Numerical Analysis of a Multi-Vector Disease Model

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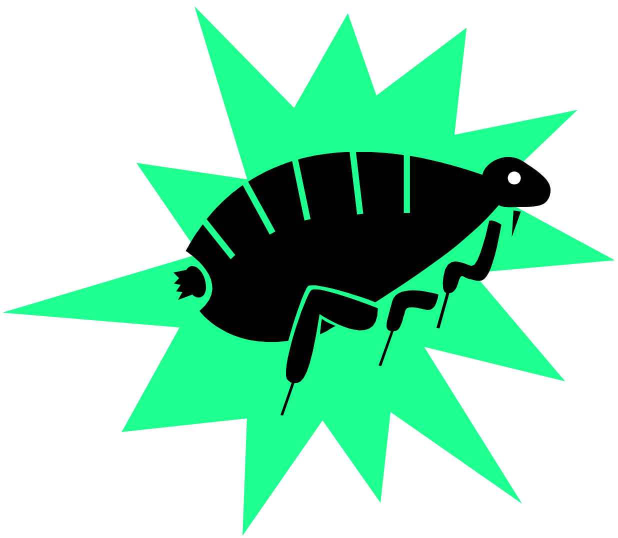
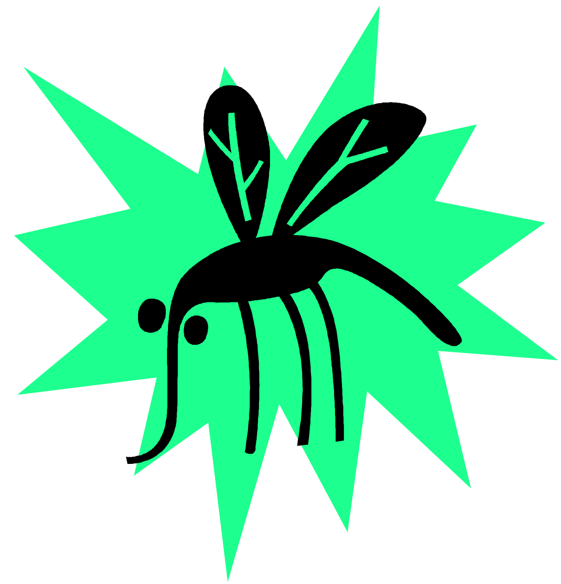
Density-Dependent Vector



Success of disease transmission depends on a high host density

vs.

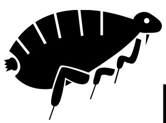
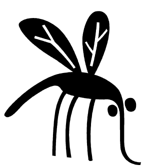
Frequency-Dependent Vector



Success of disease transmission depends on large percentage of infectious individuals

