Introduction to African swine fever

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Key features

• High lethality
• Huge losses (livelihoods, production, trade)
• Very difficult to control once established
• Spreads through infected meat
There are no vaccine or a treatment against ASF

The host

• In Africa, ASF naturally circulates in wild suids that show no clinical signs.
• Domestic pigs of all ages and gender
• Feral pigs and wild boar equally susceptible
• Humans are NOT susceptible
• *Ornithodoros* ticks are the other true reservoir
The virus

- A unique, enveloped, cytoplasmic, double-stranded DNA arbovirus
- Resistant virus to a wide range of T and PH
- Resistant in meat and the environment

One serotype, but > 20 genotypes with numerous subgroups

Variability of a segment in a single gene used for phylogenetic purposes. Nothing to do with the virulence
<table>
<thead>
<tr>
<th>ITEM</th>
<th>ASF SURVIVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoked meat</td>
<td>30 days</td>
</tr>
<tr>
<td>Salted meat</td>
<td>182 days</td>
</tr>
<tr>
<td>Dried meat</td>
<td>300 days</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ITEM</th>
<th>ASF SURVIVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chilled meat</td>
<td>110 days</td>
</tr>
<tr>
<td>Skin/Fat (even dried)</td>
<td>300 days</td>
</tr>
<tr>
<td>Frozen meat</td>
<td>1,000 days</td>
</tr>
</tbody>
</table>
However...

<table>
<thead>
<tr>
<th>ITEM</th>
<th>ASFV SURVIVAL TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooked meat (minimum of 30 minutes at 70°C)</td>
<td>0 days</td>
</tr>
<tr>
<td>Canned meat</td>
<td>0 days</td>
</tr>
</tbody>
</table>

Obvious implications for the epidemiology and disease control

→ Stable in carcases (dead animals) for 3-5 weeks
<table>
<thead>
<tr>
<th>ITEM</th>
<th>ASF SURVIVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood</td>
<td>&gt;90 days</td>
</tr>
<tr>
<td>Feces at room temperature</td>
<td>11 days</td>
</tr>
<tr>
<td>Putrified blood</td>
<td>15 weeks</td>
</tr>
<tr>
<td>Contaminated pig pens</td>
<td>1 month</td>
</tr>
</tbody>
</table>

**How to destroy ASF virus?**

Heat (70°C, 30 min)
Sunlight

Appropriate disinfectants for ASF:

- 2% caustic soda (sodium hydrate)
- Detergents and phenol substitutes
- Sodium or calcium hypochlorite (2-3%)
- Iodine compounds

**Cleaning before disinfection!**
Clinical presentation

- Clinical signs highly variable
  - Depending on virus virulence, breed, route of exposure, infectious dose
  - Sometimes only fever and death, or unspecific signs
  - Presentation in the field not identical to experimental cases
- Within-herd spread may vary greatly

How do pigs/wild boar get infected?

- Direct contact with sick animals or infected blood
- Mating
How do pigs/wild boar get infected?

- Feeding on garbage (scavenging/free-roaming)
- Swill feeding
- Scavenging on carcasses

How do pigs get infected?

- Soft ticks (*Ornithodoros*)
- Other mechanical vectors?
How do pigs get infected?

• Contaminated fomites (vehicles, clothes,...). Infected fodder?

• Iatrogenic
How do pigs **NOT** get infected?

- Aerosol
- Water, i.e. lakes or rivers
- Mechanical vectors (?)

**IT IS ALL ABOUT HUMAN BEHAVIOUR!**
The importance of pig and pork value chains

- High within-country variability
- High seasonality
- Highly dynamic in response to the markets, e.g. an ASF epidemic
- Many unknowns

**BUT UNDERSTANDING THEM WELL IS KEY FOR PREVENTION**

Key epidemiological characteristics

- Despite what textbooks say, ASF is not a highly contagious disease – BUT it is highly lethal
Key epidemiological characteristics

- Despite what textbooks say, ASF is not a highly contagious disease
- ASF usually presents itself in waves
The 4 phases of a transmissible disease

**Introduction**

Despite what textbooks say, ASF is not a highly contagious disease

**Invasion**

ASF usually presents itself in waves

**Epidemic**

Strong seasonality

**Fade out**

Key epidemiological characteristics

- Despite what textbooks say, ASF is not a highly contagious disease
- ASF usually presents itself in waves
- Strong seasonality
### Unpredictable behavior as ASF spreads

**ASF Africa**
- 1910s-Today
- Multiple genotypes
- Sylvatic cycle
- Tick-Pig cycle
- Mostly domestic cycle (as waves)

**ASF in Iberian Peninsula**
- 1960s-90s
- Genotype I
- Pig cycle
- Tick-Free range pigs challenging
- Finally controlled

**ASF jumps (Europe & Caribbean)**
- 1960s-1980s
- Genotype I
- Domestic cycle
- Fast control (sometimes extreme measures)

