Classical Swine Fever

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Classical Swine Fever

Classical Swine Fever is also called
Hog Cholera

"The most typical feature of CSF:
it is so *atypical*."

Dr Bill White

Classical Swine Fever

Classical Swine Fever

CSF is a highly contagious viral disease of swine.

Mortality varies from almost zero to 100%.

Only the domestic pig and wild boar are susceptible naturally.

"Hog cholera, also known as swine fever, is a disease native to America. It is highly contagious and its prevalence led to the first notice of an animal disease by the federal government in 1860."

http://www.lib.iastate.edu/spcl/manuscripts/MS389.html

http://www.extension.umn.edu/administrative/information/components/crisis01.html

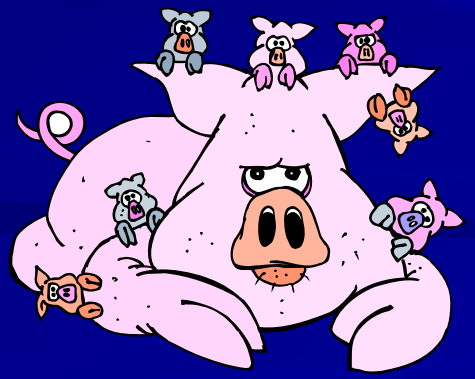
Hog Cholera epidemic in Minnesota in 1913

http://www.colvet.es/infovet/may99/ganaderia.htm

- 1976 Last US outbreak
- 1978 US declared “Hog Cholera” free

Breeding sows infected by low virulent strains usually abort,

…but may produce ‘late onset’ piglets that shed virus for 6-12 months before dying.



Classical Swine Fever

…can survive for months
in refrigerated meat
and for years
in frozen meat

Many Expressions

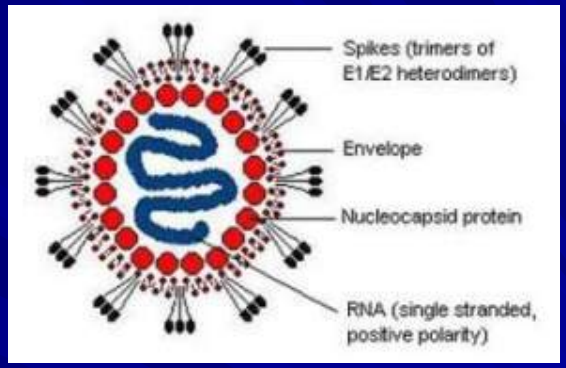
- Occurs in acute, subacute, chronic, persistent (‘late onset’) or inapparent forms.
- Clinical forms closely match virulence of the viral strain and susceptibility (age) of the pig.

Classical Swine Fever

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

Etiology

- Only one serotype
- Lipid enveloped virus
- Virus family Flaviviridae, Virus genus *Pestivirus*



Etiology

- Related Pestiviruses:
  - Bovine Viral Diarrhea (BVD)
  - Border Disease Virus of Sheep, Reindeer and Giraffe

Host Range

http://www.krykiet.com/polish_wildlife.htm

Domestic swine and European wild boar are the only natural reservoir of classical swine fever virus

Host Range

Collared Peccary is only mildly susceptible.

aka *Javelina*

Incubation

- 3-4 days average, 3-15 days range depending on strain, route and dose
- 2-14 days (O.I.E.)
- The Severe Acute form:

  2-6 days incubation; death at 10-20 days post infection

Syndromes

Virulence, immune status, age, breed, and pregnancy figure in the clinical picture.

- Highly virulent strains: prevalent decades ago - causes Peracute and Classic Acute disease

Syndromes

- Moderately virulent strains: prevalent today - causes Subacute Disease

- Low virulent strains:

  prevalent today - causes Chronic Disease and Carrier Sow Syndrome/Persistent Infection

Syndromes

- Seroconversion only after 2-3 weeks
  - CSF virus is immunosuppressive like BVD in cattle
- Cellular tropism of virus
  - Endothelial, lymphoreticular, macrophages, some epithelial

Acute Disease (Classic Disease)

Mortality: approaches 100%.

Viral shedding: 10-20 days until antibodies

Acute Disease

Clinical Signs

High Fever: 106-108ºF (>41ºC)

Depression

Conjunctivitis

Constipation, then Diarrhea

Skin hemorrhages/Cyanosis

Acute Disease

Pile up for warmth

Anorexic and gaunt

Staggering gait

Convulsions

Abortion

Death 10-20 days post infection

Acute Disease

- Pathology
  - Severe tonsilitis
  - Severe leukopenia
  - Hemorrhagic swollen lymph nodes
  - Hemorrhages renal cortex
  - Petechiation of the bladder, larynx, epiglottis, heart, intestinal mucosa, skin
  - Splenic infarcts
  - Necrotic gastroenteritis
  - Encephalitis

Subacute Disease

Mortality: reduced

Viral shedding: until death.

Subacute Disease

Clinical signs with subacute disease

are similar to acute disease,

but considerably less severe.

*As with Acute CSF, the disease is clinically and pathologically consistent with a generalized septicemia

Subacute Disease

Fever for 2-3 weeks

105-106ºF

(>41ºC)

Death within 30 days post infection

Chronic Disease

Mortality: High; Invariably die in 1-3 months

Viral Shedding: May shed virus for months

Long term carriers of virus in tissues: lymph nodes, lung, spleen.

Chronic Disease

Low virulent strain or infection of vaccinated herd.

Three clinical phases:

- Initial: resembles Subacute
  - Fever
  - Anorexia
  - Depression
  - Leukopenia
- Second: improve, look ~normal
- Final: ‘runts’ with ‘Initial’ Phase signs.

