



Good
Afternoon





AFRICAN SWINE FEVER

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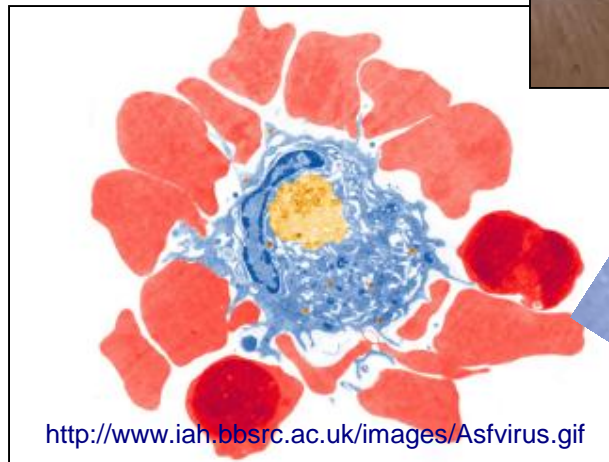
The DEVASTATING VIRUS



African Swine Fever

■ African Swine Fever

is a tick-borne, contagious, febrile, systemic viral disease of swine



African Swine Fever

- Highly contagious viral disease of domestic pigs with up to 100% mortality
- Pigs die as a result of a hemorrhagic fever



African Swine Fever

- Some pigs may develop acute 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
- Data unavailable or incomplete
- Disease reported absent



Main Global Exporters of Pork

■ 1. Germany	US\$ 4.8 B	15.8%
■ 2. U.S.A.	\$ 4.6	15.2%
■ 3. Spain	\$4.1	13.5%
■ 4. Denmark	\$2.7	9.1%
■ 5. Canada	\$2.5	8.4%
■ 6. Netherlands	\$2.2	7.2 %
■ 7. Brazil	\$1.5	4.9%
■ 8. Belgium	\$1.4	4.8%



Main Global Exporters of Pork

■ 9. Poland	\$1.1 B	3.5%
■ 10. France	\$932.9	3.1%
■ 11. Mexico	\$527.6	1.7%
■ 12. Ireland	\$502.6	1.7%
■ 13. Austria	\$433.5	1.4%
■ 14. Hong Kong	\$427.2	1.4%
■ 15. Chile	\$396.5	1.3%





GLOBAL TRADE

■ **CHINA produces over half of the world's pork!!!**





Situation in China NOW...

- The amount of live pigs sold by the affected six provinces reached 174,175,000 occupying 25.3 % of the nationally sold live pigs in 2017.



African Swine Fever

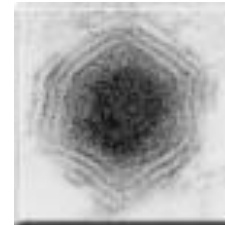
- Etiology
- Host range
- Incubation
- Clinical signs
- Transmission
- Diagnosis
- Differential Diagnosis



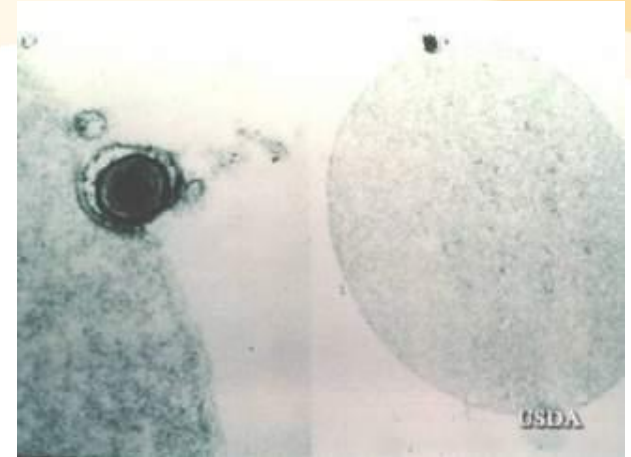
Etiology

- 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.

