

Investigating the contribution of peri-domestic transmission to risk of zoonotic malaria infection in humans

ABSTRACT

Background: In recent years, the primate malaria *Plasmodium knowlesi* has emerged in human populations throughout South East Asia, with the largest hotspot being in Sabah, Malaysian Borneo. Control efforts are hindered by limited knowledge of where and when people get exposed to mosquito vectors. It is assumed that exposure occurs primarily when people are working in forest areas, but the role of other potential exposure routes (including domestic or peri-domestic transmission) has not been thoroughly investigated. Methodology/Principal Findings: We integrated entomological surveillance within a comprehensive case-control study occurring within a large hotspot of transmission in Sabah, Malaysia. Mosquitoes were collected at 28 pairs households composed of one where an occupant had a confirmed *P. knowlesi* infection within the preceding 3 weeks ("case") and an associated "control" where no infection was reported. Human landing catches were conducted to measure the number and diversity of mosquitoes host seeking inside houses and in the surrounding peri-domestic (outdoors but around the household) areas. The predominant malaria vector species was *Anopheles balabacensis*, most of which were caught outdoors in the early evening (6pm - 9pm). It was significantly more abundant in the peri-domestic area than inside houses (5.5-fold), and also higher at case than control households (0.28 ± 0.194 vs 0.17 ± 0.127 , $p < 0.001$). Ten out of 641 *An. balabacensis* tested were positive for simian malaria parasites, but none for *P. knowlesi*. Conclusions/Significance: This study shows there is a possibility that humans can be exposed to *P. knowlesi* infection around their homes. The vector is highly exophagic and few were caught indoors indicating interventions using bednets inside households may have relatively little impact.