Passive Immunization of Piglets with Hyperimmune Plasma Containing Virus Neutralizing Antibodies to Porcine Reproductive and Respiratory Syndrome Virus

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Summary and Implications

Polyvalent hyperimmune plasma (HP) with high-titers of virus neutralizing (VN) antibody to porcine reproductive and respiratory syndrome virus (PRRSV) strains was produced in gilts and used to passively immunize 3 week old piglets. The piglets were subsequently challenged with live virus. Results showed delay of viremia, decrease in live virus titers, decrease in gross lung lesions, or delay in transmission to naïve, non-immunized sentinel pigs.

Introduction

Passive immunization of pregnant sows with high-titer VN antibody against PRRSV, prior to live virus challenge, has been shown to increase piglet viability at farrowing. The goal of our research was to produce polyvalent hyperimmune plasma (HP) with high-titers of VN antibody to PRRSV strains, and to evaluate protection provided by passive immunization of 3-week old piglets.

Materials and Methods

Hyperimmune plasma with neutralizing antibodies (α-PRRSV) was induced by injection of naïve gilts with 3 live strains of PRRSV: HLV013, HLV093, and HLV096. Normal swine plasma (NSP) was harvested from PRRSV negative gilts. Plasma was harvested at necropsy.

Study 1: 16 pigs were randomized into the following groups: 1—NSP challenged, 2—α-PRRSV challenged, 3—α-PRRSV non-challenged, 4—naïve sentinels exposed to NSP pigs, 5—naïve sentinels exposed to α-PRRSV pigs. Pigs were intraperitoneally (IP) administered 0.6 ml/kg of bodyweight (bw) of the appropriate plasma at day 0. HP had an FFN titer of 1:1024 against the challenge strain. At 1 day post immunization (dpi), pigs were challenged intranasally (IN) with 2 ml of a HLV013. At 3 days post challenge (dpc), naïve sentinel pigs were moved into the appropriate room for 0 days post exposure (dpe). Pigs were bled at 0, 3, 7, 10, 14, and 21 dpe.

Study 2: 12 pigs were randomized into the following groups: 1—NSP challenged, 2—α-PRRSV challenged, 3—naïve sentinels exposed to NSP pigs, 4—naïve sentinels exposed to α-PRRSV pigs. Pigs were subcutaneously (SC) administered 2ml/kg bw of the HP. Challenge virus was HLV013.

Study 3: The same experimental design as challenge study 2 was repeated with challenge virus HLV096. HP had an FFN titer of 1:512 against the challenge strain.

Sera from all three studies was submitted to Iowa State University Veterinary Diagnostic Laboratory for IDEXX ELISA, and to South Dakota State University Animal Disease Research and Diagnostic Laboratory for fluorescent focus neutralization (FFN) assay. Geometric mean of inverse FFN titers was calculated for each treatment group. Live virus titration and gross lung lesions were scored as previously described.

Results and Discussion

Pigs immunized with 0.6 ml/kg IP of HP had positive VN titers (Figure 1A). The α-PRRSV challenged pigs had a 2 log decrease in viremia at 3 and 6 dpc as compared to the NSP pigs (Figure 1B). Sentinel pigs exposed to α-PRRSV pigs also had a decrease in viremia as compared to the sentinel pigs exposed to NSP pigs. When immunization volume was increased and administered subcutaneously, FFN titers increased and there was a delay in viremia and decrease in lung lesion scores (Figure 2) in the α-PRRSV pigs. In challenge study 3, α-PRRSV challenged pigs did not become viremic until 14 dpc, and sentinels exposed to these pigs never became viremic (Figure 3B). Lung scores were numerically different among groups.

Partial protection was provided against homologous PRRSV strains by delaying or decreasing viremia, decreasing gross lung lesion scores, and delaying or decreasing transmission to naïve sentinel pigs. Future studies will test heterologous challenge strains.

Acknowledgements

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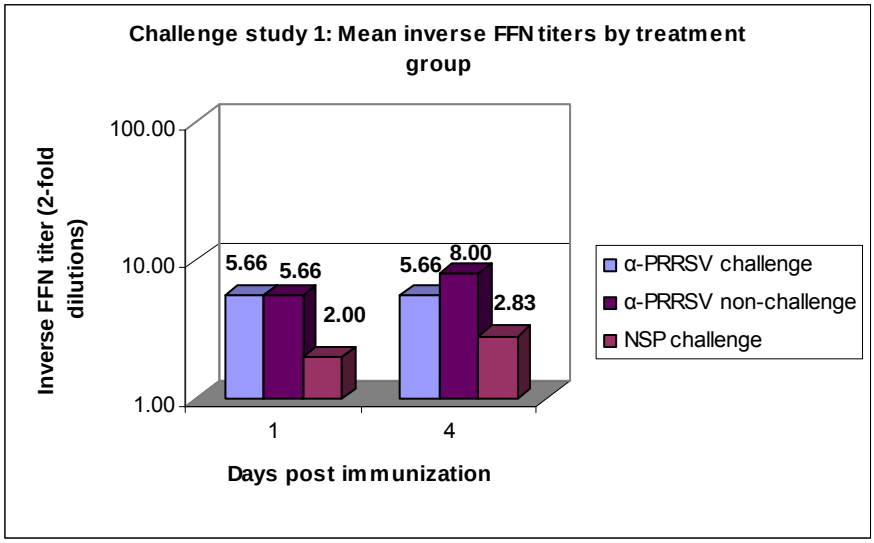


