

VPH-OP-04

TITLE

UNDERSTANDING HEPATITIS E VIRUS (HEV) DYNAMICS IN A FARROW-TO-FINISH PIG FARM USING EXPERIMENTAL, FIELD AND MODELLING DATA

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CONTENT

Objectives

Hepatitis E virus is a zoonotic pathogen for which pigs have been recognised as the major reservoir in industrialised countries. High variability of HEV dynamics has been described in pig farms and may be related to the influence of other pathogens, particularly viruses modulating immune response. This study aimed to understand the conditions for HEV spread and persistence in farrow-to-finish herds in which pigs may be co-infected with an intercurrent pathogen using a multi-pathogen modelling approach relying on experimental and field data.

Material & methods

A stochastic individual-based model was developed to represent the population dynamics of a farrow-to-finish pig herd, coupled with a multi-pathogen model combining two epidemiological models: the first one represented the dynamics of an immunomodulating virus (e.g. PRRSV) in a simplified way, whereas the second one was designed as a MSEIRS HEV model, accounting for partial passive immunity protection in piglets. On an individual and daily basis, epidemiological parameters of the HEV model were modified according to the pig's status as regard the immunosuppressive virus. Parameters were derived from experimental and field data. The minimal conditions for virus spread and persistence between batches were evaluated by simulations.

Results

Co-infection with an immunomodulating pathogen was found to favour HEV persistence and to increase the prevalence of contaminated livers at slaughter. Herd structure, driven by the batch-rearing system, and some farming practices, such as the type of housing for gestating sows, cross-fostering and mingling practices, were also evidenced as pivotal factors impacting HEV spread dramatically.

Conclusions

Based on an innovative multi-pathogen approach, our model has provided insights on HEV infection dynamics and has given the opportunity to evidence effective control strategies. Taken together, modelling and field data would make it possible to design a comprehensive HEV control plan and to support public health policies on this issue.