PRRS – The Challenge Continues

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Iowa Pork Congress - 2013
My Background

• 2002 graduate of Iowa State University
• Completed DVM and MS (Veterinary Microbiology)
• Joined Pipestone Vet Clinic in 2002
• Started Pipestone Vet Clinic of Iowa 2008
• Married, 3 boys
Outline

• Biosecurity Review
  – Transmission
  – Filtration

• Immunological Review
  – Vaccines

• Sow Farm Clean up

• Epidemiological Data

• Summary Comments
PRRS Biosecurity

• Transmission via:
  – Animals
  – Semen
  – Fomites
  – Air
Biosecurity - Animals

• Animals are the highest risk for PRRS transmission
  – They propagate the agent
  – Shed in all secretions/excretions
Biosecurity - Animals

• Animals – Sow Herds – Gilts
  – It is critical to have isolation/quarantine space for breeding herds
  – Testing – placement and 2 weeks post placement
    • Oral Fluids or Serum

• Wean-to-Finish sites
  – All In/All Out flow
  – Continuous flow sites tend to circulate PRRS and other diseases once infected
Biosecurity - Semen

• Semen is still a risk today
  – Critical to work with a reputable source and understand their testing protocols
  – Do not use semen until test cleared for the batch/boars that collection day
Biosecurity - Fomites

• Standardized D&D
  – D&D = Disinfection and Down time
  – All inanimate objects entering a farm subject to D&D
  – Spray all materials, equipment, etc with Synergize and dry
  – 1 hour and Dry are the critical elements – must meet both criterion
Biosecurity - Trucks

• Transport is highly correlated with most disease movement

• Are your trucks clean, really clean?
  – Inspected?
  – Audited?

  – The industry needs to re-evaluate current transport biosecurity
Biosecurity - Air

• A lot of new knowledge – we continue to learn
Aerosols

• Viral quantities found in air were significantly higher in 2011 than in previous years
  – Hypothesized strains continue to become more virulent/more readily shed

• Vaccination with Modified Live Vaccines significantly reduces aerosol shedding
  – Vaccination of sites surrounding sow farms is a good idea
Project 1: Experimental design

**Challenge Control Room (West)**

**Challenge Vaccine Room (East)**

- **Controls**
  - 1,000 pigs
  - PRRSv infected
    - 1-18-2
  - Sham inoculated
    - 2x saline

- **Treatments**
  - 1,000 pigs
  - PRRSv infected
    - 1-18-2
  - Vaccinated
    - 2x ATP
## Results (Linhares et al., Vaccine, 2011)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Vaccine group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td># PRRSV positive air days*</td>
<td>17 days</td>
<td>31 days</td>
</tr>
<tr>
<td>Duration of aerosol shedding*</td>
<td>45 days</td>
<td>70 days</td>
</tr>
</tbody>
</table>

* = Differences significant at p < 0.05
Project 2

• Recently completed:
  – Vaccinate first
  – Challenge second
  – Outcomes: shedding and performance
Experimental design

- **Controls**
  - 1,000 pigs
  - Sham inoculated
    - 1x saline
  - Challenged
    - 1-18-2

- **Treatments**
  - 1,000 pigs
  - Vaccinated
    - 1x MLV
  - Challenged
    - 1-18-2

**Challenge Control Room (West)**

**Challenge Vaccine Room (East)**
Preliminary data: Air Sampling
Filtered Farms

• Filter bypass continues to be a challenge
  – Backdrafting through fans
  – Filter Box design/seal
  – Cracks, leaks, drains, etc.
Filter Farm Data

• Our data would indicate there is a significant reduction in the frequency of PRRS infections on filtered farms, but it isn’t perfect

• When comparing pre and post filtration, we are observing a 61% reduction in new viral introductions
The impact of air filtration is significant, but not perfect.
How often are farms challenged?