SIR Modeling

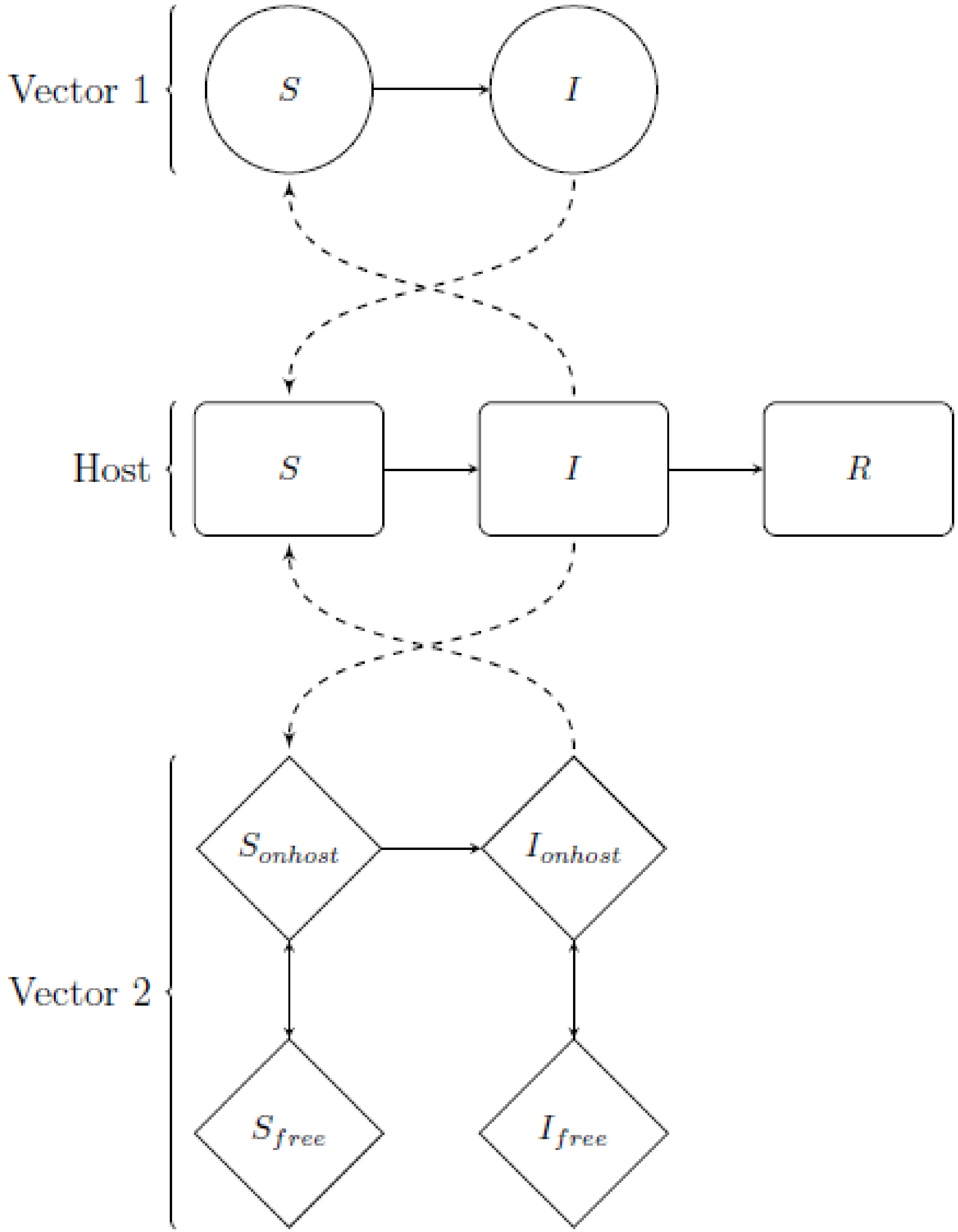
Susceptible | Infected | Recovered

 Density Dependent	$\frac{dS}{dt} = -\beta S I$	$\frac{dI}{dt} = \beta S I - \gamma I$	$\frac{dR}{dt} = \gamma I$
 Frequency Dependent	$\frac{dS}{dt} = -\frac{\beta I}{N} S$	$\frac{dI}{dt} = \frac{\beta I}{N} S - \gamma I$	

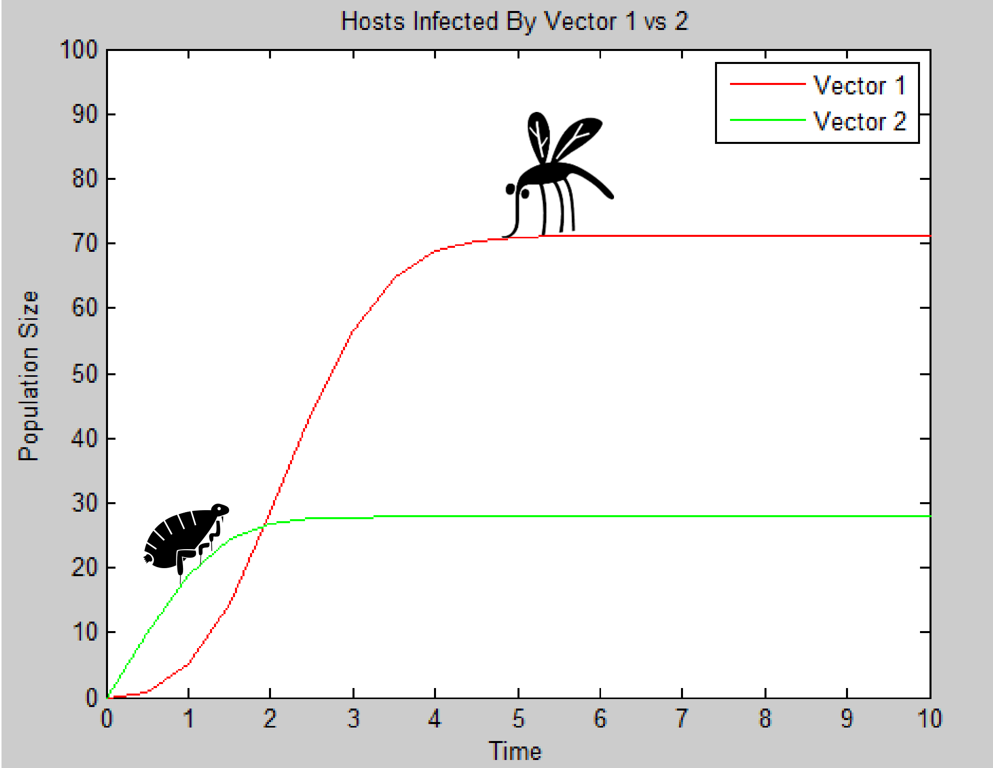
$$\text{Total Host Population} = \text{N} = \text{S(t)} + \text{I(t)} + \text{R(t)}$$

