



Seminario HUBERT MENNICKENT de Matemática Aplicada

“Creando y difundiendo Matemática y sus Aplicaciones”

Expositor:

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Título de la Charla:

Non-local convection-diffusion-reaction models for hantavirus infection in rodents

Fecha y Hora:

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Lugar:

Auditorio San Agustín, Facultad de Ingeniería
Universidad Católica de la Santísima Concepción (UCSC)

Resumen:

Hantavirus Pulmonary Syndrome is a severe respiratory disease in humans caused by infection with a hantavirus carried by wild rodents. Humans are usually exposed to the virus through geographically isolated outbreaks. Simulations of the disease dynamics within the rodent population is essential to improve the knowledge of the spread of the disease in humans. On the basis that spatial variations in the density of rodents has to be taken into account, that aggressivity of males increases the contact rates and that males are attracted towards females and repulsed from other males, we propose some gender-structured SEIR models for which the males at each disease stage are modeled by a convection-reaction equation with non-local convection that directs them as mentioned above and the females at each disease stage are modeled by a diffusion-reaction equation representing their random motion. To capture the sharp gradients that may appear in the numerical solutions we use high order shock-capturing methods for the convective part, whilst the advancing in time is performed by treating the diffusive parts implicitly and the convective part explicitly through Runge-Kutta Implicit-Explicit schemes. In this talk we will review the basic concepts of epidemiological models to smoothly introduce the ODE system in [Allen, McCormack, Jonsson, 2006]. The spatio-temporal models will be subsequently introduced along some details of the numerics. Finally, some results showing spatial pattern formation that might be related to isolated outbreaks will be shown.



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