

## How much is the spread of 1-7-4-related PRRS viruses due to animal movement?

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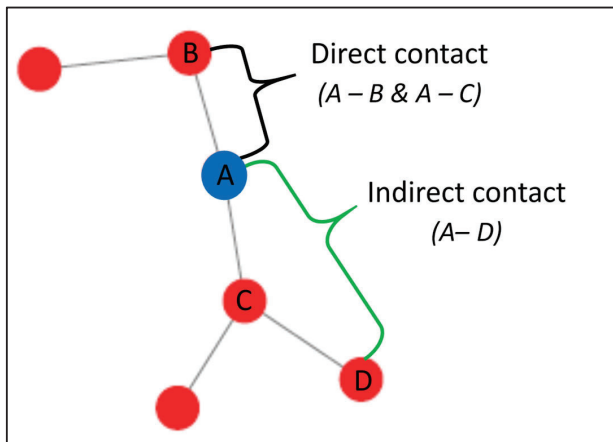
### Keypoints:

- Animal movements from 496 farms from a dense pig production area in the US, between 2014-2017, were analyzed
- Direct contact (through animal movements) and indirect contact with an L1A (Lineage 1A)-positive farm increased the likelihood of L1A occurrence, and occurrence of non-L1A PRRS virus one year prior decreased the likelihood of an L1A occurrence
- Outbreak risk increased for farms that engaged in more outgoing shipments

**Objective:** This study aimed to quantify the contribution of animal movements to the risk of outbreaks with PRRS viruses of the 1-7-4 family (here, broadly referred to as Lineage 1A, L1A).

PRRS can arguably be considered one of the most expensive endemic pig diseases in the US and globally, with far reaching impacts on the global protein economy. Continual emergence of novel PRRSV strains with varying virulence has been highlighted as one of the challenges hampering effective disease management. In recent years, viruses classified as RFLP-type 1-7-4, which mostly belong to the phylogenetic family known as Lineage 1A (L1A), have caused outbreaks with more severe clinical presentation.

**Data:** Here, we analyze 3,383 animal movements (excluding market and cull movements) from 496 farms from a dense pig production area in the US, between 2014-2017. The analysis was done using temporal network autocorrelation models for animal movements together with 1,856 PRRSV ORF5 sequences linked to these farms. **Case definition:** Farms were defined as L1A-positive in a given 6-month period if at least one L1A sequence was recovered from the farm. A farm's current and past exposure to L1A and other PRRS strains was assessed through its direct and indirect connections in the animal movement network. For example, Figure 1 depicts the blue farm's direct and indirect contacts.



### Key preliminary findings:

1. Direct contact (through animal movements) with an L1A-positive farm increased the likelihood of L1A occurrence on a farm by 16.8%
2. Indirect contact with an L1A-positive farm also increased the likelihood of L1A occurrence by 8.1%
3. Occurrence of non-L1A PRRS virus on a farm one year prior decreased the likelihood of an L1A occurrence by 7.5%
4. Outbreak risk increased for farms that engaged in more outgoing shipments

**Figure 1:** Simple undirected network of farms in contact via animal movements

**Take-home:** While the risk posed by direct contact with PRRS-positive farms is unsurprising (finding 1), we show here that indirect contact (i.e., farms two steps away in the network) also increases infection risk (finding 2). In addition, the occurrence of a L1A virus on a farm is influenced by previous PRRSV occurrence on the farm (finding 3), suggesting a potential role of herd immunity due to previous exposure to a related virus. In addition, all L1A outbreaks could not be attributed to animal movements and therefore other modes of transmission were also important. For example, the importance of outgoing shipments suggests that even sending animals from a farm presents biosecurity risks (finding 4). Overall, repeated animal movements between farms increased the risk for disease occurrence through live animals or breaches in biosecurity of the farm particularly in an area such as the study area, with high prevalence of PRRSV.

Given the data limitations of this study (convenience sampling), continuous surveillance of farms should be done to understand not only the dynamics of viruses in the beginning of outbreaks, but also on how they evolve and shape immune response toward other viral variants in the future. While animal movements are inevitable, better biosecurity and truck hygiene may be beneficial in reducing risks of mechanical transmission.