Descriptive Spatial Analysis of Bovine Tuberculosis (BTB) in Great Britain in 2004: Evaluating Two Visio-Exploratory Methods for Surveillance Reporting

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The rising bovine tuberculosis (BTB) incidence in Great Britain (GB) places a significant burden on the agricultural industry and government. The government has acknowledged the need to improve understanding of BTB epidemiology, of which a key element is enhancing surveillance (Defra, 2005). In general, disease surveillance programmes have been relatively slow to integrate spatial analytic methods with aggregate measures (Pfeiffer, 2005). One recent development includes DEFRA's Rapid Analysis and Detection of Animal-related Risks (RADAR) (DEFRA, accessed on July 7, 2005). However, there is scope for integrating spatial visio-exploratory methods to enhance endemic disease surveillance reporting, such as BTB, to improve the understanding of the epidemiology in cattle in GB.

Two visio-exploratory techniques are here used to describe the spatial distribution of BTB in GB cattle in 2004. The usefulness of these methods as part of routine surveillance reporting is evaluated.

Kernel density maps are used to describe the spatial distribution of BTB in GB in 2004. The spatial scan statistic (SaTScan^{TM}) is used to investigate spatial clustering. Spatial clusters of BTB were identified amongst i) all breakdowns; ii) all spoligotyped (confirmed) breakdowns; and iii) breakdowns yielding individual spoligotypes 9, 10, 11, 17, 22 and 25, respectively.

Visual assessment of clustering in high BTB-density areas was confirmed by the scan statistic. The diversity of spoligotype clusters observed in areas of traditionally high BTB density illustrates the potentially complex epidemiology and challenge this presents for BTB control. Identification of spoligotype clusters allows inferences to be made about the underlying epidemiology.

This preliminary investigation suggests that spatial visio-exploratory methods based on molecular typing data can provide a useful tool for investigating BTB epidemiology and enhancing surveillance reporting. A future avenue of work would be to evaluate the development of space-time clusters in a prospective manner, which could be used to inform decision-making and control of BTB.

References
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