Lesions

Button ulcers in cecum and colon (caused by bacteria)

Calcification rib cartilage

Glomerulonephritis

‘Carrier Sow Syndrome’

Mortality: In pregnant sow disease goes unnoticed. Sow may shed virus for months especially at farrowing

High Mortality: In piglets infected congenitally or post-natally. Piglets look healthy at birth, shed virus for 6-12 month before dying

‘Carrier Sow Syndrome’ Clinical Signs

- Clinical Signs in Sows
  - Usually mild (fever)
  - or subclinical.

‘Carrier Sow Syndrome’ Clinical Signs

- Clinical Signs in Piglets
  - Stillbirths, deformities, mummies,
  - born dead, or congenital tremors.
  - Some are born healthy:
  - become persistent shedders to maintain CSF in breeding herd;
  - are immuno-tolerant but will eventually die of ‘late onset’ disease at 6-12 months of age.

Congenital Form of CSF

- Weak "Shaker" piglets
- Persistently infected
  - Viremic - seronegative piglets
- Life-long viremia
- Will in time lead to complications and death

Classical Swine Fever Clinical Signs

- HOT, SICK PIGS

- Huddling

Neurological Signs

Clinical Signs

- Constipation followed by diarrhea
- Reproductive disorders

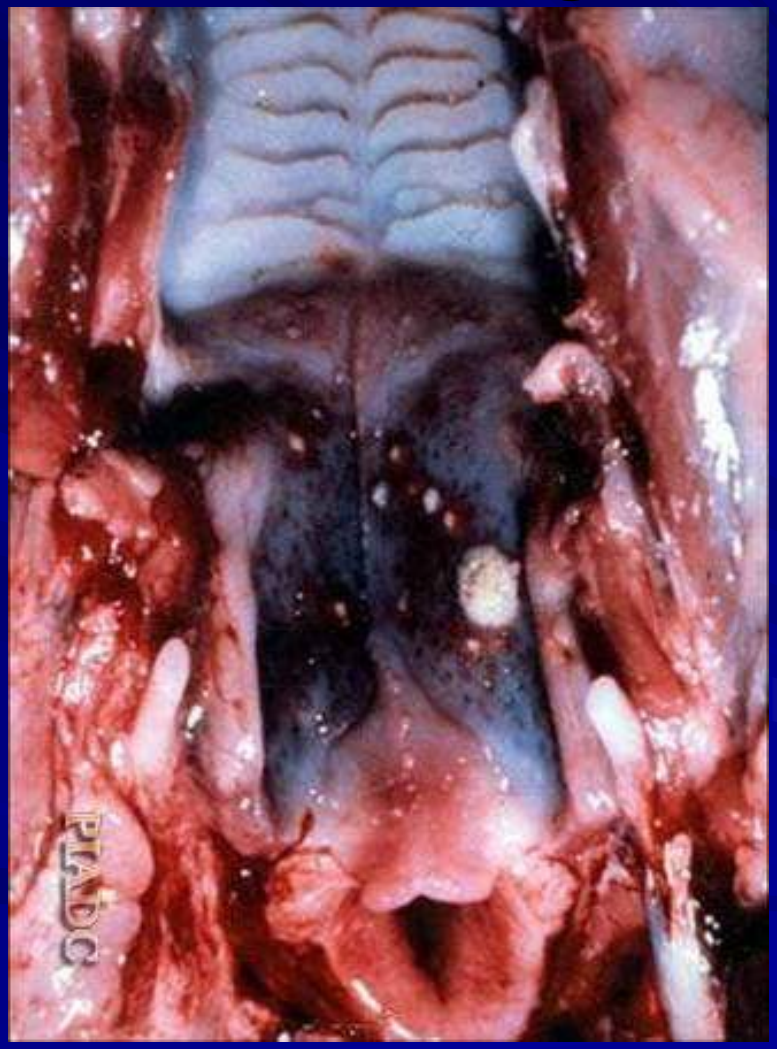
Clinical Signs

Physical exam to view tonsils

Clinical Signs

- Tonsillar necrosis

Tonsil Necrosis and Severe Hemorrhage



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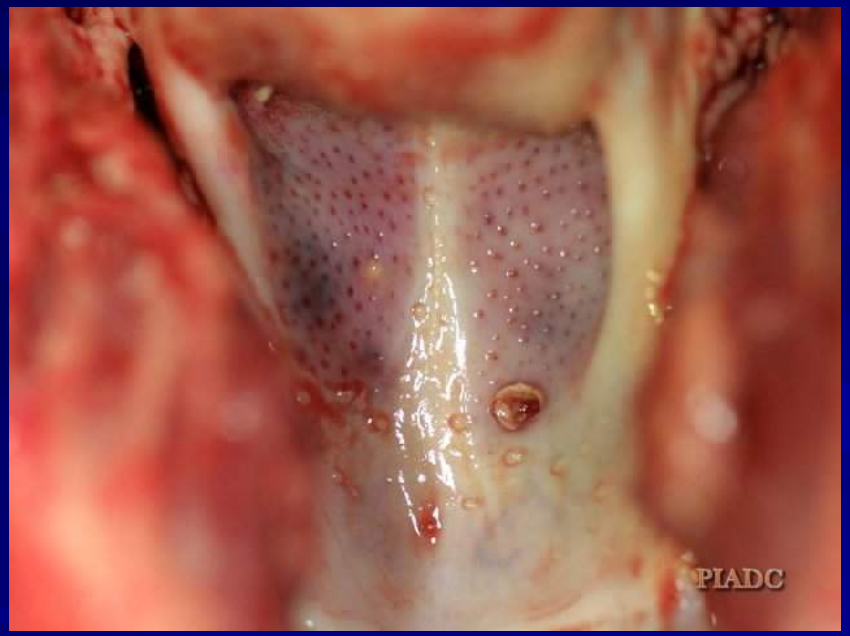
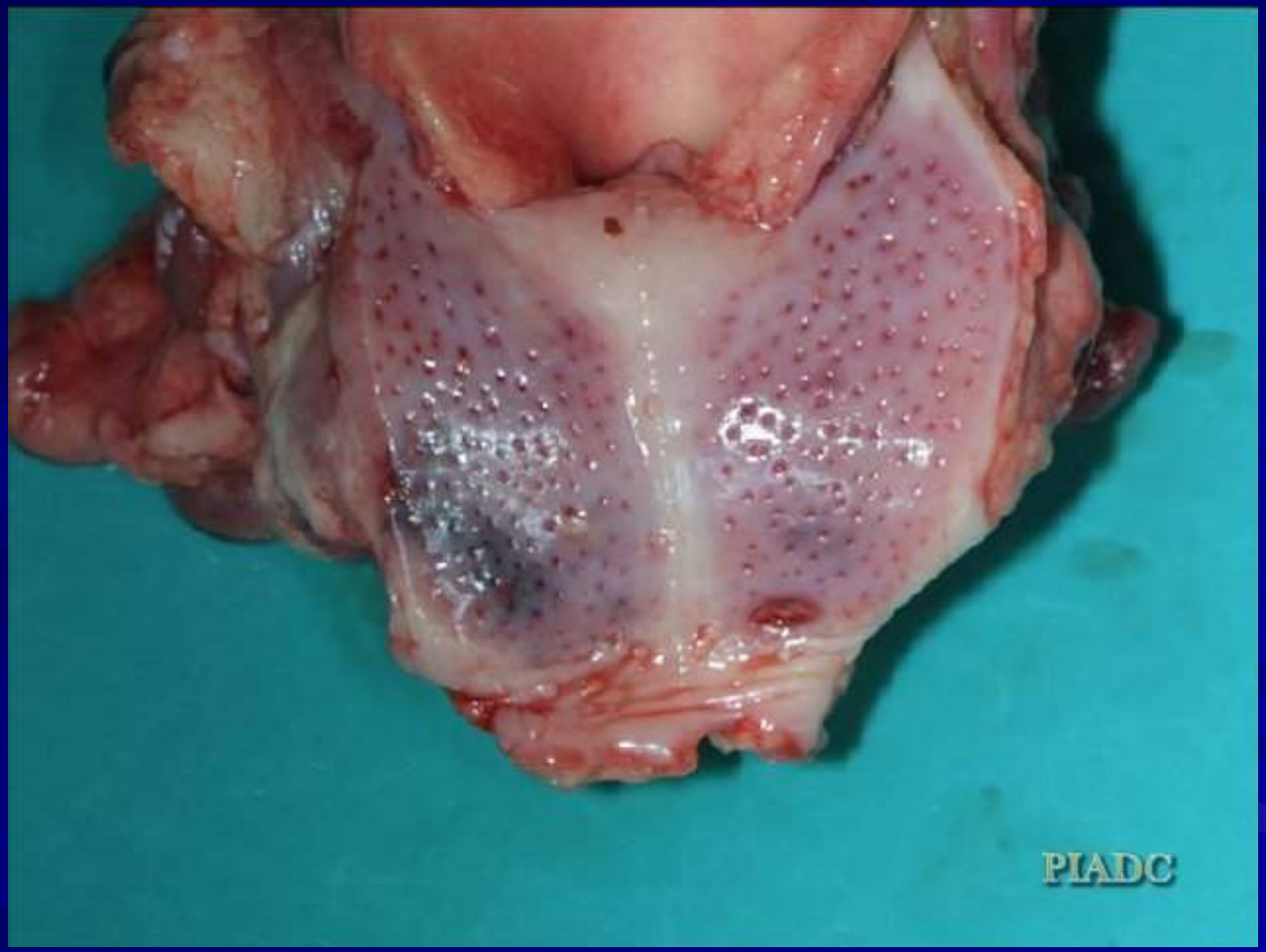
Tonsil Necrosis





