PRRS Virus Overview

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Coordinator
MN N212 Voluntary Regional PRRS Elimination Project
Acknowledgements

• University of Minnesota-SDEC
  Montse Torremorell, Bob Morrison,
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• Supporting Veterinarians
• Participating Producers
Power Point Contents

• PRRS Disease
• Economic Impact of PRRS Outbreak
• Biosecurity
• Managing Herd Outbreaks
• Minnesota N212 Voluntary Regional PRRS Elimination Project
PRRS

Porcine Reproductive and Respiratory Syndrome
Impact of PRRS virus

Abortions

Dead Pigs

Slow Growth
FEVER AND SICK PIGS
Respiratory Disease
What makes PRRSv so NASTY?

- Spreads every way possible (Intrauterine, milk, colostrum, feces, urine, saliva, semen, blood, and aerosol-up to 6 miles)
- It’s Immunosuppressive
- Survives a long time in cold wet conditions
More Nasty

- Highly infectious—only small amount of virus necessary to infect a herd
- Persistent infection up to 200 days in some pigs—shedders
- Mutates easily—makes commercial vaccines effective inconsistently
- Simple blood tests cannot differentiate between field strain and vaccine strain of virus
Some good news: PRRSv only infects pigs—no other species can be infected
# PRRS Survivability Studies

<table>
<thead>
<tr>
<th>Condition</th>
<th>Length of Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frozen</td>
<td>Years</td>
</tr>
<tr>
<td>Moist, Cold, Wet</td>
<td>11 days</td>
</tr>
<tr>
<td>70°F (21°C)</td>
<td>6 days</td>
</tr>
<tr>
<td>98.6°F (37°C)</td>
<td>24 hours</td>
</tr>
<tr>
<td>132°F (56°C)</td>
<td>20 minutes</td>
</tr>
</tbody>
</table>

Pitkin, Otake, Dee, “Biosecurity protocols for the prevention of spread of PRRSv”, Swine Disease Eradication Center, University of Minnesota
# Infectivity of PRRS virus in pig manure at different ambient temperatures

Median PRRSv infectious half-life at different ambient temperatures in manure

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Half-life in Manure</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 C (Refrig)</td>
<td>112.6 Hours</td>
</tr>
<tr>
<td>22 C (Room)</td>
<td>14.6 Hours</td>
</tr>
<tr>
<td>37 C (Body)</td>
<td>1.6 Hours</td>
</tr>
<tr>
<td>43.5 C</td>
<td>1.6 Hours</td>
</tr>
<tr>
<td>63 C</td>
<td>2.9 Minutes</td>
</tr>
<tr>
<td>80 C</td>
<td>0.36 Minutes</td>
</tr>
<tr>
<td>100 C (Boiling)</td>
<td></td>
</tr>
</tbody>
</table>
Figure 1 - Half-life of PRRSv-infectivity in minutes from 4 to 80°C in manure and cell growth media environments
Slurry risk (Dee et al, 2011-2012)

• Pipestone research:
  – Pigs shed PRRSV in feces for 7 days.
  – PRRSV survives in slurry 14 days at $4^0$ and 5 days at $10^0$ C.
  – PRRSV survives in pit solids < 14 days.
  – Pumping equipment (agitator & hoses) and personnel attire (coveralls & footwear) are vehicles for mechanical transport of virus.
  – Infectious PRRSV can be aerosolized over short (3m) and long distances (30 m) during application.
Slurry application risk: Proof of concept
FINANCIAL IMPACT OF PRRS

U.S. SWINE INDUSTRY
$640 MILLION TO $1 BILLION

Holtkamp ISU 2011
FINANCIAL IMPACT OF PRRS

$225 to $350 Per Sow-Acute Infection

– Over $150,000 per outbreak on 500 sow unit

--Holck, Polson, 2009 PRRS Compendium
FINANCIAL IMPACT OF PRRS

- Breeding/Farrowing: $74.16 per litter
  Reduction in pigs weaned & Reduced Farrowing Rate

