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BG-SENTINEL™ TRAP EFFICACY AS A COMPONENT OF PROOF-OF-CONCEPT FOR PUSH–PULL CONTROL STRATEGY FOR DENGUE VECTOR MOSQUITOES

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ABSTRACT. The efficacy of the BG-Sentinel™ (BGS) trap as a "pull" component of a "push–pull" system (PPS) for management of the dengue vector, *Aedes aegypti*, was evaluated using local households in Pu Tuey, Kanchanaburi, Thailand. The pull component was the concluding phase of a 3-part investigation using a PPS combination spatial repellent (SR) and BGS trap to capture adult vector mosquitoes. Two sentinel households were selected for evaluation of BGS trap efficacy based on the highest pretrial indoor resting densities of *Ae. aegypti* using Centers for Disease Control and Prevention (CDC) mechanical backpack collections. Potential *Ae. aegypti* resting sites around the selected houses were identified as possible competing sites that might influence the BGS trap capture efficiency. Results showed that BGS traps were productive in capturing *Ae. aegypti* females (93.4% of all *Aedes* collected) in the presence of competing man-made, artificial resting sites. The CDC backpack aspirator collections provided an indirect measure of local *Aedes* population, although technically not comparable for supporting productivity of BGS traps due to different collection days and households sampled. The predominant competing resting sites were water containers found within 3 m around the outside of sentinel households. The most productive BGS collections between houses differed by location. The most productive period of operation for *Ae. aegypti* BGS trapping was between 1330 and 1730 h. The BGS trap appears an effective "pull" device in the PPS strategy in natural settings.

KEY WORDS *Aedes aegypti*, *Aedes albopictus*, BG-Sentinel trap, dengue vector control, push–pull strategy

INTRODUCTION

Dengue viral transmission poses a serious risk to over 2.5 billion people living primarily in tropical and subtropical areas. Despite a recent commercially available vaccine, the control of this disease remains challenging and still relies almost exclusively on vector control and management of the primary mosquito vectors, *Aedes aegypti* (L.) and *Ae. albopictus* (Skuse) (Reiter and Gubler 1997, McCall and Kittayapong 2007, Morrison et al. 2008, WHO 2009). A recent proposed vector control strategy against the major dengue vector, *Ae. aegypti*, is the so-called "push–pull" system (PPS), which was shown useful for the control of various agricultural pests (Miller and Cowles 1990, Nielsen 2001, Midega et al. 2006, Amudavi et al. 2007, Cook et al. 2007). For controlling potential pathogen-transmitting mosquitoes, the PPS involves a "push" component, generally a chemical-based repellent (Fradin and Day 2002, Barnard and Xue 2004, Wagman et al. 2015) that renders a source or treated area as unsuitable or unattractive to the target species. A repellent exploits the avoidance ("escape") behavior of the mosquito with an additional "pull" component that subsequently lures the repelled mosquito to an attractant-based trap, thereby effectively removing the insect from the environment and any further risk of propagation or transmission of pathogens.

In a multiphase PPS study, a spatial repellent (SR) was used at sublethal doses and over a minimal treatment coverage (for cost-effectiveness) to reduce indoor densities of *Ae. aegypti* (Salazar et al. 2012). The BG-Sentinel™ (BGS) trap (Biogents AG, Regensburg, Germany) was used as the pull component to remove chemically repelled female *Ae. aegypti* from indoor to outdoor peridomestic environments. Additionally, the BGS trap facilitated the monitoring of mosquito movement between different structures, allowing for an evaluation of potential diversion of repelled mosquitoes to untreated locations and thereby avoiding capture (Salazar et al. 2013).

The BGS trap design exploits some key elements of *Ae. aegypti* host-seeking behavior by combining an olfactory cue, the BG Lure™ (Biogents AG,

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