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Infection dynamics of Porcine Reproductive and Respiratory Syndrome Virus (PRRSV) in vaccinated and non-vaccinated pigs

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Introduction

Piglets from a PRRSV (EU type) seropositive stable sow herd were seronegative at weaning, but became infected with PRRSV EU after transfer to the finishing units located at the same site. To control PRRSV among the finishing pigs, vaccination with a modified live virus PRRSV EU vaccine (Intervac PRRS) all pigs prior to transfer to the finishing stables were initiated from October 2008. In July 2009 it was decided to terminate vaccination of pigs at transfer. The aim of this study was to investigate if non-vaccinated pigs could be inserted in an empty and clean stable without being infected despite the presence of vaccinated pigs in neighboring rooms.

Materials and methods

The study was performed as an intervention study with two groups of pigs including 58 vaccinated and 20 non-vaccinated Danish Landrace, Yorkshire and Duroc crossbreeds. All pigs were identified with ear tags. The vaccinated pigs were 8 weeks of age at the time of vaccination. Blood samples and nasal swabs were taken 0, 1, 2, 3, 8 and 13 weeks after vaccination. The non-vaccinated pigs varied from 5 to 10 weeks of age at transfer to the finishing stable and were sampled 0, 5 and 10 weeks after transfer. Non-vaccinated pigs were transferred to a clean and disinfected stable three weeks after the vaccinated pigs were vaccinated. There was no physical contact between the two groups, that were separated by walls and a door that was kept closed during the study. All blood samples were examined for antibodies against the US and EU PRRSV types by a differentiating blocking ELISA (4) and for the EU PRRSV type by IPMA (1). A ratio (OD%eu/OD%us) was calculated if ELISA EU or ELISA US were positive (cut off: OD% ≤ 44). IPMA EU detected antibodies in four dilutions (1:50; 1:250; 1:1250; 1:6250). Serum samples and nasal swabs from vaccinated pigs were examined for PRRSV RNA by real time RT-PCR (3) and the ORF5 and ORF7 were sequenced from selected positive samples.

Results

None of the tested non-vaccinated pigs seroconverted to PRRSV after transfer to the fattening unit despite the simultaneous occurrence of viraemia in vaccinated pigs housed in a neighboring room. All vaccinated pigs were seronegative at the time of vaccination. After vaccination they developed an immune response, which resulted in 85.5 % pigs with IPMA EU titers ≥ 1250 three weeks after vaccination. The mean ELISA OD%eu in week three was 42.3. Eight weeks after vaccination, all pigs were seronegative (mean ELISA OD%eu at 21.9) and 18.2 % of the pigs had IPMA EU titers above 1250. PRRSV RNA was detected in serum samples 1 to 3 weeks after vaccination, but could not be detected in nasal swabs at any time. The level of PRRSV peaked 1 week after vaccination and then rapidly declined. None of the pigs had PRRSV viraemia at 8 and 13 weeks after vaccination. The virus was found to be identical to the vaccine virus (DV-MLV) by sequencing of ORF5 and ORF7. Thirteen weeks after vaccination, 94.5 % of the pigs had IPMA EU titers above 1250, indicating an acute infection. No clinical symptoms were observed at this time. The mean ELISA ratio in week 13 was 0.6 indicating a previous PRRSV EU infection.

Discussion

The lack of transmission of PRRSV EU from vaccinated to non-infected pigs in neighboring rooms, is of importance for herd eradication programs in which PRRSV vaccination is carried out in order to reduce clinical effect. Until 8 weeks after vaccination, the vaccine induced an immune response comparable to a natural infection as previously described (2, 5). Virus was not detected in serum beyond week 3 after vaccination, and virus was not detected in nasal swabs at any time. Thus, it seems to be safe to mingle pigs 8 weeks after vaccination which is routinely used in Denmark. To our surprise, the IPMA EU titers markedly increased 13 weeks after vaccination indicating acute (re)infection. Although serum and nasal swabs were PCR-negative, this may be due to either an infection with a wild type virus or reactivation of the vaccine virus. Further studies are needed to elucidate if this is a general features in pigs vaccinated with live PRRSV vaccines.

References