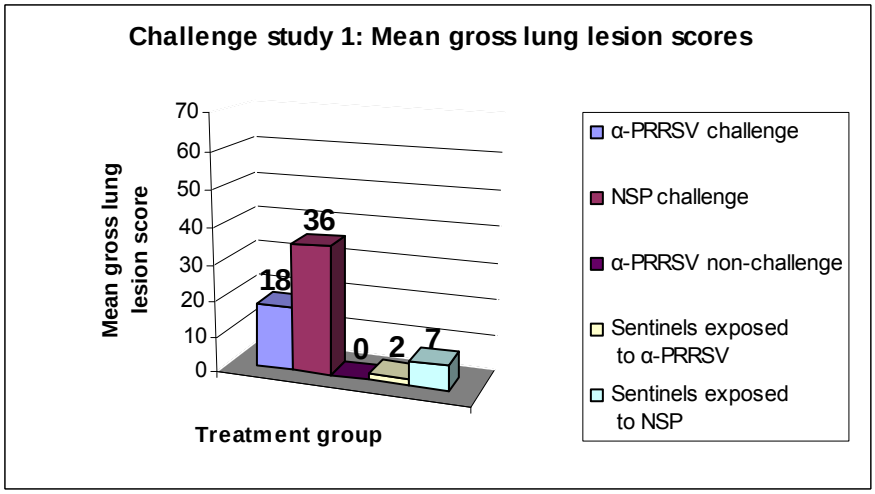
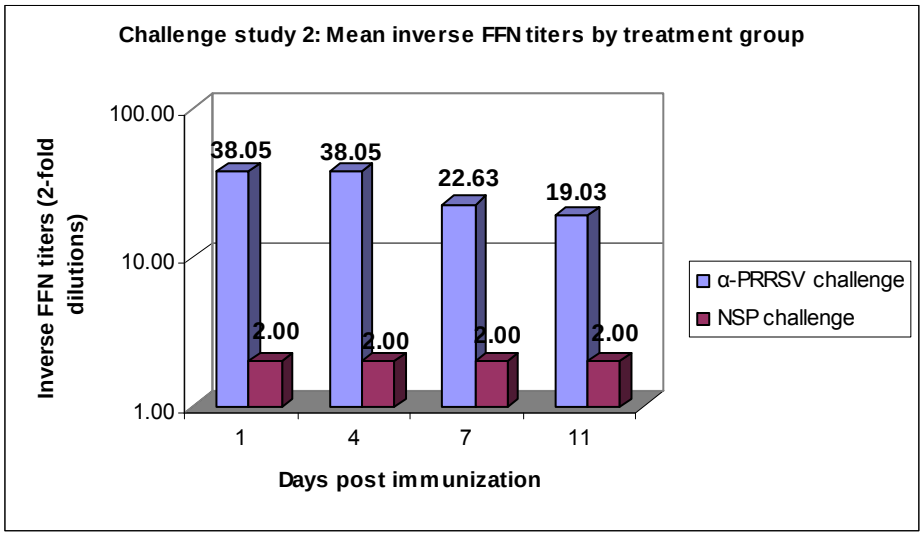


Figure 1. Challenge study 1 results. Mean of inverse FFN titers is shown for each group. Gross lung lesions means were calculated for each group.



