

Biosecurity solutions for the prevention of African swine fever

African swine fever (ASF) is a highly contagious haemorrhagic viral disease that can be fatal to pigs and wild boars. It is responsible for serious production and economic losses.

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This transboundary animal disease can be spread by live or dead pigs (domestic or wild) and processed pork products. Furthermore, transmission can occur via contaminated feed and fomites such as shoes, clothing, vehicles, knives, equipment etc, due to the high environmental resistance of ASF virus.

There is no approved vaccine against ASF unlike classical swine fever (Hog Cholera), which is caused by a different virus and which has a totally different epidemiology. Historically, outbreaks have been reported in Africa and parts of Europe, South America, and the Caribbean.

More recently, since 2007, the disease has been reported in multiple countries across Africa, Asia and Europe, in both domestic



and wild pigs. ASF is a disease listed in the World Organisation for Animal Health (OIE) Terrestrial Animal Health Code and must be reported to the OIE.

Transmission routes

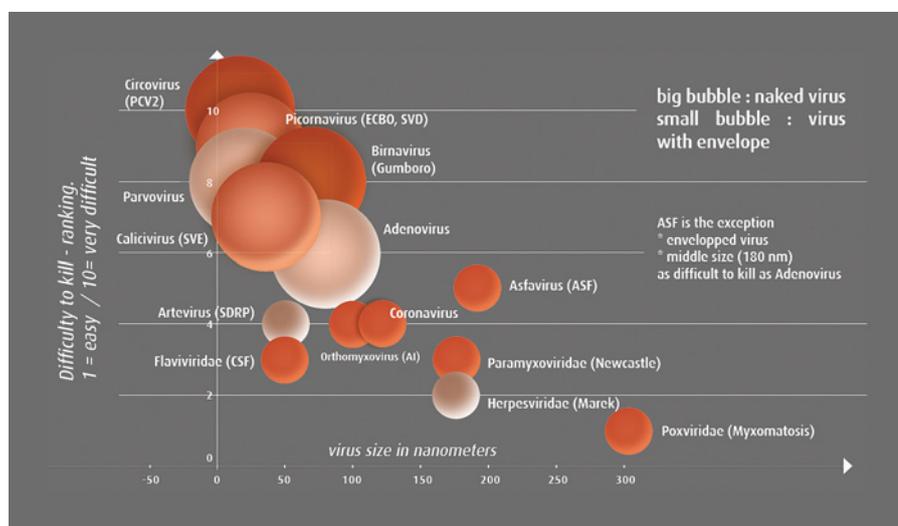
ASFv can spread according to different transmission routes:

- Oro-nasal route by direct contact with an

infected animal carrying the virus and via the secretions. The virus is present in all body fluids and tissues of infected animals.

- Oro-nasal route by direct contact with contaminated environment (excrement, fodder, manure, litter, equipment, vehicles, clothing).
- By Ingestion of contaminated food (contaminated processed food waste, contaminated fresh meat) or contaminated water.
- Via ticks bites (*Ornithodoros* genus) and biting flies.

Fig. 1. Classification of virus sensitivity to common disinfectants. Small and naked virus are more difficult to kill than big enveloped viruses.



A middle-sized virus with a complex structure

ASF virus is a double-stranded DNA virus belonging to the unique species African Swine Fever virus, the genus *Asfivirus* and the family *Asfarviridae*.

Several genotypes (22) of the species have been identified and the virulence differs greatly from one isolate to another.

The extracellular envelope has a diameter varying between 175 to 215nm. ASF virus has a middle size compared to other virus species which only measure less than 50nm (see Fig. 1).

The viral capsid is an icosahedral structure of capsomeres surrounded by a lipidic outer layer, qualifying the virus as enveloped. This outer layer is crucial for the virus infectivity.

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A virus very sensitive to disinfectants

Considering the biosecurity measures to implement, it is a real advantage that ASFV belongs to the group of enveloped viruses, as this group is much more sensitive to disinfectants compared to viruses without an envelope (qualifying as naked), especially if they are small. That is why the virucidal activity of disinfectants is tested, in Europe, on a reference virus: ECBO (Cytopathic Bovine Orphan virus), which is a small naked virus (27nm), both easy to cultivate in vitro and highly resistant to disinfectants.

A disinfectant which demonstrates the compulsory virucidal activity on the ECBO virus, according to European standardised methods, is guaranteed to perform complete virucidal activity on the ASFV, whatever the genotypes.

Environmental persistence

ASFV is resistant and persistent in the environment. Some strains not only survive but also remain infectious across a range of pHs between 4 to 13.

Different studies report virulent activity for ASFV strains stored for more than five years at 5°C, for 18 months at 20°C and between 10-30 days at 37°C. The virus can survive in soils or animal faeces for 5-6 months and up to 30 months in chilled meat. Nevertheless, it is inactivated at a temperature of 60°C applied for 30 minutes.

In general, we can observe that resistance and survival of enveloped viruses as ASFV is much higher based on temperatures below 10°C compared to high temperatures (above 20°C), in the environment or confronted with disinfectant treatment (see inset).

Two glutaraldehyde/ammonium based products (Vulkan Max/Vulkan Air) have been tested successfully on ECBO virus according to EN standards and demonstrate a high efficacy.

Vulkan Max, in particular, demonstrates efficacy on specific ASFV:

- At 0.8% according to EN 14675 standard/30 minutes/10°C
- At 0.2% according to Russian standard/1 hour/20°C/low soiling level conditions
- At 0.5% according to Russian standard/1 hour/20°C/high soiling level conditions

Biosecurity measures

Prevent pathogen contamination from outside to the production site. There is no vaccine against the disease and, nowadays, no treatments are available. The fight against the disease relies on biosecurity measures and strict management; avoiding the spread of the virus from infected animals or endemic areas (strict animal imports and monitored transportation).

On farm biosecurity

- Ensure buildings are pet, wild bird and rodent proof. Erect fencing around pig production units to keep out wild boars.
- Prevent contamination from vehicles to the production site: clean and disinfect vehicles. Keep trucks with feed and goods as far away from the stables/sheds/barns as possible.
- Clean and disinfect tractors and trailers (particularly those used to remove manure).
- Internal biosecurity (Danish entry system flow): Use clean specific clothes or coveralls and foot dips. Wash your hands before entry.
- Cleaning and disinfection procedures with proven efficacy products, equipment and surroundings disinfection, liquid manure removal.
- Monitoring of entrants (food, water). Drinking water disinfection.

- Animal health monitoring (abnormal signs or symptoms).

If contamination occurs

If a case is reported, establish an emergency procedure for hazardous areas including:

- Elimination of animals: slaughter and incineration of all animals in the contaminated compartments and/or farms.
- Isolation and securing of the site: rigorous confinement and isolation procedures.
- Cleaning and disinfection of barns in collaboration with the competent authorities and selected service providers.

As observed in Europe and in some regions of Asia, the transmission of African swine fever seems to depend largely on the wild boar population density and their interaction with low-biosecurity pig production systems, alongside contamination by food waste caused by human interaction. Good management of the wild boar population, biosecurity knowledge and co-ordination among the veterinary services, wildlife and forestry authorities are required, alongside human education in waste management to successfully prevent and control ASF. ■

References are available
from the author on request