ABSTRACTS SUBMISSION

119_Brook Jensen - Arizona State University - États-Unis
bmjense4@asu.edu

Using models as a predictor of insecticide resistance evolution and vector borne disease transmission likelihood of various insecticide resistance management strategies

Brook Jensen(1), Alden Estep(2), Abba Gumel(3), Sarah Rhydberg(1), Brenna Kayce(1,4) and Silvie Huijben(1,4)

(1) Center for Evolution and Medicine, Arizona State University; (2) United States Department of Agriculture; (3) School of Mathematical and Statistical Sciences, Arizona State University; (4) Barrett, The Honors College at Arizona State University

One of the main vector-borne disease prevention strategies is the use of insecticides to reduce vector populations. The deadliest vector worldwide is the mosquito, causing over 400,000 deaths each year. Perpetual use of the same insecticides by public health and agriculture has resulted in the emergence of insecticide resistant mosquitoes, rendering many insecticides no longer effective which results in poor mosquito population control and continued disease transmission. Much research has been done on the mechanisms of resistance, however there is a lack of research in the evolutionary trajectory of diploid organisms once resistance has emerged. Mathematical approaches have been developed to predict optimal resistance management strategies under field conditions, however, these suffer from lack of empirical data to estimate genotype-specific parameters for selection and fitness. Therefore, to improve insecticide resistance evolution predictions and concurrently improve vector borne disease transmission reduction predictions, I propose to establish a new mathematical simulation that will include biologically measured fitness and selection parameters of different insecticide susceptible and resistant mosquito genotypes, using Aedes aegypti as the model organism. Fitness and selection parameters will be measured for both field and laboratory Ae. aegypti. Pyrethroid insecticides will be the main type of insecticides used as this is one of the main classes of insecticides used globally, especially for mosquitoes. Within the mathematical simulation, the insecticide resistance management strategies that will be modeled include monotherapy (one insecticide), rotation (a different insecticide every few generations), combination (multiple insecticides at the same time), mosaic (treating different parts of a population with different insecticides), low dose (one insecticide at low concentration), and evolutionary refugee (leaving a sub population untreated).

1. What is your pathogen? Multiple options possible (e.g. if working on coinfections)

Other viruses: Yellow fever, Dengue, Chikungunya, and Zika

2. On a scale of 1-5 is your work mostly eco/epidemiological or evolutionary? 4

3. On a scale of 1-5 is your work mostly theoretical or experimental/empirical? 3