CLASSICAL SWINE FEVER STANDARD OPERATING PROCEDURES: 1. OVERVIEW OF ETIOLOGY AND ECOLOGY

FAD PReP

Foreign Animal Disease
Preparedness & Response Plan

United States Department of Agriculture

United States Department of Agriculture • Animal and Plant Health Inspection Service • Veterinary Services

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The Foreign Animal Disease Preparedness and Response Plan (FAD PReP) Standard Operating Procedures (SOPs) provide operational guidance for responding to an animal health emergency in the United States.

These draft SOPs are under ongoing review. This document was last updated in **October 2016**. Please send questions or comments to:

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Classical Swine Fever

Etiology & Ecology Quick Summary

Disease

Classical swine fever (CSF), hog cholera, swine fever, European swine fever, peste du porc, cólera porcina, virusschweinepest.

Mortality & Morbidity

High morbidity, often fatal, but morbidity and mortality depend on strain virulence.

Susceptible Species

Domestic and wild swine.

Zoonotic Potential?

No.

Reservoir

Pigs and wild boar.

Transmission

Direct contact with infected swine. Virus present in blood, secretions and excretions, and tissues of affected swine. Indirect contact and swill feeding also important in transmission.

Persistence in the Environment

Moderately fragile in the environment. Sensitive to drying and ultraviolet light. Can survive 3 days at 50°C and 7–15 days in 37°C, and up to 4 weeks in winter conditions. Can survive in urine and feces for at least 2 weeks, depending on strain and other conditions.

Animal Products and By-Products

Virus survives in moist and protein-rich environments for long periods, including 4 years in frozen meat.

1.1 Introduction

CSF is a highly contagious, often fatal, viral disease of swine with acute, chronic, and congenital presentations. The severity of the disease varies with the strain of the virus, the age of the pig, and the susceptibility of the herd.[1] The CSF virus (CSFV) only naturally infects domestic and wild swine (*Sus domestica* and *Sus scrofa*).[2] CSFV infection is challenging to diagnose due to the range and nonspecific nature of clinical signs.[3] Humans are not susceptible to CSFV infection.

CSF is considered to be one of the most important infectious diseases of swine, and a significant threat to animals and animal industry in the United States. An example of the potential impact of CSF is the 1997–1998 outbreak in the Netherlands, which resulted in the loss of more than 11 million swine and cost an estimated $2.3 billion dollars to eradicate.[4,5]

Because CSFV could manifest in a subclinical or chronic form with few clinical signs, it may not be detected rapidly. For this reason, active and passive surveillance is conducted through the Animal and Plant Health Inspection Service (APHIS) Classical Swine Fever Surveillance Program.

1.1.1 Goals

As a preparedness goal, the APHIS will provide etiology and ecology summaries for CSF and update these summaries at regular intervals.

As a response goal, the Unified Command and stakeholders will have a common set of etiology and ecology definitions and descriptions, to ensure proper understanding of CSF when establishing or revising goals, objectives, strategies, and procedures.

1.1.2 Further Information

This document is intended to be an overview, focusing on CSF in domestic swine. Additional resources on CSF, as well as the articles referenced in this standard operating procedure (SOP) are listed in Attachment 1.A. Abbreviations used throughout this SOP are listed in Attachment 1.B. Case definitions and diagnostic criteria are available from the APHIS Classical Swine Fever

[1] World Organization for Animal Health (OIE). (2016). Classical swine fever. *General Disease Information Sheets*. Retrieved from http://www.oie.int/doc/ged/D13956.PDF.

[2] Risatti, G. R., & Borca, M. (2014). Overview of Classical Swine Fever. In S. E. Aiello, M. A. Moses, & M. A. Steigerwald (Eds.), *Merck Veterinary Manual.* Kenilworth: Merck Sharp & Dohme Corp. Retrieved from http://www.merckvetmanual.com/mvm/generalized_conditions/classical_swine_fever/overview_of_classical_swine_fever.html.

