Classical swine fever, also known as hog cholera, peste du porc, colera porcina, and virusschweinepest, is a highly contagious viral disease of pigs. In today’s presentation we will cover information regarding Classical Swine Fever (CSF), including the organism that causes the disease as well as 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, the clinical signs and necropsy findings, as well as the diagnosis and treatment of the disease. Finally, we will provide prevention and control measures for the disease and actions to take if CSF is suspected. Photo courtesy of Dr. Alex Ramirez, DVM, MPH, DACVPM, Iowa State University.

Classical swine fever virus (CSFV) is a lipid-enveloped RNA virus that belongs to the family Flaviviridae, genus Pestivirus. Only one CSFV serotype has been found, but there is minor antigenic variability between strains. The virus can range from high to low virulence, resulting in acute, subacute, chronic and persistent forms of the disease in infected swine. The virus is closely related to bovine viral diarrhea virus 1 (BVDV-1), BVDV-2 and the ovine Border disease virus. CSFV is moderately fragile in the environment but may survive for 3 to 15 days in the environment (longer periods in cold conditions). In a protein-rich environment, the virus is quite stable and can survive in refrigerated meat (for months) and frozen meat (for years). The virus is not inactivated by smoking or salt curing. Photo: Cells infected with CSFV replicating on a cell culture monolayer. The figure shows a fast replicating, highly virulent (oval and large plaque) virus, and a slow replicating, lower virulence (small and round plaques) virus replicating on a cell plaque.
Antecedentes históricos
- Confirmada por primera vez en los Estados Unidos en 1833
- Endémica a finales de los siglos 19 y 20
- Erradicada en 1997-1998
- En 36 países en 1989
- Erradicación Exitosa

Impacto económico
- Impacto en la producción
- Pérdida de mercados de exportación
- Control a través de:
  - Cuarentena
  - Sacrificio

Epidemiología

Distribución geográfica
- Asia, América del Sur y Central
- México
- Erradicada de EE.UU.
- Australia
- Nueva Zelanda
- La mayor parte de Europa

Morbilidad y mortalidad
- La edad y la condición inmune de los animales influye en el impacto del virus
- Mayor mortalidad en animales más jóvenes
- Mayor mortalidad en animales en coencas de carne de puerco
- Menores tasas de mortalidad y mortalidad crónica
- Pocos animales afectados
- Algunos casos asintomáticos

Classical swine fever (CSF) was first described in the United States in the early 19th century (1833, in Ohio) and was endemic throughout the late 19th and 20th centuries. The disease was confirmed in the UK in 1864, and spread rapidly until 1878 when steps were taken to control the disease. CSF was eradicated from Great Britain in 1966. Constant progress toward eradication has been made in Eastern Europe, stemming from guidelines developed for CSF control in individual states of Eastern Europe in 1980. In 1989, CSF was recognized in 36 countries, and was suspected of being present in two additional countries. CSF has been successfully eradicated in Australia, Canada, the United States, New Zealand and most of western and central Europe. Photo: historical depiction of pig undergoing vaccination.

While CSF has been eradicated from many countries, re-introduction is always a possibility. CSF can have a major impact on production, resulting in excessive morbidity and possibly mortality, as well as infertility and other deleterious health effects at the herd level. Additionally, classical swine fever is an OIE ‘priority’ disease for international trade. Confirmed cases can lead to a ban on the import and export of pigs and pork products to many different countries. As an example, in 1997-1998, an outbreak of CSF in the Netherlands spread to more than 400 herds in the country. Over 12 million pigs were euthanized (some in eradication efforts, most for welfare reasons) at an estimated cost of $2.3 billion. Similar re-introductions of the disease have occurred in the United Kingdom (2000), and other European countries (2001). On the farm, control will require quarantine and slaughter of affected and exposed swine.

Classical swine fever is found in much of Asia, some Caribbean islands and African countries and much of South and Central America. The disease has been reported in parts of Mexico. The disease has been eradicated from the United States, Canada, New Zealand, Australia and most of western and central Europe. Photo of CSF outbreaks occurring during January through June 2006. From the OIE (World Organization of Animal Health)- World Animal Health Information Database (WAHID) for Jan-June 2006. The red areas indicate areas of current disease events (2006). The green areas indicate areas where CSF has never been reported.