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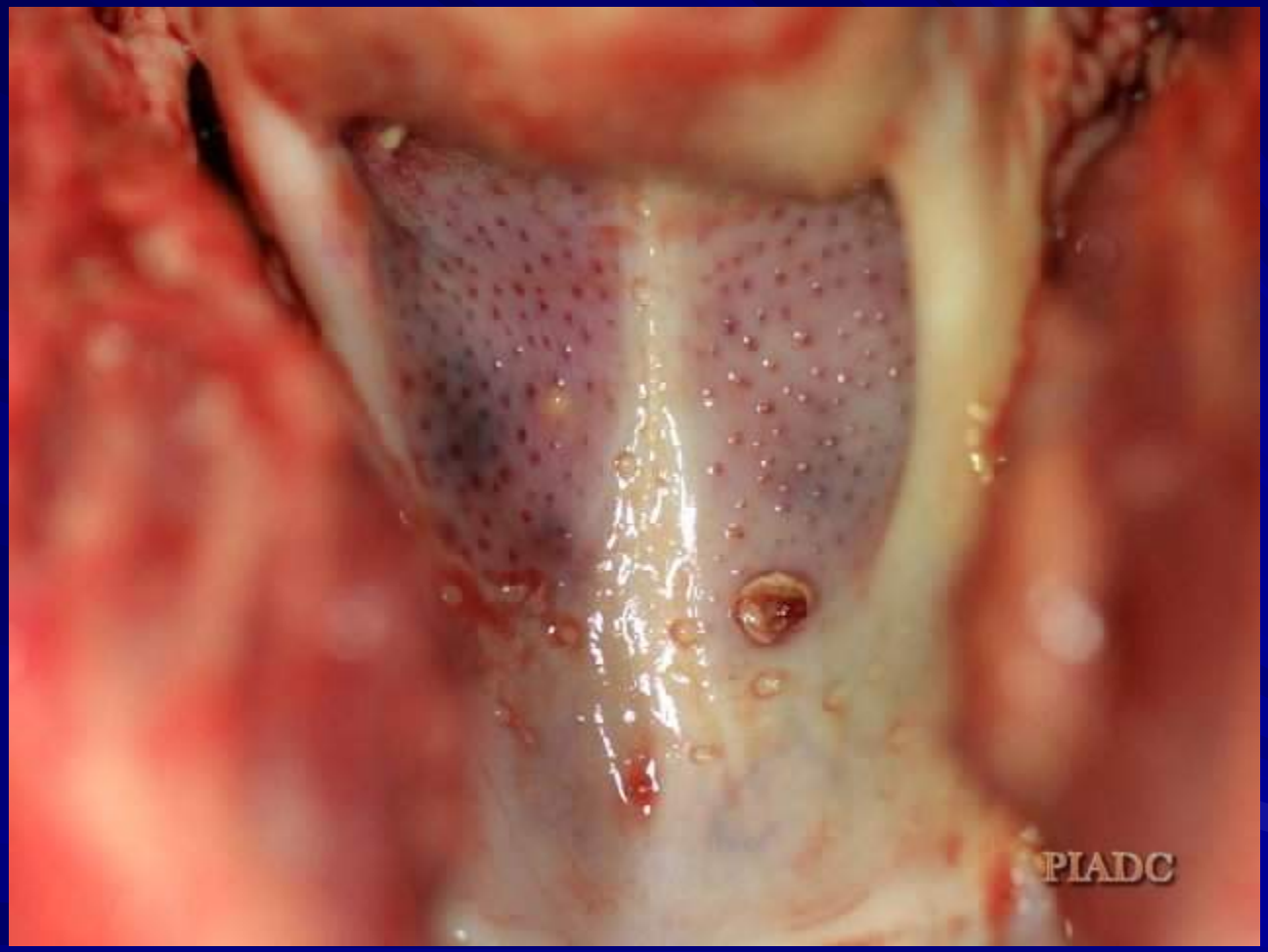

