EFFICACY OF INGELVAC® PRRS MLV AGAINST EUROPEAN ISOLATES

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Introduction

Porcine Reproductive and Respiratory Syndrome (PRRS) is a viral infectious disease of swine, which causes important economic losses (1). It was first described in the USA in 1987 and later in Canada and Europe in 1990. Clinical signs are mainly characterized by respiratory problems and reproductive failure causing abortions, mummified fetuses, and stillborn piglets. In addition, the surviving piglets are weak and show growth retardation. The PRRS virus is single stranded and belongs to the Arterividae family, and the genus Arterivirus. The virus has high genetic and antigenic variability. European and American type isolates can be distinguished. Although, genetically they are clearly heterogenic, they are related in terms of serology and cross-protection.

Ingelvac PRRS modified live vaccine, which contains an American type virus, is one available vaccine option world-wide (4). The heterogenic protective property of the vaccine is important for vaccine users. Cross-protection against virus isolate types, which are least genetically related to the American types, is of special interest. Once the immunogenicity of a vaccine strain is proven under heterologous challenge conditions, it can be recommended as a general tool in combating PRRS, despite the variability of the virus. The aim of the present paper is to demonstrate the efficacy of a single dose of Ingelvac PRRS modified live vaccine in protecting offspring from gilts infected with two heterologous virulent field isolates of European type virus.

Materials and Methods

Two experiments were performed (2, 7). In both studies gilts received a single dose of Ingelvac PRRS MLV vaccine intramuscularly and were challenged intranasally at day 90 of gestation. A Spanish isolate 5710 (HIPRA laboratories) was used in the first and Lelystad Virus (10) in the second study. The infectious dose was 10^5 and 10^6 $TCDI_{50}$ and the vaccination-challenge interval was 1 month and 5 months, respectively. After farrowing, the number of piglets mummified, born dead, or born alive in each litter was recorded. Litters were followed until 28 days after farrowing. Blood samples were collected from gilts and piglets, and dead piglets were sampled as appropriate. Serum anti-PRRSV antibodies were assayed by the HerdCheck PRRS ELISA (IDEXX Laboratories, Westbrook, ME, USA). Viral detection of European or American strains was done by RT-PCR (3, 6). In the first study data were analyzed using ANOVA with an F test. If p was significant ($p<0.05$), the 2 groups were compared using the Turkey-Kramer multiple comparisons test which determined differences between groups. In the second study frequency data for two classes were analyzed using Fischer's exact test. All tests on differences between groups were designed as two-tailed tests. Differences were considered to be statistically significant, if $p \leq 0.05$.

Results

All sows were seronegative for PRRS virus at the beginning of the study. By day 30 after immunization all vaccinated sows seroconverted as determined by ELISA. The controls remained negative. At farrowing and, thus, after virus challenge all animals were positive for PRRS specific antibodies.

Significantly more live piglets were born to vaccinated sows than controls (Table 1) in both studies. Significantly more piglets born to vaccinated sows survived till weaning (28 days of age) than controls. These data indicate that Ingelvac® PRRS MLV, which contains an American PRRS virus strain, can protect against heterologous EU-strains.

Table 1: Farrowing results and piglet performance

Challenge strain		Number of piglets born	Live piglets	Dead piglets	Weaned piglets
Spanish	C	62	40%	60%	44%
	V	77	78%*	22%*	68%*
LV	C	55	76%	24%	56%
	V	132	95%**	5%*	73%*

C – controls; V - vaccinates
Percentage of vaccinates is significantly different from percentage of controls (*: $p<0.05$ and **$p<0.01$).

The transmission of the European challenge viruses to the offspring was analyzed by PCR. Significantly fewer piglets born to vaccinated sows were positive in both studies than unvaccinated controls (Table 2). However, the vaccine could not completely prevent virus transmission from the sow to her offspring.

Table 2: Percentage of piglets positive for PRRS virus; cumulative PCR results from new-born till 28 days[1]

Challenge strain	Controls (n)	Vaccinates (n)[2]
Spanish	75% (52)	31% (67)*
LV	89% (53)	11% (132)**

[1]Samples were collected with different frequency in the two studies and included those from dead piglets. Positive piglets had at least one positive result.
[2]Vaccinates were significantly different from controls
(*: $p<0.05$ and **: $p<0.001$).

Discussion

A single dose of the Ingelvac PRRS modified live vaccine significantly reduced piglet loss after both heterologous European virus challenges. In the vaccinated groups significant increases in the number of live piglets was observed. Three to five times fewer piglets were born dead to gilts that had been vaccinated. This confirms results of a similar study that showed reduction of piglet mortality born to vaccinated animals that had been challenged with the heterologous Lelystad Virus virus strain (8). The number of successfully weaned piglets, an important economic factor, was also improved by vaccination.

In a previous study Lager et al. reported complete protection against transplacental infection when gilts were vaccinated and challenged with homologous virus strains (5). In our study vaccination of gilts with a vaccine containing American type virus strongly reduced the transplacental transmission of European type virus to their offspring. However, transmission could not be prevented completely.

The main difference between the two experiments reported here was the time interval between vaccination and virus challenge. The interval was shorter in gilts challenged with the Spanish virus strain, and they were vaccinated during pregnancy. It has been reported earlier that vaccinating

pregnant sows is safe and improves reproductive failure (9). Regardless of the interval between vaccination and virus challenge, it had no influence on piglet protection.

In conclusion, this study showed that Ingelvac® PRRS MLV vaccine was efficacious in the protection of gilts from the clinical and economic consequences of infection with heterologous, virulent European strains of PRRS virus. The farrowing performance of vaccinated gilts was superior to control gilts and piglet losses were reduced. Furthermore, vaccination greatly reduced transmission of both European type PRRS virus challenge strains. It can be expected that Ingelvac® PRRS MLV provides a broad range protection to virtually all currently known PRRS virus isolates. Thus, this vaccine is an effective tool in fighting PRRS.

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