Procedures for taking PRRS out of the breeding herd

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Introduction

• PRRSv costs US swine industry $664M (NPB study 2011)
• Industry direction towards PRRSv elimination, including regional elimination
• Methods to eliminate PRRSv have been validated:
  • Total herd depop/repop, partial depop, and herd closure (Zimmerman et al., 2006)
  • Herd closure is financially advantageous over total depop (Torremorell et al., 2003; Holtkamp 2012)
    • Introduction of gilts is temporarily stopped for at least 7 months
  • Success rate ~ 85%
Chart 1 - Aggregate incidence / week & cumulative since July 1.

1. Data represent 5 systems with 192 sow herds

- % new cases
- 2011
- 2010
- 2009

49%
Chart 4 - EWMA analysis of incidence data

- 2011
- 2009
- 2010
Control

• Objective – live with the virus but *wean PRRSv negative pigs*
  – PRRS negative semen
  – “McRebel” in farrowing
  – Gilt acclimation
    • Resident virus
    • Vaccine
    • No PRRS virus
  – +/- vaccination of sow herd
## Sow herd classification

<table>
<thead>
<tr>
<th>Testing</th>
<th>Infected; Positive unstable</th>
<th>Positive stable</th>
<th>Positive stable</th>
<th>Provisionally negative</th>
<th>ELISA negative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>IIA</td>
<td>IIB</td>
<td>III</td>
<td>IV</td>
</tr>
<tr>
<td></td>
<td>after 4 x 30 over 90 days with virus</td>
<td>after 4 x 30 over 90 days &amp; no virus</td>
<td>&gt;= 60 gilts after &gt;= 60 days</td>
<td>&gt;= 60 samples</td>
<td></td>
</tr>
</tbody>
</table>

**Symbols**
- ▲: Infected; Positive unstable
- △: Positive stable
- ▲: Positive stable
- ▲: Provisionally negative
- △: ELISA negative

**Holtkamp et al. 2010**

[PRRS CAP](http://www.PRRS.org)
Elimination

• Herd closure first described by Torremorell et al (2002 / 2003):
  – “A PRRSV-negative population was established from positive sources by managing the gilt pool and batching the pig flow.
  – It appeared that PRRSV infection, indicated by lack of seroconversion in the offspring, eventually either disappeared or became inactive.”

Eliminating virus from sow herd

- Herd closure for farrow to wean sites
  - Load with gilt replacements
  - Close for at least 7 months
  - Expose with resident virus or vaccine

- Negative semen
- McRebel

- Monitor progress in weaned pigs
Change in no. pigs weaned for 52 weeks after closure in 15 herds

Schaefer & Morrison; SHAP 2007
Sampling Strategy

• Serum for virus or antibody
  • “Random” sample
    • 95% / 5%  = 60 samples
    • 95% / 10% = 30 “
    • 95% / 20% = 20 “
    • 95% / 30% = 10 “

• Risk-based sampling increases sensitivity
  • Aborted sows, lower viability suckling pigs
**Time line for a sow farm**

1. **Herd becomes infected**

2. **PRRS not detected at weaning for at least 90 days**

- **I - Positive unstable**
  - PCR + at weaning

- **II A – Positive stable**
  - Seropositive gilt replacements and/or intentional exposure to live PRRSV or any vaccine (live or killed) in the sow herd
**Time line for a sow farm**

I - Positive unstable
- PCR + at weaning

II A - Positive stable

II B - Positive stable

Herd becomes infected

PRRS not detected at weaning for at least 90 days

Decided to eliminate PRRS virus. No further live virus exposure
Time line for a sow farm

I - Positive unstable
- PCR + at weaning

II A - Positive stable

II B - Positive stable

II - Positive stable

- PRRS not detected at weaning for at least 90 days

Decided to eliminate PRRS virus.
- No further live virus exposure

III - Provisionally Negative
- After > 60 gilts remain seronegative for > 60 days.
Time line for a sow farm

Decided to eliminate PRRS virus. No further live virus exposure

I - Positive unstable - PCR + at weaning

II A - Positive stable
II B - Positive stable

III - Provisionally Negative
- After ≥ 60 gilts remain seronegative for ≥ 60 days.

IV - Negative
- No ELISA +ve sows remain.

Herd becomes infected

PRRS not detected at weaning for at least 90 days
Evaluation of herd exposure methods to produce PRRSv-negative pigs from infected breeding herds (TTNP study)

Linhares D, DVM, MBA; Cano JP, DVM, PhD; Torremorellí M, DVM, PhD; Morrison R, DVM, MBA, PhD.