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Severe depression

Skin hyperemia & hemorrhage

Conjunctivitis

Conjunctivitis

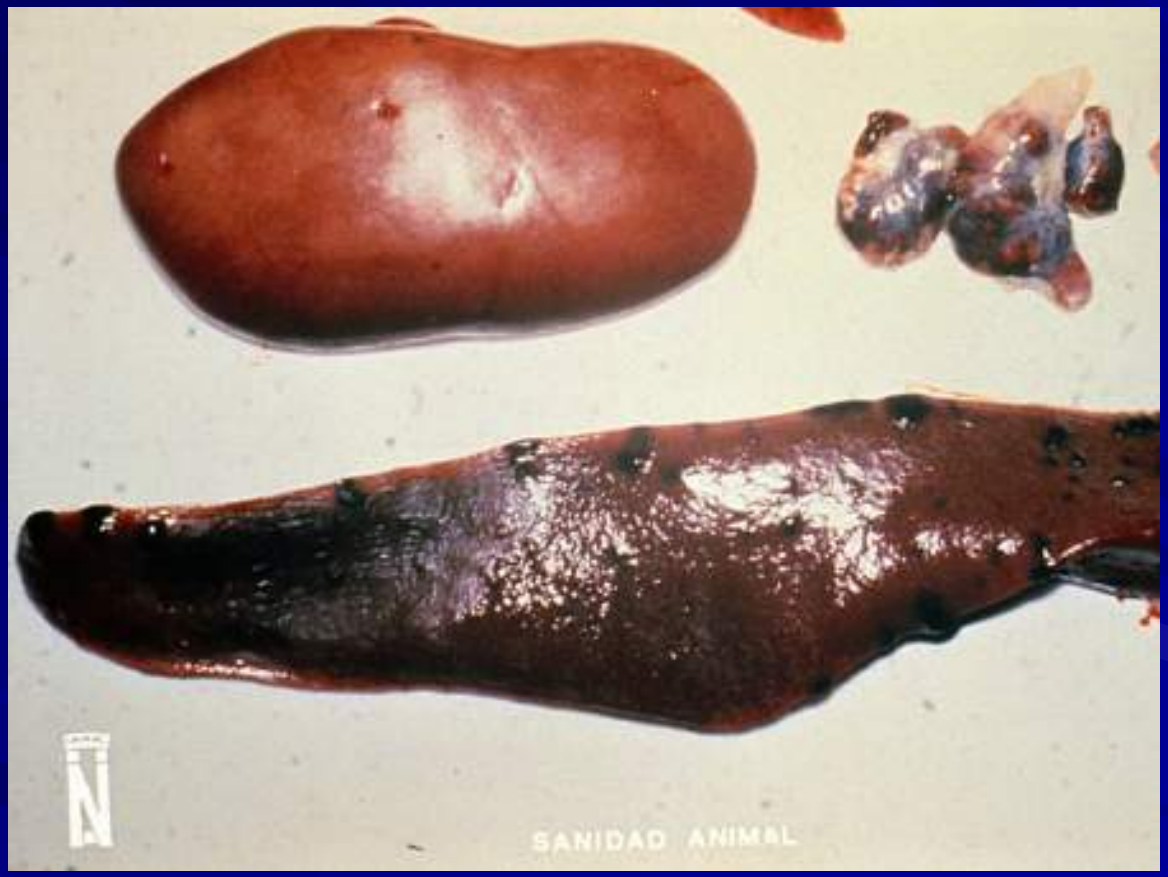
European Wild Boar

Classical Swine Fever - 2006

High Mortality in Piglets

Classical Swine Fever - 2006

Lesions of CSF



Mottled LN

Mottled Lymph Node

Mottled Lymph Nodes

Lymph node necrosis

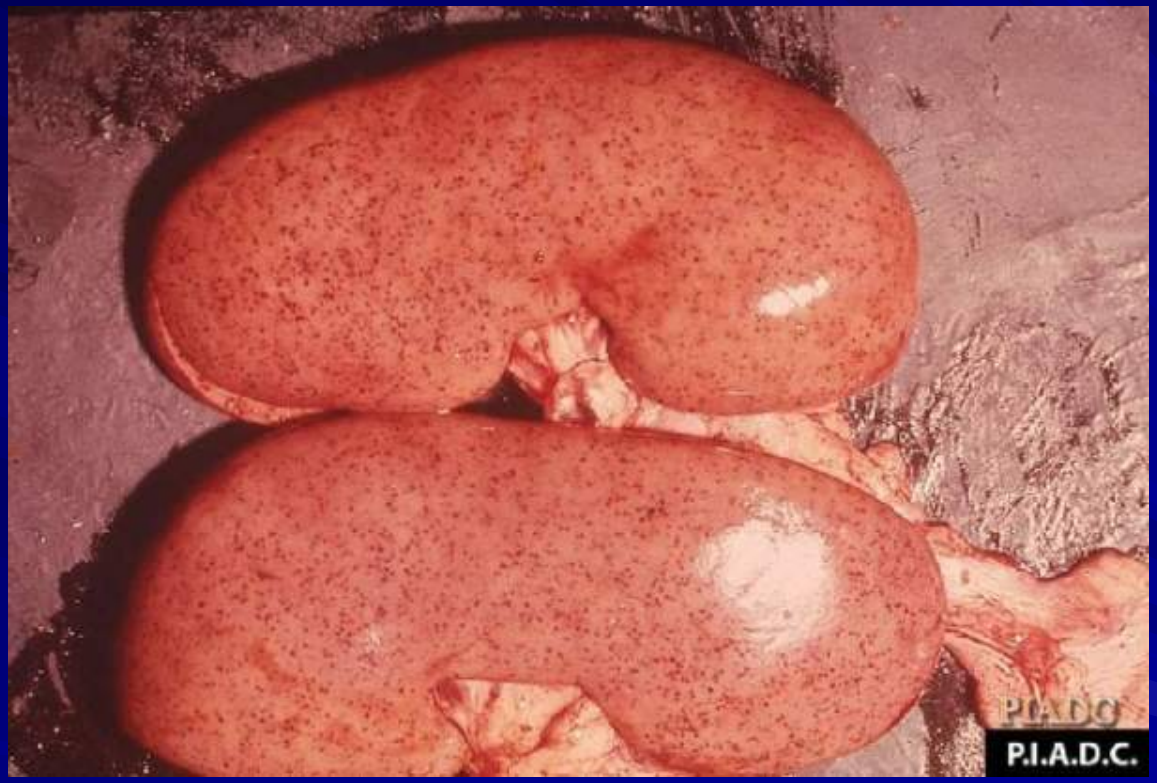
Splenic infarcts

Spleen lesions

Spleen

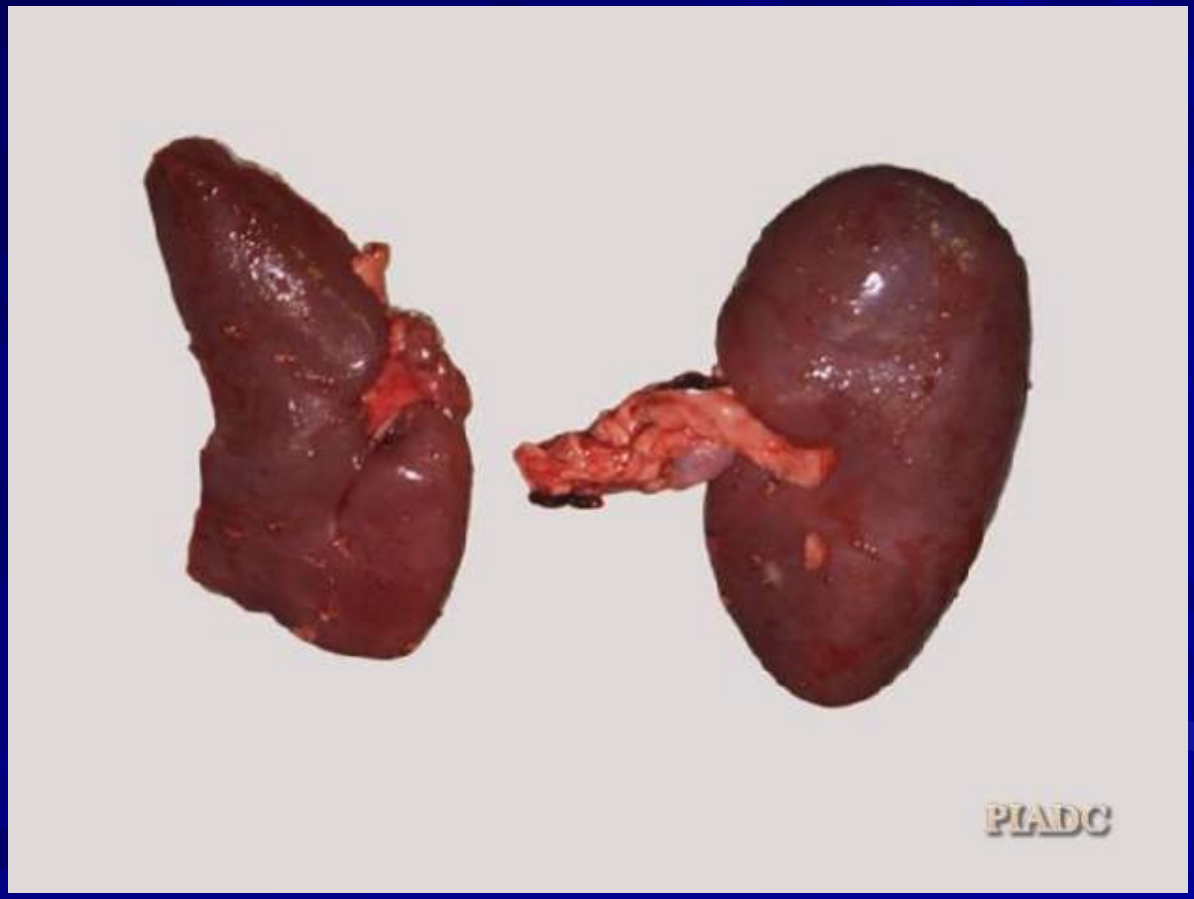
Spleen

Renal petechiation



Renal lesions

Renal lesions



Renal lesions

Chronic CSF: Button Ulcers in Cecum

Congenital infection with CSFV

Aborted and mumified fetuses.

Detection of CSF in pig breeding operations might be particularly difficult to detect, since the symptoms in adult pigs may be very mild and can be caused by many other pathogens. Thus an investigation for CSFV should be carried out in any case of reduced fertility index, when any other risk factors for CSF (e.g. area where CSF occurs in wild boar) are present and/or other diseases of the reproductive tract have been excluded.

Transmission

- The main source of infection is the PIG, either live animal contact or uncooked pig products

Transmission

- Mechanical transmission
- Fomites very important
- Veterinarians and farm workers
- Discarded infected pig meat

Transmission

- VERY CONTAGIOUS
- Causes devastating epidemics

Classical Swine Fever - 2006

Transmission

- Direct Transmission
