Management and Control of PRRS: Introduction to Ingelvac PRRS MLV

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The Porcine Reproductive & Respiratory Syndrome (PRRS) has been with us now for almost a decade. The first documented outbreaks occurred in North America in 1987 and in western Europe in 1990/91. The first PRRS virus was isolated at the Central Veterinary Institute (ID-DLO) in Lelystad, the Netherlands, in the spring of 1991. In the summer of 1994 the first modified live virus (MLV) vaccine was made available in the USA and Canada.

Control of PRRS

The two methods currently used to control PRRS are Nursery Depopulation and Vaccination, combined with alterations of pig flow patterns, upgraded gilt pool management and other management techniques to reduce the opportunity for the virus to spread. None of these individually will conquer PRRS, but by using various combinations of the above, significant strides towards control can be achieved.

Nursery Depopulation

The first effective control measure (Nursery Depopulation) became available soon after the PRRS virus was isolated and serological tests were developed. This technique has been researched and developed by Dr. Scott Dee in Minnesota. The procedure involves the identification and depopulation of the production area where the PRRS virus is continuously recirculating in a herd. This area in most continuous-flow, farrow-to-finish (or farrow-to-wean) herds is the nursery. Before doing the depopulation, however, two things must first be established:

(1) Identify where the virus is continuously circulating in the herd.
(2) Confirm that it is the ONLY place that the virus is actively circulating ie. there is no viral activity in pigs in any other production areas.

If both of these criteria are met, then the depop of the nursery may proceed. The above two criteria are fulfilled by performing serological tests on a cross-section of the herd. This establishes a serological profile of the herd or a serological fingerprint, so to speak. To do this, a statistically determined number of blood samples, usually 10, is tested from each of the following:

(1) The sow herd.
(2) Nursery pigs.
(3) Finisher pigs.

Analysis of test results allows identification of the area where the PRRS virus is circulating. It also determines whether that is the only area of virus activity. If both of these criteria are met then the depop can proceed. The depop is followed by a clean-up, rest of the nursery and then restart the flow of piglets through the nursery.

Pig Flow Management

All-In, All-Out pig flow with very strict attention to eliminate the very popular practices of holding back slow growing pigs or moving back smaller pigs to be mixed with a younger (smaller) age group. The widespread adoption of SEW (segregated early weaning) and multi-site production technologies in North America over the last few years is an extension of this type of pig flow strategy.

Gilt Pool Management

Isolation and quarantine of incoming replacement gilts to separate buildings for up to 60 days, preferably at a different site from the home farm, is the cornerstone of current gilt pool management techniques. This is then combined with programmed acclimatization that may involve vaccination (before 18 weeks old).

Other Management Tools

Other management techniques include establishing All-In/All-Out pig flow and adopting various measures proposed in the recently announced "McRebel" program:

- No cross-fostering after day 1
- No holding back or moving back pigs
- No feedback of aborted and stillborn fetuses

Vaccination

An MLV PRRS vaccine (RespPRRS® in Canada and USA; Ingelvac PRRS MLV elsewhere) was introduced as an aid in the control of the respiratory form of PRRS in the summer of 1994. It is given (a single dose) intramuscularly (IM) to pigs between 3 and 18 weeks of age. The MLV vaccine induces IFA, SN and ELISA antibodies to PRRS. However, given the current knowledge of the lack of protection by antibodies, the vaccine is most likely providing its protection by stimulating cell mediated immunity (CMI). Activation of CMI is a characteristic of MLV vaccines. IFA antibodies are produced as early as 7 days post vaccination. However, 7 days appear to be insufficient for most field conditions. Thus, timing of vaccination has to be taken into account when implementing a PRRS vaccination program. It is evident that blanket recommendations are not satisfactory since the dynamics of PRRS within each herd are different. Every herd has to be evaluated individually and a suitable program tailored to each herd.

