Postdoctoral Scholar:
Mathematical Modeling for Gene-Drive Trials

Overview

Gene drive technologies offer the promise of managing targeted populations for the benefit of public health, agriculture, and the environment. A gene drive system, when introduced into a wild-type population, will rapidly increase toward fixation by altering normal Mendelian inheritance in favor of the transgene. We are proposing a field test aimed at using gene drive to eliminate human malaria in Africa. The system being developed by our team uses an autonomous Cas9-based gene drive coupled with two anti-malaria parasite genes aimed at eliminating malaria transmission by rendering the mosquito vector refractory to the parasite. This is referred to as a population modification or population replacement strategy which eliminates the parasite but not the mosquito.

The Vector Genetics Laboratory (VGL) at the University of California, Davis is a member of the University of California Malaria Initiative (UCMI). The VGL is tasked with moving gene drive technology from the laboratory to the field by conducting trials involving the release of our transgenic mosquito to evaluate its efficacy and safety. We have assembled a team of mosquito ecologists, parasitologists and population geneticists currently at work describing mosquito and parasite biology at our field sites in the islands of São Tomé and Príncipe (located in the Gulf of Guinea, roughly 300km off the coast of central Africa) and the Comoros Islands (roughly midway between Madagascar and Mozambique in the Indian Ocean). Our team includes resident staff located on-site and a large team of public health educators and administrators focused on community and regulatory engagement.

Gene drives in mosquito vectors of malaria are currently at the forefront in the development of this technology, which has never been deployed in a field situation. Mathematical models aimed at describing how a gene drive mosquito may behave when introduced into a natural mosquito population at a field site are needed to evaluate feasibility, plan trial design and inform regulatory authorities regarding efficacy and safety.

Qualifications

We seek applications from candidates with experience in any of the following research areas: mathematics, statistics, population genetics modeling, ecological modeling, computer science, or closely related fields.

Minimum Job Requirements:

- An ability to work and communicate effectively in a diverse team environment
- Experience with mathematical/statistical modeling- Proficiency in a programming language
- A PhD earned no more than five years ago in a related field

Desired Qualifications:

- experience with Python and R
- publications in refereed journals and a history of successful research in collaborative team environments
- experience developing multi-scale models and/or in uncertainty quantification and data fitting
- exposure to population genetics or epidemiology modeling- familiarity working with big datasets

Duties/Responsibilities

Perform independent research focusing on modeling the spread and persistence of transgenic mosquitoes with gene drive in natural populations. This position will perform mathematical analysis of dynamical systems models and will collaborate with the PI to identify and contribute to the formalization of models for the spread and persistence of gene drive system introduce into natural populations. Position will be responsible for interpretation of mathematical results and will write computer code in the R language for numerical analysis, model fitting, model evaluation/validation, and data visualization.

Position will be responsible for the dissemination of research results to both internal and external audiences, including drafting manuscripts for submission to peer-reviewed journals; giving talks at local, national, or international conferences; drafting internal reports for project collaborators; and providing content for outward-facing websites for the lab (VGL), and the consortium (UCMI). Position will serve in a supporting role to presentations by other investigators as directed by the supervisor.

How to apply

Applicants should submit the following materials:

- A cover letter
- A curriculum vitae
- Contact information for 3 referees

Send the above combined into a single PDF to Gregory Lanzaro (gclanzaro@ucdavis.edu)

Review of applications will start immediately. This position will be open until filled. The anticipated start date for this position is early/mid 2023. The appointment is for a duration of two years with a possibility of extension based on funding.