The severity of classical swine fever varies with the viral strain. The age and immune status of the animals also affects the disease outcome. Younger animals often have higher mortality rates than adult pigs. Disease from highly virulent strains most commonly result in acute infection with high morbidity and mortality rates; the case fatality rate can approach 100%. Subacute disease usually has lower case-fatality rates compared to acute cases; mild cases of illness have lower mortality rates. Less virulent strains may be more difficult to detect as can chronic infections of CSF. Only a few animals in the herd may show signs of illness and these signs can resemble other swine diseases. Some infections of CSF can be asymptomatic; these animals may serve as carriers for further dissemination of the disease.
Transmisión animal

- Altamente contagiosa en
  - Sangre, saliva, orina, heces
  - Tejidos de cerdos infectados
- Transmisión
  - Ingestión
    - Desechos alimentarios o productos cárnicos contaminados
  - Contacto directo o fomites
    - Menos común: aerosol, semen, vectores
  - Los cerdos infectados son el único reservorio

Transmisión animal

Classical swine fever virus is highly contagious. Sources of virus include blood and all tissues, secretions and excretion (saliva, urine, feces, semen) of sick and dead animals. Transmission primarily occurs from ingestion of the virus. This can occur following feeding of contaminated garbage or meat products. Transfer of the virus can also occur through direct contact of pigs with infected animals; this can occur through the mucous membranes, conjunctiva, and skin abrasions. Transfer of the virus by contaminated objects (fomites), such as boots, vehicles, equipment is also possible. Aerosol spread can occur in confined spaces; however the virus does not travel long distances in the air. This is a less common route of transmission as is transfer by insect vectors. Infected pigs are the only reservoir of virus. Humans are not susceptible to CSF infection.

Los animales y la Fiebre Porcina Clásica

Síntomas clínicos

- La CSF solamente afecta al cerdo
- Periodo de incubación: 2 a 14 días
- Variabilidad de la enfermedad
  - De agudamente mortal a asintomática
- Viremia persistente
  - Lechones infectados congénitamente
  - Excreción viral durante meses
- Los síntomas se asemejan a los de otras enfermedades porcinas

Síntomas clínicos

Classical swine fever only affects domesticated and wild pigs. The incubation period ranges from 2 to 14 days. The clinical signs of CSF vary with the strain of the virus and the susceptibility of the pigs. More virulent strains cause acute disease, while less virulent strains can result in a high percentage of chronic, mild, or asymptomatic infections. Highly virulent strains were once more prevalent, most epizootics are now caused by mild to moderately virulent strains. Clinical signs of CSF resemble other common swine diseases and are clinically indistinguishable from those of African swine fever.

Síntomas clínicos

In acute infections, common clinical signs include a high fever, dullness, weakness, drowsiness, tendency to huddle, anorexia, and constipation followed by diarrhea. Several days after the first symptoms appear, the abdomen, inner thighs and ears may become cyanotic (purplish discoloration). Hemorrhages can also occur in the skin. Incoordination, staggering, posterior paresis and convulsions may be seen in the terminal stages, and recovery is rare. Chronic disease symptoms include fever, anorexia, stunted growth, and alopecia; these symptoms may wax and wane for months. Chronic infections are almost always fatal. Reproductive symptoms may also be seen with any level of virulence. Photos: Top: Weak, huddling pigs (www.fao.org); Middle: cyanotic ears; Bottom: Hemorrhages in the skin. (middle and bottom photos from Dr. R. Thanawongnuwech, Veterinary Pathology-Chulalongkorn University with permission).
Las lesiones post mortem pueden ser muy variables. Con infecciones agudas, las lesiones más comunes son la hemorragia, especialmente en los riñones, riñón, laringe, tráquea, intestinos, bazo, pulmones y los lóbulos de las orejas. Las lesiones que pueden encontrarse incluyen focos necróticos en las amígdalas, fiebre porcina clásica, leucemia, atrofia del cerebro, malformaciones de cabeza y patas.

Las lesiones de la enfermedad crónica son menos severas y pueden estar complicadas por infecciones secundarias. Los focos necróticos pueden encontrarse en el intestino delgado y el recto. Las lesiones que pueden encontrarse incluyen la hipoplasia del cerebro, atrofia tímica, malformaciones de cabeza y patas.

El diagnóstico diferencial varía con el tipo de enfermedad, y pueden incluir enfermedades septicas como salmonelosis, eperythrozoonosis, pasteurellosis, actinobacillosis y Haemophilus parasuis. Las infecciones porcino reproductivo y respiratorio sindrómico y porcino circovirus asociadas también deben considerarse. Los diagnosticos diferenciales adicionales incluyen la fiebre porcina africana, hemólisis inducida por anticuerpos, anticoagulante (por ejemplo, warfarina) y enfermedades del nuevo nace, trombocitopenia purpura, intoxicación por sal, enfermedades por Aujeszky (pseudorabies) y parvovirus.

