

Efficacy of a PRRSV1 vaccine for a PRRSV2 - infected farm in Japan

Shimada, T¹.; Uchiyama, C².; Uchiyama, Y².

¹Katori Livestock Clinic, Chiba, Japan

²JELLY BEANS Ltd., Chiba, Japan

Introduction

Porcine Reproductive and Respiratory Syndrome Viruses (PRRSV) are divided into two species; PRRSV1, mainly detected in Europe, and PRRSV2, mainly detected in North America. In Japan, PRRSV2 vaccines are used because it is PRRSV2 that is mainly detected in that country. The aim of this study was to compare the efficacy of a PRRSV1 vaccine and a PRRSV2 vaccine on a PRRSV2-infected farm in Japan.

Material and methods

This study was conducted on a 2-site farm consisting of a breeding farm and a fattening farm, with a total of 2,200 sows in Japan. On this farm, the breeding farm consists of 2 farms: one that used a PRRSV2 vaccine which had 1,000 sows and another that used a PRRSV1 vaccine which had 1,200 sows. No transmission took place on these farms.

The vaccination protocol for the PRRSV vaccine on this farm is 4 times per year for sows and twice for piglets; at 25 days of age and 55 days of age. This farm had already used the PRRSV2 vaccine and started to use the PRRSV1 vaccine in April 2023. Reproductive parameters and production parameters were recorded from October 2022 to September 2023.

PCR tests and ELISA tests for blood samples from whole herds were conducted three times; in February, May, and September. PCR tests for blood samples from piglets were conducted every month. Every other week, processing fluid was collected and subjected to PCR testing

Results

For whole herds, field strains were detected in blood samples until May, but field strains appeared to have been eliminated in September.

Table 1. PRRS-PCR results for whole herds

| Serum samples | PRRS2 vaccine period | PRRS1 vaccine period(HIPRA) | |
|---------------|----------------------|-----------------------------|--------------|
| | Feb-23 | May-23 | Sep-23 |
| Gilts | neg | neg | neg |
| Sows | field strain | HIPRA strain | neg |
| 30 days old | field strain | neg | HIPRA strain |
| 60 days old | field strain | field strain | HIPRA strain |
| 90 days old | field strain | field strain | HIPRA strain |
| 120 days old | neg | neg | neg |
| 150 days old | neg | neg | neg |

For piglets, field strains were initially detected in 5 out of 6 samples, but the PCR results remained negative from May onwards.

Table 2. PRRS-PCR results for piglets

| Number of samples | PRRS2 vaccine period | PRRS1 vaccine period(HIPRA) | | | | | |
|-------------------|----------------------|-----------------------------|--------|--------|--------|--------|--------|
| | Mar-23 | Apr-23 | May-23 | Jun-23 | Jul-23 | Aug-23 | Sep-23 |
| PRRS Positive | 5(field strain) | 1 | 0 | 0 | 0 | 0 | 0 |
| PRRS Negative | 1 | 5 | 6 | 6 | 6 | 6 | 6 |

With regard to processing fluids, field strains were detected every week before the PRRSV1 vaccination, but were detected only in April after changing to the PRRSV1 vaccine.

Table 2. PRRS-PCR results of processing fluid

| | PRRS2 vaccine period | | PRRS1 vaccine period(HIPRA) | | | | | |
|---|----------------------|--------------|-----------------------------|--------------|--------------|--------------|--------|--------|
| | Feb-23 | Mar-23 | Apr-23 | May-23 | Jun-23 | Jul-23 | Aug-23 | Sep-23 |
| 1 | field strain | field strain | field strain | neg | HIPRA strain | neg | neg | neg |
| 2 | field strain | field strain | field strain | HIPRA strain | neg | HIPRA strain | neg | neg |
| 3 | field strain | field strain | field strain | HIPRA strain | neg | neg | neg | neg |
| 4 | field strain | field strain | field strain | neg | neg | neg | neg | neg |
| 5 | field strain | field strain | field strain | neg | neg | neg | neg | neg |

The rate of abortions and stillbirths when using the PRRSV2 vaccine was 4.57%, but this decreased significantly to 2.19% after the PRRSV1 vaccine had started to be used on this farm. Abortions in late pregnancy that were suspected to be related to PRRS also decreased.

