Abstract

RABIES - A SUITABLE CASE FOR TREATMENT

ABSTRACT

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Rabies is a viral disease becoming increasingly prevalent in Continental Europe. Although the probability of human beings contacting the disease is very small there is a high economic cost due to the disease. This cost is incurred due to the implementation of disease prevention methods, the treatment of specific disease outbreaks, and compensation for infected farm animals which must be destroyed.

The major disease vector in Europe is the red fox, and current methods of prophylaxis are aimed at reducing the fox population to such a level that the disease cannot propagate. Other control policies such as the immunisation of the fox population have been proposed but comparative field studies of the relative costs and benefits are difficult to undertake.

When endemic in a population the disease appears to follow a cyclic pattern with a major epizootic occuring approximately every four years. The precise mechanism is unclear but appears to be related to the density of the host vector population.

The characteristics of the disease system are eminently suited to the application of system dynamics. The work described in the paper attempts to analyse this system qualitatively using a rigorous method of system description to identify system resources and states. The host vector system was analysed in detail together with the disease subsystem with which it is intimately linked.

From a qualitative analysis it is apparent that an important variable is the number of itinerant foxes in the fox population (juvenile foxes not having aquired a fixed territory). This has an influence on the disease infection rate which can override the normal transmission mechanism which is more related to resident population density.

The analysis also graphically illuminates the major

difference between the two primary control policies, both of which are aimed at influencing the transmittal rate of the disease. It is apparent that until population densities are very low the spatial spread of the disease (rate of advance of the epizootic front) is not decreased but may increase, with increasing population density. Thus a hunting policy may be counter productive although apparently costing less than an immunisation policy.

It is envisaged that although the rabies system is a special case whereby there is no recovery from the disease, the principles generated by the analysis may be applicable to epidemiology in general. Such applications providing a definition of a disease system such that effective control policies may be elucidated.

The work presented here is complete in itself forming a qualitative analysis of the system. It also provides the basis for a quanitative analysis using a derived computer simulation model.