  - Contact between sick and healthy animals: all tissues, excretions, secretions, semen and blood (oronasal).
  - Transplacental infection: Carrier Sow Syndrome.
  - Airborne spread to neighbors possible if high density pig farms.
- Indirect Transmission
  - Feeding uncooked garbage with infected meat.
  - Fomites: vehicles, equipment, boots, clothes.

How is CSFV often introduced into a new country? **Garbage!**

How does CSFV travel once established? **Movement/Fomites**

Stability of CSF Virus

Moderately Fragile

- Survives well in cool, moist & protein rich environments
  - E.g. Stored Meat
- Can survive some forms of meat processing
  - Survives curing and smoking
- Partially resistant to heat
  - Readily killed by cooking
- Inactivated at pH < 3.0 or > 11.0
- Susceptible to organic solvents (ether, chloroform)
- Inactivated by most disinfectants: 1-2% NaOH suitable

Route of Infection of CSF

- Ingestion: e.g. contaminated swill
- Contact with the conjunctiva
- Mucous membranes
- Skin abrasions
- Insemination
  - Contaminated semen caused 1967 outbreak in the Netherlands

Oronasal Route

All secretions and excretions are infectious

Environmental Persistence: Moderately Fragile

- **Sensitive to desiccation & UV**
- **Stable at pH 3-11**

Environmental Persistence: Moderately Fragile

- **Survival in Pork Products**
  - Up to 85 days in chilled pork.
  - >4 years in frozen pork.
  - 313 days in Parma hams and 140 -252 days in Serrano and Iberian hams.
  - Readily killed by cooking e.g. 30 min 65^{o}C.

