African Swine Fever (ASF)

**Classic case:** Endemic in Africa, Sardinia, Madagascar
- Sick domestic pigs—fever, huddling, difficulty breathing
- Hemorrhage and cyanosis of skin, abdomen, extremities
- Death

**Reportable Foreign Animal Disease**
- Key DDX is Classical Swine Fever

**Presentation:**

**History**
- Close contact between domestic pigs and wart hogs, infected ticks
- Introduction of new pigs into herd (without quarantine)
- Swill feeding domestic pigs containing
  - Contaminated undercooked pork / pig remnants
  - Access to remnants through scavenging
- Movement of vehicles / people between herds during outbreak

**Clinical Signs:** Several forms based on virulence (0-100% mortality)

- **Peracute form, ASF**
  - Sudden death with no clinical signs

- **Acute form, ASF**—Most common (~100% mortality)
  - High fever >105°F (>41°C) FIRST SIGN in herd
  - Huddling, shade seeking
  - Depression, anorexia, abdominal pain, vomiting
  - Constipation, +/- bloody diarrhea
  - Red, congested mucous membranes
  - Rapid difficult breathing
  - Blood-tinged foam from nostrils
  - Conjunctivitis
  - Cyanosis—Abdomen, inner thighs, ears
  - Skin hemorrhages, reddened areas, hyperemia
  - Abortion – all stages of pregnancy
  - Swaying gait, weak pelvic limbs
  - Coma; Death within 1-7 days
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Extended version

- **Subacute form, ASF (Uncommon)**
  - Fluctuating fever
  - Depression, anorexia
  - Swelling of joints
    - Painful gait
  - +/- Pneumonia
  - Death due to heart failure
  - Swollen throat common before death

- **Chronic form, ASF (Uncommon)**
  - Emaciation
  - Long dull hair
  - Ulcerative sores over bony points
  - Stiff gait due (arthritis)
  - Survival- weeks to months

- Pigs surviving less virulent strains
  - May shed virus for 1 month
  - Blood infectious for 6 weeks
  - May be persistently infected for life
    - DO NOT excrete OR
    - transmit virus to offspring in-utero

- Acute ASF:
  - Skin cyanosis, congestion and hemorrhage of eyes
  - Ear tip hyperemia

**DDX:**  **Classical swine fever** - Clinically indistinguishable

Acute porcine reproductive and respiratory syndrome (PRRS), porcine dermatitis and nephropathy syndrome (porcine circovirus), erysipelas, salmonellosis (*Salmonella choleraesuis*), eperythrozoonosis, actinobacillosis, Glasser’s disease (*Haemophilus suis*), Aujeszky’s disease ( pseudorabies), thrombocytopenic purpura; warfarin poisoning, heavy metal toxicity, postweaning multisystemic wasting syndrome, hemolytic disease of the newborn, parvovirus, pasteurellosis, trypanosomiasis, anthrax

**Test of choice:**  Reportable Disease to World Organization for Animal Health (OIE)

- **Field Diagnosis:** Hx, clinical signs, lesions followed by lab testing
  - IF ASF is suspected, IMMEDIATELY notify:
    - Federal Area Veterinarian in Charge (AVIC)
    - State Veterinarian (SV)
    - Quarantine farm until definitive diagnosis determined - Actions directed by SV or AVIC

- Samples sent ONLY to State Diagnostic (authorized) Lab
  - Under secure conditions
    - Prevent spread of disease
  - Tonsil preferred
  - Spleen, kidney
  - Lymph nodes
  - Whole blood in EDTA
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Necropsy and Histopathology:
- **Acute lesions** – **THINK HEMORRHAGIC**
  - Bluish-purple skin discoloration / hemorrhages
    - Extremities, chest, abdomen
  - Bloody froth from nose and mouth
  - Pus discharge from eyes, nose
  - Perineum soiled with bloody feces
  - Hemorrhagic thoracic and abdominal fluid
  - Widespread congestion and hemorrhage of internal organs
  - Enlarged, friable, dark spleen
  - Hemorrhagic lymphadenomegaly
  - Lungs do not collapse when thorax opened
    - Heavy and shiny, with prominent divisions between lobules
    - Ooze moisture and froth when cut
  - Blood-stained froth in trachea
  - Pinpoint hemorrhages on kidney surfaces
  - Hemorrhage and ulceration of stomach lining
  - Congested, bloody intestinal tract

