COMPARATIVE ANALYSIS OF PRRS AND ASF VIRAL TRANSMISSION USING CONVENTIONAL NEEDLE AND NEEDLE-FREE DEVICES FOR PORCINE CIRCOVIRUS VACCINATION IN A PIG MODEL

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Background & Objectives

PRRS is a devastating disease in pigs characterized by respiratory and reproductive disease. In addition to PRRS, the spread of ASF has increased the threat to herds free of this disease. Intramuscular administration using needles has been the main way of vaccinating pigs although, risks associated with conventional needles are high. PRRS virus, for instance, was transmitted by conventional needles and was able to induce the disease in naïve pigs [1]. The objective of this study was to evaluate the iatrogenic transmission of ASF virus and PRRS virus between conventional needles and a needle-free device.

Materials & Methods

In the study eighty-five 3-week-old pigs were procured from a herd free of ASF and PRRS. Twenty-five pigs were randomly allocated into 5 groups (seeder) of 5 pigs each; ASF/Needle (G1), ASF/Hipradermic® (G2), PRRS/Needle (G3), PRRS/Hipradermic® (G4), and no-challenge control (G5). Sixty, age-matched sentinel pigs were randomly allocated into 6 groups of 10 each. At 0 days post seeder challenge (DPC), G1 and G2 groups were oronasally administered with ASF inoculum. G3 and G4 groups were intranasally inoculated with HP-PRRSV-2. Following challenge, blood collection was performed weekly and assayed for the presence of ASF and PRRS using real time PCR. At 7 DPC (0 days post sentinel vaccination, DPV), G1 and G3 groups were intramuscularly administered with 2 ml of a ready to use Porcine circovirus+*Mycoplasma hyopneumoniae* vaccines (PCVMH) using conventional needles. G2 and G4 groups were intradermally administered with 0.2 ml of a ready to use PCVMH (Mhyosphere® PCV ID, HIPRA, Spain) using needle-free device (Hipradermic®, HIPRA, Spain). The same needles or needle-free device were used to inject the same volume of PCVMH in sentinel pigs (1 seeder to 2 sentinels) with the same method of injection. Blood samples and mortality were collected from sentinels at 0, 7, 14, 21 and 28 DPV. ASF and PRRS viremia were evaluated using real time PCR.

Results

All the seeders exposed to ASF and PRRS were PCR positive and had the highest viraemia at 7 DPC. (Table 1). Following injection, sentinels from G1 and G3 were PCR positive at 7 and 14 DPV, respectively. Otherwise, sentinels from G2 and G4 were PCR negative throughout the experiment (Table 2).

Table 1. The number of seeder pigs testing positive against ASF and PRRS as measured using real time PCR, and mortality rate following challenge. The results of real time PCR are reported as Ct value and Genomic copies number (GCN)/mL for ASF and PRRS, respectively.

Seeder groups	Results	Days post challenge	
		0	7
G1: ASF/Needle	PCR Avg Ct value+SD Mortality	0/5* ND 0/5**	**5/5** **25.50+1.65** **0/5**
G2: ASF/ Hipradermic®	PCR Avg Ct value+SD Mortality	0/5 ND 0/5	**5/5** **28.87+1.29** **0/5**
G3: PRRS/Needle	No. of pigs with GCN Avg GCN/mL+SD Mortality	0/5 ND 0/5	**5/5** **209.51+24.29** **0/5**
G4: PRRS/ Hipradermic®	No. of pigs with GCN Avg GCN/mL+SD Mortality	0/5 ND 0/5	**5/5** **237.60+33.36** **0/5**
G5: Control/No challenge	PCR No. of pigs with GCN Mortality	0/5 0/5 0/5	**0/5** **0/5** **0/5**

*Number of pigs with Ct value/ total number of pigs left in the group
**Number of pigs died/ total number of pigs in the group

Table 2. The number of sentinel pigs tested positive against ASF and PRRS as measured using real time PCR, and mortality rate following vaccination.

Sentinel groups	Results	Days post vaccination				
		0	7	14	21	28
G1: ASF/Needle	PCR Mortality	0/10* 0/10**	**1/10** 0/10	**6/8** **2/10**	**8/8** **2/10**	- **10/10**
G2: ASF/ Hipradermic®	PCR Mortality	0/10 0/10	0/10 0/10	0/10 0/10	0/10 0/10	0/10 0/10
G3: PRRS/Needle	PCR Mortality	0/10 0/10	0/10 0/10	**4/10** 0/10	**6/10** 0/10	**8/10** 0/10
G4: PRRS/ Hipradermic®	PCR Mortality	0/10 0/10	0/10 0/10	0/10 0/10	0/10 0/10	0/10 0/10
G5: ASF/Control	PCR Mortality	0/10 0/10	0/10 0/10	0/10 0/10	0/10 0/10	0/10 0/10
G6: PRRS /Control	PCR Mortality	0/10 0/10	0/10 0/10	0/10 0/10	0/10 0/10	0/10 0/10

*Number of positive pigs/total pigs.
**Number of pigs died/ total number of pigs in the group.

Discussion & Conclusion

Our findings revealed the potential for ASF and PRRS transmission whilst using a needle during vaccination.

On the contrary, the possibility of applying intradermal vaccines with a needle-free device such as Hipradermic® inhibits both ASF and PRRS transmission and could be used as an alternative vaccination method which avoids the iatrogenic transfer of pathogens between animals via shared needles.

References

1.Madapong *A et al.* 2021 Safety of PRRSV-2 MLV vaccines administrated via the intramuscular or intradermal route and evaluation of PRRSV transmission upon needle-free and needle delivery. 11, 23107