Disease and Diagnostic Update

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Distribution of ISU VDL’s 78,341 Cases Accessions in FY2015
Swine Respiratory Pathogens

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<tbody>
<tr>
<td>Bacteriology</td>
<td>88,100</td>
<td>96,941</td>
<td>119,684</td>
<td>146,940</td>
<td>180,784</td>
<td>179,676</td>
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<tr>
<td>Toxicology/Nutrition</td>
<td>1,852</td>
<td>3,419</td>
<td>4,872</td>
<td>9,046</td>
<td>10,167</td>
<td>10,854</td>
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<td>Histopathology</td>
<td>81,115</td>
<td>81,408</td>
<td>83,324</td>
<td>90,027</td>
<td>87,650</td>
<td>96,636</td>
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<td>Serology</td>
<td>487,101</td>
<td>393,434</td>
<td>472,766</td>
<td>589,910</td>
<td>587,559</td>
<td>559,404</td>
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<tr>
<td>Molecular/Virology</td>
<td>85,028</td>
<td>99,496</td>
<td>137,515</td>
<td>184,822</td>
<td>215,687</td>
<td>309,582</td>
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**Swine Respiratory Pathogens**

- PRRSV: 38%
- M. hyopneumoniae: 26%
- H. parasuis: 8%
- B. bronchiseptica: 7%
- A. pleuropneumoniae: 7%
- PCV: 3%
- AV: 3%
- A. pleuropneumoniae: 2%
- A. suis: 2%
- A. pyogenes: 2%
- Neisseria: 1%
- PRV: 1%
- PRV: 1%
- Other: 0.16%
- Other: 0.12%
- Other: 0.07%
- Other: 0.01%
- Salmonella: 0.01%
Swine Influenza A Trends are Steady

Influenza Subtype Detections

No known H5 found in swine to date; Iowa
Map 1. PEDV: Cumulative Confirmed and Presumptive PEDV Positive Premises since June 5, 2014

PEDV Confirmed Positive and Presumptive Positive Premises since June 5, 2014 (confirmed/presumptive)
Created: 03/16/2016

Figure 1. Number of Confirmed Positive Premises by Week *

<table>
<thead>
<tr>
<th>CUMULATIVE SINCE JUNE 5, 2014</th>
<th>PEDV</th>
<th>PDCOV</th>
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<tbody>
<tr>
<td>Positive Accessions</td>
<td>7,727</td>
<td>797</td>
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<tr>
<td>Accessions Tested</td>
<td>62,515</td>
<td>35,120</td>
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<tr>
<td>Percent Positive</td>
<td>12.4%</td>
<td>2.3%</td>
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In the news........

**USDA Issues Root Cause Investigation Report for Swine Enteric Coronavirus Diseases**

Published Sep 30 2015

September 30, 2015 -- The United States Department of Agriculture’s Animal and Plant Health Inspection Service (APHIS) today released a root cause investigation report outlining potential scenarios for how the Swine Enteric Coronavirus Disease (SECD) virus entered the United States. APHIS examined seventeen potential root cause scenarios, looking to see if they meet all four criteria needed to bring the virus from an overseas location to US pig farms, as well as if there was evidence to support the scenario. While the investigation did not uncover definite proof for any route of entry, a small number of scenarios were deemed plausible.

The scenario that best fit the criteria for virus entry into the U.S. was a virus spread through reuse of contaminated Flexible Intermediate Bulk Containers (FIBCs). FIBCs are commonly used to transport many types of material including soil for flood control, soybeans, pet treats, or almost any kind of bulk material. They are designed to be reused. It is not a common practice to clean and disinfect these FIBCs between uses in the United States.

Evidence collected as part of the investigation suggests that the FIBCs could be potentially contaminated in their origin country and, upon arrival in the United States, are likely being reused. If a contaminated FIBC was used to transport bulk feed or ingredients to the swine feed mill network, a small bit of contaminated material could have been mixed into feed delivered to many locations and spread the virus onto farms.

**Infectious causes of diarrhea by age**

![Graph showing frequency of etiological diagnosis in enteritis cases by age and infectious cause.](image)
Age distribution of rotavirus shedding

- **Group A only**
  - ≤ 7: 6%
  - 8 - 20: 51%
  - 21 - 42: 13%
  - > 42: 10%

- **Group B only**
  - ≤ 7: 10%
  - 8 - 20: 28%
  - 21 - 42: 15%
  - > 42: 7%

- **Group C only**
  - ≤ 7: 5%
  - 8 - 20: 16%
  - 21 - 42: 29%
  - > 42: 25%

**Diagnostic data**
- **Group A**
  - More common post-wean
- **Group B**
  - Seen equally pre- and post wean
- **Group C**
  - More common < 1 wk of age
- **Coinfections are common**

**Agents of pig diarrhea:** > 6 weeks of age (ISU-VDL)

- Salmonella: 25%
- PPE: 20%
- Hemolytic E. coli: 15%
- Rotavirus: 10%
- TGE: 7.5%
- Idiopathic: 5%
- Colitis, nonspecific: 2.5%
- E. coli: 2.5%
- Chronic atrophic: 2.5%
- PCV: 2.5%
- Bacterial: 2.5%
- Coccidiosis: 2.5%
- HBS: 2.5%
- Parasitic: 2.5%
- Brachyspira: 0%
PCVAD Trends Increasing?

