# Analysing the risk of a bovine brucellosis epidemic in Great Britain using the cattle tracing scheme: have we just been lucky so far?

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**Introduction** Bovine Brucellosis is a widespread, economically devastating and highly infectious zoonosis caused by *Brucella abortus*. In cattle it causes premature abortion around five to seven months into the normal nine month gestation and the disease can be transferred to humans through milk. Great Britain (GB) has been "Officially Brucellosis Free" (OBF) since 1991 and it is in the country's best interest to maintain this status. There have been three reintroductions of the disease since 2003, the most recent in a beef herd in Cornwall 2004 (DEFRA, 2004). Such outbreaks threaten the UK's OBF status. By identifying epidemiological risk factors and using data from the Cattle Tracing Scheme for GB (CTS) we examined the spatial and temporal patterns of births for both the whole of GB and the South West region in particular and used this information to identify risk periods due to cattle births. Then cattle movements originating from, or ending in Cornwall (the location of the last outbreak) were identified from the CTS database. A subset of 57 000 high-risk, potentially infectious, moves were identified and examined to establish the potential spatial spread of the disease from these movements.

**Materials and methods** Cattle Tracing System data was sourced through DEFRA's RADAR unit (Rapid Analysis and Detection of Animal Related Risks). The CTS defines movements as including: births, deaths and movements -on and movements -off specified locations, with dates and individual identification. Analysis was performed in the Microsoft Access 2003 database. Each field was given an individual name and source table identified by its initials to allow traceability as the merged files became more complex. Time of parturition has been identified as a key risk factor for the spread of Brucellosis. Therefore, data were extracted to characterise the temporal and spatial birth patterns for Great Britain as a whole, for a subset relating to the area of interest: the south west of England, (the counties of Cornwall, Devon, Dorset, Avon, Somerset and the Isles of Scilly: -Figure 1). This was further divided into DEFRA-designated breed codes and breed purpose codes to ascertain any differences. DEFRA-designated beef breeds were then focussed on to investigate potential spatial spread of disease by identifying potentially high-risk movements from all those movements that originated from, or ended in Cornwall. By using georeference data it was possible to create a visual representation of these individual movements illustrating spatial distributions of the potentially infectious movements at different probability values (Fig 2).

**Results** Risk factors identified: 1) Risk of within-herd spread constantly present due to temporal distribution of births peaking between October and May for beef breeds. 2) Highest potential risk movements for spatial spread are female beef cattle that move from farm to farm with 54,000 moves of this type occurring in Cornwall in 2004, giving opportunity for herd –to –herd –transmission. 3) Large farms have a higher potential risk, although this looked at individual moves rather than batches. The mean number of days per annum that any farm had multiple off movements to the same location was four. 5) Risk from imported animals was negligible over this period.

**Figure 1** Births per month in the SW by region

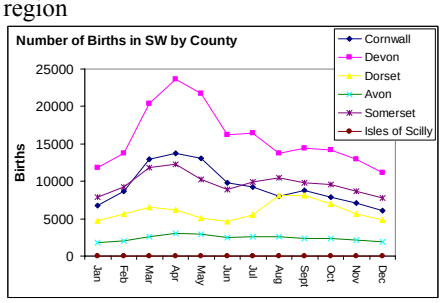
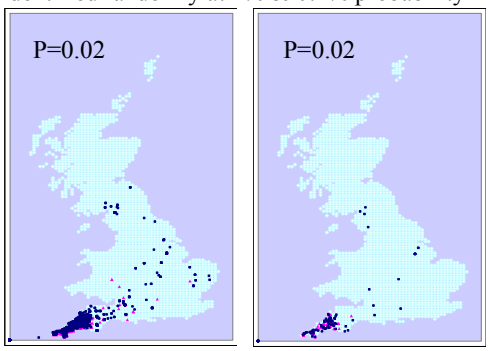



**Figure 2** Potentially infective moves identified randomly at 2% & 0.2% probability




**Conclusions** This study shows that there is a continuing risk to the UK from bovine Brucellosis and there is significant variation in the potential for within-herd transmission. Long-distance cattle are movements out of Cornwall lead to many parts of GB with a real risk of widespread transmission. However, the risk of an initial outbreak in Cornwall is no higher than elsewhere in the country, but as a net exporter of cattle, should an outbreak occur the risk of onward transmission is probably higher than average. This work illustrates the potential for the CTS cattle movement data to be used to investigate the risk from bovine Brucellosis and other bovine disease. Furthermore, it indicates that while the more stringent UK Brucellosis monitoring policy provides adequate surveillance to identify outbreaks in a timely manner, suggesting that luck has played little part in preventing an epidemic. However, this may not remain the case if we were to revert to the EU monitoring policy that advocates testing once every five years rather than the UK's current two.

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**References**

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