[3] Moennig, V., Floegel-Niesmann, G., & Greiser-Wilke, I. (2003). Clinical Signs and Epidemiology of Classical Swine Fever: A Review of New Knowledge. *The Veterinary Journal, 165*(1), 11–20. http://doi.org/10.1016/S1090-0233(02)00112-0.

[4] Terpstra, C., & de Smit, A. J. (2000). The 1997/1998 epizootic of swine fever in the Netherlands: control strategies under a non-vaccination regimen. *Veterinary Microbiology, 77*(1–2), 3–15. http://doi.org/10.1016/S0378-1135(00)00252-2.

[5] Meuwissen, M. P. M., Horst, S. H., Huirne, R. B. M., & Dijkhuizen, A. A. (1999). A model to estimate the financial consequences of classical swine fever outbreaks: principles and outcomes. *Preventive Veterinary Medicine, 42*(3–4), 249–270. http://doi.org/10.1016/S0167-5877(99)00079-3.

Surveillance Program. These documents are available on the APHIS Foreign Animal Disease Preparedness and Response Plan (FAD PReP) website: www.aphis.usda.gov/fadprep.

1.2 Purpose

The purpose of this document is to provide responders and stakeholders with a common understanding of the disease agent.

1.3 Etiology

1.3.1 Name

This disease is called classical swine fever, hog cholera, swine fever, European swine fever, peste du porc, cólera porcina, and virusschweinpest.[6]

1.3.2 Virus Characteristics

According to the International Committee on Taxonomy of Viruses, CSFV is in genus *Pestivirus* of the family Flaviviridae.[7] It is closely related to ruminant pestiviruses, including bovine viral diarrhea virus and border disease virus.[8]

1.3.3 Morphology

CSFV is a single-stranded ribonucleic acid (RNA) virus, approximately 40–60 nm in diameter and consists of a nucelocapsid that is in a glycoprotein envelope. There is one serotype of CSFV and three geographically linked genotypes, each with three or four subgroups: 1.1, 1.2, 1.3 (South America and Russia); 2.1, 2.2, 2.3 (Europe and parts of Asia); and 3.1, 3.2, 3.3, 3.4 (Asia).[9,10]

1.4 Ecology

1.4.1 General Overview

CSF is endemic in parts of Central and South America, Eastern Europe, Asia, and Africa.[11] The World Organization for Animal Health (OIE) currently recognizes 30 countries as CSF-free,

[6] OIE. (2009). Classical swine fever. *Technical Disease Card*. Retrieved from http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Disease_cards/CLASSICAL_SWINE_FEVER.pdf.

[7] International Committee on Taxonomy of Viruses. (2015). Classical swine fever virus. Retrieved from http://www.ictvonline.org/virusTaxonomy.asp.

[8] Risatti, G. R., & Borca, M. (2014). Overview of Classical Swine Fever. In S. E. Aiello, M. A. Moses, & M. A. Steigerwald (Eds.), *Merck Veterinary Manual.* Kenilworth: Merck Sharp & Dohme Corp. Retrieved from http://www.merckvetmanual.com/mvm/generalized_conditions/classical_swine_fever/overview_of_classical_swine_fever.html.

[9] Paton, D. J., McGoldrick, A., Greiser-Wilke, I., Parchariyanon, S., Song, J. Y., Liou, P. P., Stadejek, T., Lowings, J. P., Björklund, H., & Belák, S. (2000). Genetic typing of classical swine fever virus. *Veterinary Microbiology*, *73*(2–3), 137–157. http://doi.org/10.1016/S0378-1135(00)00141-3.

[10] Kirkland, P. D., Le Potier, M.-F., Vannier, P., & Finlaison, D. (2012). Classical Swine Fever (Hog Cholera). In J. Zimmerman, L. Karriker, A. Ramirez, K. Schwartz, & G. Stevenson (Eds.), *Diseases of Swine* (10th ed., pages 539–546). John Wiley & Sons, Inc. Retrieved from http://www.vet.unicen.edu.ar/ActividadesCurriculares/EnfermedadesInfecciosas/images/Documentos/2015/Diseases of Swine. J.J.Zimmerman. 10th Edition. 2012.pdf.

