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African Swine Fever

*Pesti Porcine Africaine,
Fiebre Porcina Africana,
Maladie de Montgomery*




African Swine Fever is also known as Pesti Porcine Africaine, Fiebre Porcina Africana, and Maladie de Montgomery.

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Overview

- Organism
- Economic Impact
- Epidemiology
- Transmission
- Clinical Signs
- Diagnosis and Treatment
- Prevention and Control
- Actions to take




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In today's presentation we will cover information regarding the organism that causes African swine fever and its epidemiology. We will also talk about the economic impact the disease has had in the past and could have in the future. Additionally, we will talk about how it is transmitted, the species it affects, clinical signs and necropsy findings, as well as diagnosis and treatment of the disease. Finally, we will address prevention and control measures for the disease and actions to take if African swine fever is suspected.

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The Organism

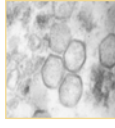


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African Swine Fever Virus

- Febrile, systemic disease
- Tick-borne and contagious
- Shares characteristics with poxvirus
 - Only virus in family of "ASFV-like viruses"
- Only DNA virus that is an arbovirus



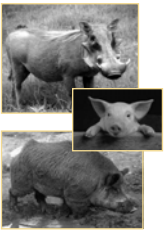
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African swine fever (ASF) is a febrile systemic viral disease of swine which is tickborne and contagious. The ASF virus (ASFV) (shown above) is a large, lipoprotein-enveloped, icosahedral, double-stranded DNA virus. ASFV was formerly classified as a member of the Iridoviridae, but is now the only member of a family called the "African swine fever-like viruses." Although it has been found to have many characteristics of poxvirus, ASFV is the only member of ASF-like viruses. ASFV replicates in *Ornithodoros* ticks, and thus is the only DNA virus that can qualify as an arbovirus. Photo courtesy of www.fao.org.

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African Swine Fever Virus

- Stable in environment
- Virulence ranges from high to low
- Affects domestic and wild pigs



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ASFV is quite stable in the environment and will survive over a wide range of pH. Virulence of isolates varies from high (100% mortality in 7-10 days after exposure) to low virulence (only seroconversion occurs). ASF affects domestic pigs and wild pigs, including the warthog, bush pig, and giant forest hog in Africa and the feral pig in Europe.

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Importance




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History

- 1957: Spread from Africa into Europe
 - Successful eradication
- 1963: ASFV is isolated from soft tick
 - Transmitted between tick species
 - Pigs are "accidental" hosts?




Initially, domestic and wild pigs were thought to be the only hosts of ASFV. The first spread of the disease outside Africa was into Europe in 1957, which was almost certainly successfully eradicated. In 1963, Spanish workers isolated ASFV from the soft tick *Ornithodoros erraticus* collected from ASF-infected farms. Researchers then showed that ASFV replicates in the tick and is transferred between many species of African ticks. Some researchers believe that ASFV is actually a tick virus, and that the pig is an accidental host.

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Economic Impact

- ASF can lead to high mortality
- Isolation and slaughter
 - Required for eradication
- Ban on import/export of hogs
- Can become prolonged epidemic




ASF can lead to the destruction of several thousand hogs on a single farm, and millions overall. Confirmed cases can lead to a ban on the export and import of pigs to and from many different countries, with obvious economic impact. For successful eradication to occur, isolation and slaughter are required. Many countries lack resources to deal with a prolonged major epidemic, which is very possible if rapid diagnosis is not made and appropriate actions are not taken.

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Epidemiology





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Geographic Distribution

- Endemic in sub-Saharan Africa
 - Highest area of incidence: Equator to northern South Africa
- Found in feral pigs
 - Sardinia, Portugal, Spain
- Eradicated from Cuba, Haiti, the Dominican Republic

ASF is endemic in most of sub-Saharan Africa, with the highest area of incidence seen from the Equator to northern South Africa. ASFV can also be found in feral pigs in Sardinia, Portugal and Spain. An outbreak of ASF occurred in Cuba, Haiti and the Dominican Republic, but it was successfully eradicated from the region. This figure shows the current/recent distribution of countries affected by ASF since 1995; the most recently infected countries are colored red, the countries in which ASF is endemic are shown in white, and countries that have eradicated ASF but are still considered high risk are colored yellow. Photo courtesy of www.fao.org.

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Morbidity/Mortality

- Morbidity approaches 100%
 - Previously unexposed herds
 - Herds in which pigs have contact with each other
- Mortality varies with virulence of isolate
 - Ranges from 0%-100%
- No treatment or vaccine

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In domestic pigs, morbidity approaches 100% in herds in which the pigs have contact with each other and have not been previously exposed to the virus. Mortality varies with the virulence of the isolate, and can range from 0%-100%. Factors that can increase mortality from virulent isolates include concurrent disease, a young age, and pregnancy. Mild or asymptomatic disease is usually seen in warthogs and bush pigs. No treatment or vaccine currently exists for this disease.

