Mathematical Models and Control Strategies of Infectious Diseases
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Lecture 1 - Epidemiological Thresholds and Control Strategies I: Field Studies

Population patterns of infection are determined largely by susceptibility to infection. Infection and vaccination induce an immune response that, typically, reduces susceptibility to subsequent infections. Susceptibility groups induce epidemiological thresholds that can guide the design of interventions. Mathematical models are constructed to illustrate these concepts.

Lecture 2 - Epidemiological Thresholds and Control Strategies II: Laboratory Studies

Interventions conceived to reduce susceptibilities of individuals from natural exposures must be assessed on a range of exposure intensities because natural exposures are typically of varying intensities. Mathematical models are proposed to guide the design and analysis of laboratory studies where controlled conditions allow for more accurate efficacy measures.

Lecture 3 - Disease Ecology and Evolutionary Perspectives I: Influenza

We explore the consequences of a heterogeneous immune response in individual hosts on the evolution of a rapidly mutating virus. We show that several features of the incidence and phylogenetic patterns typical of influenza A may be understood in this framework.

Lecture 4 - Disease Ecology and Evolutionary Perspectives II: Malaria

The evolutionary mechanisms structuring the expression pattern of variant surface antigen (VSA) families that allow pathogens to evade immune responses and establish chronic and repeated infections pose major challenges to theoretical research. We develop models to investigate selective processes on malaria parasites.