

**Team Number:** LAMS-2

**Project Name:**

*Adios Aedes aegypti!*

Modeling The Use Of G.M.O Mosquitos In The Wild.

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**Interim Report:**

Since the kickoff conference, our team has made great progress! We have made several changes to our project including changing from Starlogo, to Netlogo. We also decided to break the problem into parts by assigning tasks to every team member. We are going to rotate through the three major roles of “Writer”, “Programmer”, and “Researcher”. Currently, we are individually working on programs, but soon, we will compare programs and will either combine all three programs or use the best one.

Zika is a virus transmitted by the *Aedes aegypti* mosquitoes. It is known to harm fetuses by giving them brain and birth defects. It is also known to give an adult Guillain-Barre syndrome (paralysis). The traditional ways of killing off the mosquitoes are toxic, and inefficient. According to “Pick Your Poison,” “If we don’t do something about this very quickly, we have a public health catastrophe on our hands.” Scientists have created Genetically Modified Organisms (GMO) mosquitoes to decrease the mosquito population. Our team will measure how GMO mosquitoes will affect the population.

First, using NetLogo we will make four populations of mosquitoes: *wild* male and female mosquitoes, GMO males, and the offspring of GMO. The company Oxitec, has recently designed a GMO male mosquito called OX513A. They are “a strain of transgenic *Aedes aegypti* mosquitoes, designed to reduce the population of mosquitoes by passing a lethal gene to their offspring.”[2] We will make slider bars to control the population of each type of mosquito. After making a model of a stable *wild* male and female mosquitoes population, we’ll introduce the GMO males. Using a slider bar, we will determine the number of GMO males required to decrease the overall population. We will define the life expectancy using ticks as days, for the *wild* mosquitoes, the GMO male mosquitos, and for the offspring of GMO mosquitoes. According to Dengue Vaccine Research and Development website [3] *wild* female *Aedes aegypti* mosquitoes live three weeks and *wild* males live up to one week [1]. Oxitec GMO OX513A mosquitoes tend to live less than one week [1]. The GMO offspring mosquitoes die before they reach maturity which according to dengue website [3], is just under two weeks and therefore can never breed, causing a drop in the overall population. We have chosen only to model the spread in mosquitos, as opposed to other vectors, in order to simplify the issue.

So far we have experimental versions of the Netlogo programs where we have been implementing different parts of the simulation and plan to combine them in the coming weeks into the full simulation program. On one code we have implemented the reproduction of mosquitoes with male and females. We are still missing the third type, that is, the GMO males that stop the population growth. In another program, we have experimented on making the mosquitos fly about and on how to infect people. We are still experimenting with how often the infections happen. We also need to program the lifespan of

mosquitoes and the infection of healthy mosquitoes from sick people. Then we will have a property in each type to show “infected”, or “not infected.” We will change the color based on infection status (red for infected, blue for not infected, and white for GMO). Based on the advice got from our reviewer, we will add a slider for the amount GMO mosquitos to find their effect on the total population of mosquitos, and the spread of the Zika virus, with and without GMO. We expect, by the end of the year to be able to code, model the GMO mosquitoes, and we plan on learning what the GMO mosquitoes will do to the overall population.

### **References:**

- [1] “Oxitec FAQ's.” *Oxitec*, Oxitec, 2016, <http://www.oxitec.com/programmes/united-states/>
  
- [2] Servick, Kelly. “Winged Warriors” *Science* Oct. 2016: 164-167. Print.
  
- [3] “Dengue Vaccine Research and Development.” *Dengue Vaccine Research and Development*, Dengue Viris Net.com , 2016, [www.denguevirusnet.com/vaccine-research.html](http://www.denguevirusnet.com/vaccine-research.html).
  
- [4] Kupferschmidt, K. "Pick Your Poison." *Science* 354.6309 (2016): 171-73. Web.
  
- [5] Contributor, Kelly Johnson Reader. "Get Serious about Zika Fight." *USA Today*. Gannett Satellite Information Network, 23 Nov. 2016. Web. 10 Dec. 2016.