will be adherence, as use of topical repellents is also new in this province. A team from the NMCP will develop materials to encourage use of repellents and LLINs.

The role of a placebo in this kind of trial was discussed as it would allow for the trial to be blinded, which is obviously desirable, however, it is very easy for participants in the trial to identify if they are using the product under test or a placebo and difficult to prevent individuals or households exchanging products.

The importance of obtaining as broad a range of inputs from as wide a range of disciplines as possible at the design stage was stressed.

Participants suggested that a compendium of study designs to support countries to systematically investigate personal protection measures would be useful.

Adherence and Sustainability of Interventions Based on Personal Protection – Prof. Marc Coosemans

The third presentation examined the gap between product efficacy and community effectiveness and described the steps on the “effectiveness ladder”, which result in considerable efficacy losses as one moves from the laboratory to real life conditions.

Discussion

An ongoing trial in Myanmar was described in which forest workers are issued with permethrin-treated blankets. In the study area there are around 30,000 confirmed malaria cases annually, 80% of which occur in forestry-related workers. These workers do have small huts in the forest, but most sleep outside and don't use nets due to their bulk, and for fear of damaging the nets. All workers use

blankets. In the trial 28 treated blankets were distributed and there are 150 controls. Results indicate a 75% reduction in biting by *An. dirus*.

Participants suggested that it would be useful to look at lessons learned on improving adherence with interventions in other intervention areas, e.g. hand washing with soap.

Participants requested further information on the extent to which people are outside at night and the impact on infection status in an African context. Participants were informed that the Peace Corps is being encouraged to contribute to answering this question in Ghana and a study by Killeen in Kenya is due to be published shortly.

In summary, there is a clear need to continue to stimulate innovative ideas and approaches and build the evidence base, e.g. for spatial repellents, attractants, and other tools for specific population groups. The role of networking and information sharing in the development of protocol designs is also very important.

Actions and 2012 Work Plan

- Outdoor Transmission Workshop 12-13 March 2012 organized by the Faculty of Tropical Medicine, Bangkok
- Inventory of institutions and researchers in the Mekong region
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Agenda	
13:00-13:10	Overview of expectations and current activities
13:10-13:20	Review of the current situation and magnitude of outdoor transmission of malaria and potential control tools
13:20-13:30	Discussion
13:30-14:00	Approaches to raise the proof of principle, research evidence based control interventions to tackle outdoor transmission (methodological)
14:00-14:30	Discussion
14:30-14:45	Needs for achieving adherence and sustainability of interventions based on individual protection
14:45-15:00	Discussion
15:00 – 15:30	Afternoon break / coffee and tea

Participants list

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