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Transmission

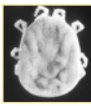
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Animal Transmission

- Direct contact (usually oronasal)
 - Feeding of uncooked garbage
 - Infected animals
 - Fomites
 - Contaminated people
 - Equipment/vehicles
 - Feed
 - Bite of infected ticks
- Found in all tissues and body fluids



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The primary method of spread from country to country has been through the feeding of uncooked garbage containing ASFV-infected pork scraps to pigs. Once a pig becomes infected, ASFV spreads by direct contact with infected animals, contaminated people, equipment, vehicles, and feed. The amount of ASFV needed to infect a pig depends on the route of exposure. Transmission during direct contact is usually by oronasal spread. Some pigs may become carriers. ASFV is also spread through the bite of infected *Ornithodoros erraticus* or *O. moubata* (pictured) soft ticks; in one outbreak, pigs became infected after being fed the intestines of guinea fowl that had eaten infected ticks. ASFV can be found in all tissues and body fluids, with particularly high levels in blood. The incubation period is 48 to 72 hours following intranasal-oral exposure. Humans are not susceptible to ASF. Photo courtesy of www.fao.org.

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Animals and African Swine Fever


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Clinical Signs: High Virulence

- Incubation period: 48-72 hours
- High fever
- Moderate anorexia
- Leukopenia
- Recumbency
- Erythema, cyanotic skin blotching
- Possibly diarrhea (bloody) and abortions
- Death can follow



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More virulent isolates of ASFV cause a high fever, moderate anorexia, leukopenia, recumbency, and erythema that is most apparent in white pigs (shown above). Cyanotic skin blotching on the ears, tail, lower legs, or hams may also develop. Diarrhea (shown above) and abortions are sometimes seen, but most pigs infected with ASFV remain in good condition. With highly virulent isolates, progressive anorexia and depression develop and are usually followed by death within 10 days. Photo source: www.defra.gov.uk

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**Clinical Signs:
Chronic Infection**

- Multi-focal erythema
 - Ears, abdomen, inner thigh
 - May be raised and necrotic
- Low fever
- Pneumonia
- Painless swelling of carpal and tarsal joints
- Emaciation, stunting
- Death



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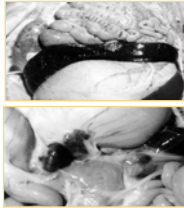
ASF can be a peracute, acute, subacute, or chronic disease. Multi-focal erythema on the ears, abdomen, and inner thighs is a common clinical sign of chronic infection of ASFV. The foci may become raised and necrotic, as shown above. A low fever may be present. Other possible signs seen include pneumonia, painless swelling of the carpal and/or tarsal joints. Additionally, pigs may show emaciation and stunting. Death can occur from these sequelae. Photo source: www.vet.uga.edu/vpp/gray_book

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**Post Mortem Lesions:
Most Common**

- Spleen
 - Enlarged
 - Friable
 - Dark red, black
- Lymph nodes
 - Swollen
 - Hemorrhagic



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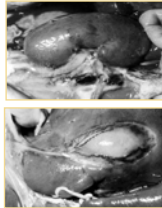
The most consistent and characteristic post mortem lesions occur in the spleen and lymph nodes. With highly virulent infections, the spleen is usually enlarged, friable, and dark red or black (shown above). With moderately virulent infections, the spleen is enlarged but not friable, with a nearly normal color. Lymph nodes may be swollen and hemorrhagic, with the most commonly affected lymph nodes being the gastrohepatic (shown above), renal, and mesenteric. The tonsils may be swollen or reddened. Photo Source: www.vet.uga.edu/vpp/gray_book

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**Post Mortem Lesions:
Less Common**

- Hemorrhages
 - Petechiae
 - Ecchymoses
- Edema
 - Lungs and gall bladder



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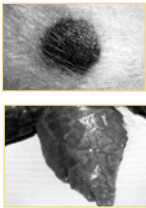
Less consistent post mortem signs of ASFV infection include hemorrhages (shown above in kidney), petechiae, and ecchymoses. Edema may be found in the lungs and gall bladder (bottom photo), and the pleural, pericardial, and peritoneal cavities may contain excess fluid. Dark red or purple areas may also be found on the skin of ears, feet, and tail. Photo source: www.vet.uga.edu/vpp/gray_book

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**Post Mortem Lesions:
Chronic Infection**

- Focal skin necrosis
- Fibrinous pericarditis
- Generalized lymphadenopathy
- Swollen joints
- Consolidated lobules in lung



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With chronic infection, the most common post mortem lesions are focal skin necrosis (top photo), fibrinous pericarditis, generalized lymphadenopathy, swollen joints, and consolidated lobules in the lung (bottom photo). Photo source: www.vet.uga.edu/vpp/gray_book

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Differential Diagnosis

- Hog cholera - clinically indistinguishable
- Erysipelas
- Salmonellosis
- Aujeszky's disease (Pseudorabies)
- Eperythrozoonosis
- Pasteurellosis
- Thrombocytopenic pupura
- Warfarin poisoning
- Heavy metal toxicity

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The differential diagnosis for ASF includes hog cholera (more commonly known as classical swine fever, which is very similar to and clinically indistinguishable from ASF), erysipelas, salmonellosis, eperythrozoonosis, pasteurellosis, Aujeszky's disease, thrombocytopenic purpura, warfarin poisoning, and heavy metal toxicity.

