Summary: PRRSV-Vaccinated, Seronegative Sows and Maternally Derived Antibodies: Impact on PRRSV-1 Challenge Outcomes in Piglets

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Key Findings:

- The influence of maternally-derived antibodies (MDAs) on PRRSV-infection was investigated by challenging piglets born to both PRRSV-vaccinated seropositive sows and PRRSV-vaccinated but seronegative sows (non-responders to vaccination).
- Piglets born to PRRSV-vaccinated seronegative sows have increased viral replication and nasal shedding in the first days post-challenge.
- Piglets born to PRRSV-vaccinated seronegative sows lacking PRRSV-specific maternally-derived antibodies (MDAs) showed an earlier and more intense seroconversion, leading to significantly higher antibody titers at 10 days post challenge compared to the piglets have PRRSV-specific MDAs.

Introduction

PRRSV vaccines can be administered to both sows and piglets to aid in reducing the negative consequences of the disease. Both modified live vaccines (MLVs) and inactivated/killed vaccines are used in the field. However, field reports have stated the presence of ELISA seronegative sows, despite repeated vaccination against PRRSV. Piglets born from these PRRSV-vaccinated but seronegative sows lacked the presence of PRRSV-specific maternally-derived antibodies (MDAs). Thus, they showed a stronger vaccine viremia and earlier seroconversion compared to piglets born from PRRSV-vaccinated seropositive sows who had the presence of MDAs. In this study, the influence of MDAs on PRRSV-infection was investigated by experimentally challenging four-weeks-old pigs born from both PRRSV-vaccinated seronegative, and PRRSV-vaccinated seropositive sows.

Material & Methods

Piglets included in the study (*n* = 36) originated from a Belgian farrow-to-finish herd in which the sow population was routinely vaccinated with a modified live vaccine against PRRSV. Eighteen piglets were born from three PRRSV-seropositive sows (responders to vaccination) and had a clear presence of PRRSV-specific MDAs (E+ piglets). The other eighteen piglets were born from three PRRSV-seronegative sows (non-responders to vaccination) and did not have PRRSV-specific MDAs (E− piglets). In each group, twelve piglets were intranasally challenged with 2 mL of a $10^{5.5}$ $TCID_{50}$/ml dose of the heterologous PRRSV-1 07V063 strain, the remaining piglets were mock-challenged (PBS) and served as controls.

Results

During the first days after infection, higher serum viremia and nasal shedding were observed in the challenged E− piglets compared to the challenged E+ piglets (Figure 1). However, at 10 days post-infection, the peak serum viremia was significantly higher in the E+ piglets in comparison to the E− piglets and serum viremia remained slightly higher in this group until the end of the study. Additionally, the two challenged groups had a different immune response to the PRRSV infection. The E− challenged piglets showed an earlier and more intense seroconversion, leading to significantly higher antibody titers at 10 days post-infection (dpi) compared to the E+ challenged piglets. Furthermore, a trend towards both higher induction of serum IFN-γ and higher induction of IFN-γ secreting cells was observed in the E− challenged piglets. In contrast, a significantly higher induction of serum TNF-α at 7 dpi was seen in the E+ challenged piglets compared to the E− challenged piglets.

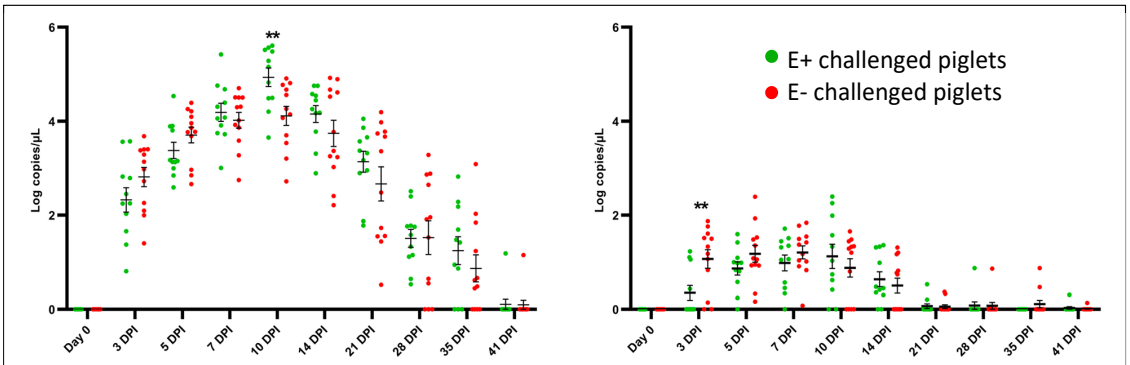

Figure 1. Viral load in the serum (**left**) and nasal swabs (**right**) of PRRSV-seropositive piglets (E+ piglets; *n* = 11) and PRRSV-seronegative piglets (E− piglets; *n* = 12), intranasally challenged with the PRRSV-1 07V063 strain at 4 weeks of age. Error bars represent the mean viral load ± standard error of the mean (SEM) calculated at each time point. ** p-value < 0.01.

Discussion

The results gathered in this study suggest that PRRSV-specific MDAs induce partial protection during the early stages of infection but are not sufficient to protect against a high challenge dose. The presence of piglets lacking PRRSV-specific MDAs might pose a risk for PRRSV infection and enhanced transmission in pig farms in young piglets.

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