- **Subacute lesions**
  - Hemorrhagic thoracic and abdominal fluid (heart failure)
  - Hemorrhagic lymphadenomegaly
  - Fibrin on lung and heart surfaces
  - Firm lungs with mottled appearance (pneumonia)
  - Swollen joints with accumulated fluid and fibrin

- **Chronic lesions**
  - Emaciation
  - Sores and ulcers over bony points
  - Firm enlarged lymph nodes
  - Fibrin on lung and heart surfaces
  - Swollen joints

- **Serology**
  - ASF antibodies persist a long time
  - **Paired serum sample titers, IFA, immunoblotting**
  - ELISA- prescribed for international trade

- **Virus isolation**
  - Innoculation of blood or tissue sample in primary culture of pig monocytes
  - Hemadsorption of pig RBCs to surface of infected cells supports diagnosis
    - (some strains non-hemadsorbing)

- **Antigen detection - Direct immunofluorescence** on frozen tissue sections, buffy coat, tissue smears

- **PCR**
  - Performed on tonsil scraping
  - Can detect virus before onset of clinical signs
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**Rx of choice:** NO treatment
- ALL pigs on premises slaughtered
- Carcasses buried or incinerated

**Prognosis:** No prognosis-slaughter
- **OIE ‘priority’ disease for international trade**
- Economically devastating disease
- **North America is ASF-free** but there is potential for introduction.
  - Countries with ASF today
  - Import and export bans of pigs and pork products to many countries

**Prevention:**
- **NO effective vaccines** available
- Strict **biosecurity** and **sanitation** protocols
- **Importation restrictions** on pigs and pork products
  - Ensure infected live pigs or products do not enter ASF free areas
- **NEVER feed pigs undercooked garbage (swill) or pork products**
  - Many countries have banned swill feeding
  - Eradication programs
    - Rapid diagnosis, slaughter and disposal of all animals on infected premises
    - Serologic survey of all pig farms within a specific control zone to identify all infected pigs
- **Africa:** Keep wart hogs and materials contaminated by wart hogs away from herd

**Pearls:**
- Highly contagious **hemorrhagic** viral disease of PIGS
- **Clinically indistinguishable from Classical Swine Fever**
- Maintained in Africa by natural cycle of transmission
  - Wild African pig species (wart hog, bush pig, giant forest hog)
  - Soft eyeless argasid tick vector, *Ornithodoros moubata* (tampan)
  - Wart hogs become infected but **DO NOT** develop clinical signs
  - Clinical disease only in domestic and feral pigs, European wild boar
  - Virus spread to domestic pigs by (free-ranging village pigs common)
    - Infected tick bite
    - Ingestion of wart hog tissues

- **Asfivirus**- **ONLY** member of **Family Asfarviridae**
  - Large enveloped, DNA virus
  - **ONLY** DNA virus transmitted by **arthropods**
  - **Survives long time** in environment
  - Survive long periods in moist, protein-rich medium (especially cold, frozen)
  - Killed at high temperatures
    - Pig meat cooked at 158°F (70°C) for 30 minutes

*Soft ticks inhabit wart hog burrows. (Ornithodoros moubata, tampan). Important vector of ASF*
African Swine Fever (ASF) Extended version

- **Transmission**
  - **Primary route** of infection- upper respiratory tract
    - Oronasal
    - Blood
      - Pig fights
      - Bloody feces
      - Necropsy
    - Tick bites
    - **Ingestion of contaminated pig meat**
    - Fomites
      - Viral replication occurs primarily in tonsils, lymph nodes in head and neck and rapidly spreads via bloodstream
        - Virus present in all body fluids and tissues
        - Severe disruption to blood clotting mechanism major role in hemorrhagic lesions
  - **Main method of transmission country to country**
    - Ingestion of contaminated garbage or pork products
    - Ships, planes, **illegally imported pig meat by tourists**
    - Outbreaks have occurred in Europe, Caribbean Islands, Brazil, Ukraine (2012)

**Images worth a look:**
- The Center for Food Safety and Public Health, Iowa State University - a plethora of ASF images
- FAO.org African Swine Fever – several images of ASF

See also the Merck Manual: **Hyperemia** of the skin of the ears; hemorrhagic **gastrohepatic** lymph node; generalized **hyperemia** of abdomen and legs; **hemadsorption** of RBCs to macrophages

**Refs:** The Pig Site; The Center for Food Safety and Public Health, Iowa State University; FAO.org African Swine Fever; Jackson and Cockcroft, Handbook of Pig Medicine pp 184-185; Merck Manual, 10th ed (online): African Swine Fever; Images courtesy of FAO.org African Swine Fever, unless otherwise noted

My Notes: