AFRICAN SWINE FEVER VIRUS (ASFv)

A Biosecurity Guide
AFRICAN SWINE FEVER VIRUS Timeline

1909
- ASFv first described

1921
- CASE zero found in Kenya

1957
- ASFv spreads to Lisbon, Portugal

1971
- Outbreak in Cuba
  - 500,000 pigs culled

1978
- Latvia declares ASF emergency
- Romania announces its first outbreak
- Czech Republic experiences ASF for first time

1985
- Brazil, Haiti, Dominican Republic report ASFv

2015
- France, Belgium, and other European countries report sporadic ASFv outbreaks

2017
- Romania experiences 591 outbreaks mainly in the Danube Delta region
- Poland reports an additional 63 ASF cases
- Bulgaria reports 7 backyard pigs infected by ASF
- Romania announces another 42 outbreaks resulting in the culling of 140,000 pigs
- Belgium reports two infected wild boars have been found on a military base

2018
- Estonia reports ASF

2021
- Second outbreak in Portugal
- ASFv established in Iberian Peninsula
African Swine Fever Virus

ASF is eradicated from Iberian Peninsula
ASF appears again in Alentejo, Portugal, but is successfully eradicated

1995

ASF is confirmed in the Caucasus region of Georgia
ASF is reported in Armenia

1999

ASF is confirmed in Azerbaijan (related to Georgian outbreak)

2008

ASF is confirmed in Belarus, marks the virus’s expansion into Europe
Eastern European countries declare ASF an endemic disease

2013

Spain & Portugal are declared free of ASF

2018 (continued)

Spain & Portugal are declared free of ASF

2019

Poland detects ASF in >130 wild boars and backyard holdings
Ukraine notifies of 11 outbreaks
Latvia announces ASF detection in domestic and wild pigs
Lithuania experiences its first outbreak

ASF jumps to China
- 1st identified in the Liaoning province
- 2nd case reported in Henan province
- 3rd case found in Jiangsu province
- 4th case reported in Zhejiang province
- 5th case found in Anhui province

A carcass positive for ASF was found on Taiwan’s shore
An ASF outbreak outside control zone in Belgium, near border of France
ASF continues to spread in China to include Gansu and Ningxia provinces
ASF detection in pork products smuggled into Australia
ASF spreads into north-central Mongolia
ASF detected in two provinces in Vietnam
ASF detected in two provinces in Cambodia

ASF flies from China to South Korea in contaminated, processed pork
AFRICAN SWINE FEVER VIRUS

African swine fever (ASF) was first observed in Kenya in 1909 following the introduction of the European (exotic) domestic pig. It was then described retrospectively in 1921 as a highly contagious hemorrhagic disease in both wild and domestic pigs. ASF has extremely high morbidity and mortality, spreads rapidly and causes severe illnesses, thus is a notifiable disease with the World Organization for Animal Health (OIE).

In the third quarter of 2018, ASF made its biggest leap into China. The first case was reported in Shenyang, in the district of Shenbei New, in the Liaoning province which is in the north east of the country – a pig dense area. A second case was confirmed in a slaughterhouse in the city of Zhengzhou, in the Henan province – about 870 miles south west of the first case. The third case of ASF virus was reported in a farm in Liangyungang, in the Haizhou district, in the Jiangsu Province – approximately 350 miles east of the 2nd case. The fourth case was found in Yueqing City and Wenzhou City, in the Zhejiang Province – about 500 miles further along the Pacific coast from the 3rd case. The fifth case was reported in Wuhu, in Nanling district, in the Anhui province – directly west of Shanghai. And finally, we received proof of ASF contaminated, processed pork being brought to South Korea via a traveler flying in the Incheon Airport.

For these reasons, Neogen has created a comprehensive biosecurity strategy. It is intended for producers, veterinarians and allied industry partners to reference and develop an effective biosecurity plan against ASF in the United States. This plan will cover the etiology and ecology of ASF and control and eradication strategies for producers and veterinarians.
What is ASFv?

African Swine Fever is a virus that belongs to the Asfivirus genus of the Asfarviridae family. ASFv is an enveloped virus like PRRSv, PEDv, CSFv, and TGEv. Unlike the majority of the viruses we manage in the U.S., ASF is a double-stranded DNA virus. Currently, there is only 1 recognized serotype, but within that serotype, there have been 22 different genotypes.

**Susceptibility**
Viral susceptibility is a concern to most of the species within the Suidae family including, but not limited to domesticated pig, European wild boar, bush pigs, and giant forest hogs. Though susceptible to the virus, African pigs and some pigs native to South America are believed to be resistant to clinical disease.

**Disease Forms**
Infection presents itself in four clinical forms: Peracute, Acute, Subacute, and Chronic infections, and are based on the virulence of the strain, immune status of the herd, clinical signs being seen, and overall gross lesions.

**Transmission**
There are three modes of transmission: Direct, Indirect, and Vector-borne transmission. Direct transmission can occur through infected saliva, respiratory secretions, urine and feces. Indirect transmission occurs from contaminated fomites, such as infected garbage that is fed to pigs. Vector-borne transmission is typically seen via the Orinthodorus tick, where the virus can spread via sexual reproduction, through their offspring (transovarial), or through different phases of life (transstadial).