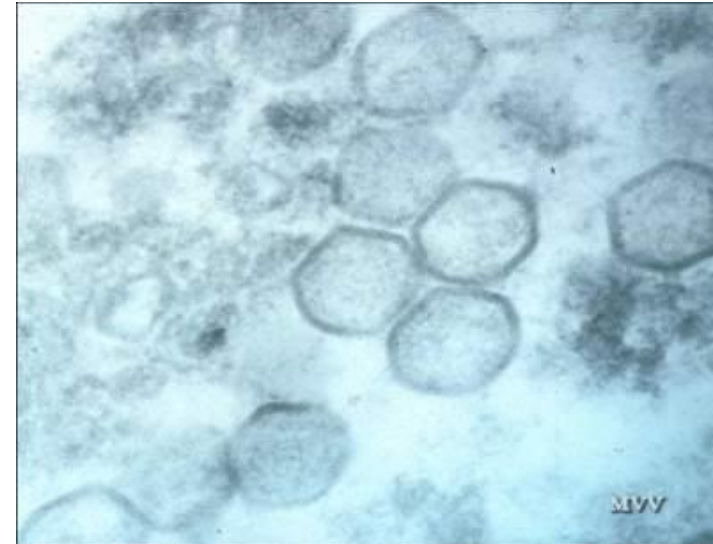


* **“ASFAR”**
African
Swine
Fever
And
Related viruses

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

- Marked variations in virulence of isolates:
 - Highly virulent - 10-100 % mortality by 7-10 days after exposure;
 - Moderately virulent - Acute illness, a high % of pigs survive;
 - Low virulence - Seroconversion





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



Host Range

In Africa:

- Warthogs
- Bush Pigs
- Giant Forest Hogs

In Europe:

- Wild Pigs



Host Range

■ European Wild Boar

■ African Wild Swine

- Wart hog
- Giant forest hog
- Bush pig



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



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



General Clinical Signs

- 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)



<http://www.spc.int/rahs/Manual/images/asf-03.jpg>



Abortion

- Occurs whether isolates are high, moderate or low in virulence.
- Fetuses may be anasarcaous.
- 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



Clinical Signs: High and Moderate

- 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



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) (40.5-41.5)
- Discolored skin
- Huddling
- Diarrhea / melena
- Abortions
- Death



