African Swine Fever

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African Swine Fever
African Swine Fever

African Swine Fever is a tick-borne, contagious, febrile, systemic viral disease of swine.

http://www.ian.bbsrc.ac.uk/images/Asfivirus.gif
African Swine Fever

- Highly contagious viral disease of domestic pigs with up to 100% mortality
- Pigs die as a result of a hemorrhagic fever
Some pigs may develop subacute or chronic forms of the disease.

Control depends on the slaughter and destruction of all infected and in-contact pigs.
There is no vaccine for African Swine Fever
African Swine Fever

Is a serious transboundary animal disease with the potential for rapid international spread

World Distribution in 2004

Disease reported present
Disease reported absent
Data unavailable or incomplete

African Swine Fever 2006
The ASF virus is the only member of the genus asfivirus in the family Asfarviridae*

Large (~ 200 nm) lipoprotein-enveloped, icosahedral, double-stranded DNA virus

ASFV is the only DNA virus that can qualify as an arbovirus.

* “ASFAR”
African Swine Fever
And Related viruses
Etiology

- ASFV is a large, dsDNA, enveloped virus recently classified in the new family *Asfarviridae*
- Rare example of a DNA arthropod-borne virus
- The stability of the virus is a notable feature:
  
  *Infectivity is retained after 15 weeks in chilled meat, and for 5-6 months in processed hams*
Strain Virulence

- **Highly virulent** - 10-100 % mortality by 7-10 days after exposure;

- **Moderately virulent** - Acute illness, a high % of pigs survive;

- **Low virulence** - Seroconversion only.
Environmental Persistence

- Stable at pH 4-13

- Survives at least:
  - 11 days in feces (room temp)
  - 1 month in soiled pig pens
  - 70 days in blood on wooden boards
  - 15 weeks in putrefied blood
  - 18 months in blood at 4°C
Environmental Persistence

- Survival in pork products:
  - 15 weeks in chilled meats
  - 300 days in cured hams ("Parma hams")
  - 15 years in frozen carcasses
Host Range

*Ornithodoros* ticks are believed to be the original host.
Host Range

Soft ticks

- *Ornithodoros erraticus* from ASF-infected farms.
- *Ornithodoros porcinus porcinus (moubata)* from warthog burrows.
- *Ornithodoros* ticks in Haiti, Dominican Republic and California.
Host Range

ASFV is believed to be a tick virus with domestic pigs and wild pigs as accidental hosts.
Host Range

African
Domestic pigs

African Swine Fever 2006
Host Range

In Africa:
- Warthogs
- Bush pigs
- Giant forest hogs

In Europe:
- Wild pigs

http://www.cruisersafaris.com/images/trophy/warthog_tf.jpg
Host Range

- European wild boar
- African wild swine
  - Wart hog
  - Giant forest hog
  - Bush pig

African Swine Fever 2006
Host Range

NOTE –
Collared peccary
not susceptible

White collared peccary
“Javelina”
Incubation Period

Following intranasal-oral exposure, pigs develop fever and leukopenia in 48 to 72 hours.
Incubation Period

- 5 days or less after infection by tick bite.

- 5-15 days after contact with ASFV-infected pigs.

Argasid tick bites on pig ear.
African Swine Fever

Morbidity:
High morbidity — usually 100% in pigs that have contact with one another; 100% in naïve pigs

Mortality:
Highly virulent isolates have about 100% mortality
Moderately virulent isolates range from low percentage to 60-70%.
Morbidity and Mortality

Age
Pregnancy status
Other diseases have effect
General Clinical Signs

- HOT, SICK, RED pigs

African Swine Fever 2006
General Clinical Signs

- In contrast to pigs with hog cholera:
  - African Swine Fever pigs do not develop conjunctivitis or encephalitis
  - Despite high fever, ASF infected pigs stay in good condition, whereas hog cholera infected pigs drastically lose weight
Some groups of pigs may develop diarrhea, but it is not a direct effect of the virus.

Pigs may also develop dark red to purple discoloration of skin on ears, tail, extremities, or skin on hams. (This is a nonspecific sign also seen in other diseases)
Abortion

- Occurs whether isolates are high, moderate or low in virulence.

- Fetuses may be anasarcous.

