講題: Dynamics of Oncolytic Viral Therapy under Type I Interferon Regulation

講師:張瑞珍教授

時間:2026 年 5 月 13 日(星期三) 13:10~14:00

地點: 計 306 室

摘要: Oncolytic viral therapy (OVT) is a promising cancer treatment that relies

on viruses to selectively infect and destroy tumor cells. However, its success is strongly influenced

by interactions among the tumor, the immune system, and antiviral responses such

as type I interferon (IFN-I). In this talk, we present a delay differential equation model that

incorporates tumor-virus-immune dynamics, IFN-I regulation, and a discrete time delay representing

the viral infection cycle. We show that treatment outcomes depend critically on the

interplay between viral infectivity, IFN-mediated viral suppression, and immune response.

Our analysis reveals rich dynamical behavior, including bistability and Hopf bifurcations,

indicating that small changes in parameters can lead to drastically different therapeutic outcomes.

In particular, IFN-I exhibits a dual role: it can either suppress viral replication and

promote tumor escape or support viral persistence and improve treatment efficacy, depending

on the biological context. Sensitivity analysis further identifies key parameters driving tumor

control, including IFN production, immune activity, and viral infectivity. These results

suggest that personalized therapeutic strategies accounting for IFN signaling and immune

strength may significantly improve OVT outcomes.

講題: Cooperation, Refuge, and Complexity: Dynamics of a Discrete Predator-Prey

System

講師:張瑞珍教授

時間:2026 年 5 月 13 日(星期三) 14:10~15:00

地點: 計 306 室

摘要: Oncolytic viral therapy (OVT) is a promising cancer treatment that relies

Predator-prey interactions are strongly influenced by behavioral mechanisms

such as cooperative hunting and prey refuge. In this talk, we develop and analyze a discretetime

predator-prey model with Ricker-type prey growth, incorporating both prey refuge and

predator cooperation.

We show that the long-term dynamics depend sensitively on the interplay between prey

growth and cooperative effects. When prey growth is moderate and the predator reproduction

number exceeds a threshold, predator and prey coexist globally. Under other conditions,

the system admits predator extinction or stable oscillatory dynamics. Our analysis further

reveals that cooperation can have contrasting effects: it may stabilize coexistence for moderate

prey growth, but can also induce complex dynamics, including oscillations and chaos,

when prey growth is low or high. In particular, cooperation can act as a “rescue” mechanism

that enables predator persistence even in challenging environments. These results highlight

how the combined effects of cooperation and refuge can both stabilize and destabilize ecological

systems, providing insight into the emergence of complex population dynamics in

discrete-time models.

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