THE SCIENCE WORLD
A Monthly e Magazine
ISSN:2583-2212
May 2024 Vol.4(5), 1760-1768

Popular Article

African swine fever: a threat to the pig population

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https://doi.org/10.5281/zenodo.11218507

Abstract

African swine fever (ASF), which has caused significant losses in pig herds and severe economic ramifications, has emerged as a significant threat to the pork sector in recent years. The disease, which is currently affecting many parts of the world, is having a negative influence not only on the health and welfare of animals but also on biodiversity and farmer incomes. Feral (wild) pigs and farm-raised pigs are both susceptible. Although ASF cannot infect humans, it can spread easily from pig to pig through direct contact with bodily fluids from an infected animal. If pigs are given uncooked food waste that contains contaminated pork products, this technique may also lead to the virus spreading among the animals.
Keywords: ASF, Pig, economic loss

Introduction and Etiology

The African swine fever virus (ASFV), a large, enveloped DNA virus, is the virus that is causing African swine fever (ASF). Being the only known arthropod-borne DNA virus, it is the only member of the Asfivirus genus and Asfarviridae family. This makes it unique. Thus far, more than 20 ASFV genotypes have been found. The degree of virulence exhibited by ASFV isolates varies widely; very virulent isolates might result in up to 100% fatality, whilst less virulent isolates may just cause seroconversion. The term "seroconversion" in immunology describes the duration of time that a particular antibody develops and becomes visible in the blood. Blood tests for the antibodies can identify the condition once seroconversion has taken place. While genotypes I and II have been discovered outside of Africa, all genotypes are present on the continent. ASFV mostly infects

monocytes and macrophages, which are cells that are part of the mononuclear phagocytic system. Additionally, the virus prefers lymph nodes close to the head.

Distribution of ASF virus Genotypes

- There are 22 different ASF virus (ASFv) genotypes (I–XXII) that have been identified and are now in use in Africa.
- Up until the 2007 Georgia outbreak, which proved genotype II from East Africa, only genotype I outbreaks were reported in Europe and America.
- Despite minor genetic variations amongst closely related strains, just one genetic variety is currently expanding throughout Eastern Europe.
- Genotype 1 accounted for the majority of ASF cases in Europe up to 2007. All outbreaks in Eastern Europe after that year were identified as genotype 2.
- ASFv strains can be classified as highly virulent (death rates of 90–100%), moderately virulent (death rates of 70–80% in juvenile animals and 20–40% in adults), or low virulent (death rates of 10-15%).

Environmental stability of ASFV

ASFv exhibits great resistance in the environment, particularly in proteinaceous conditions (e.g., uncooked hog meat products) and at lower temperatures. The virus can live for a very long time in tissues, blood, and excrement. It can live in feces for a few days, in contaminated pig pens for a minimum of one month, and in blood preserved at 4oC for up to one or one and a half years. Additionally, the virus can infect boned pork kept at 3.9°C for 150 days, dried ham salted for 140 days, and frozen carcasses for several years.

Virus Inactivation

Many household disinfectants are powerless against the virus that causes African swine fever. Use of a disinfectant that has been specially certified for the virus should be done with caution. It has been discovered that serum and excrement significantly reduce the effectiveness of disinfectants; therefore, it is crucial to clean thoroughly before applying disinfectant. On nonporous surfaces, ASFV is said to be destroyed by citric acid, sodium hypochlorite, some iodine, and quaternary ammonium compounds. To render ASFV inactive, raw meat needs to be cooked to a minimum of 70°C for a duration of 30 minutes. On clean surfaces, the virus can also be rendered inactive by a pH of less than 3.9 or a pH of greater than 11.5; however, the presence of serum boosts the virus's resistance, necessitating a pH of up to 13.4 for inactivation.

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Published 19.05.2024

Epidemiology

African swine fever is still a worry since it has traditionally had a significant negative influence on animal health and the economy. In 1921, ASFV was initially identified in domesticated pigs in Montgomery, Kenya. Presently, the majority of sub-Saharan Africa, including the island of Madagascar, is thought to be endemic for the disease.

Portugal saw the first cases of ASF outside of Africa in 1957. In the 1960s, the illness grew widespread in Spain and Portugal before spreading to other European nations (such as the Netherlands, Italy, France, and Belgium). With the exception of the Italian island of Sardinia, where the virus is now thought to be endemic, eradication efforts "stamped out" the disease in the 1990s and took more than 30 years to fully eradicate.