- May find petechiae in placenta, skin, and myocardium, and a mottled liver.
Clinical Signs

- Coagulopathy, abnormal clotting
- Thrombocytopenia
- Hemorrhages
- Sudden death in peracute
- High fever, low appetite, huddling, shallow breathing, reluctant to move
Clinical Signs

- These signs are influenced by the virulence and the physiological state (age, pregnancy status)

- There are three categories:
  - Highly Virulent Isolate
  - Moderately Virulent Isolate
  - Low-Virulent Isolate
Similar for first 4-6 DPI (days post infection)

After about 2 DPI, pigs develop:
1. Fever of 105-107°F
2. Moderate anorexia
3. Leukopenia

After 4-6 DPI, differences related to different isolates will be apparent
Clinical Signs: High and Moderate

- White skinned pigs will have erythematous skin.

- If left alone, pigs will lie down.

African Swine Fever 2006
Clinical Signs: Highly Virulent

- Pigs eat and move less
- Most die between 7 and 10 DPI.
- It is not unusual to see a pig walking and find it dead a short time later

Clinical Signs

- **Peracute**
  - Sudden death

- **Acute**
  - Fever (105-107°F) –
  - Discolored skin
  - Huddling
  - Diarrhea / melena
  - Abortions
  - Death

African Swine Fever 2006
Clinical Signs:
Peracute or acute disease

African Swine Fever 2006
Clinical Signs

- Huddling
Clinical Signs

- Erythema of skin:
Clinical Signs: Acute/ Peracute
Clinical Signs: Moderately Virulent

- Infected pigs usually have high fever for 10 to 12 DPI. Some mortality occurs at this time.

- After 12 to 14 DPI, temperatures and leukocyte count begins to return to normal levels.
Clinical Signs: Moderately Virulent

- Very young pigs may have high mortality rate and lesions similar to those caused by highly virulent isolates.
Clinical Signs: Moderately Virulent

Some pigs will die at 7 to 8 DPI, frequently caused by hemorrhage into the stomach.

Underlying causes: ASF infection causes prolonged bleeding time.
Clinical Signs: Low-Virulence

- Other low-virulent isolates will cause pigs to have low fever for 2 to 3 weeks, then develop reddened areas of skin that become raised and necrotic.

- Painless enlargements of joints may also appear

- This form is chronic, and may reoccur. The animal will eventually die during an acute episode of the disease.
Clinical Signs: Low-virulence

- Many nonpregnant animals infected with low-virulence isolates may seroconvert but not show other signs of infection.

- Pregnant animals will abort.
Clinical Signs: Chronic

- Transient / recurrent fever
- Stunting / emaciation
- Pneumonia
- Skin ulcers
Gross Lesions
Highly Virulent Virus

- **Peracute deaths**
  - Lesions may be poorly developed

- **Animals that die 7 or more DPI**
  - Classic lesions likely.
Gross Lesions
Highly Virulent Virus

Three lesions most consistent with ASF infection:

1. Greatly enlarged dark red to black friable spleen
2. Enlarged hemorrhagic gastrohepatic lymph nodes
3. Enlarged hemorrhagic renal lymph nodes
Post-mortem exam
Lesions

Swollen necrotic spleen
Hemorrhagic gastro-hepatic lymph nodes
Lesions

Large, necrotic spleen

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Lesions
Lesions

Paracortical hemorrhage in gastrohepatic lymph node.

African Swine Fever 2006
Lesions

African Swine Fever 2006
Gastrohepatic & Renal LN’s
Renal cortical petechiae and ecchymoses
Lesions

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Lesions: Peracute/Acute
Lesions

African Swine Fever 2006
Lesions - Acute

African Swine Fever 2006
Gross Lesions
Highly Virulent Virus

- Other lesions are more variable:
  - Dark red to purple areas of skin on ears, feet, and tail.
  - Petechial hemorrhages on serosal surfaces
  - Renal cortical petechial / ecchymotic hemorrhages
  - Perirenal edema
  - Edema of the gall bladder
  - Swollen liver
  - Pulmonary edema

African Swine Fever 2006
Lesions
Gross Lesions

From 8-12 DPI
- Gross lesions are similar whether pigs are infected with a moderately virulent or highly virulent ASFV.

