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**Constraints on the use of lifespan-shortening *Wolbachia* to control dengue fever.** (English)

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Summary: Dengue fever, a viral disease spread by the mosquito *Aedes aegypti*, affects 50-100 million people a year in many tropical countries. Because the virus must incubate within mosquito hosts for two weeks before being able to transmit the infection, shortening the lifespan of mosquitoes may curtail dengue transmission. We developed a continuous time reaction-diffusion model of the spatial spread of *Wolbachia* through a population of *A. aegypti*. This model incorporates the lifespan-shortening effects of *Wolbachia* on infected *A. aegypti* and the fitness advantage to infected females due to cytoplasmic incompatibility (CI). We found that local establishment of the *Wolbachia* infection can occur if the fitness advantage due to CI exceeds the fitness reduction due to lifespan-shortening effects, in accordance with earlier results concerning fecundity reduction. However, spatial spread is possible only if the fitness advantage due to CI is twice as great as the fitness reduction due to lifespan shortening effects. Moreover, lifespan-shortening and fecundity-reduction can have different effects on the speed of wave-retreat. Using data from the literature, we estimated all demographic parameters for infected and uninfected mosquitoes and computed the velocities of spread of infection. Our most optimistic estimates suggest that the spatial spread of lifespan-shortening *Wolbachia* may be so slow that efficient spatial spread would require a prohibitively large number of point releases. However, as these estimates of demographic parameters may not accurately reflect natural conditions, further research is necessary to corroborate these predictions.

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*Wolbachia*; *Aedes aegypti*; dengue fever; reaction-diffusion

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