Clinical Signs: Peracute or Acute Disease



Clinical Signs

■ Huddling

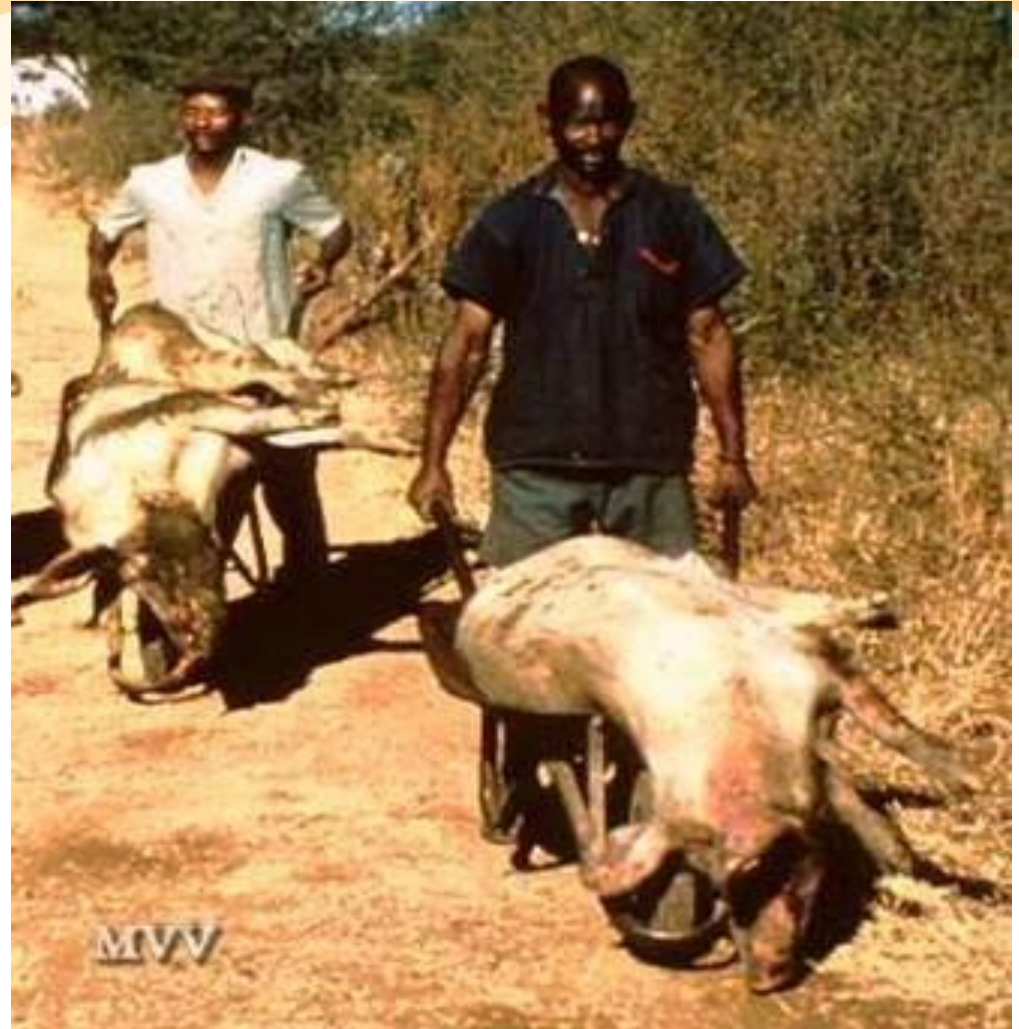


Clinical Signs

■ 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

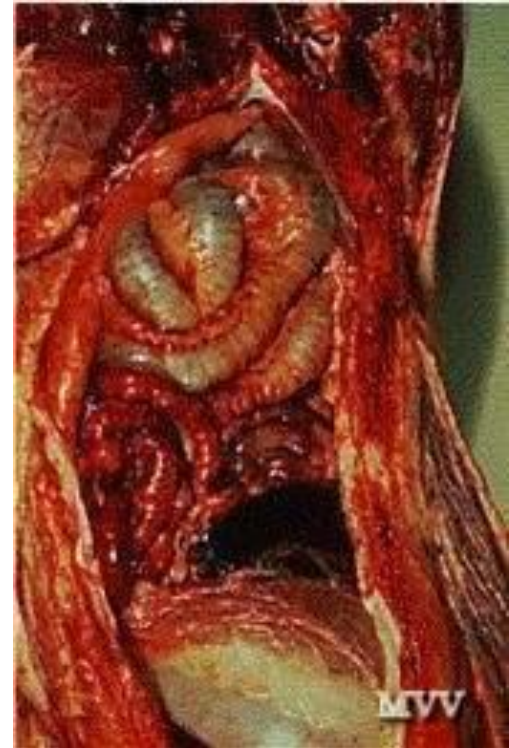
- Very young pigs may have high mortality rate and lesions similar to those caused by highly virulent isolates



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 re-occur. The animal will eventually die during an acute episode of the disease.