During that period, in 1963, *Ornithodoros erraticus*, a soft-bodied tick, was captured from farms afflicted with ASF, and it was from this tick that Spanish researchers identified ASFV. They discovered that the virus may spread through tick bites and that it replicates inside ticks. Ticks can carry the virus for a lifetime, and infected soft tick colonies can harbor the infection for many years. ASF debuted in Cuba in 1971, marking its Western Hemisphere debut.

After the death or depopulation of almost 400,000 pigs, the disease was eliminated. ASF outbreaks happened in Brazil, the Dominican Republic, Haiti, and Cuba in the late 1970s. Both Brazil (1978–1981) and Haiti (1978–1984) saw severe outbreaks. Through depopulation efforts, the illness has been successfully eradicated from the Western Hemisphere.

In the Caucasus region of Eurasia, the Republic of Georgia received ASFv in 2007. From then, it extended to Belarus, the Russian Federation, Armenia, and Azerbaijan, among other nearby nations. Infections had been documented as far west as Poland, Lithuania, and Latvia as of 2015. In the Middle East (Iran), viruses that seem to have started with this outbreak have also been discovered in wild pigs. Although the virus causing this outbreak has no known origin, it is believed to have originated from frozen or processed imported pig meat.

Given that the disease is already widespread in China and that India borders China, Myanmar, and Nepal, bordering Indian states need to be on the lookout for the importation of live pigs and pork products. People living near borders, particularly in the northeast, need to be sufficiently made aware of this.

Species Affected

As the name implies, African swine fever affects members of the Suidae family of pigs. Domesticated pigs, Eurasian wild boars, warthogs, bush pigs, and gigantic forest hogs are among the

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species that can contract the disease. Swine that are feral are likewise vulnerable. Since they typically show no symptoms, warthogs and bush pigs are believed to be among the African wildlife reservoirs for the virus.

Morbidity and Mortality

The morbidity rate in domesticated pigs can reach around 100%. The death rate might range from less than 5% to 100%, depending on the isolate's virulence. Pigs of all ages are susceptible to almost 100% mortality from highly virulent isolates. Pregnant animals, immunocompromised animals, young animals, and pigs with a coexisting sickness are more susceptible to die from less virulent isolates. When ASFV is introduced into new areas, mortality also tends to be high, and once it becomes endemic, the rate of subacute and subclinical cases rises. The mortality rate in subacute disease might vary depending on the age group and can range from 30% to 70%.

Transmission

Direct or indirect contact with infected animals, their bodily fluids, or their tissues can result in the transmission of the ASF virus. Pigs that are susceptible to the virus can contract it directly from other affected pigs. Because the virus is present in all of the fluids and excretions from infected animals, the most common route of exposure is oronasal (i.e., saliva, ocular secretions, nasal discharge). Even after an animal dies, ASFV is present in all bodily fluids and tissues, with blood having the highest concentrations. According to certain accounts, cannibalism of deceased pigs can play a significant role in the spread. Indirect transmission can also happen, like when uncooked pig products are fed to a child. The feeding of swill or trash containing pig products contaminated with ASFV has been connected to the international spread of ASF.

Pigs can contract ASFV by infected soft ticks in the genus *Ornithodoros*; the most common species to do so are *O. erraticus* and *O. moubata* (formerly known as O. porcinus porcinus). Ticks can carry the virus for up to three years on their own, and infected soft tick colonies can harbor the infection for many years. Certain tick species have the ability to transmit ASFV by sexual, transovarial, and transstadial means. Ticks can carry the virus for a lifetime, and infected soft tick colonies can continue to do so for many years. Ticks containing *O. erraticus* have been documented from Russia and the Caucasus region. Their exact function in the spread of ASFV in spontaneously occurring epidemics is unclear, nevertheless. According to some researchers, the pig is merely an unintentional host of ASFV, which is essentially a tick virus.

