PRRS Virus – Within Herd Transmission Dynamics

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Food Supply Veterinary Medicine
Iowa Feed and Nutrition Seminar
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Overview
• Introduction
• Study
• Survival analysis
• Findings
• Summary

Introduction
• PCV2 getting under control …. Now back to PRRS
• PRRS transmission
  – Between herds
  – Within herds
• A lot we still do not know
  – Don’t have answers
  – What are the nutrition needs of these pigs

How contagious is PRRS?

PRRS transmission

<table>
<thead>
<tr>
<th>Route</th>
<th>ID_{50}</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQ (parenteral)</td>
<td>~10</td>
</tr>
<tr>
<td>Intranasal</td>
<td>~8,000</td>
</tr>
<tr>
<td>Artificial Insemination</td>
<td>~31,600</td>
</tr>
<tr>
<td>Oral</td>
<td>~158,500</td>
</tr>
<tr>
<td>Aerosol</td>
<td>??</td>
</tr>
</tbody>
</table>

Herman et al 2005

Study
• Prospective cohort study
• Identify Farm – willingness to participate
• Tagged 20 pigs on arrival to nursery
• Tagged pigs had to stay together through out the entire study (nursery & finishing)
• Bleed pigs at start and every 2 weeks until gone to market
• Collected data on start and end weights as well as several other parameters
Study

• Bleeding every 2 weeks from approx. 3 wks of age until market
  – PRRS ELISA on all samples (detect antibodies)
  – PCR for PRRS on 1st bleed (detect virus)
• 26 barns
  – 2 Stayed PRRS negative
  – 1 Sold mid nursery
  – 1 Vaccinated for PRRS with MLV
  – 15 from 3 sites with 5 barns each
  – 7 Independent positive flows

Study

• 520 animals enrolled
  – 104 PCR positive (20%) at start
• 5,516 samples collected
  – 3,995 positive ELISA (72.4%)
  – 1,521 negative ELISA (27.6%)
• 54 deaths (10.4%)
  – 4 no samples (7.4%)

Survival Analysis

• Logistic regression:
  – Outcome = Yes or No
  – Calculate OR or RR
• Survival analysis:
  – Similar to logistic regression
  – Look at time to event
    • How long it takes for outcome to occur
    • Does not have to be death

Survival Analysis

• Calculate hazard function
  – Instantaneous potential per unit time for the event to occur given the individual has survived up to this time
• Then compare hazard functions from two group and get a hazard rate
  – Similar to an odds ratio
  – Cox PH regression model

Survival Analysis

• Compare TIME to event
• In this case we looked at time to seroconversion
  – An increase from negative titer to a positive titer (S/P ≥ 0.4) that is maintained for at least 2 consecutive bleedings
  – Modified definition of seroconversion = 1st upward tend or 1st positive change in pattern

Survival Analysis

<table>
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<tr>
<th></th>
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<tbody>
<tr>
<td>ELISA-1</td>
<td>ELISA-2</td>
<td>ELISA-3</td>
<td>ELISA-4</td>
<td>ELISA-5</td>
</tr>
<tr>
<td>4 wks</td>
<td>6 wks</td>
<td>8 wks</td>
<td>10 wks</td>
<td>12 wks</td>
</tr>
<tr>
<td>0</td>
<td>0.025</td>
<td>0.72</td>
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<td>0.72</td>
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<tr>
<td></td>
<td>0.067</td>
<td>1.08</td>
<td>0.69</td>
<td>1.68</td>
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<tr>
<td></td>
<td></td>
<td>0.535</td>
<td>1.38</td>
<td>1.53</td>
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= Original definition for seroconversion
= Adjusted definition for seroconversion
ELISA values ≥ 0.400 are considered positive for PRRS
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<th>Total days to event</th>
<th>Number seroconverted</th>
<th>Incidence rate</th>
<th>Days to seroconversion</th>
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<tr>
<td>1</td>
<td>2,716</td>
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<tr>
<td>2</td>
<td>2,786</td>
<td>0</td>
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Positive Only | 14,774 | 379 | 0.025653 | 39.0 | 33 |

**PCR (-) @ Start**

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**PCR (+) @ Start**

**Start Weight**

- Red = PCR + at start
- Blue = PCR - at start

**Average PRRS ELISA Values - ALL Farms By Breed Sequence**

**Red = Small**

**Blue = Large**
Summary

• Survival analysis is an exciting way to look at outcomes
• PRRS virus is not very contagious
  – Slower moving in a herd
  – Dragging out the outcome
• Pigs nutritional needs will vary
• There is definitely a lot more to be learned

Acknowledgements

• National Pork Board
• Dr. Locke Karriker and Lori Layman
• Veterinarians in the field
  – Willingness to cooperate
  – Time and effort
  – Access to farms
• VDL staff

Questions?

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