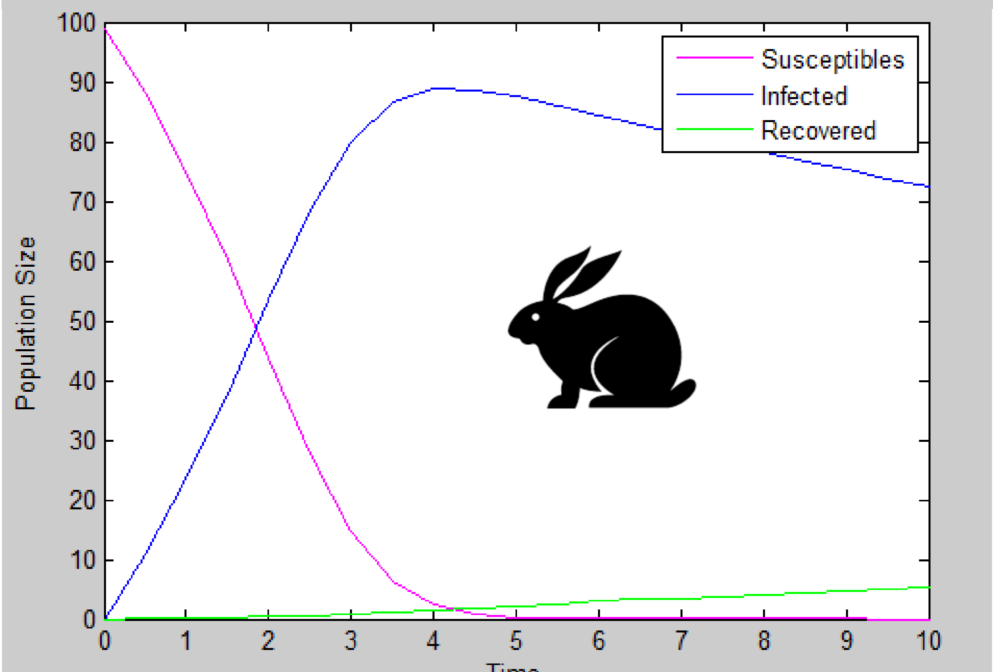
Assumes closed populations, no births or deaths of vectors or hosts

Multi-Vector Model



Impact of Vectors on Host Population





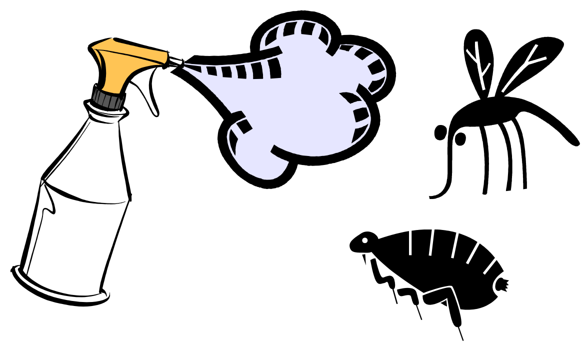
In the current model…

- Random transmission probabilities and initial population values
- Total population of each vector is constant (moving only from susceptible to infectious)

Next Steps

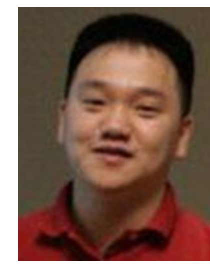
1. Continue to test the code, changing the initial values and biological parameters

2. Add in the birth and death rates for the host and vectors



3. Draw conclusions about the different vector strategies and determine which type of vector is the most efficient

The Fefferman Lab



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