Swine Dysentery
A Reemerging Problem?

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Iowa State University
Outline

I. Role / Background
II. ISU-VDL
III. Swine Dysentery
IV. Question / Answer
Serving Iowa Food Animal Agriculture
Comprehensive Diagnostic Service, Teaching, and Discovery
(Iowa’s only Full-Service & Fully Accredited Veterinary Diagnostic Laboratory)

Processing 45,000 cases/year from livestock producers
Applying world-class technology to solve real-world problems
ISU VDL Diagnostican receives the case from practicing veterinarian

Select diagnostic tests based on history and gross lesions

Serology  Molecular Diagnostics  Histopathology  Bacteriology  Toxicology  Virology

Results coordinated to arrive at a diagnosis

Transmit diagnosis to and assist local veterinarian with intervention strategies and establishment of best practices
Comprehensive Diagnostic Service, Teaching, and Applied Research

- Create = New Knowledge & Capabilities
- Share = Students, Practitioners, & Stakeholders
- Apply = Providing World Class Diagnostic Services
Network of Interdependent Relationships to Improve Food Animal Agriculture

Suppliers Of Health Products

Production Animal Medicine

Veterinarian

Veterinary Diagnostic Lab

Pathology  Virology  Bacteriology  Serology  Toxicology  Parasitology  Epidemiology

Genetics  Facilities / Environment  Nutrition  Health  Management  Business / Finance

Producer

Food Animal Agriculture

Consumer

Regulatory Agencies

* Strategic Alliances → Service, Innovation Teaching
75% Swine, 10% Bovine, 10% Poultry, 5% Other
≈ $13M/year budget; ≈ 30% State Support and 70% Fees
Swine dysentery (bloody scours): A Reemerging Problem?

ISU VDL Update

March 6 – 9, 2012
Iowa Pork Regional Conferences
Background

- *Brachyspira* spp. are gram-negative, oxygen-tolerant, anaerobic spirochetes
  - Capable of colonizing the intestines of many species including swine, rodents, dogs, humans, and birds

- Varying degrees of pathogenicity are noted within some *Brachyspira* sp. and between hosts
  - Co-infections with both pathogenic and non-pathogenic *Brachyspira* spp. may occur
<table>
<thead>
<tr>
<th><strong>Brachyspira</strong> species</th>
<th>Common / Potential hosts</th>
<th>Clinical disease</th>
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<td>Swine dysentery; ducks and rodents asymptomatic</td>
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<tr>
<td>‘<em>B. sp. SASK30446</em>’</td>
<td>Pigs, others?</td>
<td>Dysentery-like disease in swine</td>
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Swine dysentery

- First described in 1921
- The causative agent was identified in 1972
  - *Brachyspira (Treponema) hyodysenteriae*
Swine dysentery

- Economically significant disease most prevalent in grow-finish swine
  - Often associated with high mortality
  - Estimated that between 1970 – 1990, dysentery cost the U.S. swine industry at least $64 million per year

- Management issues often contributed to disease severity and persistence…
“Then vs. Now”

Common issues prior to 1990:
- Outdoor to solid floors
- Feeder pig production and commingling
- Cattle lots converted to finishing
Swine dysentery

- Largely disappeared from U.S. swine herds by the mid-1990s
  - Improved management
  - Introduction of SD-free breeding stock
  - Improved biosecurity / sanitation
  - Availability of effective drug treatments for elimination
Swine dysentery

- Recognizing signs of dysentery:
  - Dysentery generally manifests 7 – 14 days after initial infection / may occur secondary to stress
  - Soft to watery feces are often noted first
  - Diarrhea with blood and mucus occur as disease progresses
  - Uneven pig growth, increased mortality, and reduced feed efficiency follows
Swine dysentery

- Clinical signs
  - Severe diarrhea with **blood** and **mucus**
B. hyodysenteriae: Variation in feces consistency and composition
Walking pens ➔ finding feces and pigs takes time and diligence.
Swine dysentery

- Gross lesions can be variable:
  - Mucoid and hemorrhagic colitis
Swine dysentery

- Gross lesions can be variable:
  - Necrotizing and mucohemorrhagic colitis
Phenotypic characteristics of *Brachyspira*

- Beta-hemolysis
  - Strong vs. weak

- Ring phenomenon
  - Enhanced hemolysis around slits in the agar
  - Positive vs. negative
Laboratory identification

- Historically, differentiation was based upon phenotypic traits and biochemical testing of isolates.

