

RESEARCH BRIEF: Potential impact of using haulage companies on the network of pig movements

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1. KEY MESSAGE

Sharing livestock haulage vehicles increases the number of indirect contacts between pig farms and may be a more important driver than the direct movement of pigs, when considering disease transmission during an infectious outbreak in the pig sector in Great Britain. The cleansing and disinfection process of haulage vehicles is a critical control point for risk mitigation in an infectious disease outbreak.

2. MAJOR FINDINGS

- The results of this study suggest that it is difficult to generate an epidemic within the pig industry in GB via direct pig movements alone, whereas haulage by itself has the potential for spreading infectious diseases within the pig sector.
- Even with a contamination period (the duration in which lorries are left contaminated by pathogens and act as fomites, i.e. a combination of the pathogen survival period and the period before cleansing and disinfection) of less than 1 day, sharing haulage vehicles will increase the average number of premises that a pig farm may contact and transmit diseases by 60-80%.
- Results show that the number of farms that are assumed epidemiologically isolated from the rest of the network (either by only sending pigs to slaughter or due to standstill regulation) decreases, once the role of sharing haulage vehicles has been accounted for.
- Under the assumption that all links between farms are infectious and the contamination period is minimum (<1 day), haulage sharing increases the maximum number of farms infected within 7 days before the first detection (between 118 and 775 farms) compared to no haulage sharing (between 9 and 193 farms).
- Between April 2012 and March 2014 (incl.), private haulage companies (PHC) were used in 41% of all movements and 33% of the non-slaughter movements in GB, accounting for 83% and 78% of pigs moved, respectively.
- Among the 827 PHC used to move pigs in GB and for which we know the number of registered vehicles, 146 (18%) PHC registered fewer vehicles than they need for pig transport per day, based on the mean number of movements and mean number of pigs transported per day. This suggests that some PHC regularly use their vehicles more than once per day.
- Among the 827 PHC used to move pigs in GB and for which we know the number of registered vehicles, 113 (14%) registered more vehicles than they need for pig transport per day, based on the mean number of movements and mean number of pigs transported per day. This suggests that some PHC may transport multiple species.

3. OBJECTIVES

(1) Assess the impact of haulage on the connectivity between farms and (2) Assess the risk posed by sharing haulage vehicles on the spread of infectious diseases in the British pig industry.

4. POLICY IMPLICATIONS

Reducing the period of contamination of vehicles through cleaning and disinfection (C&D) is an important measure to control disease spread. However, less than 1 day of lorry contamination will still increase the potential of disease spreading widely in the pig sector. In particular, sharing haulage vehicles will limit the benefit of the standstill regulation, increasing the number of premises that could potentially be infected in an outbreak.

Currently, we don't know if vehicles within PHC are exclusively used for transporting single species. However, there may be a risk for disease spread across livestock industries (e.g. beef, sheep, pigs).

5. IMPORTANT ASSUMPTIONS AND LIMITATIONS

- We used all movements reported between Monday 2nd of April 2012 and Sunday 30th of March 2014 in both the Scottish livestock electronic identification and traceability database (ScotEID) and the electronic animal movement licensing system (eAML2).
- We considered private haulage companies (PHC) as haulage companies registered by either Quality Meat Scotland (QMS) or Red Tractor. Other haulage companies that use their own fleet of haulage vehicles (all international haulage companies as well as all major live pig producers, major retail companies and genetic improvement business were included in the list.
- We only considered movements using PHC to transport pigs and ignored all movements that were carried out by vehicles owned by either the farm of departure or destination.
- Networks were constructed between premises (including agricultural holdings and gathering places) and links between premises were either due to contacts from direct movement of pigs or due to the shared use of haulage vehicle.
- Contact between premises due to shared use of haulage vehicle was defined by the date of the move, the haulage vehicle and PHC used for the move and the contamination period. Here we considered contamination periods of <1day, 1day, 7days and 28days.
- All contacts for the network analysis were aggregated over the period of either 7days or 28days, which were chosen to be similar to farm-level infection period for important swine diseases, such as African and classical swine fevers and foot-and-mouth disease.
- To explore how diseases may spread between nodes of the multiplex network, networks were analysed first by considering that all links between premises were infectious, then by considering that links will not always result in transmission (as this depends on the degree of lorry contamination and the likelihood that contaminated vehicles infect pigs on farms). The later was done by computing the probability of each farm to infect another specific farm, considering both routes of transmission (direct animal movement contact and sharing haulage vehicles) and estimated the average number of secondary cases for all network considered in this study.

7. LINKS TO EXISTING PUBLICATIONS OR REPORTS Multilayer network analysis unravels haulage vehicles as a hidden threat to the British swine industry. Porphyre T. et al., 2019