Considering your reputation, I'm glad you only gave me the flu. PRRS
Recipient Populations: Perimeter Testing

5 filtered farms selected for sampling
- Recipient farms (PRRSV-negative)
  - n = 4
  - sampled 30 m outside of building
  - collector placed into direction of prevailing wind
- Source farm (PRRSV-positive)
  - n = 1
  - sampled at exhaust fan
  - 1 mile SE of neighboring recipient farm

Daily air sampling: March 1-31, 30 minutes per day

Outcomes
- Frequency: # PCR-positive air days
- Dose: Quantity of viable virus (TCID50/mL)
- Diversity: ORF 5 sequencing of selected samples
## Results

### Frequency

<table>
<thead>
<tr>
<th>Farm number</th>
<th>PRRSV positive air days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (recipient)</td>
<td>64%</td>
</tr>
<tr>
<td>2 (recipient)</td>
<td>41%</td>
</tr>
<tr>
<td>3 (source)</td>
<td>75%</td>
</tr>
<tr>
<td>4 (recipient)</td>
<td>65%</td>
</tr>
<tr>
<td>5 (recipient)</td>
<td>0%</td>
</tr>
<tr>
<td>Historical</td>
<td>3-11%</td>
</tr>
</tbody>
</table>
Diversity

<table>
<thead>
<tr>
<th>Farm number</th>
<th># sequences</th>
<th>Recipient</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>1-18-2 (old)</td>
<td>1-3-2 (source)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-18-2 (new)</td>
<td>1-8-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-26-2 (new) (n=2)</td>
<td>1-4-2 (ATP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2-5-2 (MLV)</td>
<td>1-26-2 (source)</td>
</tr>
</tbody>
</table>

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Conclusions

• Under the conditions of this study:
  – 1. Viral loads in aerosols from source populations infected with new variants were significantly higher than historical levels.

  – 2. PRRSV aerosol challenge of recipient populations was a frequent event.

  – 3. Viral loads in recipient aerosol samples collected at the perimeter level were significantly higher than historical levels.

  – 4. Extensive viral diversity was observed in air samples collected around the perimeter of recipient populations.
Slurry

- Pigs shed PRRS in feces for 7 days
- Virus survives in slurry for 14 days at 40 degrees and 5 days at 50-60 degrees
- Virus survival in solids is less than 14 days in standard pit environments
- Virus is aerosolized during agitation if population is shedding virus
- Virus can be found at least at 30 meters from applicators during application
- Pumping equipment can be fomites for transmission of virus
Slurry application risk: Proof of concept
PRRS Immunology

• Vaccines
  – New vaccine in the market
  – Modified Live Products
    • PRRS MLV – Boehringer Ingelheim
    • PRRS ATP – Boehringer Ingelheim
    • Fostera PRRS – Pfizer
  – Killed Products
    • MJ PRRS
    • Sirrah
    • Autogenous
PRRS Vaccines

• Ongoing research on efficacy
• Have been proven scientifically to:
  – Reduce lung lesions
  – Reduce duration of viremia
  – Reduce shedding of virus via aerosols
  – Improve certain production parameters
Load%lose%homogenize%to%eliminate%PRRSv%from%acutely%infected%breeding%herds.

Part 1: me to neg pig production (TTNP)

Part 2: production analysis (TTBP/total loss)

Part 3: negative herd factors, gilt mgmt

Linhares D, DVM, MBA; Cano JP, DVM, PhD; Torremorell M, DVM, PhD; Morrison R, DVM, MBA, PhD.
Treatment: \((LVI) vs (MLV)\)
Prior (PRRSvB infection: yes vs no)
Vaccinated herds had significantly less total loss.
LVI herds reached negative sooner

MLV herds had less total loss

Median 9 me to be negative was (~210 days)

Herds with prior PRRSv infection reached negative sooner, recovered production faster and had less total loss

Farms with up to 3 monthly PCR negative tests with production levels “in control” might still have PRRSv circulating at low prevalence levels

PRRSv monitoring must be done over 9 me
Data Provided from Steve Tousignant, Bob Morrison
Funding from National Pork Board
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Funding from National Pork Board

Aggregate incidence / week & cumulative
Beginning July 1 for years 2009-2012

% of herds with new infections

Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun

2012/13 2011/12 2010/11 2009/10 % herds reporting new infection (2012/13)
Summary Comments

• As an industry, we need to continue to come together to prevent the spread of PRRS
• We need to utilize proven scientific knowledge, not just what might work/seems to work
• We need to continue to research disease movement, immunology, genetics, etc.
• We (as an industry) have cut many corners to decrease cost that are causing problems
  – Down time
  – Sanitation
  – Etc...
Acknowledgements

• Daniel Linhares
• Steve Tousignant
• Dr. Bob Morrison
• Dr. Scott Dee
• Pipestone Research Committee
  – Dr. Scott Dee, Dr. Joel Nerem, Dr. Barry Kerkaert, Dr. Luke Minion, Dan Hanson