African Swine Fever (ASF)

- African Swine Fever (ASF) virus is a highly resistant virus that infects both domestic and wild pigs
  - Spreads directly through nose-to-nose contact, and indirectly through infected products such as fomites, insects (ticks and flies), and uncooked pork products
  - It is a large, complex virus, which helps to make it hardy and extremely stable in the environment. It can remain viable for long periods of time in blood, feces, and tissues of infected animals
- ASF causes high morbidity and high mortality in pigs
- ASF cannot be spread to humans, so it is not a human health concern. There are currently no vaccine or treatment options for ASF
- Trade restricting disease – lose our export markets
African Swine Fever Spread

Schematic scenario of the ASF movement across the Eastern Europe

Legend:
- ASF endemic area in the African countries
- State borders
- ASF outbreaks' density
  - High
  - Low

Outbreak density has been estimated by Kernel Density procedure (ArcGIS, Earl)
China – Current Status

- **Official Reports**
  - 108 cases with approximately 850,000 pigs lost

- **Unofficial Reports – Multiple confirmations**
  - 1000-2000 cases
  - 10,000,000 Million pigs lost
  - 6,000,000 sows
  - Rumored projections for 2019
    - **100-200 MILLION PIGS** lost
      - Infected pigs and reduced breeding numbers
    - US Industry Produces **110M** pigs per year
Why is this important?

**FIRST YEAR of outbreak in the United States revenue loss by commodity would be**

- $8 billion for pork
  - U.S. exports 25% of pigs that are produced
- $3 billion for beef
- $4 billion for corn
- $1.5 billion for soybeans

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How long will it take to be recognized as ASF Free

**VERY TEDIOUS TO REESTABLISH ASF FREE STATUS**

- 3 years NO outbreak
  - Can be reduced to 12 months if no tick involvement
- No Evidence of ASFV infection for 12 months
  - Active Surveillance is required
- Imported Domestic pigs comply
  - Oh Canada....
- NO ASF in WILD PIG Pop.
  - Surveillance Required. Blood! No viremia or antibodies

LETS JUST AVOID GETTING IT

Marlin Hoogland, DVM
What should you expect to see in ASF Outbreak?

• Fever (104-108F)
  – Be sure to carry your thermometers!!

• Hemorrhages
  – Ears, nose, hind quarters on live pigs
  – Petechial, ecchymosis to frank hematomas

• Bloody diarrhea (melena)

• Anorexia

• Recumbency (lying down, not getting up)

• Abortion (May be primary sign in Sow Herds)
  Will just look like sick pigs initially!! (Salmonella, PRRS, Erysipelas, PCV2, etc)

If you observe any of these signs, contact your veterinarian!!
• ASF moves very slowly at first
• Looks like PRRS, PCV2, etc early on.
  • Don’t see massive hemorrhages right away
• This farm took 2 weeks before mortality increased above baseline!!
What post-mortem lesions might you see with ASF?

- Splenomegaly (large spleen)
  - Very large and friable
- Internal hemorrhages
  - Kidneys (very common)
  - Lymph nodes
    - Gastro-hepatic (very common)
    - Renal
    - Retropharyngeal
    - Others
  - Walls of intestine
  - Lumens

http://www.cresa.cat/blogs/sesc/lesions-de-pest-a-porquina-africana/?lang=en
Pathology of ASF:
Hemorrhagic lymph nodes
ASF: Yes or No??

- Case processed at ISU VDL in Nov 2018
  - PRRS
  - PCV2
  - *Salmonella cholerasuis*
How is the virus spread?

Key Risk factors – why is control proving so challenging?

- Wild / domestic pigs eat anything!
- Contact between Wild Boar and backyard / feral pigs
- Lack of Biosecurity
- Human behavior – poor practices
  - Lack of knowledge / information
  - Money constraints
  - Lack of compensation
- Virus entering the Catering cycle
  - Cured, smoked, raw hams
- Movement of humans / migrant workers with pork products
- Surviving swine becoming carriers?
- Ticks?
- Long distance movement of wild boar – hunting?

