

NEGATIVE CROSS-RESISTANCE AS A RESISTANCE MANAGEMENT TOOL FOR PYRETHROID RESISTANCE IN MALARIA VECTORS

**POONAM SHARMA VELAMURI, N. ELAMATHI, VAISHALI VERMA,
AND KAMARAJU RAGHAVENDRA**

National Institute of Malaria Research, Sector – 8, Dwarka, New Delhi – 110 077, India

Abstract Malaria is a global health challenge. Vector control remains the fundamental, central and critical component of prevention and control of malaria. Insecticides remain the mainstay in vector control for malaria prevention. Pyrethroids are currently the insecticides for adult vector control intervention. The increasing and widespread development of pyrethroid resistance is a serious potential threat to malaria vector control programmes. Managing insecticide resistance is a key challenge for effective and affordable vector control. Spread of resistance to insecticides increase with prolonged use of the same or several insecticides exerting high selection pressure on the vector population. Hence, innovative strategies are essential to maintain and/or sustain vector control. Monooxygenases and esterases are the enzymes which are responsible for metabolism and detoxification of pyrethroid and also bio-activate chlorfenapyr and indoxacarb into an active toxic form, respectively. *In silico* enzyme and insecticide interaction activity studies also validated that there could be a possibility of chlorfenapyr and indoxacarb to exhibit negative cross-resistance (where detoxifying enzyme for one insecticide is responsible for bio-activation of the other insecticide) against pyrethroid resistance. It is suggested to use chlorfenapyr to manage resistance due to enhanced monooxygenases and indoxacarb with enhanced esterases. This novel approach will lead to improve the current vector-control approaches by introducing alternate insecticide, i.e., negative cross-resistance toxins to manage insecticide resistance employing alteration/ rotation. This innovative resistance management strategy can prolong the useful life of insecticides, while at the same time preserve or enhance the utility of existing insecticides in use.