PCV2 mutations/genotypes

- **Mutation rate**
  - $1.2 \times 10^{-3}$ substitutions/site/year
  - *Highest rate reported for DNA viruses*

- **Recent report of a mutant PCV2**
  - In a herd with reported vaccine failure
  - Identified PCV2
    - ORF 2 similar to PCV2b
    - ORF 1 similar to PCV2a
      - Combined sequence similar to a China PCV2d with proposed increased virulence
    - One extra amino acid in the ORF 2

- **Multiple genotypes**
  - PCV2b predominates worldwide
  - Global shift from PCV2a to PCV2b
    - North America and Asia in 2005

- **Multiple clusters**
  - Location dependent

- **Recombination**
  - PCV2a/PCV2b virus

- **Dual infection is possible**
Mulberry Heart Disease (MHD)

- 1st described in the late 1960s
- Vitamin E and/or selenium deficiency (1970s)
  - Has been experimentally replicated with diets deficient in both vitamin E and selenium
- Multiple names
  - White muscle disease (generally reserved for ruminants)
  - Microangiopathy (coined first, prior to MHD)
MHD: Causes???

- Vitamin E and/or Selenium deficiency
  - Vitamin E and Selenium responsive
  - Most believe that Vitamin E deficiency is the main component.

- Infectious disease?
  - Reports of *Streptococcus suis* and possibly *Haemophilus parasuis* infection as a cofactor

Possible risks factors for MHD

- Stocking density $\rightarrow$ increased stress
- Vitamin A deficiency
- High moisture corn
  - Fungal growth decreases Vitamin E
- High fat diet – polysaturated fats
- Selenium deficient soil $\rightarrow$ decreased levels in corn and soybeans
- Antibiotics
  - Sulfur containing drugs $\rightarrow$ Chelated by antioxidants
- Water
  - Metal levels
- Iron Injections
Are lameness issues increasing?

- Importance of lameness
  - Welfare issues
  - Increased mortality
  - Decreased growth efficiency

- Concerns as likely enhanced by:
  - Increased market weights
  - Improved growth rates
  - Variation in feed ingredients

Neto et al 2012

Osteochondrosis

- Focal disturbance of bone formation
- Vascular compromise causes the focal disturbance
- Vascular issues are associated with multiple etiologies
  - Trauma, sepsis
- Confounding issues
  - Weight, conformation, copper status

All pigs have some degree osteochondrosis
Metabolic bone disease

- Name given to nutritional bone disease associated with one or multiple of the following
  - Calcium
  - Phosphorous
  - Vitamin D
  - Deficiency or ratio problem

- **Rickets** is the name applied to growing pigs
- Dog-sitting, sudden death or muscle twitching are potential clinical signs
- Diagnosis
  - Gross → soft ribs (bend before breaking), broken bones, enlarged ribs
  - Microscopic → thickened growth plate
  - Analyte testing → serum for calcium, phosphorous and vitamin D
Mycoplasma spp. arthritis

- **Mycoplasma hyosynoviae**
  - Typically older pigs
  - Arthritis only
  - Red-tinged joint fluid

- **Mycoplasma hyorhinis**
  - Younger pig
  - Polyserositis
  - Fibrinous arthritis
Mycoplasma spp. arthritis

- **Mycoplasma hyosynoviae**
  - Common late finishing or gilt lameness issue
  - Swollen joints → not typical
  - Lesions often seen in the stifle (knee)

- **Mycoplasma hyorhinis**
  - Early finishing lameness
  - Swollen joints → yes
  - Lesions in stifle or hock
  - Need to differentiate from other bacteria

Common swine etiologies; infectious

MHS joint fluid

MHR joint fluid
Hemorrhagic Bowel Syndrome

• Originally: Syndrome of sudden deaths in whey-fed pigs; 1959

• Current:
  • Sudden death of previously healthy pigs
  • Sporadic, from 0-4% mortality (20-33% of total mortality)
  • More common in summer in pigs 18-26 weeks
  • Many “HBS” deaths are really partial volvulus / intestinal torsion
  • No gender differences

Hemorrhagic Bowel Syndrome

• Risk factors:
  1. Anything that contributes to inconsistent feed intakes
  2. Large meals
  3. Fighting, playing, mounting behavior

• Possible pathogenesis:
  • Disruption of feed intake → microflora “bloom” toxemia, allergy?

• Diagnosis by exclusion → becomes a “default diagnosis”
  • Rule out volvulus, torsion, gastric ulcer, etc.
Hemorrhagic Bowel Syndrome

Complete volvulus: segmental necrosis
Gastric Ulceration

- Location = pars esophagea
- Increased frequency with modern production
  - intensive housing
- No sex predication
  - Equal amongst barrows and gilts
- Increased growth promotes (high health)
- Prevalence at slaughter 32-64%
- Development and resolution
  - 12-24 hrs
  - Can heal quickly too
  - Chronic 5-51 days
Gastric Ulceration

• Risk factors

“Anything that causes an empty stomach”

• Out of feed event
• Erratic feeding practices
• Stress → social or environmental
• Disease → typically respiratory disease
• Feed particle size
• High carbohydrate diets
• Mycotoxins → feed refusal
• Copper toxicity
• Vitamin A toxicity

Gastric Ulcer
Must look at pars esophagea
May be intermittent bleeding
→ anemic but no blood clot in stomach
Usually dark feces (melena)
Questions???