Antes de recoger o enviar cualquier muestra de animales sospechosos de enfermedad en animales, los autoridades competentes deben ser notificadas. Las muestras deben enviarse bajo condiciones seguras y a laboratorios autorizados para prevenir el contagio de la enfermedad.

CSF debe sospecharse en cerdos con septicemia y fiebre alta. Otras infecciones que podrían ser notadas incluyen fiebre porcina clásica, fiebre postradicional, parvovirus y pseudorabies. La presencia de los animales de nueva incorporación o retorno a la granja, alimentación de desechos alimentarios o sobras de comida en estado crudo o faltos de cocimiento, en especial de productos rurales, ingreso de nuevos animales a la granja, presencia de visitantes o trabajadores externos, falta de respuesta de los cerdos enfermos a los tratamientos de rutina, son hallazgos que pueden sugerir la presencia de CSF.
Diagnóstico

- Pruebas de laboratorio
  - Detección de virus, antígenos, ácidos nucleicos
  - Muestras de tejidos (amígdalas, bazo, riñones, ileón distal)
  - Sangre entera
  - ELISA o inmunofluorescencia directa
  - Serología
  - ELISA o neutralización viral
  - Prueba de neutralización comparativa
  - Prueba definitiva

Differentiation of classical swine fever from other diseases (especially African swine fever, from which CSF is clinically indistinguishable) requires laboratory testing. CSF can be distinguished by detecting the virus or its antigens in whole blood or tissue samples. CSF surveillance most commonly uses rRT-PCR (real time reverse transcriptase polymerase chain reaction) testing on tonsils and nasal swabs. Virus antigens may also be detected by direct immunofluorescence or ELISAs. Serology is used for diagnosis; the most commonly used tests are virus neutralization tests and ELISAs. The definitive test for differentiation is the comparative neutralization test.

Tratamiento

- No deberá intentarse tratamiento alguno
- Las medidas necesarias serán dictadas por las autoridades estatales y/o federales de sanidad animal
- Sacrificio de:
  - Casos confirmados
  - Animales que estén en contacto con otros
  - Posible sacrificio de la piara completa
- Restricciones zonales de movilización de cerdos
- ¿Vacunación?

No treatment should be attempted for pigs suspected with CSF. The state veterinarian or federal Area Veterinarian in Charge (AVIC) should be contacted immediately upon suspicion of disease. Actions needed will be directed by these animal health authorities. Confirmed cases and in-contact animals should be slaughtered, and measures taken to protect other pigs in the area. This may entail complete herd slaughter combined with area restrictions on pig movements, or vaccination (depending on local disease control regulations). **Note: Producers will only receive indemnity for animals destroyed under the order of animal health officials.** In countries where classical swine fever is endemic, vaccines may be used to protect animals. Both modified live and subunit (marker) vaccines are manufactured, although availability varies with the country.

La enfermedad en el ser humano

- Los seres humanos no son susceptibles a la CSF

Humans are not susceptible to classical swine fever infection.

Prevención y control
**Medidas recomendadas**

- **Notificación a las autoridades**
  - Al nivel federal: Médico Veterinario Encargado del Área (AVIC) www.aphis.usda.gov/vs/area_offices.htm
- **Cuarentena**

If you suspect a case or outbreak of classical swine fever, contact your state and/or federal veterinarian immediately. State and/or federal animal health authorities will direct the disease response. Official herd quarantines may be imposed in efforts to control the spread of the disease.

**Vigilancia en los Estados Unidos**

- **USDA-APHIS-VS**
  - **Notificación pasiva**
    - Envío de un Experto en Diagnóstico de Enfermedades Exóticas (FADD, por sus siglas en inglés)
  - **Monitoría activa**
    - Poblaciones de alto riesgo
    - Muestreo de tejidos (amígdalas, tromandas nasales)
    - Serología

Currently, Veterinary Services (VS) relies on three surveillance programs for detection of CSF. Passive reporting is conducted by private practitioners (or producers, diagnosticians, slaughter plant inspectors) of suspicious cases with clinical signs similar to a foreign animal disease such as CSF. Once reported to the Area Veterinarian in Charge (AVIC), a Foreign Animal Disease Diagnostician (FADD) is dispatched to investigate the case and collect samples for shipment to the Foreign Animal Disease Diagnostic Laboratory (FADDL) at Plum Island, New York. Additionally, active surveillance is conducted and involves specimen collection from high risk populations, such as waste feeding operations along the Texas – Mexican border. Serum testing has declined dramatically as the focus has shifted to testing tissue samples (e.g., tonsils, nasal swabs) for antigen rather than serum for antibodies. The December 2003 CSF surveillance plan provides the rationale for this transition.