- Nursery: $6.01 per pig
  Increased Mortality; Reduced Feed Conversion; Reduced Average Daily Gain

- Grow/Finish: $7.67 per pig
  Increased Mortality; Reduced Feed Conversion; Reduced Average Daily Gain

--Neumann, JAVMA, 8-1-05
Impact: Change in nursery mortality pre- and post-filtration of study herds-Scott Dee Study

- **Pre-filtration (PRRSV+)**
  - Flow 1: 8.3%
  - Flow 2: 19.8%
  - Flow 3: 13.2%

- **Post-filtration (PRRSV-)**
  - Flow 1: 2.6%
  - Flow 2: 1.9%
  - Flow 3: 1.6%
BIOSECURITY

What is being done on many of today’s swine farms
Bench “Danish” Entry

Biosecurity and Minimal Disease Herds (Danish SPF Entry)

- Street clothes and footwear should be removed in "unclean area."
- Footwear must be disinfected before entering hog barn.
- Footbath
- Protective clothing and boots should be kept here.
- Water-tap with hose.
- Clean Area
- Unclean Area
- Bench
- Wooden-grate passage should be entered only in stocking feet (never in boots).
- Hands must be washed and disinfected.
Dedicated Trailers
Transport Vehicle Sanitation

- About 50% of vehicles used for transporting pigs are not decontaminated between loads (Bigras-Poulin et al., 2007; Schneider et al., 2011; Lambert et al., 2012)

- Currently validated methods for trailer decontamination require truck wash
  - Cost ($300-450 USD of variable cost)
  - Wash, Disinfect, Dry
Clean-up Equipment
Effective Disinfectants

• Synergize: Quaternary ammonium+ glutaraldehyde mixture @ 0.8% concentration
• Virkon: Modified potassium monopersulfate @ 1% concentration
• 2 Hour minimum contact
• Foaming improves visualization and contact

-Pitkin, Otake, Dee U of MN
Effective Disinfectants

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• Virkon: Modified potassium monopersulfate @ 1% concentration
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-Pitkin, Otake, Dee U of MN
Establish “Clean/Dirty” Line for Transport on Farms
EXPANDED FEED STORAGE

Minimum one-week supply to allow flexible, non-emergency delivery
Air filtration in studs and sow farms
Air filtration
Dee, 2005

MERV 16 (EU 9)
95% DOP @ ≥ 0.3 microns
Cost of Filtration

• $150 per sow space (attic only)

• $200/sow space (tunnel ventilation)
PRRS TESTING OPTIONS

• Blood testing
  ELISA (Antibody)
  PCR (Virus)

• Rope Sampling of Oral Fluids
To order DVD and chart:
800-456-7675
OPTIONS FOR MANAGING HERD OUTBREAKS

• CONTROL THE IMPACT
  Live with it, but limit losses

• ELIMINATION OF THE VIRUS FROM HERD
PRRS ELIMINATION TOOLS

• Finishing Sites: Depopulation and Repopulation with Negative Pigs All-in/All-out Pig Flow

• Farrowing Sites: Herd Closure and Rollover “Load, Close, Expose”
Herd Closure Elimination

• **Load** the unit with gilts

• **Close** herd to all new pigs-210 days + 12-43 weeks, median 27 weeks (Linhares)

• **Expose** all pigs to virus (Homogenize) Live Virus Inoculation-LVI Modified Live Virus Vaccination-MLV
Confirm Elimination

- Test weaned pigs until negative PCR (30 piglets monthly until 4 consecutive negative tests)
- Re-load with naïve gilts
- Test new arrivals, which now act as sentinel pigs
- **Rollover** with negative additions
N212 REGIONAL PRRS ELIMINATION PROJECT

A voluntary, producer-led, coordinated, regional disease control program
PROJECT HISTORY

• 2004: Stevens County Voluntary, producer-led, coordinated disease control program was initiated.

• 2009: Project was expanded to include the six surrounding counties.