Presentations: CVM, intl PRRSv symposium, CRWAD, webinar, AASV
Baseline demographic characteristics of the enrolled herds*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>LVI</th>
<th>MLV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number enrolled</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>Prior immunity</td>
<td>14 (56%)</td>
<td>5 (50%)</td>
</tr>
<tr>
<td>RFLP strain 1-4-4</td>
<td>11 (44%)</td>
<td>6 (60%)</td>
</tr>
<tr>
<td>Herd size (Mean ± SE)</td>
<td>3,498 ± 361</td>
<td>2,353 ± 446</td>
</tr>
<tr>
<td>Time from infection to intervention</td>
<td>22 ± 3</td>
<td>19 ± 4</td>
</tr>
</tbody>
</table>

* There were no significant differences between groups at alpha level of 0.05. Prior immunity and RFLP 1-4-4 (Fisher’s exact, p-values 1.000 and 0.471 respectively), herd size and time from infection to intervention, (t-test, p-values 0.082 and 0.631 respectively)
Monitoring

- Herds were monitored for PRRSv by serum PCR
- Monthly testing, starting at 12 weeks post intervention
- Herds were considered as producing negative pigs when 4 consecutive negative PCRs were obtained.
In general, “200 days” is not enough to achieve TTNP:

Cumulative TTNP - all farms

% herds that achieved TTNP

Weeks post whole-herd inoculation

200 days
## Routes of transmission

<table>
<thead>
<tr>
<th>Sow – Sow</th>
<th>Sow-Pig</th>
<th>Pig-Pig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needles</td>
<td>Cross fostering</td>
<td>Cross fostering</td>
</tr>
<tr>
<td>New gilts</td>
<td>Nurse sows</td>
<td>Processing Equipment</td>
</tr>
<tr>
<td>Feed back material</td>
<td></td>
<td>Warming boxes</td>
</tr>
<tr>
<td>Water toughs</td>
<td></td>
<td>Continuous flow farrowing</td>
</tr>
<tr>
<td>Group housing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Translate routes into what happens on the farm**
<table>
<thead>
<tr>
<th>Herd PRRS Status</th>
<th>I (positive unstable)</th>
<th>II (positive stable)</th>
<th>III (provisional negative)</th>
<th>IV (negative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gilt Introductions</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes – Prev. Infected</td>
</tr>
<tr>
<td>Prebreeding vaccines</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Prefarrowing vaccines</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Change needles between sows and gilts</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Manure feedback prefarrow</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Manure Feedback prebreeding</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Tissue or serum feedback to gilts</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Sow Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wash all crates with dry time between litters</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Allow part weaning of rooms</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Change needles and blades between litters</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Use of warming tubs/split suckle boxes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Use Processing carts</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Farrowing House Management Practices</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Movements at less than 24 hours of age only for litter size</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Fall back litter (1 nurse sow per 26 crates)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Pool small pigs in one litter</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Holding pigs at weaning for quality</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Piglet Movements</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Manure Feedback</td>
<td>No</td>
<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
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1. Herd PRRS Status
2. I (positive unstable)
3. II (positive stable)
4. III (provisional negative)
5. IV (negative)
TTBP (weeks)

- Mean: 18.45455
- Std Deviation: 12.70818
- Maximum: 55
- Minimum: 0
- Lower Quartile: 8
- Median: 19.5
- Upper Quartile: 24

Reduction of pigs / 1,000 sows: from LCH to TTBP

- Mean: 2194.948
- Std Deviation: 2194.508
- Maximum: 9250.655
- Minimum: 0
- Lower Quartile: 616.805
- Median: 1767.308
- Upper Quartile: 3151.845

www.PRRS.org
Clean Up Costs

• The basic “Jim Lowe Plan”
  – Close herd for 30 weeks
  – Place as many gilts in farm as possible – up to 20 weeks
  – Do offsite breeding project for last 15 weeks to keep making breed target – but only at normal replacement rate
  – IMPLEMENT STANDARD MANGEMENT PRACTICES

• Costs
  – Breeding project – Rent $20,000 per 2500 sows, Extra labor $5,000-10,000 bonus to pay crew to go off site
  – Increased testing - $5000
  – Total $30,000-35,000 – or $13-14 per sow

• Payback time of 10-12 weeks!
Implications

• Half herds required at least 200 days

• Follow protocols

• Better understanding of factors associated with shorter TTNP
Where we are headed

• Voluntary, producer-driven regional control
  o Low – medium density $\rightarrow$ potential elimination.
  o High density $\rightarrow$ wean negative pigs
    o Filter sow farm
    o LVI and/or live virus vaccine

• Increasing sharing of data to facilitate learning
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