[11] OIE. (2016). Classical swine fever. *General Disease Information Sheets*. Retrieved from http://www.oie.int/doc/ged/D13956.PDF.

encompassing Australia, New Zealand, North America, and Western Europe; the OIE also considers only Brazil to have CSF-free zones.[12] Retention on the OIE list of CSF-free countries is dependent on certain surveillance and reporting requirements as detailed in the *Terrestrial Animal Code*.[13] As the result of an eradication program started in the United States in 1961, the last recorded case of CSF in this country was in 1976.[14]

Currently, the United States only considers the following countries or regions free or low risk of CSF: Australia, Canada, one region in Brazil, Chile, the APHIS-defined European CSF region (Austria, Belgium, Croatia, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, the Netherlands, Poland, Portugal, the Republic of Ireland, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom), regions of Mexico, Fiji, Iceland, the Marshall Islands, Micronesia, New Zealand, Norway, and Palau. For an up-to-date list of the regions and countries considered to be CSF-free and special restrictions that apply to some of the countries/regions above, visit: https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-and-animal-product-import-information/import-live-animals/ct_classical_swine_fever_information.

1.4.2 Susceptible Species

Pigs and Eurasian wild boar develop clinical signs following CSFV infection, and the virus may be capable of infecting all members of the pig (Suidae) family.[15] Productive infection in warthogs and bushpigs has been demonstrated experimentally.[16] Additionally, CSFV has been detected in peccaries, although it is unlikely this species maintains the disease, and experimental subclinical infections have been demonstrated in cattle, goats, sheep, and deer.[17,18] There is no zoonotic potential of CSF—humans are not susceptible to CSFV.[19]

1.4.3 Transmission of Classical Swine Fever Virus

[12] OIE. (2016). Resolution No. 23 Recognition of the Classical Swine Fever Status of Member Countries. In *General Session Final Report* (pages 21–22). Paris. Retrieved from http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/2016_A23_RESO_CSF.pdf.

[13] OIE. Infection with Classical Swine Fever. Terrestrial Animal Health Code (2016). Retrieved from http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_csf.htm.

[14] Edwards, S., Fukusho, A., Lefèvre, P. C., Lipowski, A., Pejsak, Z., Roehe, P., & Westergaard, J. (2000). Classical swine fever: The global situation. *Veterinary Microbiology*, *73*(2–3), 103–119. http://doi.org/10.1016/S0378-1135(00)00138-3.

[15] Center for Food Security and Public Health (CFSPH). (2015). Classical Swine Fever. *Iowa State University*. Retrieved from http://www.cfsph.iastate.edu/Factsheets/pdfs/classical_swine_fever.pdf.

[16] Everett, H., Crooke, H., Gurrala, R., Dwarka, R., Kim, J., Botha, B., Lubisi, A., Pardini, A., Gers, S., Vosloo, W., & Drew, T. (2011). Experimental Infection of Common Warthogs (Phacochoerus africanus) and Bushpigs (Potamochoerus larvatus) with Classical Swine Fever Virus. I: Susceptibility and Transmission. *Transboundary and Emerging Diseases*, *58*(2), 128–134. http://doi.org/10.1111/j.1865-1682.2011.01202.x.

[17] Dahle, J., & Liess, B. (1992). A review on classical swine fever infections in pigs: Epizootiology, clinical disease and pathology. *Comparative Immunology, Microbiology & Infectious Diseases*, *15*(3), 203–211. http://doi.org/10.1016/0147-9571(92)90093-7.

[18] Terán, M. V., Ferrat, N. C., & Lubroth, J. (2004). Situation of Classical Swine Fever and the Epidemiologic and Ecologic Aspects Affecting Its Distribution in the American Continent. *Annals of the New York Academy of Sciences*, *1026*(1), 54–64. http://doi.org/10.1196/annals.1307.007.

