Preparation and evaluation of the inactivated multi-strain PRRS vaccine made with viruses isolated from Vietnam

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Introduction

Due to the significant economic losses in Vietnam as well as other countries, Central Vietnam Veterinary Institute (CVVI) has reviewed possible options of the Porcine Reproductive and Respiratory Syndrome (PRRS) vaccine to control the disease nationwide. Several PRRS vaccines imported from abroad have now been used on swine farms in Vietnam, but swine producers and veterinarians have expressed concerns over imported vaccines due to immunological variation among PRRS viruses for cross-protection[1] and inherent high mutation rates in the virus[2,3]. One idea to overcome these concerns was to produce the inactivated multi-strain vaccine made with prevalent viruses from the country. Thus, CVVI as one of national institutes has prepared the MJPRRS® inactivated vaccine with PRRS viruses obtained from Vietnam, and evaluated immune response and efficacyof the vaccine for reducing the virus replication in PRRS naïve 4 week old pigs.

Materials and Methods

In collaboration with MJ Biologics (Mankato, MN, USA), CVVI reviewed 551 PRRS field case samples collected from 2007 to 2011 in Vietnam and ran ORF-5 sequencing for 298 samples. Six out of 298 samples were finally selected to make a trial batch of MJPRRS vaccine. The vaccine has been evaluated in PRRS naïve 4 week old pigs by challenging them3 - 4 weeks after a single vaccination in a tightly controlled environment. Body temperature was measured each day. Weight and blood samples were taken at 0, 5, 10 and 15 dpi for ELISA, PRRS quantitative PCR (Q-PCR) and Western blot analysis.

Results

Two independent tests showed significant differences between vaccinated and unvaccinated pigs in all measures. ELISA results (Figure 1, A) show a significant difference in response time between vaccinated and unvaccinated pigsafter they were challenged. This result agrees with Q-PCR data (Figure 1, B). The vaccinated group showed about a 90% lower virus titer at the highest viremic stage and cleared virus faster compared to the unvaccinated group. It is explained well by the Western blot results in Figure 2 showing antibodies against PRRSV envelope proteins in addition to anti-N-protein (ORF7) antibodies equivalent to the ELISA results. Western blots also showed the antibody from vaccinated pigs had better affinity to theVietnam isolates. Physical observations of body temperature and initial weight gains post challenge indicated a faster response in vaccinated pigs as compared with the unvaccinated pigs.

Figure 1. Comparison of ELISA titers and Q-PCR CT values between vaccinated (•) and unvaccinated pig (Δ) after challenging.

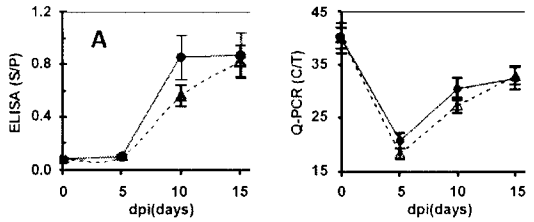
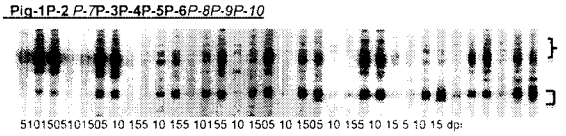


Figure 2. Quality and quantities of anti-PRRSV antibodies in blood samples from vaccinated (bold) and unvaccinated pigs (*italic*) after challenging; antibodies against PRRSV envelope proteins ({) and N-protein ([).



Conclusions and Discussion

The present results show good correlation among the ELISA, Q-PCR and Western blot analysis, and indicate that MJPRRS inactivated vaccine made with Vietnamese PRRS viruses initiates effective immune responses in PRRS naïve pigs. The vaccinated group responded faster to incoming live virus than did the unvaccinated group. As a result, the PRRS virus replication was reduced in the vaccinated pigs compared to the unvaccinated pigs, and those animals recovered faster. This could be a very important factor for reducing virulent PRRS outbreaks by minimizing the secondary infections in practical situations. The improved affinity of anti-PRRSV antibodies in serum from the vaccinated pig suggests that the vaccine should be made with viruses isolated from Vietnam in order to get better cross-protection and better vaccine efficacy.

References

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