**ASF in Sardinia**
- 1970s-Today
- Genotype I
- Domestic cycle, (illegal free-range)
- Spill-over in wild boar

**ASF in ex-USSR**
- 2007-Today
- Genotype II
- Pig cycle
- Spill over in wild boar, sometimes for long periods

**ASF in Baltics & Central Europe**
- 2012-Today
- Endemic in wild boar
- Slow spread
- Sporadic outbreaks in pigs

**ASF in Romania**
- 2018
- Genotype II
- Bushfire-like spread in pigs
- Few wild boar affected

**China**
- 2018
- Genotype II
- Only domestic pigs??
Clinical presentation

<table>
<thead>
<tr>
<th></th>
<th>Peracute ASF</th>
<th>Acute ASF</th>
<th>Subacute ASF</th>
<th>Chronic ASF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>High</td>
<td>High</td>
<td>Moderate</td>
<td>Irregular or absent</td>
</tr>
<tr>
<td>Thrombocytopenia</td>
<td>Absent</td>
<td>Absent or slight (late)</td>
<td>Transient</td>
<td>Absent</td>
</tr>
<tr>
<td>Skin</td>
<td>Erythema</td>
<td>Erythema</td>
<td>Erythema</td>
<td>Necrotic areas</td>
</tr>
<tr>
<td>Lymph nodes</td>
<td>-</td>
<td>Gastrohepatic and renal with marbled aspect</td>
<td>The majority of lymph nodes resemble a blood clot</td>
<td>Swollen</td>
</tr>
<tr>
<td>Spleen</td>
<td>-</td>
<td>Hyperaemic splenomegaly</td>
<td>Partial hyperaemic splenomegaly or local infarction</td>
<td>Enlarged with normal colour</td>
</tr>
<tr>
<td>Kidney</td>
<td>-</td>
<td>Petechial haemorrhages, mainly in cortex</td>
<td>Petechial haemorrhages in cortex, medulla and pelvis with renal oedema</td>
<td>-</td>
</tr>
<tr>
<td>Lung</td>
<td>-</td>
<td>Severe alveolar oedema</td>
<td>-</td>
<td>Pleuritis and pneumonia</td>
</tr>
<tr>
<td>Gall bladder</td>
<td>-</td>
<td>Petechial haemorrhages</td>
<td>Wall oedema</td>
<td>-</td>
</tr>
<tr>
<td>Heart</td>
<td>-</td>
<td>Haemorrhages in epicardium and endocardium</td>
<td>Haemorrhages in epicardium and endocardium</td>
<td>Fibrous pericarditis</td>
</tr>
<tr>
<td>Tonsils</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Necrotic foci</td>
</tr>
<tr>
<td>Reproductive alteration</td>
<td>-</td>
<td>-</td>
<td>Abortion</td>
<td>Abortion</td>
</tr>
</tbody>
</table>
Clinical signs

- Generally characterized by the sudden death of pigs
- All ages and both genders may be affected
- Wild boar shows the same clinical signs

Peracute

- high fever (41-42 °C)
- loss of appetite and inactivity
- Sudden death within 1-3 days before any clinical sign.
- Often, no apparent clinical signs nor lesions in organs
Acute (1)

- After 4-7 days incubation period (seldom, up to 14 days)
- Fever of 40-42 °C
- Lack of appetite
- Increased respiratory rate.
- Death within 6-9 days for highly virulent strains, or 11-15 days for moderately virulent isolates.
- Lethality up to 90-100 %
- Ocular and nasal discharge;
- Sleepy and weak, lie down and huddle
- Carcasses in good body condition
Acute (2)

- Infected pigs may show one or several of the following signs:
  - constipation or diarrhoea, which may progress to bloody
  - vomiting
  - abortion at all stages of pregnancy;
  - haemorrhagic lesions, reddening, cyanosis...
Cyanosis (bluing) at the tips of ears

Necrotic lesions on skin of the abdomen, neck and ears
Bloody froth from the nose and mouth
Acute form in wild boar – Clinical signs

• Same signs in wild boar and feral pigs.
• Colour changes and haemorrhages in the skin easily missed in due to darker skin and thick hair.
• The same applies to dark-skinned pig breeds.
Acute form – Mot typical post-mortem findings
Haemorrhagic and enlarged gastrohepatic and renal lymph nodes. Non-diseased tissue is a healthy white/pink colour without inflammation.

Spleen often enlarged, friable (fragile) and shows signs of infarction (dark area). Healthy spleens are uniformly coloured (red-brown) and textured.
Kidneys with notable petechiation on the cortex. Healthy renal tissue is a uniformly coloured light brown without any surface irregularities.

Bloody froth from the nose/mouth and a discharge from the eyes
Haemorrhagic heart

Haemorrhagic bladder
Haemorrhagic stomach

Haemorrhagic intestines
Haemorrhagic liver (and other serosal surfaces)

Pulmonary oedema and consolidation of lung tissue
Excess fluid around the heart and in body cavities.

How about post-mortem findings in wild boar?

Exactly the same!
Haemorrhagic gastrohepatic lymph node

Haemorrhagic kidney
Petechiation on the kidney’s cortex

Spleen enlarged
Thanks for your attention