[19] Dahle, J., & Liess, B. (1992). A review on classical swine fever infections in pigs: Epizootiology, clinical disease and pathology. *Comparative Immunology, Microbiology and Infectious Diseases*, *15*(3), 203–211. http://doi.org/10.1016/0147-9571(92)90093-7.

The only natural reservoirs of CSFV are infected pigs and Eurasian wild boar. CSFV may be shed in infected animals' oronasal discharges, semen, blood, urine, feces, and other secretions, though the strain and virulence of the virus may impact the route and quantity of virus shedding.[20,21] Virus shedding may occur when no clinical signs are present, including during the incubation period and in the case of chronic infection with unapparent clinical signs.[22] Piglets infected in utero or shortly after birth may persistently or intermittently shed CSFV for months.[23]

CSFV is primarily introduced via oronasal transmission through direct contact with infected animals and indirect contact through contaminated fomites, including conveyances and personnel.[24,25] Other modes of transmission include short distance (≤ 1 km) airborne transmission, improperly cooked pork or pork products (swill) used as feed, mechanical vectors such as insects, and congenital transmission.[26,27]

1.4.4 Diagnosis

Due to the lack of pathognomonic symptoms, CSF can only be confirmed by laboratory diagnosis. CSFV can be detected in whole blood and tissue (samples of choice are tonsil, pharyngeal or mesenteric lymph nodes, spleen, kidney, and distal ileum). Virus identification can be accomplished through reverse transcription polymerase chain reaction (RT-PCR) or real-time RT-PCR, virus isolation in cell culture with virus detection by immunofluorescence or immunoperoxidase and confirmation by monoclonal antibodies, or a direct immunofluorescence test on cryostat sections of organs.[28] Antibodies may be detected during the 3rd week of CSF infection and persist for life. Serological tests for diagnosis or surveillance for CSF include neutralization peroxidase-linked assay and fluorescent antibody virus neutralization.[29] For

[20] Weesendorp, E., Stegeman, A., & Loeffen, W. (2009). Dynamics of virus excretion via different routes in pigs experimentally infected with classical swine fever virus strains of high, moderate or low virulence. *Veterinary Microbiology*, *133*(1–2), 9–22. http://doi.org/10.1016/j.vetmic.2008.06.008.

[21] Durand, B., Davila, S., Cariolet, R., Mesplède, A., & Le Potier, M. F. (2009). Comparison of viraemia- and clinical-based estimates of within- and between-pen transmission of classical swine fever virus from three transmission experiments. *Veterinary Microbiology*, *135*(3–4), 196–204. http://doi.org/10.1016/j.vetmic.2008.09.056.

[22] Risatti, G. R., & Borca, M. (2014). Overview of Classical Swine Fever. In S. E. Aiello, M. A. Moses, & M. A. Steigerwald (Eds.), *Merck Veterinary Manual*. Kenilworth: Merck Sharp & Dohme Corp. Retrieved from http://www.merckvetmanual.com/mvm/generalized_conditions/classical_swine_fever/overview_of_classical_swine_fever.html.

[23] OIE. (2009). Classical swine fever. *Technical Disease Card*. Retrieved from http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Disease_cards/CLASSICAL_SWINE_FEVER.pdf.

[24] Kirkland, P. D., Le Potier, M.-F., Vannier, P., & Finlaison, D. (2012). Classical Swine Fever (Hog Cholera). In J. Zimmerman, L. Karriker, A. Ramirez, K. Schwartz, & G. Stevenson (Eds.), *Diseases of Swine* (10th ed., pages 539–546). John Wiley & Sons, Inc. Retrieved from http://www.vet.unicen.edu.ar/ActividadesCurriculares/EnfermedadesInfecciosas/images/Documentos/2015/Diseases of Swine. J.J.Zimmerman. 10th Edition. 2012.pdf.