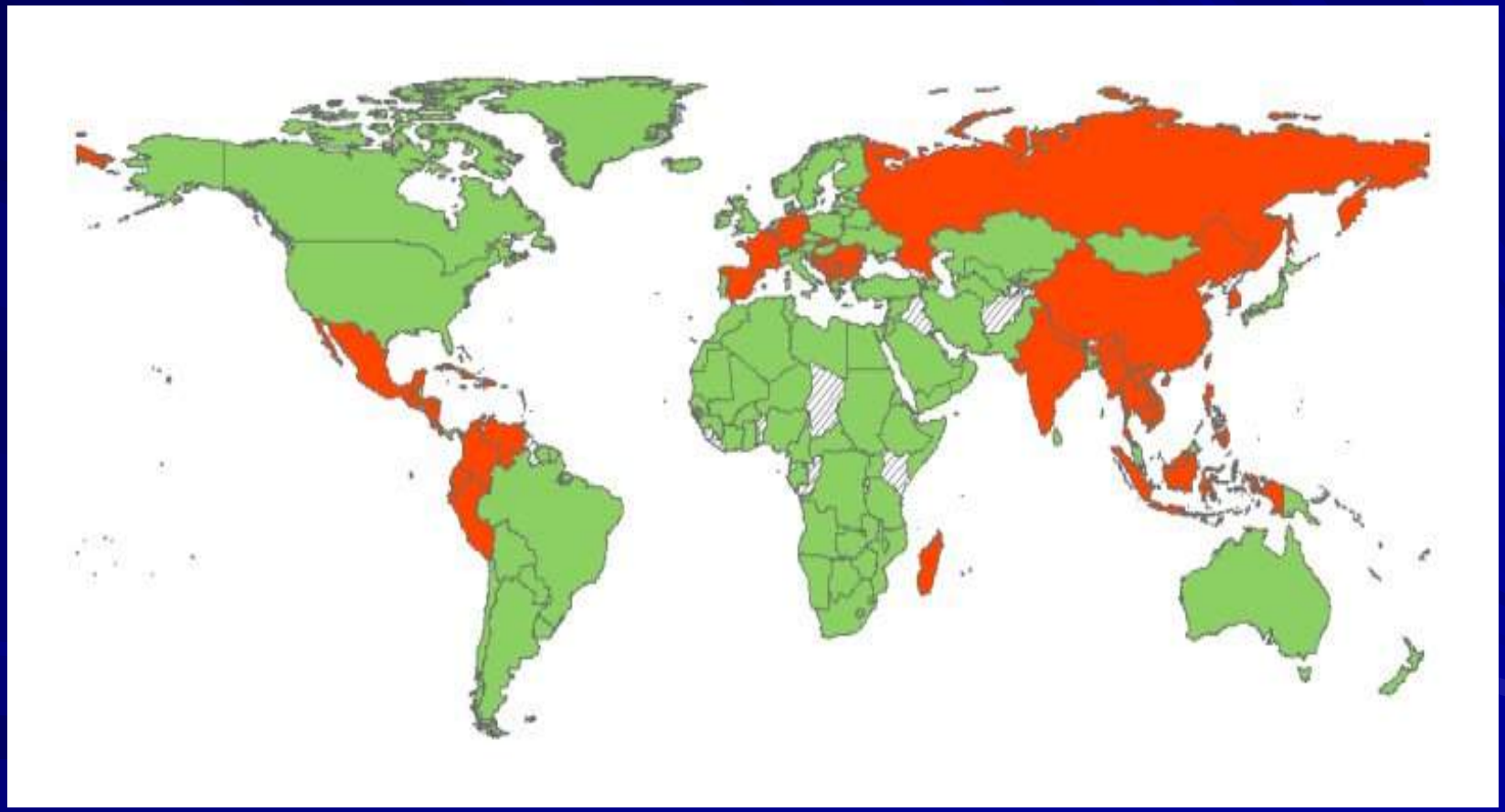
Spanish Serrano Ham

Parma ham — *prosciutto di Parma* — is a type of Italian raw, salted and dried ham, produced in Parma region. It is one of the most famous varieties of cured hams.

Environmental Persistence: Moderately Fragile

- **Survival in environment**
  - Months in contaminated pig pens in temperate climates.
  - 15 days in liquid phase of manure slurry.

Classical swine fever 2004



Classical Swine Fever - 2006

Geographic Distribution

- Distributed nearly worldwide
- Higher prevalence
  - East & Southeast Asia, India, China, South and Central America
- Africa???
- Eradicated in:
  - U.S.
  - Australia
  - New Zealand
  - Canada
  - Parts of Europe

Threat to Puerto Rico and U.S.

Disease Control Measures

Immunity & Vaccines for CSF

- Good immunity post-infection
- MLV vaccines available
  - Lapinized vaccines
  - Cell culture vaccines
  - Yearly dose (Safe in pregnant gilts)
- Marker sub-unit vaccines
  - DIVA strategy
    - E2 Vaccine and E^{rns} ELISA

Diagnosis

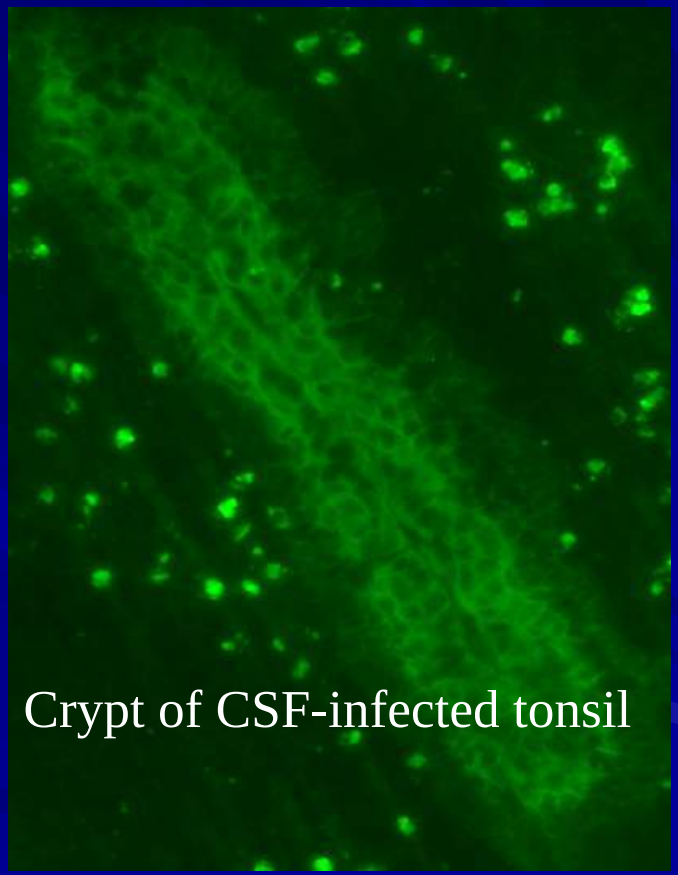
- History
- Clinical signs
- Post Mortem findings
  - Hemorrhage in lymph nodes, kidneys, tonsils, etc.
  - Splenic infarcts: nearly pathognomonic
- Histopathology
  - Degeneration and necrosis of endothelial cells
  - LN: lymphocytic depletion & reticular hyperplasia
- Laboratory testing: required for confirmation

