

COWS IN CONTACT: CHARACTERISATION OF NETWORKS BETWEEN CATTLE FARMS



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Introduction:

Complex contact networks link farms via movements of animals, equipment and people and play a role in disease transmission between farms, as was highlighted during the 2001 Foot and Mouth disease epidemic in the UK. Many models do not take into consideration the heterogeneous movement of livestock, equipment and people when determining how pathogens move between herds.

Aims:

- To develop models of the contact networks associated with a wide range of direct and indirect contacts between farms in a region
- To identify the potential role of individual farms and contact types with regard to infectious agent transmission within these networks
- To explore the concept of biosecurity and how attitudes towards it affect farm management strategies

Methods:

- A cross-sectional observational study using an interview-based questionnaire was undertaken.
- Fifty six cattle farms were visited in a 10km by 10km study area in Cheshire, England.
- Statistical analyses were performed using SPSS 12.0.1 for Windows; networks were analysed using UCInet 6 for Windows and NetDraw.

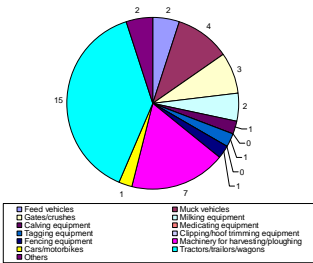


Results: Descriptive Analysis

Movement of animals

All farms traded animals. Most (89%) farms traded animals through markets, 73% with other farms and 50% with dealers. Half the farms had additional stock on premises away from their main holding.

Fig 1: Types of equipment shared between farms



Shared equipment

Almost half (43%) of farms shared equipment with other farms (Figure 1). The most commonly shared equipment group was tractors, trailers and wagons, followed by ploughing and harvesting equipment.

Company and contractor visits

On average, farms were visited approximately 63 times per month by companies and contractors (average 14 companies or contractors per farm) (Figure 2).

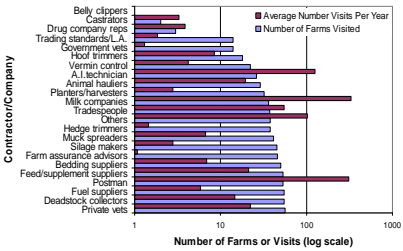


Fig 2: Types and frequencies of company/contractor farm visits

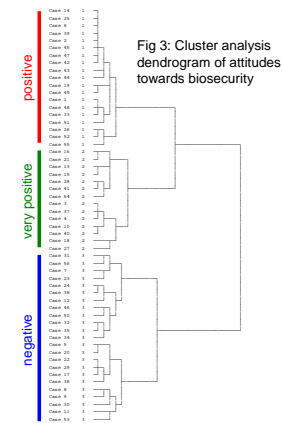


Fig 3: Cluster analysis dendrogram of attitudes towards biosecurity

Attitudes to biosecurity

Attitudes towards a range of biosecurity practices were examined using cluster analysis. This revealed 3 main attitude groups (Figure 3).

These groups indicated that farmers tended to be either very positive, positive or negative about the highlighted biosecurity practices.

Networks

Networks of each of the measured contact types were constructed. These included animal movements, equipment sharing, companies and contractors that frequent the farms and any social contacts with other farmers (Figure 4).

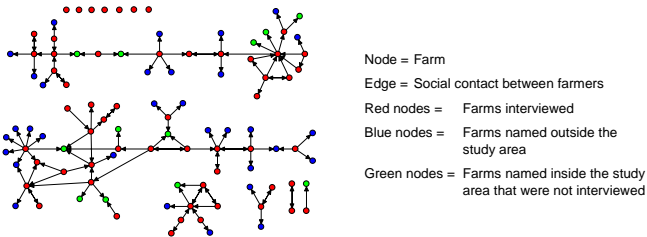


Figure 4: 1-mode social network

Factors associated with attitudes to biosecurity

Quadratic Assignment Procedure (QAP) analysis was used to estimate correlations between observed networks and attitudes to biosecurity. There appeared to be significant correlation ($p<0.05$) between both private vets and neighbours with biosecurity attitudes (Table 1). That is, farms that were contiguous neighbours, and those that used the same private vets were more likely to have similar attitudes than would be expected by chance. There was no correlation between social interactions and attitudes towards biosecurity.

Table 1: QAP output

Procedure	Significance values	
	Private Vets	Neighbours
Simple Matching	0.02	0.03
Hamming Distance	0.02	0.03

Conclusion:

Complex network models of animal movements and other forms of contact exist between farms in this area – these routes are potentially significant in disease transmission.

The correlations between attitudes towards biosecurity and outside influences may be useful in determining effective methods for information dissemination relating to disease prevention and control.

Acknowledgements:

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