Spatiotemporal dynamics of the persistence of various Wolbachia strains in released carrier mosquitoes

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A mathematical model is developed to simulate the spread dynamics of Wolbachia bacteria in Aedes aegypti mosquito populations. Its effectiveness as a biological control tool for vector-borne diseases, such as dengue, is assessed.The model integrates spatial and temporal factors, accounting for habitat heterogeneity and mosquito mobility. It also incorporates imperfect vertical transmission of Wolbachia, a crucial factor in understanding infection dynamics in natural populations.Simulations are conducted to address key questions such as: What is the optimal number of infected mosquitoes to release? What characteristics should a Wolbachia strain have to maximize effectiveness? What are the long-term effects of mosquito releases?By gaining a deeper understanding of the interaction between Wolbachia and mosquitoes, more efficient and sustainable control strategies can be developed.

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