Table 6
Differentiation of porcine *Brachyspira* species by biochemical reactions

<table>
<thead>
<tr>
<th>Group</th>
<th>Hemo-lysis</th>
<th>Indole production</th>
<th>Hippurate hydrolysis</th>
<th>α-gal&lt;sup&gt;a&lt;/sup&gt;</th>
<th>β-glu&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Species indicated</th>
</tr>
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<tr>
<td>I</td>
<td>strong</td>
<td>±&lt;sup&gt;c&lt;/sup&gt;</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td><em>B. hyodysenteriae</em></td>
</tr>
<tr>
<td>II</td>
<td>weak</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
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<tr>
<td>IIIa</td>
<td>weak</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>±</td>
<td>-</td>
<td><em>B. pilosicoli</em></td>
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<sup>a</sup>α-gal = alpha-galactosidase activity.

<sup>b</sup>β-glu = beta-glucosidase activity.

<sup>c</sup>Negative isolates have only been reported from Belgium, Germany and Canada.
Laboratory identification

- Polymerase chain reaction (PCR) testing has allowed a more rapid and more precise means of identification from culture isolates.

- PCR at the ISU VDL has historically screened for 2 *Brachyspira* species:
  - *B. hyodysenteriae*
  - *B. pilosicoli*
Current trends

Since 2007, the following trends have been noted from submissions to the ISU VDL:

- An increase in the number of cases submitted with clinical signs suggestive of swine dysentery (SD)
- Increased frequency of positive *Brachyspira* culture and an increase in the number of SD diagnoses
- A steadily increasing number of cases with clinical signs, lesions, and culture results characteristic of SD (strong beta / ring +) where *B. hyodysenteriae* was NOT identified by PCR
Summary of *Brachyspira* Cultures at the ISU VDL

![Graph showing the number of cases of different *Brachyspira* species from 2003 to 2011.](image-url)
Current trends

- **Dysentery-like disease in swine**
  - A diagnosis of SD, by definition, requires isolation of *B. hyodysenteriae* from clinical specimens
  - However, disease indistinguishable from SD has been observed in the ISU VDL and reported elsewhere from which a *Brachyspira* sp. other than *B. hyodysenteriae* was isolated:
    - ‘*B. suanatina*’
    - ‘*B. sp. SASK30446*’
    - *B. intermedia*
    - Other potentially novel species untypable by current PCR
Intervention

- When a suspected index case is identified:
  - Early consultation with your veterinarian is essential
  - A complete necropsy with submission of fresh and fixed tissues to the VDL is necessary to confirm a diagnosis
  - Appropriate medication strategies can be applied once the diagnosis is confirmed
Intervention

- Pigs can shed spirochetes indefinitely

Need to stop the anal-oral shunt

- Eradication and control measures must account for environment and herd dynamics.
Measures of Impact

- **Decreased:**
  - Feed conversion
  - Average daily gain

- **Increased:**
  - Culls
  - Mortality

- **Costs:**
  - Estimates vary but can be as high as **$17.50** per pig in severely affected systems
  - Range $9.50 - $17.50
Prevention

Potential reservoirs for *Brachyspira* spp.:

- Infected Pig Populations
- Live-haul Transport
- Rodents
- Lagoon water / water fowl
- Feed trucks
- Farm personnel
- Visitors / vehicles
Prevention

- Persistence estimates:
  - Mice: at least 1 year
  - Rats: 2 days
  - Dogs: 2 weeks
  - Birds / Waterfowl: at least 3 weeks
  - Pigs: indefinitely
  - Pits & Lagoons: at least 60 days
Swine dysentery

- Sources of exposure:
  - Iowa finishes approx. 1/3 of pigs marketed in the U.S.
  - Yet, Iowa imports roughly 75% of the pigs finished here.
Brachyspira risk factors and **DISEASE EXPRESSION** are on a continuum:

**Organism factors**

- **Chemotaxis, viscotaxis**
- **Endotoxins, cytotoxins, LOS**
- **Increasing hemolysins**

**Host / Environment factors**

- **Digestibility, fermentation**
- **Dynamic microflora**
- **Dose, mixed infections**
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Question / Answer