Dr. Chris Oura
Key Risk factors – why is control proving so challenging?

4. Role of humans

- Disposal of dead pigs – rivers
- Selling pigs in the face of an outbreak
- Movement of sick pigs to market
- Swill feeding
- Vehicle contamination
- Vets, farm workers and hunters
- Poor levels of biosecurity
- Carcase disposal - flies

Farmers / hunters - Lack of information

Low levels of compensation

Source: Empress Watch, 2013.
ASF virus is relatively stable

- frozen meat: indefinitely
- dry meat and fat: almost one year
- blood, salted meat and offal: more than 3 months
- faeces: over one week

Temperature plays an important role in decreasing the survival duration of ASF virus in any matrix.

ASFV survives the process of putrefaction and carcasses may remain infectious for weeks
African Swine Fever Virus

- Stable in the environment
  - Viable for 7 days at pH 13.4 in presence of 25% serum
  - Will survive:
    - 15 weeks in putrefied blood
    - 1 month in soiled pig pens
    - 70 days in blood on wooden boards
    - 11 days in feces at room temperature
  - Will survive:
    - 3 hours at 50°C
    - 18 months in pig blood at 4°C
    - 150 days in boned meat at 39°C
    - 140 days in salted dried hams

Mebus, 1998
Feed ingredient biosecurity?

What about testing of feed ingredients?

- Dee et al. was able to show that different feed ingredients that are imported from China and Europe could potentially carry infective ASF virus.
- USDA currently does not have a feed testing protocol validated.
  - No testing of feed ingredients will be allowed by USDA
- Producers need to be discussing supply chain biosecurity with their feed suppliers.

https://www.ipic.iastate.edu/AfricanSwineFever.html
What is the oral infectious dose?

- Oral Infectious Dose
  - Water is VERY LOW!!
  - Feed has a higher infectious dose, but probability increases with each meal of infected feed
5. How can it be mitigated?

- Quarantine via ASFV half-life
  - *Viral decay is time × temp dependent*
  - ASFV is stable at cold temps, but is sensitive to heat
  - Currently no direct time × temp for ASFV
  - Extrapolation of other data suggests ASFV risk will be lowered with higher temp

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>ASFV T½ days</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBM-Conventional</td>
<td>4.6</td>
</tr>
<tr>
<td>SBM-Organic</td>
<td>4.7</td>
</tr>
<tr>
<td>Soy oil cake</td>
<td>4.9</td>
</tr>
<tr>
<td>DDGS</td>
<td>Neg</td>
</tr>
<tr>
<td>Lysine</td>
<td>Neg</td>
</tr>
<tr>
<td>Choline</td>
<td>5.1</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>Neg</td>
</tr>
<tr>
<td>Moist cat food</td>
<td>4.6</td>
</tr>
<tr>
<td>Moist dog food</td>
<td>4.2</td>
</tr>
<tr>
<td>Dry dog food</td>
<td>4.1</td>
</tr>
<tr>
<td>Pork sausage casings</td>
<td>4.4</td>
</tr>
<tr>
<td>Complete feed (+ control)</td>
<td>4.3</td>
</tr>
<tr>
<td>Stock virus (+ control)</td>
<td>4.7</td>
</tr>
</tbody>
</table>
### Math: Storage estimate for elimination of ASFV based on 5 day T 1/2