The main difference between these two types of isolates:
- Splenomegaly is still present,
- More normal color and is not friable.
Chronic ASF: Necrotic skin lesions

Raised reddened areas with central areas of necrosis

Raised reddened area behind the ear.
Gross Lesions
Low Virulent Virus

The most common lesions in chronic ASF:
- Necrotic skin lesions
- Consolidated lung lobules
- Generalized lymphadenopathy
- Swollen joints
- Pericarditis
Epidemiology: Sylvatic cycle in Africa

- Infected Argasid ticks in warthog burrows transmit virus to young warthogs.
  - Pigs remain infected for life.
  - Transtadial, transovarial, sexual transmission.

- Pigs can be raised successfully in confinement with double fencing, proper isolation, and sanitary procedures.
Epidemiology: Epidemic cycle

- Introduction into domestic swine by feeding garbage / swill contaminated with pork scraps.
- Blood contaminated sources
- Direct contact and fomites
  - People
  - Vehicles
  - Equipment
  - Feed
Transmission

Transmission by contact and ticks
provided by Dr Tom McKenna, USDA APHIS IS

African Swine Fever 2006
Transmission

- The soft tick has been proven a vector.
- **Primary Method:**
  - Feeding of uncooked garbage containing African Swine Fever infected pork scraps to pigs.

African Swine Fever 2006
Wild suids in Africa are carriers of the virus
Acquire the virus from *Ornithodoros moubata* that invade warthog burrows
Young warthogs become infected as neonates and retain high viral titres for up to about 3 weeks
Where ASF becomes endemic in domestic pigs, the virus is maintained by carrier pigs
Transmission

Warthog burrow
Transmission

- Ingestion ➔ Tonsil ➔ Local LNs ➔ Viremia
- Virus in excretions and secretions, blood.
- Carrier pigs incriminated in maintaining infection in herds.
- Pigs with mild forms of ASF may shed virus for ~ 30 days.
- Bites of infected ticks.
Transmission

Once a pig is infected, the disease spreads by:
- Direct contact
- Contaminated people, vehicles, feed
- Carrier pigs
- Equipment
Diagnosis

- African Swine Fever should always be suspected where there are febrile pigs
- Necropsy findings include:
  - Greatly enlarged spleen, dark red to black in color, friable spleen
  - Very enlarged, hemorrhagic gastrohepatic lymph nodes
  - Very enlarged, hemorrhagic renal lymph nodes
Diagnosis

Hog Cholera vs. African Swine Fever
- Hog cholera infected pigs become depressed and lose weight, whereas ASF infected pigs have neither symptoms

- Hog cholera is also characterized by a foul-smelling diarrhea
Diagnosis
Laboratory Specimens

- Serum / clotted blood
- EDTA, heparin blood
- Lymph nodes
- Spleen
- Tonsil
- Lung
- Liver
- Kidney

African Swine Fever 2006
Virus isolation

- Haemadsorption test (HAD) of leukocyte cultures.
- Haemadsorption autorosette test of PBLs of suspect pigs.

Pig inoculation

- Requires inoculation of naïve and CSF-vaccinated pigs.
- Not recommended with newer tests available.
Genotyping field strains of African swine fever virus by partial p72 gene characterisation based sequencing method which permits detection and characterization of ASFV variants.

Useful for molecular epidemiological clarification of ASFV.

Diagnosis

Field Diagnosis

- Peracute and Acute Infection

- 3 Classic Lesions:
  1. Large dark friable spleen
  2. Large hemorrhagic gastrohepatic LNs
  3. Large hemorrhagic renal LNs

- Renal petechiae, serosal hemorrhages
Differential Diagnosis

- Classical Swine Fever
- Salmonellosis
- Erysipelas
- Ep erythrozoonosis
- Septicemias
- Porcine Reproductive and Respiratory Syndrome (PRRS)
- Porcine Dermatitis and Nephropathy Syndrome (PDNS)
African Swine Fever - Bibliography


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Tom McKenna, DVM PhD, USDA APHIS, “African Swine Fever”
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W.A. Geering, A.J. Foreman and M.J. Nunn, Exotic Diseases of
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p.218-224. Plus picture web sites (below pictures)
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