Risk of ASFV in Feed

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Why Feed?

• Porcine epidemic diarrhea virus
  – Last major transboundary animal disease introduced into U.S.
  – Introduced April 2013
    • Spread rapidly
    • 10% of herd died within 1 year
  – Unveiled **risk of feed** as vehicle for virus introduction and spread
Feed as a Transboundary Viral Disease Vector
What is the risk of feed or feed ingredients serving as a route for ASFV introduction and transmission?
3 Part Approach

1. Determine **survival** in feed and feed ingredients under transboundary model
Transoceanic Model

- Feed Ingredients
  - 5 g ingredient + $10^5$ TCID$_{50}$ ASFV
- Environmental Chamber
  - Temperature, relative humidity
- Timetable: 30 days
- Diagnostic methods
  - PCR, VI, Bioassay

Dee et al., 2018
# ASFV Georgia 07 Survival in Feed

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>SVA (FMDV)</th>
<th>ASFV (PRRSV 174)</th>
<th>BVDV (CSFV)</th>
<th>VSV</th>
<th>CDV (NiV)</th>
<th>IAV-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybean meal-Conventional</td>
<td>(+)</td>
<td>(+)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
</tr>
<tr>
<td>Soybean meal-Organic</td>
<td>(-)</td>
<td>(+)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
</tr>
<tr>
<td>Soy oil cake</td>
<td>(+)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
</tr>
<tr>
<td>DDGS</td>
<td>(+)</td>
<td>(-)</td>
<td>(+)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
</tr>
<tr>
<td>Lysine</td>
<td>(+)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
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</tr>
<tr>
<td>Choline</td>
<td>(+)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
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</tr>
<tr>
<td>Vitamin D</td>
<td>(+)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
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</tr>
<tr>
<td>Moist cat food</td>
<td>(+)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
</tr>
<tr>
<td>Moist dog food</td>
<td>(+)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
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<td>(-)</td>
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<tr>
<td>Dry dog food</td>
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<tr>
<td>Pork sausage casings</td>
<td>(+)</td>
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<td>(-)</td>
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<td>(-)</td>
<td>(-)</td>
</tr>
<tr>
<td>Complete feed (+ control)</td>
<td>(+)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
</tr>
<tr>
<td>Complete feed (- control)</td>
<td>(+)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
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<tr>
<td>Stock virus control</td>
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</tr>
</tbody>
</table>

- **Promoted virus survival**
- **No detectable virus**

Dee et al., 2018
3 Part Approach

1. Determine **survival** in feed and feed ingredients under transboundary model

2. Investigate **oral dose** and transmission in feed through natural feeding behavior

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**EMERGING INFECTIOUS DISEASES**

Volume 25, Number 5—May 2019

*Research*

**Infectious Dose of African Swine Fever Virus When Consumed Naturally in Liquid or Feed**


Author affiliations: Kansas State University, Manhattan, Kansas, USA

DOI: 10.3201/eid2505.181495
Transmission of ASFV?
Determine the **infectious dose** and the **risk of infection** for ASFV Georgia 2007 via natural drinking and feeding behavior.
Experimental Design

Niederwerder et al., 2019. *Emerging Infectious Diseases.*
ASFV Oral Exposure

Niederwerder et al., 2019 *Emerging Infectious Diseases.*
Infection probability for repeated ASFV exposures

$10^4$ TCID$_{50}$ has **25% probability at 1 exposure**  

Probability close to **100% at 10 exposures**

Nursery (4 exposures/d) vs Finisher (40 exposures/d)

Niederwerder et al., 2019 *Emerging Infectious Diseases.*
3 Part Approach

1. Determine **survival** in feed and feed ingredients under transboundary model

2. Investigate **oral dose** and transmission in feed through natural feeding behavior

3. Assess tools for **mitigating** risk of transmission in feed and feed ingredients
Acknowledgements

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