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Adaptation of *Anopheles* vectors to Anthropogenic Malaria-associated rubber plantations and indoor residual spraying: Establishing population dynamics and insecticide susceptibility

Adisak Bhumiratana[*1] and **Suntorn Pimnon**[3,2]
[1]Thammasat University, Thailand
[2]Bangkokthonburi University, Thailand
[3]Mahidol University, Thailand

Anthropogenic activity such as the establishment or expansion of rubber plantations can influence local dynamic malaria transmission in *Anopheles*-infested land areas of rubber plantations of Bo Rai district, Trat province, Thailand. The study was carried out between 2015 and 2016 in an emerged malaria-associated rubber plantation (MRP) ecotope of Bo Rai district soon after a 2013-2014 malaria outbreak was locally arrested by the implementation of core interventions of vector control including the indoor residual spraying (IRS). Based on human landing catch collections, we assessed the population dynamics of local *Anopheles* vectors adapted to the study MRP ecotope. Using an IRS-protected house, the periodic assessment of species composition, abundance, and blood-feeding behaviors of local *Anopheles* vectors was done in pre-IRS, during IRS, and post-IRS (3rd-month, 6th-month, and 12th-month post). We then tested the susceptibility of pooled population samples of some predominantly night-biting *An. dirus* and *An. campestris* vectors against the Deltamethrin (DEL) and Bifenthrin (BT) insecticides that were currently used in vector control. The study MRP ecotope elicited *Anopheles* population ratios (pi) of *An. campestris* (pi=0.747), *An. dirus* (pi=0.168), *An. minimus* (pi = 0.037), *An. barbirostris* (pi=0.027), *An. jamesii* (pi=0.019), and *An. pseudowillmori* (pi=0.002), respectively. Among these *Anopheles* mosquitoes, *An. dirus* and *An. campestris* were predominantly night-biting vectors. *An. dirus* as primary vector of *Plasmodium falciparum* behaved exophagy rather than endophagy in human blood seeking, but was likely to avoid feeding indoors in the IRS-protected house. There was significant difference in the abundance of exophagous vs. endophagous population samples of *An. dirus* observed at pre-IRS (P<0.001 for mean number; P=0.046 for human landing rate) and during IRS (P=0.001 for mean number; P=0.037 for human landing rate). It was highly susceptible to the 0.05% DEL and 0.09% BT showing 100% mortality rate. *An. campestris* as suspected vector of *Plasmodium vivax* behaved both exophagy and endophagy in human blood seeking and had ability to feed indoors in the IRS-protected house. The species was highly susceptible, 95.0% (95% CI, 79.1-100.0), to the BT. It had a tendency to show decreased sensitivity of 87.2% (95% CI, 78.4-95.9) to DEL. Such findings supported the evidence that the study MRP ecotope as highly receptive environment was essential site for surveillance of locally adapted *Anopheles* vectors and residual malaria parasite transmission through human vector combinations in the absence or presence of the core interventions of vector control.

Biography

Adisak Bhumiratana has completed his graduation, and after completing his graduation got trained in the fields of infectious diseases, epidemiology, and public health from USA: The Centers for Disease Control and Prevention (CDC) in Atlanta, FDA Regional Office in Atlanta, and FDA's Gulf Coast Seafood Laboratory on Dauphin Island, Alabama, and from Japan: Research Institute for Microbial Diseases, Osaka University in Osaka, and Research Center for Zoonosis Control, Hokkaido University in Sapporo. He is at the Center for Ecohealth Education and Research (CEER) at the Faculty of Public Health, Thammasat University, Thailand, and has been responsible for the curriculum development for PhD Global Health Science (International Program). He has published more than 35 papers including 25 papers in internationally refereed journals.

adisak.bhu@mahidol.ac.th

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