Hamilton Institute

Stochastic Modelling of the Immune Response.

Ken Duffy and/or Vijay Subramanian,
Hamilton Institute, NUIM.

Thursday, September 27th, 2007

Abstract:
During an adaptive immune response, lymphocytes proliferate for five to twenty cell divisions, then stop and die over a period of weeks. The recently proposed Cyton Model of lymphocyte proliferation provides a framework for studying this response. Experimental evidence indicates that the fate of individual cells is potentially highly variable. Thus the model assumes stochastic values for division and survival times for each cell in a responding population.

In the paper that proposed the Cyton Model, the mathematical analysis used a direct approach that enabled prediction of the mean immune response. Given the stochastic nature of the model a more refined analysis is needed to determine the likelihood that the typical response is close to the mean response. In this talk we present a more sophisticated stochastic analysis of the system by introducing a generalisation to the Bellman-Harris branching process. This enables us, for example, to determine the expected variability in the immune response, which arises due to its cell-level stochasticity.

We compare the predictions to experimentally observed lymphocyte population sizes from experiments. The important biological conclusion that immune response is typically robust and predictable despite the potential for great variability in the experience of each individual cell.

We will assume as little probabilistic knowledge of the audience as possible.

Venue: Seminar Room, Hamilton Institute, Rye Hall, NUI Maynooth

Time: 2.00 - 3.00pm (followed by tea/coffee)

Travel directions are available at www.hamilton.ie

SYSTEMS BIOLOGY
Hamilton Institute