Evaluation of PRRS and ASF virus dissemination between pigs when using conventional needles and a needle-free device

Nilubol, D.*[1]; Miranda, J.[2]; Romero, S.[2]; Traiyarach, S.[2]; and Tantituvanont, A.[3]; Palabrica, D.*[4].
[1] Department of Veterinary Microbiology, Faculty of Veterinary Science, Chulalongkorn University, Thailand
[2] HIPRA, Amer (Girona), Spain
[3] Department of Pharmaceutic and Industrial Pharmacies, Faculty of Pharmaceutical Sciences, Chulalongkorn University, Thailand
[4] Robina Farms Diagnostic Laboratory, Universal Corn Products Compound, Philippines

*Corresponding author: dachrit@gmail.com, dantepalabrica@yahoo.com

Background & Objectives

African swine fever (ASF) is a highly contagious viral disease of domestic and wild pigs, responsible for massive losses with a mortality rate that can reach 100% in pig populations and that can have serious economic consequences due to export restrictions. ASF has generated one of the main crises in the pig industry in recent years. On the other hand, Porcine reproductive and respiratory syndrome virus (PRRSV) is also one of the diseases which causes the greatest economic losses to the swine industry.

Intramuscular administration using needles has been the main route of vaccination in pigs, although risks associated with conventional needles are high. PRRSV, 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 ASF and PRRSV transmission with conventional needles and a needle-free device.

Materials & Methods

Forty-two, 3-week-old pigs were procured from an ASF-free and PRRSV-free herd. Eighteen pigs were randomly allocated into 6 groups called seeders, with 3 pigs in each, namely IM/ASF, ID/ASF, IM/PRRSV, ID/PRRSV and 2 control groups, NoChal/ASF and NoChal/PPRSV (Table 1). Twenty-four age-matched pigs were divided into 4 groups of 6 each as sentinels: IM/ASFsent, ID/ASFsent, IM/PRRSVsent and ID/PRRSVsent (Table 2).

At 0 days post exposure (DPE), the IM/ASF and ID/ASF groups were contact-exposed to ASF-infected pigs and the IM/PRRSV and ID/PRRSV groups were intranasally inoculated with 4 ml of HP-PRRSV-2 (106 TCID50/ml, 2 ml/nostril). At 7 DPE (0 days post injection (DPI)), 2 ml PBS was administered via the intramuscular route (IM) to the IM/ASF and IM/PRRSV groups using needles, whilst the ID/ASF and ID/PRRSV groups were given 0.2 ml PBS intradermally (ID) using a needle-free device (HIPRADERMIC®, HIPRA, Spain).

Also at 7 DPE, the same needles or needle-free device were used to inject the same volume of PBS to sentinel pigs (1 exposed pig to 2 sentinels) with the same route of injection used for each. Blood samples were collected from the seeders at 0, 7, 14, 21 and 28 DPE and from the sentinels at 0, 7, 14, 21 and 28 DPI. ASF and PRRSV viraemia was evaluated using RT-qPCR.

Results

The ASF and PRRSV exposed groups had the highest viraemia at 7 DPE. Following injection, the IM/ASFsent and IM/PRRSV sent groups were PCR positive at 7 DPI. In contrast, sentinel pigs of both the ID/ASF sent and ID/PRRSV sent groups were PCR negative throughout the experiment.

Conclusions & Discussion

Our findings revealed the potential for ASF and PRRSV transmission through needles during vaccination. On the other hand, the needle-free device inhibits both ASF and PRRSV transmission and could be used as an alternative route of vaccination, avoiding transmission.

Figure 1. Seeder groups

Seeder groups	N° of pigs	Challenge	Injection route	RT-qPCR 7 DPE
IM/ASF	3	Exposed to ASF-infected pigs	Adjuvant 2 ml, IM, using conventional needle	+
IM/PRRSV	3	HP-PRRSV-2, 10^6 $TCID_{50}$/ml, 4 ml/pig, 2 ml/nostril		+
ID/ASF	3	Exposed to ASF-infected pigs	0.2 ml, ID, using Hipradermic®	+
ID/PRRSV	3	HP-PRRSV-2, 10^6 $TCID_{50}$/ml, 4 ml/pig, 2 ml/nostril		+
NoChal /ASF	3	-	-	-
NoChal /PRRSV	3	-	-	-

Figure 2. Sentinel groups

Sentinel groups	N° of pigs	Injection route	Ratio	RT-qPCR 7 DPI
IM/ASF sent	6	Adjuvant 2 ml IM, using conventional needle	Needle used for 1 seeders was used for 2 sentinels	+
IM/PRRSV sent	6			+
ID/ASF sent	6	0.2 ml ID, using Hipradermic®	Hipradermic® used for 1 seeder was used for 2 sentinels	-
ID/PRRSV sent	6			-

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.