Economic Impact

African swine flu can have detrimental effects on the health of animals as well as the economy

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and global trade. Swine infected with ASF may have a high rate of morbidity and mortality. The illness poses a risk to food security worldwide. ASF is classified as a high consequence foreign animal disease by the United States Department of Agriculture (USDA) and as a notifiable illness by the World Organization for Animal Health (OIE). A restriction on the import and export of pigs and pork products to and from numerous nations may result from confirmed cases, which would have a severe detrimental effect on the global economy.

Quarantining and depopulating pig herds afflicted by the virus will be necessary for an effective eradication in order to prevent its spread. This strategy has been used in previous epidemics, which have resulted in the eradication of hundreds of thousands of pigs. A protracted outbreak and pandemic may result from a failure to depopulate and implement quarantine. There is no proof that people can contract ASFV. There are no documented incidences of ASF in humans.

Clinical Disease

ASF can incubate for 5 to 21 days after coming into direct contact with infected pigs, while it can also occur less than 5 days after coming into touch with infected ticks. Acute, subacute, chronic, and peracute forms of African swine fever are all possible. Certain animals are capable of seroconverting without exhibiting any symptoms.

Acute form: The symptoms of acute ASF instances include weakness, anorexia, fever, lethargy, and recumbency. Erythema is visible, and it is more noticeable in white pigs. Certain pigs get cyanotic skin blotching, particularly on the tail, ears, hams, and lower legs.

Subacute form: Moderately virulent strains of the ASF virus induce subacute illness. The acute form's clinical symptoms are less severe in presentation, although they are similar. The first indication can be abortions. In this form, fever, thrombocytopenia, and leukopenia may be temporary. Hemorrhages may transpire when thrombocytopenia is present. In 3–4 weeks, affected pigs often either pass away or recover.

Chronic form: Pigs suffering from the chronic type may experience despondency, loss of appetite, and sporadic mild temperature. In certain animals, the symptoms might just include stunting and emaciation. Some pigs get joint swelling and respiratory issues. Diarrhoea and sometimes vomiting have been recorded, and coughing is a typical symptom. It is possible to see ulcers and reddish or elevated necrotic skin foci. African swine fever that persists can be lethal.

Post Mortem Lesions

The virulence of the isolate and the progression of the illness have an impact on the gross lesions of ASF, which vary greatly. Animals with acute or subacute ASF may have variable degrees of organ

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damage. When an animal dies suddenly, the corpse is frequently in good shape. In addition to symptoms of bloody diarrhoea or other internal hemorrhages, there could be bluish-purple discolouration and/or cutaneous hemorrhages. Hemorrhagic large internal lesions primarily affect the kidneys, heart, lymph nodes, and spleen. The spleen is typically swollen, friable, and dark crimson or black in cases of extremely aggressive diseases. The spleen is enlarged but not friable, with a nearly normal color, in a moderately virulent infection. Moreover, the carcass of an animal suffering from chronic African swine fever may be quite thin. Among the common post mortem lesions are swollen joints, pleural adhesions, consolidated lung lobules, focal skin necrosis, skin ulcers, and nonseptic fibrinous pericarditis. Some lesions may also be the result of secondary infections.

Differential Diagnosis

ASF has a wide range of differential diagnoses, and its symptoms might mimic those of other illnesses. Clinically, hog cholera and ASF are identical, also referred to as classical swine fever. Acute pig reproductive and respiratory syndrome (PRRS), erysipelas, salmonellosis, eperythrozoonosis, actinobacillosis, Glasser's disease (infection with *Haemophilus parasuis*), Aujeszky's disease (pseudorabies), thrombocytopenic purpura, warfarin poisoning, heavy metal toxicity, and other generalized septicemic or hemorrhagic conditions are some other illnesses that may present with similar symptoms.

Diagnosis

Viral isolation is a diagnostic method for African swine fever. The virus is not present in fetuses that have been aborted, but it can be found in blood from live animals or tissues (the best places to look are the tonsils, spleen, kidneys, and lymph nodes). Reference laboratories usually use virus isolation to verify the diagnosis. To find ASFV nucleic acids in clinical samples, PCR is frequently utilized. It can be used with fresh tissues or blood, but not with putrefied samples, which are inappropriate for viral isolation and antigen detection. The USDA authorized the use of whole blood and tonsils for ASF PCR in October 2018 as part of an investigation into a foreign animal illness, provided that the processing was done in licensed labs. Serological assays have a lot of applications, particularly in endemic areas. ELISAs and immunofluorescence can be used to detect ASFV antigens in tissue smears, cryostat slices, and buffy coat samples. The most popular tests are indirect fluorescent antibody (IFA), immunoblotting, and ELISAs. International trade requires the use of the ELISA, which is often validated by immunoblotting (but IFA can also be employed).

