

Characterising Disease-free Attractors with Dynamical Systems

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Abstract: Dynamical systems allow to characterise the population dynamics of pathogens such as RNA viruses or the evolutionary dynamics of cancer. These nonlinear systems, which have a huge impact on health and epidemics, are currently investigated from different perspectives including experimental, clinical, and theoretical research. In this talk I will introduce mathematical and computational models showing the presence of bifurcations involving disease-free attractors. That is, dynamical asymptotic states implying viruses extinction or tumour cells clearance. First, I will focus on the evolutionary dynamics of RNA viruses under different replication modes. Second, within the field of cancer evolution, I will introduce the so-called trans-heteroclinic bifurcation. This global bifurcation, which involves an exchange of stability between two equilibrium points with a heteroclinic connection, governs a discontinuous transition towards tumour cells' extinction.