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The Search for a Dengue Reservoir in the *Aedes* Mosquito Population

Dengue is among the most prevalent vector-borne viral diseases worldwide. Approximately 3.5 billion people live in endemic areas, with 100 million cases reported annually. Moreover, the geographical area included in these endemic areas is growing rapidly, due to the spread of the mosquito vectors *Aedes aegypti* and *Aedes albopictus*. Dengue epidemics appear periodically, occurring approximately every 2 to 5 years, depending on location and climate. In this work, we are particularly interested in the question of how the virus is sustained between epidemic outbreaks. Recent studies indicate that vertical transmission from adult female to her eggs, is not sufficient to sustain the virus in a given locale, considering the timescale between epidemics. One theory suggests a reservoir in another host mammal other than humans. However, there are no known non-human primates in which viremia has been found. We investigate an alternative theory, in which the virus potentially is sustained within the mosquito population alone, by means of vertical transmission combined with horizontal transmission via necrophagy (the consumption of dead infected larvae by susceptible larvae).

The potential for horizontal transmission and parameters associated therewith are currently under investigation by S. Remold's research group at the University of Louisville. In collaboration with this research group, we introduce a simple mathematical model, based on the SI model, for the larval stage of mosquito development that includes terms for necrophagy. Given appropriate values for the parameters in this system, we show that there is a non-zero steady state of infected larvae, which could provide a reservoir for the disease during the time between epidemic outbreaks of dengue.