[25] Elbers, A. R. W., Stegeman, J. A., & de Jong, M. C. M. (2001). Factors associated with the introduction of classical swine fever virus into pig herds in the central area of the 1997/98 epidemic in the Netherlands. *The Veterinary Record*, *149*(13), 377–382. http://doi.org/10.1136/vr.149.13.377.

[26] OIE. (2009). Classical swine fever. *Technical Disease Card*. Retrieved from http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Disease_cards/CLASSICAL_SWINE_FEVER.pdf.

[27] CFSPH. (2015). Classical Swine Fever. *Iowa State University*. Retrieved from http://www.cfsph.iastate.edu/Factsheets/pdfs/classical_swine_fever.pdf.

[28] OIE. (2009). Classical swine fever. *Technical Disease Card*. Retrieved from http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Disease_cards/CLASSICAL_SWINE_FEVER.pdf.

[29] de Smit, A. J. (2000). Laboratory diagnosis, epizootiology, and efficacy of marker vaccines in classical swine fever: A review. *Veterinary Quarterly*, *22*(4), 182–188. http://doi.org/10.1080/01652176.2000.9695054.

herd-level surveillance, enzyme-linked immunosorbent assays (ELISAs) may be used to detect CSFV antigen.[30]

1.4.5 Morbidity and Mortality

The incubation period of CSF is typically 2–14 days, although field conditions can result in CSF going undetected in a herd for 2–4 weeks or longer.[31,32] Symptoms of CSF can vary widely and clinical signs are often not present or non-specific.[33] This has led to delays in detection in past outbreaks.[34,35,36] The clinical presentation of CSF is typically described as acute, chronic, or congenital/prenatal forms of the disease.

Acute CSF infection is typically observed in swine less than 12 weeks of age and presents with clinical signs such as fever, anorexia, conjunctivitis, respiratory signs, and neurological signs. Acute CSF infection generally causes death within 1–3 weeks but older animals many experience less severe clinical signs and recover. Chronic CSF infection may have initial clinical signs similar to an acute infection followed by apparent recovery. However, chronically infected animals do not mount an effective immune response and death inevitably occurs, usually within 1–3 months. Depending on the stage of gestation during which a sow is infected, the congenital form of CSF results in poor reproductive performance, including fetal death, resorption, abortion, or still birth, or piglets with poor growth or neurological signs. Piglets with congenital CSF may be clinically asymptomatic at birth but shed CSFV for months, eventually becoming symptomatic and typically surviving less than a year.[37,38,39]

As previously stated, the severity of a CSFV strain may depend on strain, individual, and herd factors. Morbidity rates may approach 100 percent for particularly virulent strains while mortality as low as 20 percent has been seen with strains of low virulence. Highly virulent strains

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[30] CFSPH. (2015). Classical Swine Fever. *Iowa State University*. Retrieved from http://www.cfsph.iastate.edu/Factsheets/pdfs/classical_swine_fever.pdf.

[31] Moennig, V., Floegel-Niesmann, G., & Greiser-Wilke, I. (2003). Clinical Signs and Epidemiology of Classical Swine Fever: A Review of New Knowledge. *The Veterinary Journal*, *165*(1), 11–20. http://doi.org/10.1016/S1090-0233(02)00112-0.

[32] OIE. (2009). Classical swine fever. *Technical Disease Card*. Retrieved from http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Disease_cards/CLASSICAL_SWINE_FEVER.pdf.

[33] Koenen, F., Van Caenegem, G., Vermeersch, J. P., Vandenheede, J., & Deluyker, H. (1996). Epidemiological characteristics of an outbreak of classical swine fever in an area of high pig density. *The Veterinary Record*, *139*(15), 367–371. http://doi.org/10.1136/vr.139.15.367.

[34] Elbers, A. R. W., Stegeman, A., Moser, H., Ekker, H. M., Smak, J. A., & Pluimers, F. H. (1999). The classical swine fever epidemic 1997–1998 in the Netherlands: descriptive epidemiology. *Preventive Veterinary Medicine*, *42*(3–4), 157–184. http://doi.org/10.1016/S0167-5877(99)00074-4.