Laboratory Testing for CSF

- Virus isolation
  - In Swine Cell Cultures; Inoculation in Live Pigs to confirm.
- Antigen Detection
  - Direct Fluorescent Antibody Test (DFAT)
  - Monoclonal antibody-Avidin Biotin Complex (ABC)
- Nucleic Acid Detection
  - Polymerase Chain Reaction (PCR) – Conventional & Real-time
- Antibody Detection
  - ELISA
  - Immunoperoxidase Test (IPT)
  - Virus Neutralization Test

Direct FA test for Classical Swine Fever

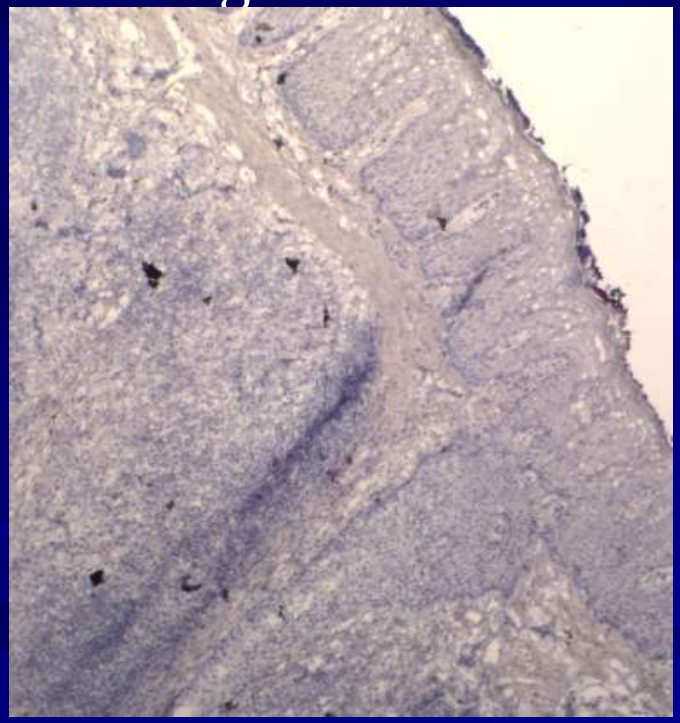
Nonspecific staining of crypt in non-infected tonsil



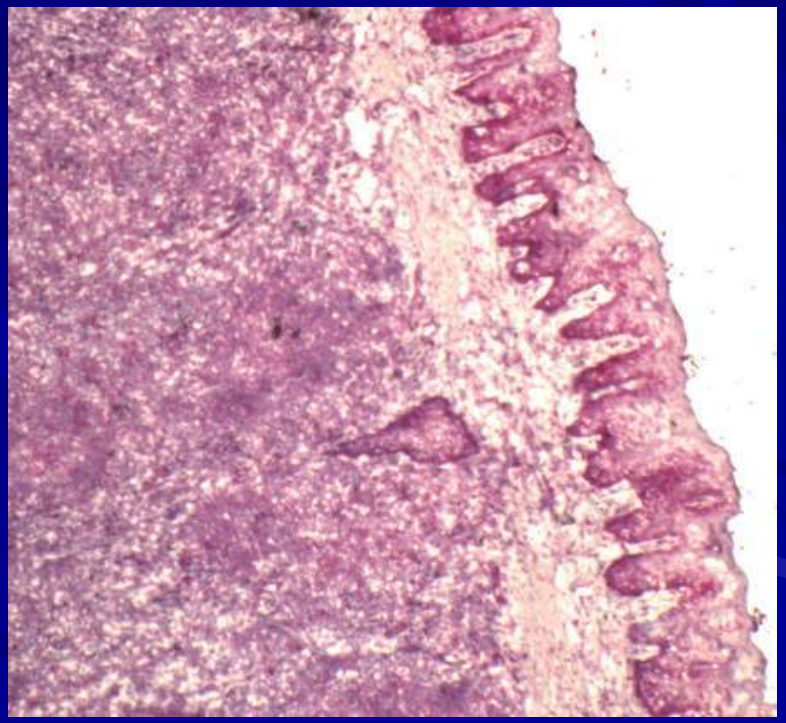
Crypt of CSF-infected tonsil

ABC Immunoperoxidase Test for Classical Swine Fever

No staining in tonsil of negative control



Cytoplasmic staining in tonsil of CSF-infected pig



Differential Diagnosis

- African Swine Fever
- Pasteurella
- Haemophilus
- Salmonellosis (septicemic)
- Erysipelas
- Eperythrozoonosis

Differential Diagnosis

- Poisoning, e.g. Coumarin (hemorrhage), Salt (CNS)
- Pseudorabies virus (PRV)
- Porcine Reproductive and Respiratory Syndrome (PRRS)
- Porcine Dermatitis and Nephropathy Syndrome (PDNS)
- Post-weaning Multisystemic Wasting Syndrome (PMWS)

Image Watermarks

Online References

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