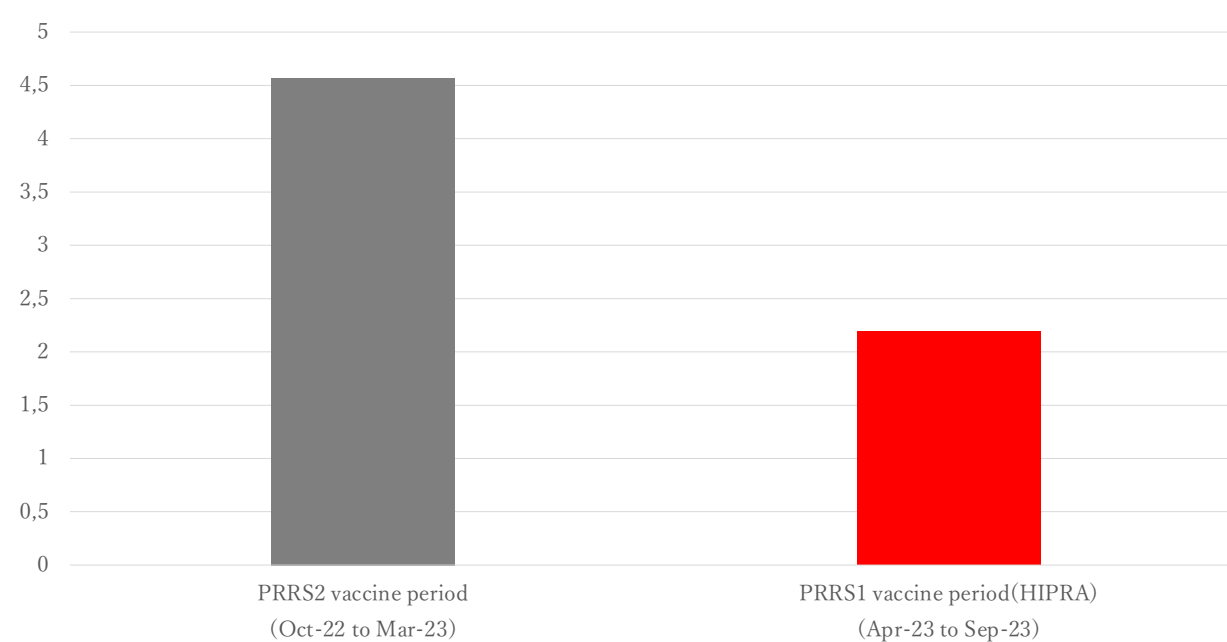


Table 1. PRRS-PCR results for whole herds

Regarding reproductive parameters, there were significant differences in terms of total piglets born and total born alive after the change to the PRRSV1 vaccine. But there was no significant difference in nursery mortality.

Table 4. Farrowing unit and nursery unit parameters

| | PRRS2 vaccine period | PRRS1 vaccine period | P-value | Test |
|------------------------|----------------------|----------------------|-----------|------------|
| | Oct22-Mar23 | Apr23-Sep23 | | |
| farrowing unit | | | | |
| Abortions | 4.57% | 2.19% | <0.001*** | Proportion |
| Total born | 15.13 ± 4.07 | 16.25 ± 3.93 | <0.001*** | T-test |
| Born alive | 14.08 ± 3.82 | 14.61 ± 3.6 | <0.001*** | T-test |
| Stillborn | 1.05 ± 1.55 | 1.64 ± 2.24 | <0.001*** | Wilcoxon |
| Sacrificed | 0.36 ± 0.79 | 0.51 ± 40.95 | <0.001*** | Wilcoxon |
| BAR(%) | 93.53 ± 9.8 | 90.7 ± 12.5 | <0.001*** | Wilcoxon |
| PWMR(%) | 5.15 ± 7.69 | 11.02 ± 15.59 | <0.001*** | Wilcoxon |
| Weaned piglets per sow | 12.73 ± 2.23 | 12.54 ± 2.48 | 0.07 | T-test |
| nursery unit | | | | |
| Mortality (%) | 1.07 ± 0.85 | 0.63 ± 0.72 | 0.06 | T-test |
| Mover to hospital | 2.35 ± 2.14 | 1.5 ± 2.06 | 0.17 | T-test |

Conclusion

In Japan, PRRSV-2 infections have been confirmed on many farms, and vaccines classified as PRRSV-2 are used. Although there are many unknown points regarding the immune reaction between PRRSV-1 and PRRSV-2, there have been reports that suggest cross-protection. We confirmed the effectiveness of a PRRSV-1 vaccine administered intradermally on a PRRSV-2-infected farm.

The results of PCR tests suggest that PRRSV1 vaccination reduced the movement of the PRRSV2 relatively early. Regarding reproductive performance, the decrease in BAR (%) and increase in PWMS (%) were thought to be due to this year's record-breaking high temperatures, although this trend is seen in the summer in Japan, where temperature differences are large throughout the year. After the change to the PRRSV1 vaccine, significant differences were confirmed, with an increase in the total number born and a decrease in abortions and stillbirths.

In particular, there was a decrease in the incidence of abortions in late pregnancy suspected to be related to PRRSV. It is suggested that intradermal PRRSV1 vaccination stabilized PRRSV2 infection in the sow herd at an early stage, which led to an increase in the total number born and a decrease in abortions and stillbirths.

Based on these results, it was speculated that PRRSV1 vaccines administered by intradermal inoculation would be effective at a relatively early stage, even on farms infected with PRRSV2.

Acknowledgement

I would like to express my appreciation to everyone who contributed to this study.