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Sampling

- Before collecting or sending any samples, the proper authorities should be contacted
- Samples should only be sent under secure conditions and to authorized laboratories to prevent the spread of the disease

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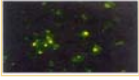
Before collecting or sending any samples from animals with a suspected foreign animal disease, the proper authorities should be contacted. Samples should only be sent under secure conditions and to authorized laboratories to prevent the spread of the disease.

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Diagnosis

- Suspect ASF in pigs with:
 - Fever
 - Characteristic post mortem changes of spleen, lymph nodes
- Laboratory Tests
 - Virus isolation
 - Viral antibody detection
 - PCR
- There is no treatment



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ASF should be suspected in pigs with a fever, and when the necropsy findings include an enlarged, friable, dark red or black spleen and extremely enlarged and hemorrhagic lymph nodes (shown above). In areas where ASF is not endemic, the disease should be diagnosed by virus isolation and the detection of viral antibodies by the immunofluorescent antibody test (shown above). Blood and tissue samples (spleen, lymph nodes, lung) from suspect pigs are inoculated into pig leukocyte or bone marrow cultures for virus isolation. ASFV antigens can be found in tissue smears or cryostat sections, and nucleic acids can be detected by PCR assay (particularly useful in putrefied samples that can't be used for virus isolation). There is no treatment for ASF.

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**African Swine
Fever in Humans**




Humans are not susceptible to African swine fever infection.

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**Prevention and
Control**



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Recommended Actions

- Notification of state or federal authorities IMMEDIATELY
 - Federal:
 - Area Veterinarian in Charge (AVIC)
 - www.aphis.usda.gov/vs/area_offices.html
 - State veterinarian
 - www.aphis.usda.gov/vs/sregs/official.html
- Quarantine

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If you suspect a case or outbreak of African Swine Fever, contact your state and/or federal veterinarian immediately and quarantine the premises.

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Quarantine

- Suspicion of ASFV
 - Entire herd quarantined
 - Strict enforcement
 - Authorities notified
 - Diagnosis confirmed
- Disposal of carcasses
 - Burning



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Strict quarantine must be imposed if ASFV is suspected. The entire herd must be quarantined immediately until authorities are notified and a diagnosis is confirmed (top photo courtesy of Katie Steneroden, ISU). Successful eradication is accomplished by rapid diagnosis, slaughter, and disposal of all animals on the infected premises. Disposal of carcasses, often by burning, is necessary (bottom photo).

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Disinfection

- Most common disinfectants ineffective
- Use an ASFV-approved disinfectant
 - Sodium hypochlorite
 - Some iodine and quaternary ammonium compounds



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As many common disinfectants are ineffective, care should be taken to use a disinfectant specifically approved for ASFV. Sodium hypochlorite (5.25% is household bleach) and some iodine and quaternary ammonium compounds have proven to be effective. Disinfection of equipment, vehicles and people (shown above) is essential when there has been exposure to an area with suspicion or confirmed diagnosis of ASF. Photos courtesy of www.fao.org.

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Prevention

- Garbage fed to pigs must be cooked
 - Unprocessed meat must be heated
- Potential tick vectors
 - Controlled with acaricides
- Isolation of infected animals
- Eradication
 - Slaughter of infected and in-contact animals

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All garbage fed to pigs should be cooked to prevent introduction of ASFV into areas free of the disease. Unprocessed meat must be heated to at least 70°C for 30 minutes to inactivate the virus; 30 minutes at 60°C is sufficient for serum and bodily fluids. Potential tick vectors should be controlled with acaricides. Because ASFV is so contagious, eradication is by slaughter of infected and in-contact animals.

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Vaccination

- No vaccine
 - All attempts unsuccessful
- We all need to do our part
 - Keep our pigs healthy
 - Free of foreign animals diseases



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There is no vaccine for ASFV; all attempts to develop one have been unsuccessful. We all need to do our part to keep our pigs healthy and free of foreign animal diseases such as African swine fever.

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Additional Resources

- World Organization for Animal Health (OIE)
- www.oie.int
- USAHA Foreign Animal Diseases – “The Gray Book”
 - www.vet.uga.edu/vpp/gray_book
- Food and Agriculture Organization of the United Nations
 - www.fao.org

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Acknowledgments

Development of this presentation was funded by a grant from the Centers for Disease Control and Prevention to the Center for Food Security and Public Health at Iowa State University.



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Acknowledgments

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