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Sexual Transmission as a potential driver of Zika emergence in the United States

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Abstract

Zika is a mosquito-borne viral disease that emerged in the Western Hemisphere in 2015 and rapidly spread throughout the Americas. Zika virus is currently the only known virus that can be transmitted by mosquitoes as well as through sexual contact. Since 2015, the United States has reported over 5000 imported cases, over 200 locally acquired cases related to mosquito-borne transmission, and over 40 cases of sexually transmitted Zika (STZ). Because Zika infection is often asymptomatic, our understanding of the rate of both mosquito-borne and sexually transmitted Zika remains poor. In this study, we develop an ordinary differential equations vector-host epidemiological model that includes sexual transmission among the adult human population. We consider temperature-dependent vector and viral dynamics to account for seasonal fluctuations, and parameterize the temperature model for different United States cities with suitable habitat for the primary vector of Zika, *Aedes aegypti*. Utilizing this model, we show how different transmission rates and infectious periods of STZ impact the potential of introductions of Zika to lead to outbreaks and how this potential varies with the time at which initial cases are imported. We discuss the conditions under which STZ drives the basic reproductive number, R_0 , over the epidemic threshold and the potential for STZ to establish a sustained transmission cycle in the U.S.