Clinical Signs: Low-Virulence

- Many non-pregnant 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



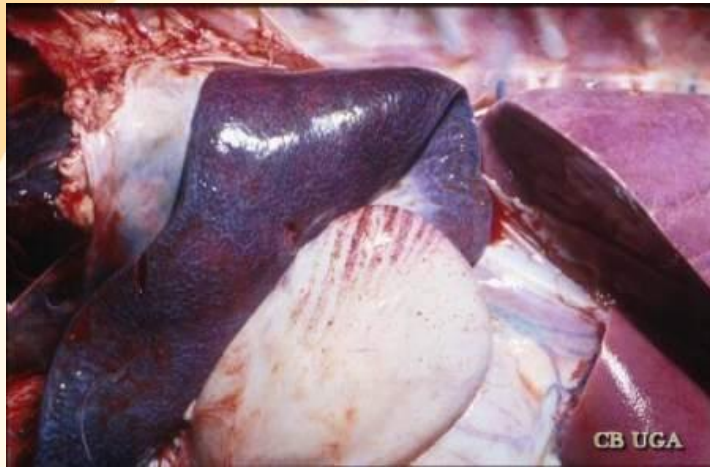
Post-mortem exam



Lesions

Swollen necrotic spleen

Hemorrhagic gastro-hepatic lymph nodes

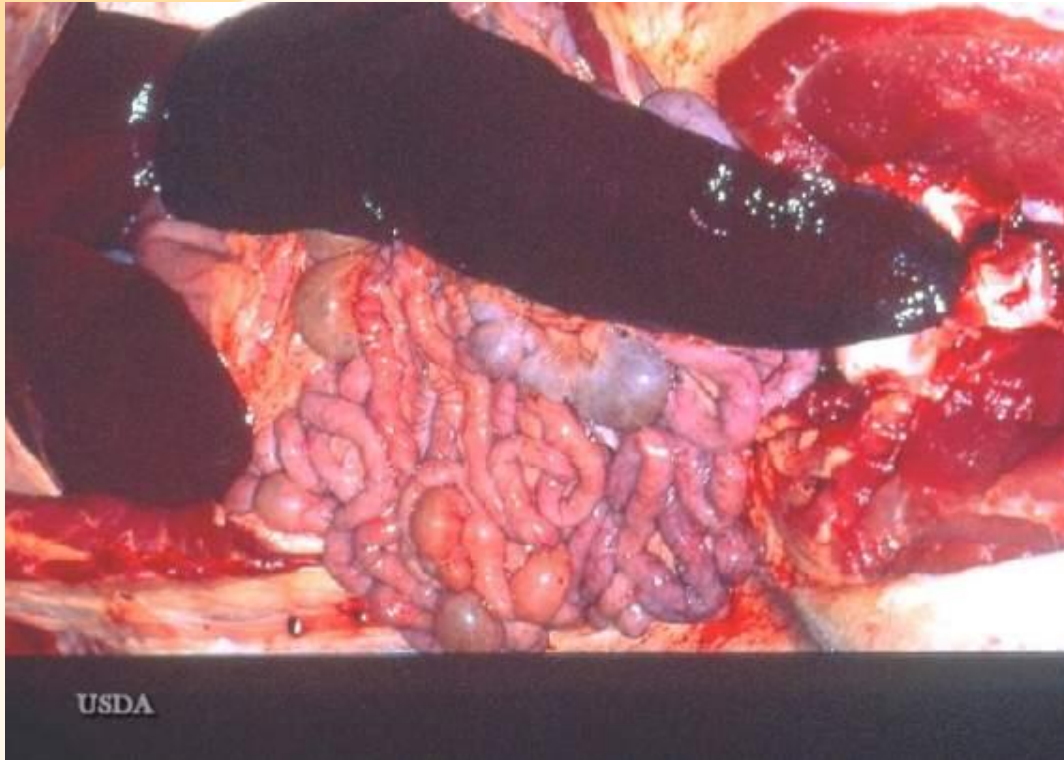


Lesions

Large, necrotic spleen



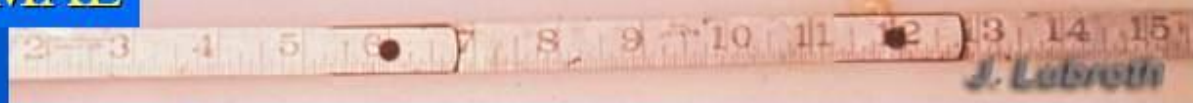
Lesions



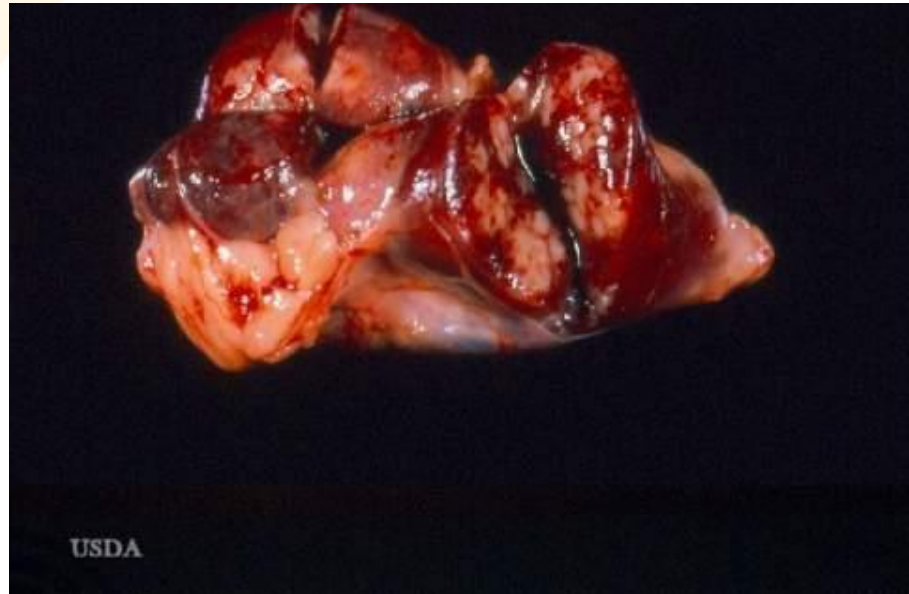
AFS INFECTED



NORMAL



Lesions



Paracortical hemorrhage in gastrohepatic lymph node.



