

Simulation of outbreak mechanisms of respiratory disease in finishing pigs caused by *Actinobacillus pleuropneumoniae*

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Purpose

Infection with *A. pleuropneumoniae* may result in pigs with respiratory disease as well as in non-diseased carrier pigs. However, what actually happens during an acute outbreak episode of pleuropneumonia is unclear. The aim of this study is to test two potential underlying mechanisms for such outbreaks, by identifying conditions for occurrence of such outbreaks under these mechanisms, using mathematical modelling. The first mechanism assumes that a common risk factor causes all cases directly by changing the host pathogen interaction in already colonised pigs (trigger mechanism). The second mechanism assumes that a transmission chain is started by the first case, inducing disease in the infected contact pigs (transmission mechanism).

Method

First, a characteristic outbreak of pleuropneumonia was defined by conducting a review of the literature; defining an outbreak at 12 weeks of age and affecting 50% of animals and lasting 4 days. Next, two mathematical models were developed to simulate outbreaks of *A. pleuropneumoniae*, one for the trigger mechanism and one for the transmission mechanism.

Results

Mathematical models showed that a characteristic outbreak could be caused under both mechanisms. However, the transmission mechanism needed a 50 times higher transmission rate for diseased pigs than described in literature for colonised pigs. Furthermore, the trigger mechanism showed that outbreaks in young pigs must be rare, as these are not yet colonised, which is supported by literature.

Conclusion

We conclude that outbreaks of *A. pleuropneumoniae* on endemic farms are most likely explained by exposure of already infected pigs to a trigger.

Relevance

This implies that control of disease caused by *A. pleuropneumoniae* has to focus on reducing transmission by colonised pigs and by preventing the occurrence of a trigger.