**Spatial epidemiology of foulbrood diseases in honey bees**

Mark Shirley[1] and Giles Budge[2]

[1]Biological, Clinical, Environmental Systems Modelling Group, Newcastle University, Newcastle upon Tyne, NE1 7RU, United Kingdom

[2]Food and Environment Research Agency, Sand Hutton, York, YO41 1LZ, United Kingdom

**Key words**: K-functions, Cuzick-Edwards, apiary network, process-based modelling

**Abstract**: Foulbrood diseases remain a threat to the European honey bee (*Apismellifera*) due to a poor understanding of disease epidemiology. We present an analysis of the spatial ecology of European foulbrood disease, demonstrating that it is significantly clustered in space independent of the inhomogeneous arrangement of bee colonies in the UK apicultural network. We describe an individual-based model of foulbrood disease based on the spatial analysis of the apiary network, which accounts for local movement (via drifting and robbing) as well as global movement (via beekeeper behaviour). According to our model, factors influencing beekeeper behaviour can account for a large proportion of new infections of European Foulbrood disease, both in discovery of infection and in moving of disease to disparate parts of the apiary network. Consequently, improving links between beekeepers and regulatory agencies can potentially decrease disease incidence in the UK.