UNIVERSITY OF MINNESOTA

Swine Disease Eradication Center

SDEC Partners Research Update

Project Update: Investigation of a novel U.S strain of highly pathogenic porcine reproductive and respiratory syndrome virus

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Background

- A novel strain of porcine reproductive and respiratory syndrome virus (PRRSv) was identified in Oklahoma (OK) and was associated with extremely high mortality, significant respiratory disease, and neurological signs.

- Reported mortality varied between barns, with average mortality of 37% and some barns >80% (although some barns in same site had normal mortality rates).

- Highly pathogenic strains of PRRSv continue to emerge and it is important to understand their pathogenesis, their transmission and their dissemination potential.

Objectives

1. Evaluate the pathogenicity of a novel 1-8-4 highly pathogenic US PRRSV strain, characterize its lesions and evaluate its clinical presentation, including neurological signs.

2. Compare the pathogenesis and the severity of clinical signs caused by the novel PRRSV strain with those caused by a more typical but also highly pathogenic 1-8-4 PRRSV strain.

Approach

- 28 weaning-age pigs from a PRRSV-negative farm were divided in 3 groups. Four pigs served as negative controls, 8 pigs were inoculated with a 1-8-4 virulent strain (MN) and 8 pigs were incoulated with the new virulent strain referred as OK. Four piglets were added to each inoculated group to serve as contact sentinel pigs.

- Body temperatures were recorded every day, blood samples and air samples were collected on days 1,3,6,9,12, and 14 post-inoculation. On day 14 post-inoculation, pigs were humanely euthanized and necropsied at the University of Minnesota, Veterinary Diagnostic Laboratory.
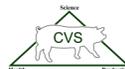
Results

- Pigs in the negative control group remained PRRSV negative during the entire length of the study.
- Pigs infected with the 1-8-4 OK strain (either inoculated intramuscularly or by contact) did not show neurological signs but showed more severe depression and respiratory signs (cough and dyspnea) than the pigs infected with the MN strain.
- The viral load, estimated by real-time PCR was higher (lower Ct values) in the serum of the pigs inoculated with the OK strain (Figure 1).
- Brain and lung tissues had more severe lesions histologically in the pigs infected with the OK strain than in pigs infected with the MN strain.
- There was a higher viral load in the air in the room housing the pigs infected with the OK strain than in the room housing the pigs infected with the MN strain.
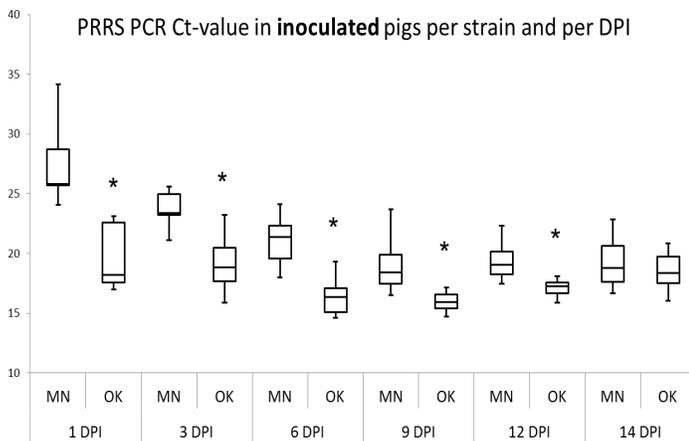

Figure 1. PRRSV load in serum: PRRSV Ct-values in the serum of inoculated pigs from 1 day to 14 days post-inoculation. *Ct-values were significantly lower in the OK group compared with the MN at days 1, 3, 6, 9, and 12 days post-inoculation ($p < 0.05$).
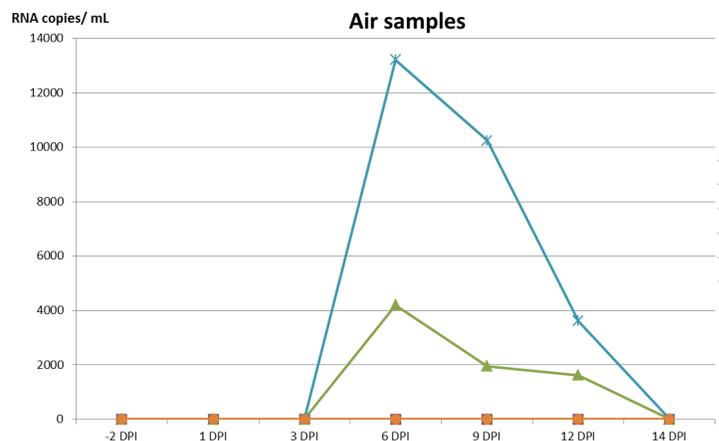

Figure 2. PRRSV Ct-value in air samples. This graph shows in blue the result from the air collected in the room housing OK-inoculated pigs, in green, air collected from the MN inoculated pigs and in orange, air collected from the negative control room. The figure shows the number of RNA copies/mL over time. The number of PRRSV RNA copies/mL was significantly higher in the OK room than in the MN room on days 6 and 9 post-inoculation.

Final conclusions

⇒ OK 1-8-4 PRRSV strain appears to be highly virulent measured by the higher viral load in the serum of the inoculated and contact pigs as well as based on the severity of the histological lesions observed in the lungs and the brain.

⇒ The high concentration of PRRSV found in the air suggests that this strain could be transmitted airborne although more studies are needed to confirm whether the airborne spread plays a role on the dissemination of this strain in the field.

⇒ It is important to characterize the pathogenicity of emerging novel PRRSV strains under controlled conditions in order to design appropriate control measures.