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THE DEPARTMENT OF MATHEMATICAL SCIENCES PROUDLY PRESENTS

COLLOQUIUM

FALL 2013

Dynamics and insecticide control of mosquitoes for Dengue fever under a predator-prey system

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ABSTRACT

Dengue is a viral disease, mainly transmitted by mosquitoes *Aedes aegypti*. In recent years, its propagation in urban and semi-urban areas has become a major problem of public health. Nowadays, more than a half of the world's population is at risk of contracting the disease.

During last decades, many scholars have been studying mathematical models that describe dengue propagation among human populations, as well as models describing mosquito life cycles. Generally speaking, the mosquito's life cycle consists of two stages: aquatic, that includes immature states such as eggs, larvae and pupae, and aerial that refers to adult mosquitoes. It is known that dengue pathogen is transmitted to humans only by adult mosquitoes; however, insecticide control can be effectively applied to both stages of mosquitoes' evolution (adulticide and larvicide sprays) in order to reduce the mosquito population. On the other hand, biologic control can also be implemented by importing natural predators (such as small fishes and aquatic insects).

In this talk, we propose a population model that includes two stages of mosquito's evolution (immature states and adults) along with its natural predator. We perform a stability analysis for the model and of sensitivity in its parameters. Threshold conditions for the growth of the mosquito population with and without predation were calculated using parameter estimation for different temperatures in Cali, Colombia. Also, by introducing two exogenous control variables (for insecticide and predation, respectively) we formulated and solve numerically an optimal control problem seeking to minimize the control effort together with a number of adult mosquitoes.

Monzón Building, Room 201, 10:30 AM
Refreshments will be served
15 minutes before the colloquium, M-213