Transmission of PEDV in Growing Pigs

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It took Mother Nature about 50 million years to make a pig
It took Man about 5 thousand years to domesticate swine
It took Man about 50 years to industrialize swine production.
It takes Mother Nature hours to make a new virus!
Porcine Epidemic Diarrhea Virus (PEDV)

- USA / Research Perspective

- Field reports – Epidemic Endemic

- Experimental data

- Reality vs. Research
Research Challenges

- Limited resources
- Most important questions
- Complement the research of others
PEDV Control

• Stop transmission of virus to susceptible pigs
  – Eliminate virus
  – Develop Protective Immunity
Field Reports

• Epidemic Disease
  – Rapid spread through USA
  – Very fast through some large production systems
    10 days > 20,000 sows
  – Some production systems not infected yet

• Endemic Disease
  – Stable Status
  – Unstable Status
Epidemic Transmission

- Pig to Pig – Direct Contact
- Indirect contact within same building/site
- Potential Area Spread
- Transport
- Feed
Transportation

14,000 head/day

602,000 head/day

??? head/day
PEDV USA to Canada
January 24, 2014

PEDV China to USA?
Environmental Stability Infectious PEDV

- Feces 7 days
- Slurry 25C 14 days
  4C  28 days
- Dry feed 7 days
- Wet feed 28 days
- Drinking water 7 days

Goyal, 2014 National Pork Board Project 13-215
Indirect Spread

• Alonso et al. Veterinary Research 2014, 45:73
  Aerosol collection of samples in room of experimentally infected pigs = infectious virus
  Aerosol collection of field samples downwind of positive sow barns = PCR positive, but not infectious

• Hesse et al. National Pork Board 13-228
  Indirect spread in isolation room experimentally infected pigs
Endemic Disease

• Following epidemic phase in most sow herds neonatal pig loss returns to normal in 6-8 weeks
• Some sow herds have “small” breaks of PEDV in neonatal pigs
• Cyclical pattern to re-breaks?
• Post epidemic reports of sows becoming seronegative in several months – susceptible to re-infection?
Endemic Transmission

• Pig to Pig

• Environment
  – Reports of herds going negative for infectious virus based on introduction of naïve pigs
  – 90-150 days to clear virus from herd
PEDV Transmission - Feed

• Mixed opinions
• Mixed experimental results and conclusions
• Others working in this area
Sneezing

Duration of shedding infectious virus?

Potential Area Spread?

Shizzling

Duration of immunity?  Sow? Colstrum?
Young pig infection model

• Day -7  3-week-old PEDV pigs from PEDV negative sows
• Day 0   Challenge of 4-week-old pigs PEDV CO 2013 isolate
• Day 0-35 Collect Rectal Swabs
• When negative – homologous challenge
• Weekly bleed
• Sentinel Pigs
Stationary Group = SG
Principle Group = PG
Sentinel Pig = S1-S4
Naïve Challenge Group = N/C
Young pig model

• Rapid transmission from seeder pig to 100% small group
  – Less than 24 hours Rectal swabs positive
• Mild to moderate diarrhea 2-7 days post exposure
• Shed infectious virus to single contact D7 & D14
• Homologous protection at 7 weeks post wild-type virus infection
Young pig model

- Homologous protection at 7 weeks post wild-type virus infection
- “Vaccinated” pigs no positive rectal swabs
- Naïve challenged pigs rectal swabs 5/5 positive (6-10 days)
- Any differences between “natural” vs. experimental infection
- This study supports NPB 13-228
Eliminate Infectious PEDV in isolation room

• First Day
  – Cleaning room
  – Foaming with Virkon
  – Dry

• Second Day
  – Foaming with Virkon
  – Dry

• Ready to go for naïve pigs
Control of PEDV

• Stop transmission of virus to susceptible pigs
  – Eliminate virus
  – Develop Protective Immunity
    • Feedback to induce wild-type infection in sow herd
Feedback Sow Immunity

• Duration of protective immunity in sows following feedback at least 4-5 months in field conditions
  Murtaugh et al 2014 National Pork Board 13-262

• Clement et al. 2014 National Pork Board 13-263
  Sow field study early data supports NPB 13-262
Vaccine

- Harrisvaccines, Inc  June 16, 2014
  Replication Defective Vector

- Zoetis  September 3, 2014
  inactivated whole virus vaccine