[35] Moennig, V., Floegel-Niesmann, G., & Greiser-Wilke, I. (2003). Clinical Signs and Epidemiology of Classical Swine Fever: A Review of New Knowledge. *The Veterinary Journal*, *165*(1), 11–20. http://doi.org/10.1016/S1090-0233(02)00112-0.

[36] Australian Veterinary Emergency Plan (AUSVETPLAN). (2015). *Disease strategy for classical swine fever*. Retrieved from https://www.animalhealthaustralia.com.au/download/2470/.

[37] Moennig, V., Floegel-Niesmann, G., & Greiser-Wilke, I. (2003). Clinical Signs and Epidemiology of Classical Swine Fever: A Review of New Knowledge. *The Veterinary Journal*, *165*(1), 11–20. http://doi.org/10.1016/S1090-0233(02)00112-0.

[38] CFSPH. (2015). Classical Swine Fever. *Iowa State University*. Retrieved from http://www.cfsph.iastate.edu/Factsheets/pdfs/classical_swine_fever.pdf.

[39] OIE. (2009). Classical swine fever. *Technical Disease Card*. Retrieved from http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Disease_cards/CLASSICAL_SWINE_FEVER.pdf.

appear to be less common than they have been historically, as current outbreaks have been caused by moderately virulent CSF viruses.[40]

1.5 Environmental Persistence of Classical Swine Fever Virus

CSFV is moderately fragile in the environment and does not spread far (≤1 km) when airborne. Experimental evidence suggests CSFV can survive for 70 days at 17ºC and for 84 days at 4ºC. However, other experiments have showed significantly less survivability. In feces, CSFV may be detectable through day 42 or longer, depending on the strain. In urine, experiments suggest CSFV would not be detectable after 18 days. CSFV persists in moist, protein-rich environments like pork tissues and body fluids and has been known to survive for months in chilled and cured pork meats.[41] CSFV is likely to be infectious in pen housing for no more than a few days.[42]

The OIE states the following about the resistance of CSFV to physical and chemical action:[43]

Action	Resistance
Temperature	Cooking readily inactivates CSFV. Meat should be heated to 65.5ºC for 30 minutes or 71ºC for 1 minute. CSFV can survive for months in refrigerated meat and for years in frozen meat. Some strains are more resistant to moderate heat than others (56ºC).
Chemicals/Disinfectants	CSFV is stable from pH 5–10, bur rapidly inactive at a pH less than 3.0 or greater than 11.0. The virus is susceptible to ether, chloroform, β-propiolactone (0.4 percent). Chlorine-based disinfectants will inactivate CSFV. CSFV will also be inactivated by cresol (5 percent), sodium hydroxide (2 percent), formalin (1 percent), sodium carbonate (4 percent anhydrous or 10 percent crystalline), ionic and non-ionic detergents as well as strong iodophors (1 percent) in phosphoric acid.
Survival	CSFV does not typically persist in the environment. It is sensitive to drying as well as ultraviolet light. The virus can survive well in pens during cold conditions, and may survive up to 4 weeks in winter. Survives 3 days at 50ºC and 7–15 days at 37ºC.

[40] CFSPH. (2015). Classical Swine Fever. *Iowa State University*. Retrieved from http://www.cfsph.iastate.edu/Factsheets/pdfs/classical_swine_fever.pdf.

[41] Risatti, G. R., & Borca, M. (2014). Overview of Classical Swine Fever. In S. E. Aiello, M. A. Moses, & M. A. Steigerwald (Eds.), *Merck Veterinary Manual.* Kenilworth: Merck Sharp & Dohme Corp. Retrieved from http://www.merckvetmanual.com/mvm/generalized_conditions/classical_swine_fever/overview_of_classical_swine_fever.html.

[42] Weesendorp, E., Stegeman, A., & Loeffen, W. L. A. (2008). Survival of classical swine fever virus at various temperatures in faeces and urine derived from experimentally infected pigs. *Veterinary Microbiology*, *132*(3–4), 249–259. http://doi.org/10.1016/j.vetmic.2008.05.020.