Gastrohepatic & Renal LN's



Lesions



Gross Lesions

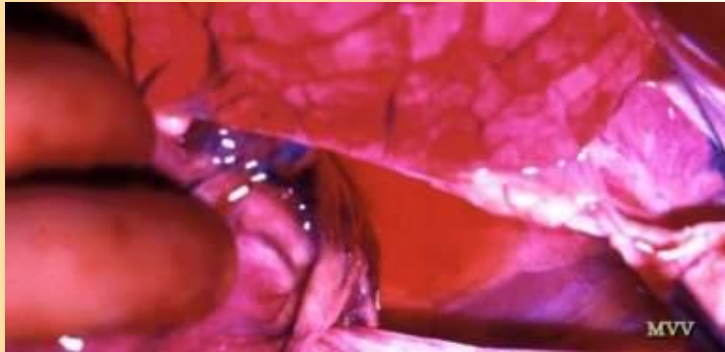
Highly Virulent Virus

■ 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



Lesions



Gross Lesions

Moderately Virulent Virus

- 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



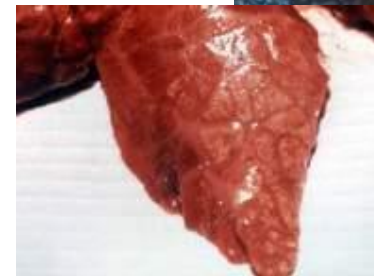
Raised reddened area
behind the ear.



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.
 - 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



