

How will the response of mosquitoes to vector control shape malaria parasite evolution?

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Malaria parasites (*Plasmodium* spp.) have a complex lifecycle, where transmission between human hosts relies on passage through female *Anopheles* mosquitoes. Vector control tools targeting mosquitoes, such as insecticide-treated bednets, reduce transmission opportunities for the parasite and have been key in decreasing the malaria burden over the past two decades. This widespread use of vector control tools has led to significant changes in mosquito ecology and their evolutionary responses are well documented (e.g. insecticide resistance). However, how vector control interventions alter the nature of vector-parasite interactions, and consequently the selection pressures on parasites, are unknown. The counter-evolution of parasites in response to interventions that act within the host (e.g. antimalarial drug resistance) has mitigated fitness losses for parasites. Therefore, there is potential for parasites to adapt to the consequences of vector control interventions, but these evolutionary responses have been overlooked. Using different combinations of mosquito strains and well-characterised *P. chabaudi* strains as a model system, we aim to investigate whether vector control interventions affect vector-parasite interactions and selection on parasite traits. This includes evolutionary responses of parasites to direct interactions with insecticides (e.g. via insecticide resistant mosquitoes) and indirect consequences (e.g. via bednets altering the biting time-of-day of mosquitoes). In particular, quantifying the genetic variation and phenotypic plasticity underpinning parasite traits involved in sporogony will provide insight into the evolutionary potential of parasites in response to changing vector ecology and altered within-vector environments. Understanding the short and long-term consequences of how vector control could affect malaria parasite evolution is key for the mitigation of any detrimental consequences of current control programmes. Furthermore, knowledge of factors that shape parasite evolution could inform development of novel control strategies by targeting evolutionarily constrained parasite traits.