



Classical Swine Fever Backgrounder

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Causative agent

Classical swine fever (CSF), also called hog cholera or swine fever, is caused by a pestivirus within the Flaviviridae family. The bovine viral diarrhea virus and border disease virus are other members of the pestivirus genus; West Nile virus and Japanese encephalitis virus are also members of the Flaviviridae family, but belong to a different viral genus. Flaviviruses are 40- to 70-nm, enveloped viruses with a protein-coated nucleic acid core that have 20 faces on their surface. They are positive-sense, single-stranded RNA viruses.

Natural distribution

Domestic pigs and wild boar are the only natural reservoirs of CSF. Humans are not susceptible to the CSF virus. CSF can be found in Asia, Central America, and parts of Africa and Europe. The disease was eradicated from the United States in 1962. Canada, Great Britain, New Zealand, Australia, Iceland, and Switzerland are also free of CSF. It has not been eradicated from South America, but outbreaks are rare.

The World Organization for Animal Health (OIE) classifies CSF as a notifiable disease because of its potential for rapid spread and substantial impact on the international trade of animals and animal products. In accord with the Public Health Security and Bioterrorism Preparedness Response Act of 2002, USDA has recognized CSF virus as a select agent that could pose a severe threat to animal health and/or animal products in the United States.

Transmission

Once infected, domestic pigs are capable of transmitting CSF virus to susceptible pigs by direct and indirect contact. Ingestion and inhalation are the most common routes of infection, but transmission has also occurred via conjunctival or mucous membrane contact, contamination of skin abrasions, insemination, and transfer of blood.

Infected animals shed the virus in saliva, feces, blood, urine, and nasal discharge. Contaminated equipment, vehicles, clothing, and footwear can mechanically transmit the virus to susceptible animals. Blood-sucking insects and birds may also mechanically transmit the virus. The CSF virus does not replicate (reproduce) in these species; unlike African Swine Fever (ASF), insects are not biological vectors for transmission of the CSF virus. Consumption of uncooked, infected pork scraps has resulted in outbreaks of CSF; the CSF virus can survive in these products for many months. Transplacental infection with strains of low virulence can produce chronically infected piglets, which can then be sources of infection and outbreaks.

The incubation period ranges from 2 to 14 days. If a pig recovers from CSF, it is capable of shedding the virus for long periods; therefore, recovered animals are important potential sources of infection. Similarly, apparently healthy but infected pigs are important sources of virus for outbreaks.

Clinical Signs

CSF can occur in acute or chronic forms. In the acute form of CSF, affected animals exhibit a high fever (up to 108 °F [42.2 °C], mean of 106 °F [41.1 °C]), severe depression, and anorexia. Other signs that may be observed include constipation followed by diarrhea, vomiting, coughing, thick discharge from the eyes, and hind limb weakness. Blotchy, purple discoloration of the skin is frequently observed; the ears, abdomen, and inner thighs are most often affected. Affected pigs may stand with arched backs. Abortions, still births, and weak litters are observed when pregnant sows are infected with

the CSF virus. Newborn piglets frequently develop neurologic signs, including tremors and convulsions. Death usually occurs in 10 to 15 days.

The chronic form of CSF results in similar clinical signs, but they are intermittent and less severe. Anorexia, fever, hair loss, and constipation alternating with diarrhea are usually observed. As with ASF, the chronic form is associated with infection by low-virulence strains. Infection of pregnant sows may result in fetal death, mummification, and stillbirths. This form can also result in “carrier-sow” syndrome, in which chronically infected sows produce persistently infected piglets; these animals have lifelong viremia, and may transmit infection when introduced into naïve herds. In some herds, the only clinical sign observed when CSF viral infection is of low virulence is poor reproductive performance. Congenital infection with CSF virus of low virulence may result in tremors, runting, poor growth, and death.

Secondary bacterial infections are common in pigs infected with the CSF virus due to virus-induced immunosuppression. *Pasteurella multocida* and *Salmonella choleraesuis* are commonly involved, and infection can result in pneumonia and severe enteritis (inflammation of the gut).

The acute, febrile, hemorrhagic syndrome associated with CSF viral infection closely resembles that of [African swine fever](#) (ASF, or hog cholera), and the two diseases may be indistinguishable in outbreak situations. Unlike CSF, ASF does not produce conjunctivitis (inflammation of the tissues around the eyes) or encephalitis, and pigs infected with the ASF virus do not appear to lose condition as rapidly as those infected with the CSF virus.

Other diseases and conditions with clinical signs similar to CSF include bovine viral diarrhea (BVD), leptospirosis, streptococcosis, actinobacillosis, multisystemic wasting syndrome, coumarin poisoning, Porcine Dermatitis and Nephropathy Syndrome, erysipelas, epierythrozoosis, viral encephalitis, salt poisoning, salmonellosis, pasteurellosis, and septicemia.

Diagnosis

Definitive diagnosis of CSF requires viral isolation and identification. Appropriate diagnostic samples include uncoagulated blood collected during the early portion of the febrile stage, as well as sections of the tonsils, spleen, kidney, ileum, and lymph nodes obtained during necropsy. Tests include the direct fluorescent antibody (FA) test, immunofluorescence, immunoperoxidase staining with monoclonal antibodies, genetic sequencing, and reverse-transcriptase polymerase chain reaction (RT-PCR). Isolation of the virus from cell cultures is more sensitive than other tests, but is slower than use of immunofluorescence.

Serologic tests available for diagnosis of CSF include the neutralizing peroxidase-linked assay, comparative neutralization (CN) test, fluorescent antibody virus neutralization, and enzyme-linked immunosorbent assay (ELISA). Antibody production is delayed in CSF-infected animals due to immunosuppression; therefore, antibodies may not be detectable until 21 days after infection. The CN test is considered by the OIE to be the definitive method for differentiation of CSF viral infection.

Specimens for serologic examination or virus isolation should be shipped refrigerated. Organ sections should be submitted in neutral-buffered 10% formalin.

Treatment

Classical swine fever is a reportable disease. State or federal animal health officials should be notified immediately when CSF is observed or suspected. There is no treatment for CSF.

Morbidity and Mortality

The case fatality rate (the number of clinically affected animals that die from the disease) of the acute form of CSF is 95 to 100% in susceptible populations.

Prevention and Control

The importation of only pigs free from CSF virus is important to prevention of disease in non-endemic countries. In endemic areas, control and eradication of CSF involves slaughter and disposal of all acutely infected and seropositive animals, and good isolation and sanitation practices. Serologic monitoring systems in countries free from CSF are important to maintaining a disease-free state.

Available modified live vaccines include those made from the lapinized Chinese, Japanese guinea pig cell culture-adapted, and French Thiverval strains. Vaccines are safe for pregnant sows and piglets more than 2 weeks old. Vaccination has been employed in endemic countries, and has been effective in preventing losses. Vaccine use in countries free from CSF or in areas where eradication programs are in place is generally prohibited, but recombinant DNA vaccines have been recently developed. These vaccines offer an advantage in that antibodies induced by the vaccine can be differentiated from those produced in response to natural infection, thereby allowing use in countries where control and eradication programs are in effect.

The virus is susceptible to desiccation (drying), cresol, sodium hydroxide, formalin, sodium carbonate, ionic and non-ionic detergents, strong iodophors, and pH extremes.

Strict quarantine and slaughter are employed to control outbreaks. Once CSF is confirmed, infected, recovered, and CSF-susceptible animals in contact with those affected are slaughtered; carcasses, bedding, and all animal products in the affected area are destroyed