• 2010: Project was expanded again to include the entire region north of Hwy 212 and all of Renville County.
GOALS OF REGIONAL ELIMINATION PROJECT

- Identify the swine herds in the area
- Invite participation by signing participation agreement
- Determine PRRS status of each herd
- Encourage elimination if herd is positive
- Encourage improved biosecurity if herd is negative
PARTICIPATION AGREEMENT

- Allow sample collection to identify PRRS status
- Access and share diagnostic results
- Allow mapping of sites
- Give up confidentiality for PRRS status

*SHARED INFORMATION IS A PRIVILEGE, NOT A RIGHT!*
# Map Legend - AASV

<table>
<thead>
<tr>
<th>Category</th>
<th>Symbol</th>
<th>Color/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unknown</td>
<td>●</td>
<td>pink</td>
</tr>
<tr>
<td>I Positive</td>
<td>▲</td>
<td>Red – can insert white v into symbol if vaccinated with live</td>
</tr>
<tr>
<td>IIa Stable &amp; vacc live</td>
<td>▲</td>
<td>Orange</td>
</tr>
<tr>
<td>Stable and LVI</td>
<td>▲</td>
<td>Orange with red mask</td>
</tr>
<tr>
<td>IIb Stable</td>
<td>▲</td>
<td>Yellow</td>
</tr>
<tr>
<td>III Provisionally negative</td>
<td>▲</td>
<td>Light green</td>
</tr>
<tr>
<td>IV ELISA Negative</td>
<td>▲</td>
<td>Dark green</td>
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## N212 Progress Report

<table>
<thead>
<tr>
<th>Category</th>
<th>2009</th>
<th>Feb 2012</th>
<th>Jan 2013</th>
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<tbody>
<tr>
<td>Sites Identified</td>
<td>446</td>
<td>874</td>
<td>812</td>
</tr>
<tr>
<td>Signed Participation Agreements</td>
<td>266</td>
<td>321</td>
<td>408</td>
</tr>
<tr>
<td>Positive PRRS Sites</td>
<td>38</td>
<td>46</td>
<td>89</td>
</tr>
<tr>
<td>Stable Vaccinated</td>
<td></td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Negative PRRS</td>
<td>247</td>
<td>257</td>
<td>273</td>
</tr>
<tr>
<td>Empty Sites</td>
<td></td>
<td>77</td>
<td>88</td>
</tr>
<tr>
<td>Unknown Status</td>
<td>181</td>
<td>571</td>
<td>343</td>
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</tbody>
</table>
Welcome to PRRS.org!
Welcome to PRRS.org, the official site for the PRRS Coordinated Agricultural Project (CAP).

Supported Actions
- Meritorious, Multi-Investigator Research
- Extension Activities
- International PRRS Symposium
- Educational Workshops
- Partnerships with External Stakeholder Groups

Goals
The goal of the PRRS CAP is to develop tools and deliverable knowledge that will reduce both animal suffering and economic losses to producers and society through the control and/or elimination of the PRRS virus.

Objectives
- Development of Tools and Knowledge
- Investigation of Vaccines - Immunity, Epidemiology - Ecology and Host Genetics
- Extension: Focused on Projects

PRRS Coordinated Agricultural Project
The control and elimination of porcine reproductive and respiratory syndrome (PRRS) will alleviate a major source of economic loss and animal suffering. The impact of PRRS is approximately $500 million in losses each year to U.S. producers.

For this reason, USDA funded the PRRS CAP that enabled the collective talents of scientists, veterinarians, producers, and allied industry researchers to develop innovative strategies for the control and eventual elimination of PRRS in the U.S.

The recent appearance of highly pathogenic PRRS in Asia and its potential threat to U.S. swine herds brings a new sense of urgency to this project. The activities supported by the CAP are the result of extensive stakeholder input and, when integrated into a logic model, identify well-focused outcomes and impacts as well as a detailed road map for the control and elimination of PRRS.

Funding and Support
- Funding for this four-year project was awarded by the United States Department of Agriculture in 2008
- Significant infrastructure support is provided by the National Pork Board
- Actively managed by a stakeholder board in coordination with a project director, co-project directors and a diverse group of PRRSV research scientists and stakeholders
SDEC
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