

Natural Selection Engineering Internship

Fighting Drug Resistant Malaria



Driving Question: As a biomedical engineering intern, how can we design a treatment that does not cause an increase in the malaria parasite population while considering multiple criteria?

Content: Design a treatment that does not cause an increase in the malaria parasite population while considering three criteria: minimizing drug resistance in the malaria parasite population; minimizing patient side effects; and keeping costs low. Students use the MalariaMed Design Tool to collect and analyze data, complete iterative tests, and learn about optimizing designs. By the end of this unit, students can describe engineering practices and compose a written proposal that supports their optimal design for making a safe and effective malaria treatment, one that also manages trade-offs between the project criteria

Standards: NGSS: **LS3.B: Variation of Traits:** In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1) **LS4.B: Natural Selection:** Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4) **LS4.C: Adaptation:** Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6) **ETS1.A: Defining and Delimiting Engineering Problems:** The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1) **ETS1.B: Developing Possible Solutions:** Models of all kinds are important for testing solutions. (MS-ETS1-4)

Major Products: Students will design an optimal treatment, create a written proposal, and create a proposal presentation.

Public Presentation: Projects will be presented in class and open to the public for viewing. Presentations will be filmed as well. Students will present to peers, staff, family members, and other community stakeholders.