**Cuarentena**

- **Sospecha o diagnóstico**
  - Sacrificio de casos confirmados, animales que estén en contacto con otros
  - Imposición de una estricta cuarentena
  - Evita que la enfermedad se propague

When there is diagnosis or suspicion of CSF, confirmed cases and contact animals are slaughtered and strict quarantine (pictured above) is imposed to prevent the spread of disease. Picture courtesy of Katie Steneroden, ISU.

**Control de la enfermedad**

- **Desinfectantes**
  - Hipoclorito de sodio
  - Compuestos fenólicos
- **El virus es sensible:**
  - Al secado
  - A la luz ultravioleta
  - pH menor a 3 o mayor a 11
- **Inactivado a altas temperaturas**
  - 150°F durante 30 minutos; 160°F durante 1 minuto

CSFV is moderately fragile in the environment. The virus is sensitive to drying and ultraviolet light. It is rapidly inactivated by pH 3 or less or pH greater than 11. The virus is stable at pH 5-10. Sodium hypochlorite and phenolic compounds are effective disinfectants. The virus can be destroyed by cooking at temperatures of 65.5 ºC (150 ºF) for greater than 30 minutes or 71 ºC (160 ºF) for one minute.

**Medidas preventivas**

- **No alimente a los cerdos con desechos alimentarios o productos cárnicos crudos**
- **Minimice la presencia de visitantes en la granja**
  - En especial aquellos que hayan viajado internacionalmente en los últimos 5 días
  - Monitoreo a los visitantes; insta en que se respeten las medidas apropiadas de bioseguridad
  - Limpie/desinfecte las botas
  - Overoles limpios

To prevent the introduction of CSF into the U.S., pigs should not be fed uncooked or undercooked garbage (swill) or meat products. Since the CSFV is stable in the tissues of infected animals, feeding these materials may transfer the virus to susceptible swine. Additionally, visitors onto the farm should be minimized. This is especially important for those who have traveled internationally within the last 5 days. Some visitors are essential to the continued operation of the farm. For these individuals, they should check-in with farm personnel upon arrival and follow biosecurity measures while on the farm (e.g., wearing clean coveralls and cleaning and disinfecting boots before entering and after leaving animal areas).
Medidas preventivas

- Monitoree rigurosamente a los animales para detectar síntomas de enfermedad
  - Inspeccione diariamente a los animales
  - Capacite al personal de la granja para que notifique la existencia de animales enfermos y síntomas de CSF
- Limpie y desinfecte
  - Vehículos
  - Equipos
  - Botas y vestimenta

Animales infectados con CSF pueden propagar rápidamente el virus a otros cerdos susceptibles, por lo tanto, cualquier animal que muestre signos de enfermedad debe ser aisllado de inmediato. Además, ya que los cerdos pueden ser asintomáticos o pueden deshacerse del virus antes de que aparezcan signos clínicos, los animales recién comprados o que hayan regresado deben ponerse en cuarentena por un mínimo de 30 días antes de introducirse en el rebaño. Se deben mantener registros sanitarios de cada uno de los animales.

Vacunación

- Disponible en países endémicos
  - Protege contra la enfermedad
  - No elimina las infecciones
- Útil para el control de brotes
- Todos debemos hacer la parte que nos corresponde
  - Mantener a nuestros cerdos saludables y libres de enfermedad

Vacunas están disponibles en los países endémicos. Aunque la vacunación puede proteger a los animales de la enfermedad clínica, no elimina las infecciones y, por lo tanto, puede ser inapropiada en los países con una política de erradicación. En los países libres de CSF, la vigilancia periódica es necesaria para confirmar la libertad de infección.

Recursos adicionales

- Sitio Web de la Organización Mundial de Sanidad Animal (OIE)
  - www.oie.int
- Sitio Web del Servicio de Inspección Fitozoosanitaria del Departamento de Agricultura de los EE.UU. (USDA – APHIS)
  - www.aphis.usda.gov

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