Influenza A Virus Environmental Contamination in Exhibition Swine Settings

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Student Summer Research Projects
Sarah Lauterbach – Weigh-in data
Courtney Wright – Tack data
Alison Martin – Hand sanitation data

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Agricultural Exhibitions

- Non-commercial swine raised in a variety of scenarios
- Pigs may have been shown multiple times
- Only swine contact many individuals have occurs at the fair
- Pigs and people comingle for a prolonged period of time
Exhibitions with Swine Shedding IAV
Study 1: Detection of swine-lineage influenza A virus on inanimate environmental surfaces during swine corralling at agricultural fairs
Fair 1: Chute Diagram

TAG

SCALE

Surface A: Plastic Board
Surface B: Plastic Board
Surface C: Metal Scale Doors
Fair 1: Virus Detection - PCR and Isolation Results

- **Ct Value**
- **Time (00:00)**
- **Legend:**
  - Pigs
  - Surface A
  - Surface B
  - Surface C
  - RED Virus Isolation

Graph showing virus detection results over time, with markers indicating different detection levels and time points.
Fair 2: Chute Diagram

TAG

SCALE

Surface A: Wood Board

Surface B: Metal Side Bar

Surface C: Metal Scale Doors
Study 2: Detection of influenza A virus on inanimate fair surfaces

Courtney Wright, AASV Student Poster Competition
Objective:
To document the frequency of IAV contamination of portable fomites at agricultural fairs to identify mitigation strategies for pathogen spread.
<table>
<thead>
<tr>
<th>Surface</th>
<th>Number tested</th>
<th>PCR positives/No. direct contact surfaces sampled</th>
<th>PCR positives/No. indirect contact surfaces</th>
<th>No. of IAV isolates (All from direct contact surfaces)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tack Box</td>
<td>80</td>
<td>11/55 (20.4%)</td>
<td>5/25 (20%)</td>
<td>1 (H3N2)</td>
</tr>
<tr>
<td>Sort Panel</td>
<td>78</td>
<td>10/43 (23.3%)</td>
<td>2/35 (5.7%)</td>
<td>0</td>
</tr>
<tr>
<td>Waterer</td>
<td>82</td>
<td>19/82 (23.2%)</td>
<td>0</td>
<td>3 (H3N2)</td>
</tr>
<tr>
<td>Feeder</td>
<td>86</td>
<td>20/86 (23.3%)</td>
<td>0</td>
<td>2 (H3N2), 1 (H1N1)</td>
</tr>
<tr>
<td>Chair</td>
<td>65</td>
<td>2/18 (11.1%)</td>
<td>4/47 (8.5%)</td>
<td>0</td>
</tr>
<tr>
<td>Feed Container</td>
<td>2</td>
<td>1/1 (100%)</td>
<td>0/1 (0%)</td>
<td>0</td>
</tr>
<tr>
<td>Broom</td>
<td>1</td>
<td>1/1 (100%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fan</td>
<td>2</td>
<td>0</td>
<td>0/2 (0%)</td>
<td>0</td>
</tr>
<tr>
<td>Cooler</td>
<td>1</td>
<td>0/1 (0%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pick</td>
<td>1</td>
<td>0</td>
<td>0/1 (0%)</td>
<td>0</td>
</tr>
<tr>
<td>Wheelbarrow</td>
<td>1</td>
<td>0/1 (0%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Watering Can</td>
<td>1</td>
<td>0</td>
<td>0/1 (0%)</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>400</strong></td>
<td><strong>64/288 (22.3%)</strong></td>
<td><strong>11/112 (9.8%)</strong></td>
<td></td>
</tr>
</tbody>
</table>
Key Findings

1. IAV was detected with PCR on 18.75% of inanimate surfaces
   • ≥1 surface tested positive at 50% of the fairs (8 Indiana and 2 Ohio fairs).
   • Within positive fairs, frequency of IAV detection ranged from 5% to 90%

2. Viable IAV was recovered from 7 surfaces across 4 fairs
   • 85% of virus isolation positive surfaces were plastic

3. Full length genomic sequencing identified H1N1 pdm09 reassortant, human-like H3N2, and cluster IV-A H3N2
   • Nearly identical viruses found in pigs at multiple fairs during 2016
   • H3N2 isolates were ≥ 99% identical to 2016 H3N2v cases found in Ohio and Michigan
Study 3: Adoption of recommended hand hygiene practices to protect public health at agricultural fairs

Alison Martin, Merial Student Poster Competition
**Objective 1:**
To determine the number of agricultural fairs with working hand hygiene stations

<table>
<thead>
<tr>
<th></th>
<th>2013-2015 fairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence</td>
<td>127/162 (78.4%)</td>
</tr>
<tr>
<td>Function</td>
<td>94/107 (87.9%)</td>
</tr>
<tr>
<td>Risk Signage</td>
<td>119/174 (68.4%)</td>
</tr>
<tr>
<td>Wash Procedure</td>
<td>58/134 (43.3%)</td>
</tr>
</tbody>
</table>
Objective 2
To determine the proportion of individuals that utilize hand hygiene stations upon exiting animal barns over a given time

142 of 2,021 (7.03%) observed individuals used the hand wash stations
Objective 3
To determine presence of IAV and/or bacteria on hand hygiene stations

- No IAV was detected on hand hygiene stations, even at fairs with IAV positive exhibition swine.
- Antimicrobial resistant bacterial phenotypes found on hand hygiene stations include:
  - Extended spectrum cephalosporin resistant
  - Fluoroquinolone resistant
- 69.2% of tested stations contained antimicrobial resistant bacteria
Overall Conclusions

• Mitigation procedures, such as disinfecting gates and scales during animal corralling, may decrease virus transmission through this route, potentially lessening IAV prevalence in swine.

• Inanimate objects could be perpetuating the spread of IAV and other microorganisms between exhibitions

• Fairs have followed recommendations to provide risk signage and hand hygiene stations, however fairgoers are not using them
Thank you!