

Stability analysis of a coupled mathematical model introducing a biological control of Dengue

Roxana Lopez-Cruz

National University of San Marcos, Peru

This work aims to study the dynamical behavior of a dengue epidemics model by introducing biological control. The first model represents the SEIR-SEI model of dengue epidemics and the second model corresponds to coupling a model of biological control. Controlling mosquitoes is considered by an infestation of bacteria that inhibit the transmission of dengue in humans. We determine an analytic expression of replacement ratios that depends on biological control. The results obtained show that the global stability of the disease-free equilibrium is determined by the value of a certain threshold parameter called the basic reproductive number R_0 and of the replacement ratios of the biological model RU , RW . The sensitivity analysis shows that the vector to human transmission rate promotes more changes to the biological control system than the other parameters. The simulation analysis of the last model shows the efficiency of the biologic control of dengue transmission.

In Special Session 54 on Emergence, Spread, and Control of Mosquito-borne Diseases: Insights from Mathematical Modeling at the Mathematical Congress of the Americas 2025.