Safety and Efficacy of Ingelvac PRRS MLV

In experimental and field studies, Ingelvac PRRS MLV has proven to be safe and effective in preventing the clinical signs, viremia and leukopenia associated with the respiratory form of PRRS in pigs vaccinated IM at 3-18 weeks of age. Ingelvac PRRS MLV also significantly increased weight gain and reduced the number of treatments following naturally-occurring challenge with virulent field virus.

Safety Studies

Extensive safety studies, conducted both in experimental and field settings demonstrated the safety of Ingelvac PRRS MLV. Safety was demonstrated in pigs given vaccine doses far exceeding that required for immunity, including:

1. ≥ 25x dose in safety and transmissibility studies in conventional pigs.
2. Four field safety studies in pigs in PRRS-positive and PRRS negative herds.

The vaccine virus did not revert to virulence in back-passage studies through conventional-health pigs, caesarian-derived/colostrum deprived pigs or pregnant sows in their third trimester of gestation, the most sensitive animal challenge model known for PRRS virus. Similar to the safety and transmissibility studies, the reversion-to-virulence studies were done at vaccine doses far exceeding the dose titre for immunity, including:

1. ≥ 100 dose in a reversion-to-virulence study in conventional pigs.
2. ≥ 25 dose in a reversion-to-virulence study in CD/CD pigs, and
3. ≥ 25 dose in a reversion-to-virulence study in pregnant sows in their third trimester.

Efficacy Studies

Several studies, including immunogenicity, duration-of-immunity, onset-of-immunity and cross-protection have demonstrated consistent efficacy of Ingelvac PRRS MLV in pigs.

Vaccination consistently and substantially reduced the level and duration of post-challenge viremia, thus reducing the level of PRRS virus in the pig's environment. Vaccination resulted in high immunological response detected by SN antibodies. Vaccination substantially reduced lung involvement and the level of detectable challenge virus from lung tissue following challenge with virulent virus. Vaccination significantly improved weight gains, compared with non-vaccinates, with the weight gains of vaccinates being comparable with those of non-vaccinated, non-challenged pigs.

Duration-of-Immunity

Protection following IM vaccination of weaning-age pigs with Ingelvac PRRS MLV lasts up to 4 months (16 weeks), the longest period tested.

Cross-Protection after Vaccination

The Lelystad (European) and North American antigenic variants represent the two extremes of genetic differences of the PRRS virus. There are, however, numerous isolates which exhibit smaller variations clustered around these two genetic extremes. The vaccine was tested against the two (North American and European) extremes and pigs were protected against both isolates. Demonstration of protection at the two extremes would indicate that it would protect against variants in-between the two extremes. In controlled experiments PRRS-vaccinated pigs had significantly fewer days of fever after challenge with Lelystad virus (LV). The vaccine also reduced both the amount and duration of virus shedding following challenge with LV. Furthermore, no virus was detected in 40% of the vaccinated contact-control pigs during the 28-day post-challenge study period. In comparison, 100% of the unvaccinated contact control pigs became viremic. Controlling virus spread to uninfected pigs in contact with virus-infected pigs is essential in controlling the continued spread of PRRS.

Field Studies

Results of on-going field studies shall be presented.

Vaccine Virus Shedding and transmission

Although shedding and transmission of vaccine virus were not observed under controlled laboratory conditions, field use has now demonstrated vaccine virus shedding amongst animals in a herd.

SEW Production

The advent of SEW and multi-site production systems has given us another tool to control PRRS (and many other diseases!). SEW, however, does not guarantee PRRS-free pigs unless all sows from all contributing herds have been stabilized! This should allow for PRRS-free pigs to be early-weaned and moved into an off-site nursery where adequate biosecurity could prevent all but the airborne introduction of PRRS.

Closing Comments

1. PRRS is a new disease that has exploded in the 1990s. But in less than 5 years producers and veterinarians have learned various techniques to manage and control this disease. More tools are now in place to help us fight PRRS. An efficacious vaccine is now available. We have dealt with other devastating diseases in the past and will certainly face new ones in the future. PRRS is not *that* different. We will conquer PRRS.

Selected References

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