[43] OIE. (2009). Classical swine fever. *Technical Disease Card.* Retrieved from http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Disease_cards/CLASSICAL_SWINE_FEVER.pdf.

1.5.1 World Organization for Animal Health Procedures for Inactivation of Classical Swine Fever Virus

The OIE recommends the following times and temperatures for the inactivation of CSFV in various products.[44]

1.5.1.1 In Swill

The OIE recommends one of the following procedures for the inactivation of CSFV in swill:

1. The swill should be maintained at a temperature of at least 90ºC for at least 60 minutes, with continuous stirring, or
2. The swill should be maintained at a temperature of at least 121ºC for at least 10 minutes at an absolute pressure of 3 bar.

1.5.1.2 In Meat

The OIE recommends the following times and temperatures for the inactivation of CSFV in meat:

1. *Heat treatment:* Meat shall be subjected to one of the following:
   a. heat treatment in a hermetically sealed container with a F_0 value of 3.00 or more;[45]
   b. heat treatment at a minimum temperature of 70ºC, which should be reached throughout the meat.
2. *Natural fermentation and maturation:* Meat should be subjected to a treatment consisting of natural fermentation and maturation having the following characteristics:
   a. an Aw value of not more than 0.93, or
   b. a pH value of not more than 6.0

   Hams should be subjected to a natural fermentation and maturation process for at least 190 days and loins for 140 days.
3. *Dry cured pork meat:*
   a. Italian style hams with bone-in should be cured with salt and dried for a minimum of 313 days.
   b. Spanish style pork meat with bone-in should be cured with salt and dried for a minimum of 252 days for Iberian hams, 140 days for Iberian shoulders, 126 days for Iberian loin, and 140 days for Serrano hams.

[44] OIE. Infection with Classical Swine Fever. Terrestrial Animal Health Code (2016). Retrieved from http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_csf.htm.
[45] F_0 is a measure of heat treatment; it is equivalent to heating for 1 minute at 121.1ºC.

1.5.1.3 In Casings of Pigs

The OIE recommends the following procedures for the inactivation of CSF likely to be present in casings of pigs:

1. Salting for at least 30 days either with phosphate supplemented dry salt or saturated brine (Aw < 0.80) containing 86.5 percent NaCl, 10.7 percent Na_2HPO_4 and 2.8 percent Na_3PO_4 (weight/weight/weight), and kept at a temperature of greater than 20°C during this entire period.

1.5.1.4 In Skins and Trophies

The OIE recommends one of the following procedures for the inactivation of CSF likely to be present in skins and trophies:

1. Boiling in water for an appropriate time to ensure that any matter other than bone, tusks, or teeth is removed;
2. Gamma irradiation at a dose of at least 20 kilogray at room temperature (20ºC or higher);
3. Soaking, with agitation, in a 4 percent (w/v) solution of washing soda (sodium carbonate –Na_2CO_3) maintained at pH 11.5 or above for at least 48 hours;
4. Soaking, with agitation, in a formic acid solution (100 kg salt [NaCl] and 12 kg formic acid per 1,000 litres water) maintained at below pH 3.0 for at least 48 hours; wetting and dressing agents may be added;
5. In the case of raw hides, salting for at least 28 days with sea salt containing 2 percent washing soda (sodium carbonate – Na_2CO_3).

Attachment 1.A References and Resources

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Attachment 1.B Abbreviations

APHIS	Animal and Plant Health Inspection Service
AUSVETPLAN	Australian Veterinary Emergency Plan
CFSPH	Center for Food Security and Public Health
CSF	classical swine fever
CSFV	classical swine fever virus
ELISA	enzyme-linked immunosorbent assay
FAD PReP	Foreign Animal Disease Preparedness and Response Plan
OIE	World Organization for Animal Health
RNA	ribonucleic acid
RT-PCR	reverse transcription polymerase chain reaction
SOP	standard operating procedure
USDA	United States Department of Agriculture