Virulence evolution in Myxomatosis: How adaptive change affects our understanding of epidemics

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Although adaptive change (biological evolution) is mostly considered a process acting on a geological timescale, in fact it can occur dauntingly fast. Whereas evolution in hominids and other large animals indeed happens on long timescales, the situation is much different for organisms with short generation times and large numbers of offspring. For example, evolution towards pesticide resistance in insects or towards penicillin resistance in bacteria occur during one human generation only. In his project Gerard is investigating the well-documented Myxomatosis epidemics in Australia as a case study for the co-evolution of pathogen virulence and host resistance. The Myxoma virus was introduced into Australia in 1951 in order to check the explosive population growth of the European rabbit (also introduced previously). This attempt of biological control was largely considered successful since 90 percent of the rabbit population died as a result. Over the last 40 years, however, both rabbits and Myxoma viruses have evolved: viruses have become more benign and rabbits have become increasingly resistant to the disease. In a model-based analysis we will try to simulate the co-evolutionary dynamics of virus and rabbit populations, using field data for calibration. Our aim is to understand past evolutionary change and predict future effects of co-evolution. In his project he will explain our population dynamical and evolutionary models and discuss the biological assumptions underlying the investigation.