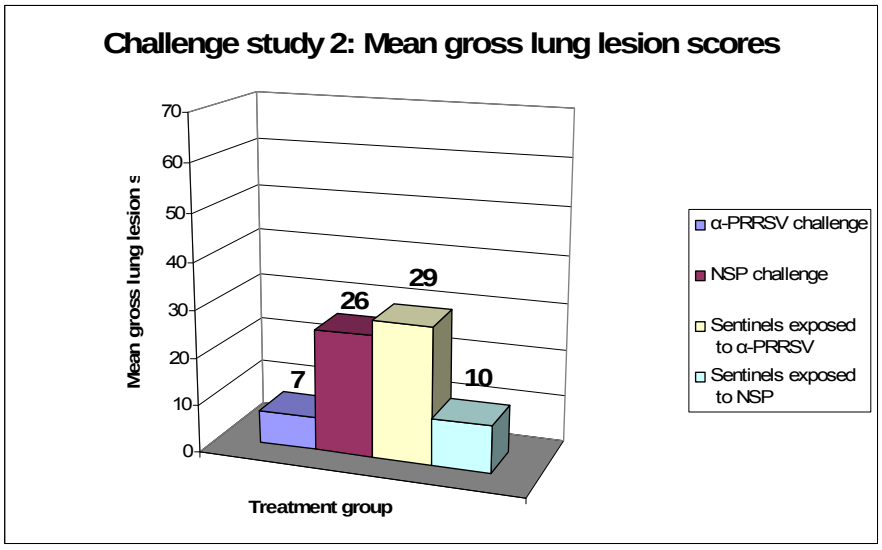
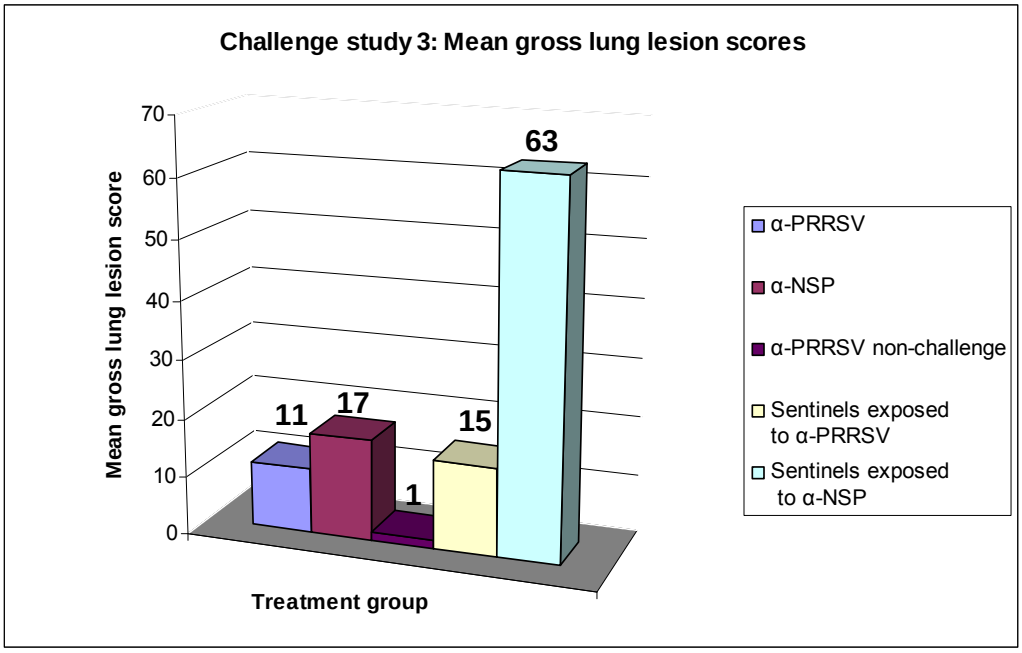


Figure 2. Challenge study 2 results. Mean of inverse FFN titers is shown for each groupGross lung lesions means were calculated for each group.



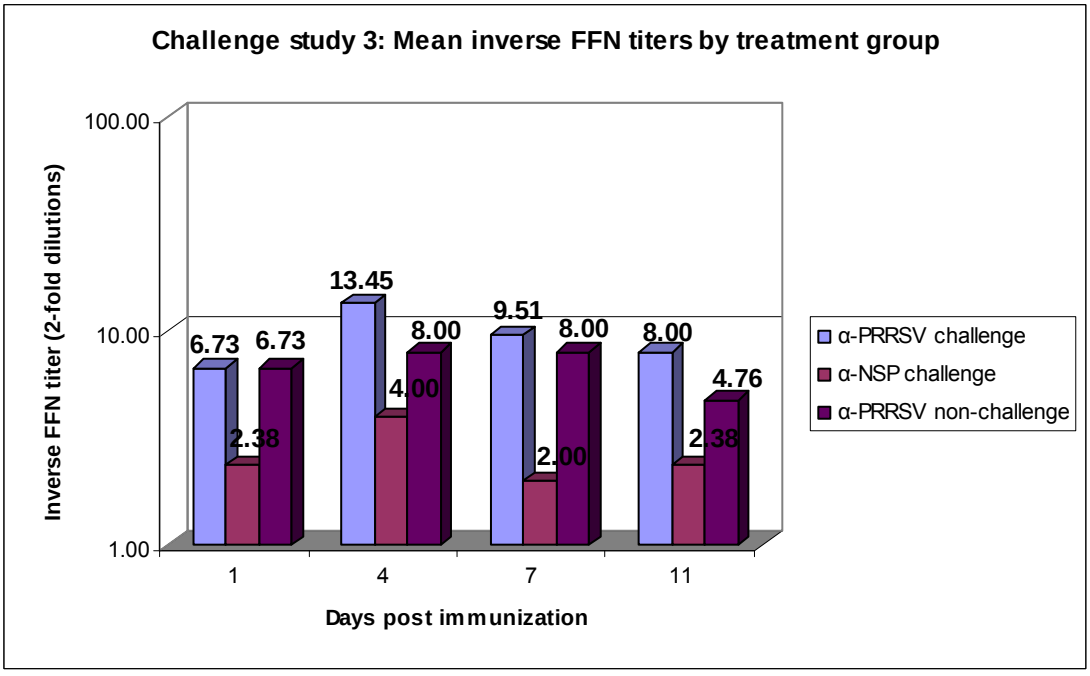


Figure 3. Challenge study 3 results. Mean of inverse FFN titers is shown for each group. Gross lung lesions means were calculated for each group.