

PAPER

Influence of porcine circovirus type 2 vaccination on the probability and severity of pneumonia detected postmortem



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Veterinary Record
(2015) 176, 124
cite as doi:
10.1136/vr.102755

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This is a summary
of a paper that is
published in full at
veterinaryrecord.
bvapublications.com

Published Online First
November 20, 2014

Context

Porcine circovirus type 2 (PCV-2) is recognised as a major pathogen in domestic pigs, with a severe negative economic impact on modern pig production. Current prevention strategies against porcine circovirus diseases include improving management strategies and implementing PCV-2 vaccination programmes. The wide geographic distribution of PCV-2, the associated economic damage and the need for efficient prevention strategies led to the introduction of PCV-2 vaccines in Austria in 2008. The aim of this study was to evaluate the impact of PCV-2 vaccination on the probability and severity of pneumonia.

Main conclusion

The results show that PCV-2 vaccination is a vital tool to reduce the risk of postmortem pneumonia findings and reduce the severity of pneumonia in slaughter pigs in particular. The vaccination effect was closely related to farm type. When vaccinated, the probability and severity of postmortem pneumonia signs showed an even more pronounced reduction for pigs originating from fattening farms compared to those from farrow-to-finish farms. Combining the effect of (i) PCV-2 vaccination, (ii) farm type and (iii) interaction effects between these two factors, a PCV-2-vaccinated pig from a fattening farm had only half the chance of a positive postmortem finding or an increased severity of pneumonia than a non-vaccinated pig from a farrow-to-finish farm.

Approach

Postmortem findings from 247,505 pigs slaughtered between 2008 and 2011 were analysed using a cumulative link mixed model. All pigs originated from 72 farms (21 fattening farms and 51 farrow-to-finish farms) and were examined by a pool of 12 official meat inspectors (qualified veterinarians) during the slaughter and meat inspection process. Medication records from 2007 to 2011 were used to identify pigs that were vaccinated against PCV-2 during the breeding period.

Results

The proportion of vaccinated pigs increased continuously, reaching a maximum of 97.1 per cent for fattening and 59.7 per cent for farrow-to-finish farms in 2011.

Three major effects could be observed: (i) PCV-2 vaccination significantly reduced the odds of postmortem findings of mild, moderate and severe pneumonia ($P < 0.01$, coefficient -0.05 , odds ratio [OR] 0.95); (ii) Pigs from fattening farms were significantly less likely ($P < 0.05$, coefficient -0.44 , OR 0.65) to exhibit signs of pneumonia at slaughter than pigs from farrow-to-finish farms; (iii) When vaccinated, the odds of detecting postmortem signs were even lower for pigs from fattening farms ($P < 0.001$, coefficient -0.19 , OR 0.83). Combining PCV-2 vaccination, farm type and interaction effects between these two factors, a PCV-2-vaccinated pig from a fattening farm was half

as likely (OR 0.51) to have a positive postmortem finding of pneumonia than a non-vaccinated pig from a farrow-to-finish farm. Additionally, the estimated coefficients showed a distinct seasonal trend over time, highlighting a higher risk of postmortem findings of pneumonia during cold months than warm months.

Interpretation

The current study attempts to evaluate the efficacy of PCV-2 vaccination by analysing postmortem findings from slaughterhouse meat inspections. Previous studies revealed the greatest vaccination effects by determining the presence of IgM antibodies in the period between the onset of viraemia to the end of finishing, resulting in a decreased probability of animals having signs of pneumonia at slaughter. Pathological and anatomical alterations of organs are often conserved throughout the animal's life, and are well suited as objective measures for disease status. The outcomes of these previous studies provide a possible explanation for the effect of vaccination against PCV-2 on pulmonary postmortem findings, as revealed in this study. Two main factors are presumably responsible for the close relationship between vaccination effect and farm type. First, rehousing of animals may result in more stringent biosecurity measures (for example, an all-in, all-out system) and therefore fattening farms might have an additional advantage in preventing pneumonia compared to one-site farrow-to-finish farms. This positive effect is further enhanced by PCV-2 vaccination. Secondly, vaccination rates on farms included in the study increased rapidly over the investigated period. On fattening farms, in particular, the herd immunity effect of vaccination may have played an important role as PCV-2 vaccination became more prevalent. Poor biosecurity, inadequate hygiene and herd management could all explain the large farm effect in the remaining variance due to these substandard management factors increasing the risk of the spread of pathogens at the farm level.

Significance of findings

It is important to have hard evidence that preventive measures are effective. Therefore, a retrospective evaluation of postmortem findings can be a valuable tool for ensuring preventive measures (for example, vaccination) are integrated into the management systems of the respective farm. This study demonstrates the benefit of a vaccination programme against PCV-2 as a successful tool to reduce the risk of postmortem pneumonia findings and to reduce the severity of pneumonia in slaughter pigs. When interpreting the observed seasonal trends, it is important to take into account that postmortem findings of pneumonia at slaughter may also represent a previous disease event or chronic pneumonia. The strong relationship between vaccination effect and farm type underlines the role of management and environmental factors on the farm of origin and their power to influence animal health and economic prosperity.