<table>
<thead>
<tr>
<th># storage days</th>
<th>TCID50</th>
<th>(anti-log)</th>
<th>% virus present (% viral decay)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$10^{2.9}$</td>
<td>781</td>
<td>.78% (99.2%)</td>
</tr>
<tr>
<td>5</td>
<td>$10^{2.6}$</td>
<td>390</td>
<td>.39% (99.61%)</td>
</tr>
<tr>
<td>10</td>
<td>$10^{2.3}$</td>
<td>195</td>
<td>.2% (99.8%)</td>
</tr>
<tr>
<td>15</td>
<td>$10^{2.0}$</td>
<td>97</td>
<td>.09% (99.91%)</td>
</tr>
<tr>
<td>20</td>
<td>$10^{1.7}$</td>
<td>49</td>
<td>.05% (99.95%)</td>
</tr>
<tr>
<td>25</td>
<td>$10^{1.4}$</td>
<td>24</td>
<td>.02% (99.98%)</td>
</tr>
<tr>
<td>30</td>
<td>$10^{1.1}$</td>
<td>12</td>
<td>.01% (99.99%)</td>
</tr>
<tr>
<td>35</td>
<td>$10^{0.8}$</td>
<td>6</td>
<td>.005% (99.995%)</td>
</tr>
<tr>
<td>40</td>
<td>$10^{0.5}$</td>
<td>3</td>
<td>.003% (99.997%)</td>
</tr>
<tr>
<td>45</td>
<td>$10^{0.2}$</td>
<td>1.5</td>
<td>.0015% (99.9985%)</td>
</tr>
<tr>
<td>50</td>
<td>$10^{0.0}$</td>
<td>1.0</td>
<td>.0007% (99.9993%)</td>
</tr>
</tbody>
</table>
Biosecurity – Role of Water

• What about water?
  – Preliminary information from KSU shows that the oral infectious dose in water can be as low as 10 viruses!!
    • Will have concerns about the impact of mass burial and contamination of ground water!!
  – Largest break in Romania – 140,000 head
    • Pull water from the Danube river
    • Locals drop dead pigs into river
    • Tested water in the farm
      – PCR POSITIVE FOR ASF!!

Biosecurity – International Travelers

• **Enact an international traveler SOP**
  – International Visitors
    • 5 days downtime once on U.S. soil
    • Ensure no imported meat into U.S.
    • Provide visitors with clothes, shoes in an off-site location
  – Employees visiting FAD country
    • No visiting farms or livestock area
    • Wear different footwear than to the farm
    • No bringing meat purchased overseas to the farm (lunch)
    • Observe 5 night downtime once on U.S. soil
Border Security

• “Beagle Brigade”
• Extra screening for flights from ASF infected countries
• Confiscated pork from China:
  – South Korea $\rightarrow$ POSITIVE
  – Taiwan $\rightarrow$ POSITIVE
  – Australia $\rightarrow$ POSITIVE FOR ASF AND FMD
Are you prepared if your site is infected?

- What do you need to euthanize an entire site of pigs?
- How would you dispose of an entire barn of finishing pigs if infected?
- How would you dispose of an entire sow farm if infected?

https://programs.iowadnr.gov/maps/afo/burial.html
Records of Movement

- Records of all pig movements into or out of each site.
- Be sure to have source and destination PIN’s.
- Move these to computerized records (excel) to facilitate downloads.

**Movement Records**

<table>
<thead>
<tr>
<th>Group</th>
<th>Individual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning date and inventory of the group or lot</td>
<td>Number of identifier applied (recorded by original owner)</td>
</tr>
<tr>
<td>Animal additions including: Source PIN(s), group or lot number, number of head entered</td>
<td>Date moved into a premises and source PIN</td>
</tr>
<tr>
<td>Animal removals including: removal reason, Destination PIN(s), group or lot numbers</td>
<td>Date moved out of a premises and destination PIN</td>
</tr>
<tr>
<td>Ending date and inventory of group or lot</td>
<td>Number of new identifier number (if an identifier has been lost)</td>
</tr>
</tbody>
</table>
Secure Pork Supply Plan
(Funded by USDA APHIS VS and NPB)

Goal: Provide a workable business continuity plan for pork premises with no evidence of the FAD infection and associated industries that is credible to Responsible Regulatory Officials

www.securepork.org
Secure Pork Supply – Additional Recordkeeping

- **Biosecurity**
  - LOS, Site Maps, Movement

- **Active Surveillance**
  - Clinical signs
  - Diagnostic testing

- **Movement records**
  - Need permit to move ANYTHING in or out of site
  - Source and destination PINS
African Swine Fever (ASF) virus is a highly resistant virus that infects both domestic and wild pigs.

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