Transmission

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



<http://vein.library.usyd.edu.au/links/exoticdiseases/exoimages/Trd276.jpg>



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



Diagnosis

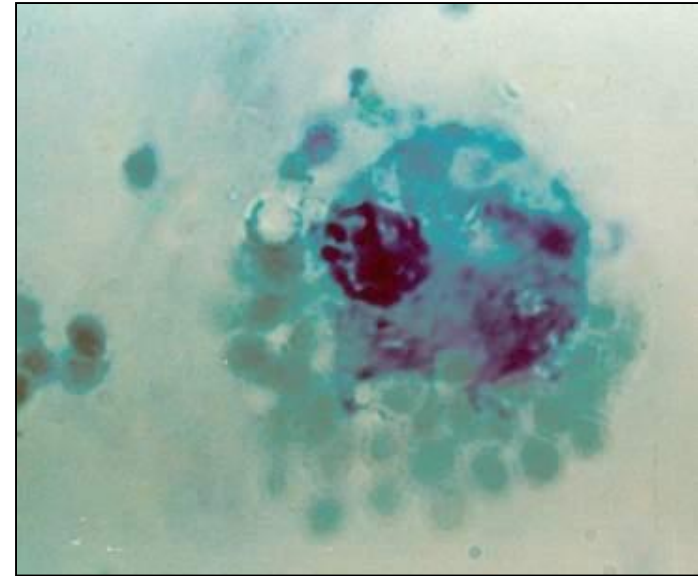
Laboratory Specimens

■ Virus isolation

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

■ Pig inoculation

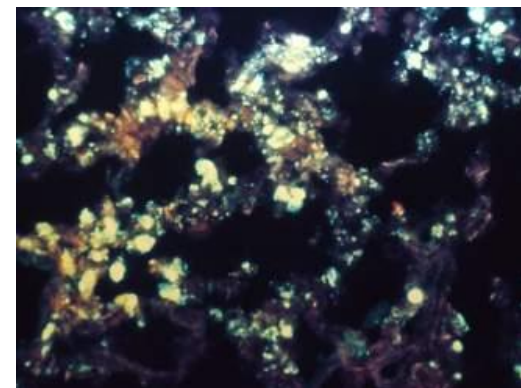
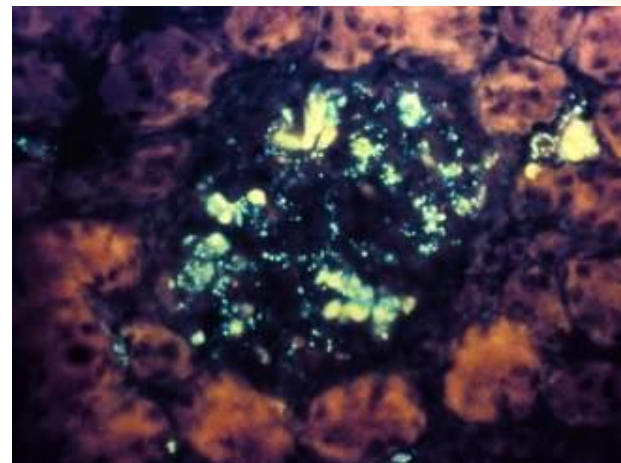
- Requires inoculation of naïve and CSF-vaccinated pigs.
- Not recommended with newer tests available.



Diagnosis

Laboratory Specimens

- Virus antigen detection
 - Direct fluorescent antibody test (DFAT)
- Virus genome detection
 - Polymerase Chain Reaction (PCR)
 - PCR-based sequencing method which permits detection and characterization of ASFV variants.
 - Useful for molecular epidemiological clarification of ASFV



Bastos, Penrith, Cruciere, et al. Arch Virol. 2003 148(4):693-706.

Genotyping field strains of African swine fever virus by partial p72 gene characterisation.

Diagnosis

Laboratory Specimens

- 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
- Eperythrozoonosis
- Septicemias
- Porcine Reproductive and Respiratory Syndrome (PRRS)
- Porcine Dermatitis and Nephropathy Syndrome (PDNS)



Key Risk Factors

- 1. Contact between wild boars and backyard/feral pigs.
- 2. Lack of biosecurity.
- 3. HUMAN BEHAVIOR/poor practices
 - ❖ Lack of knowledge/information
 - ❖ Money constraints
 - ❖ Lack of cooperation



Key Risk Factors

- 4. Surviving swine becoming carriers.
- 5. Long distance movement of wild boar hunting.
- 6. Virus entering the catering cycle, cured or raw hams.
- 7. Movement of humans/migrant workers with pork products/
- 8. Ticks?



Role of humans (farmers/hunters)

- 1. Disposal of dead pigs – rivers
- 2. Selling pigs in the face of an outbreak.
- 3. Movement of sick pigs to market
- 4. Swill feeding
- 5. Vehicle contamination
- 6. Vets, farm workers and hunters
- 7. Poor levels of biosecurity
- 8. Carcass disposal - flies



Why NO vaccine for ASFV?

- Large complex virus with many proteins (60-185 encoded)
- Inactivated/passaged virus does not protect
- Vaccine candidate antigens (viral proteins) do not protect
- Vaccine trial commercial markets require high containment facilities – expensive
- Largely African problem (in past) lack of commercial market



Why NO vaccine for ASFV?

- Spreading around the world (EU, Russia, Africa, China)
- High levels of mortality in pigs
- Evidence that the virus maybe attenuating in the field
- Very tough and resistant virus in processed meat
- The “Sandwich Effect”
- Vaccine not in sight



Advise to Pig Farmers

Biosecurity. Biosecurity, Biosecurity

- Ensure pigs not eating catering wastes, kitchen scraps or pork products
- Do not allow pig meat products inside farms
- Ensure that visitors have not been from affected regions
- Familiarise yourself with the clinical signs of ASF and report any suspicious illnesses to your vet immediately



Lessons Learned:

- Need for reliable diagnostic laboratory
- Active surveillance on all farms
- Biosecurity audits
- Purchase of more live haul trucks
- Daily updated maps with ASF outbreaks
- Transport transfer station in all farms
- Cremators on site
- Spraying for ticks in the farm areas



Lessons Learned:

- Disinfection barriers
- Strict shower in-shower out rules
- Compartmentalisation



Take Home Message

- Active surveillance to detect infection early is imperative
- Reliable test and fast results are key
- Biosecurity measures and quick removal of the source of infection are necessary to limit ASFv transmission
- People acting as fomites, were most likely responsible for ASFv introduction into farms





Thank you for your attention!

Dr. Zoilo M. Lopus
President, PPPI/PCSP