Treatment

As of right now, there is no vaccination or therapy for ASF. It is not advisable to try treating

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pigs that may have ASF. All efforts to create a vaccination against ASFV have failed thus far. Instead, the relevant animal health authorities should be in charge of responding. Measures should be taken to protect other pigs in the vicinity and confirmed cases and in-contact animals should be put to death. This might mean total herd depopulation in addition to limiting animal mobility.

Prevention and Control

Disrupting the virus's mode of transmission is the main strategy for preventing the introduction or spread of ASF. First, use strong farm biosecurity practices to keep any infected and susceptible pigs from coming into touch with one another in order to prevent direct contact transmission. In order to ensure health, this should involve keeping sick pigs apart from the herd, keeping pigs away from feral or wild hogs, housing pigs indoors when feasible, and separating recently acquired pigs from the herd for a minimum of 30 days.

Tips to prevent ASF from entering farm premises: -

1. Implementation of strict importation measures for animal products
2. Proper disposal of food waste from coming from infected countries. No human food waste should be fed to pigs.
3. Effective waste disposal and sterilization: Steer clear of rubbish feeding, or swill feeding. Feeding catering garbage is a high-risk activity since a healthy herd could become infected if the food waste is tainted with ASF.
4. All pigs, sick or not, should be quickly killed (stamping out): Animals that have recovered or survived are lifelong virus carriers. Therefore, it is advisable to kill both diseased and potentially infected pigs in order to stop the disease from spreading to other pigs and to avoid relapse. Stamping out is usually a temporary solution to end the illness. However, in most cases, it is the most economical approach that enables farms to become ASF-free as quickly as possible
5. Strict on-farm biosecurity: Prevent the spread of bacteria and viruses by adhering to biosecurity regulations, which include thoroughly disinfecting boots and clothes and refraining from introducing pork products that have not been heat-treated into a farm. Farms should have specific footwear and apparel that are used only on the farm.
6. Controlled movements of people and animals: Pigs should only be purchased from reputable and licensed vendors. ASF also encompasses people, vehicles, and equipment. Verify that anyone entering the farm hasn't spent the previous 48 hours interacting with any other pigs. Before visiting the farm, tourists who have recently gone to an ASF-positive country must take

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at least five days off. Before accessing the premises, vehicles and equipment should be thoroughly cleaned and sanitized. as bodily fluids and secretions from deceased or sick

7. African swine fever is spread via animals, hence carcass-hauling trucks should not be allowed on the farm due to high danger.
8. Monitoring and surveillance for diseases: This is crucial when transferring live pigs and pork products. Pig farms should also have a rigorous health monitoring program in place. ASF should be checked and examined in all dead or ill pigs. Pigs killed for in-home consumption should have an official veterinarian's inspection in order to identify ASF early. It is suggested that regular preventative lectures be held, that quality assessments be strengthened, and that daily feed ingredient records be kept in relation to staff training.
9. Effective and timely identification of the virus through lab testing: Contact a veterinarian right away if you notice any ASF symptoms in your pigs, and get them tested.
10. To stop the illness from entering and/or from spreading further, strict quarantine measures should be implemented in both ASF-free zones and infected zones.

Use caution when using a disinfectant that has been specifically approved for the virus, as many conventional disinfectants are ineffective. Equipment, cars, and personal protective equipment (PPE) must all be thoroughly cleaned after exposure to an area where ASF is suspected or has been diagnosed. ASFV has been observed to be destroyed on some nonporous surfaces by sodium hypochlorite, citric acid (1%) and some iodine and quaternary ammonium compounds.

Conclusion

ASF is a very contagious and reportable disease, as was previously mentioned. Actions must be done to stop the disease's spread and find the virus's source as soon as it is suspected or detected. If ASF is detected, a strict quarantine needs to be implemented. Until the authorities are informed and a diagnosis is confirmed, the entire herd needs to be placed under quarantine right away. While the investigation, diagnosis, and source of the virus are being conducted, there may be limits on movement.

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