AFRICAN SWINE FEVER VIRUS

Incubation Period—3 to 15 days

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Day 0 - Exposure</td>
<td>Day 1</td>
<td>Day 2</td>
<td>Day 3</td>
<td>Day 4</td>
</tr>
<tr>
<td>Day 5</td>
<td>Day 6</td>
<td>Day 7</td>
<td>Day 8</td>
<td>Day 9</td>
<td>Day 10</td>
<td>Day 11</td>
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<tr>
<td>Day 12</td>
<td>Day 13</td>
<td>Day 14</td>
<td>Day 15</td>
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</tbody>
</table>

Clinical Signs—Those that survive are lifelong carriers

Clinical signs will vary by disease form and virus strain where the Peracute form will have almost no clinical signs before sudden death to the Chronic form which may easily be confused for other diseases like PRRS, Erysipelas, Salmonellosis, or Pasteurellosis.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Peracute</th>
<th>Acute</th>
<th>MS - Subacute</th>
<th>Chronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virulence of Strain</td>
<td>High</td>
<td>High</td>
<td>Moderate to low</td>
<td>Low</td>
</tr>
<tr>
<td>Immune Status</td>
<td>Death before blood detection</td>
<td>Many die before blood detection</td>
<td>Detectable in blood</td>
<td>Detectable in blood</td>
</tr>
<tr>
<td>Clinical Signs</td>
<td>Close to death or dead</td>
<td>Fever, loss of appetite, bloody stool, lethargic, red to bluing skin</td>
<td>Variable, but similar and less severe than acute</td>
<td>Reoccurring mild fever, abortions, reddened and necrotic skin</td>
</tr>
<tr>
<td>Gross Lesions</td>
<td>Death occurs prior to noticeable lesions form</td>
<td>Spleen enlarged, Multiple hemorrhages (kidneys and heart, lymph nodes), Swelling of gall bladder</td>
<td>Lesions are similar, but milder than Acute</td>
<td>Fibrinous pleuritis with pneumonia</td>
</tr>
</tbody>
</table>

Morbidity and Mortality

All forms of African Swine Fever experience high levels of morbidity. Mortality will vary by form, but it is not uncommon to experience a range of 20 to 100% mortality in naïve herds.

<table>
<thead>
<tr>
<th>Disease Form</th>
<th>Mortality Rate</th>
<th>Time Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peracute</td>
<td>Up to 100%</td>
<td>7-10 days</td>
</tr>
<tr>
<td>Acute</td>
<td>Up to 100%</td>
<td>6-13 days</td>
</tr>
</tbody>
</table>
| Subacute     | Younger pigs: 70-80%  
Older Pigs: <20%     | 6-15 days   |
| Chronic      | Low            | Life Long   |

Persistence of ASFv

1. Environment
Very resilient virus that can withstand extreme temperatures, fluctuations in pH and remain viable for long periods in tissues and bodily fluids.

2. Within Host
If the host survives, they remain carriers for life. ASFv is able to persist in ticks for more than 5 years and maintain infectivity when ticks perform a blood meal.

Treatment and Vaccination
At this time, there are no effective, commercially available treatments or vaccinations to prevent African Swine Fever.
AFRICAN SWINE FEVER VIRUS

Control and Eradication Strategies

1. Prevent Contact
2. “Stamping Out”
   • Stop Production
   • Stop Transmission
3. Increase Disease Resistance

Prevent Contact

Preventing contact between African Swine Fever virus and susceptible animals can be difficult, but it can be achieved with a continuous and enhanced biosecurity plan. Though the idea of imposing a quarantine does not sound desirable, it provides a record of all things entering and leaving the premise by stopping movement of infected animals, contaminated animal products and fomites from premises within control area. A movement control program will also help regulate the coming and goings of people, vehicles, equipment, animals and animal products that leads to a successful quarantine program. Movement control is only as successful as the group instituting the program. It will fail if a breach in biosecurity, no matter the risk, occurs.

Within the quarantine are three premise designations: Infected Zone, Buffer Zone, and the Control Area (which is the sum of the first two zones). Identifying these areas and developing a contingency plan will be crucial to help prevent the introduction of this virus onto a premise or, prevent the virus from infecting other premises.
Prevent Contact

Security Checkpoint
- Removal of street shoes
- No personal items
- No home pork products

Office
- Shower-in/Shower-out
- Barn-specific attire, boots

Entrance Gate
Visitor Parking
Employee Parking
Vehicle C&D

Exterior Road
Inner Fence
3 ft Gravel
Line of Separation
Outer Fence
African Swine Fever Virus

Cleaning and Disinfection

**Goal: Prevent the Introduction of ASFv on Hard Surfaces**

1. Identify Line of Separation  
2. Mechanically remove all solid waste  
3. Apply appropriate detergent  
4. Wait appropriate amount of time for detergent to work  
5. Pressure wash the area with water. Use hot water where available.  
6. Audit area for cleanliness  
7. Apply appropriate disinfectant  
8. Allow disinfectant to dry  
9. If available, heat surface

Water Disinfection

**Goal: Prevent the Introduction of ASFv via Drinking Water**

1. Identify Source of Drinking Water  
   • If surface water, consider converting to deep well  
   • Take water sample from source and at end of drinker line  
2. Install filters to collect large particles and minerals if needed  
3. Clean water lines regularly to minimize biology growth with an EPA-registered disinfectant  
   • After every turn  
4. Install Water Disinfection System  
5. Determine appropriate disinfection levels  
   • 3-5 ppm ClO2 is recommended at the end of the waterlines. Adjustments will be necessary based on ClO2 levels.  
6. Determine appropriate acidification levels based on water treatment program  
   • A 2:1 ClO2 to acid ratio is recommended; however, adjustments may be required to reach optimal levels.  
7. Continuously evaluate chemistry levels  
   • ClO2 test strips will provide an easy and economic solution to evaluate water treatment chemical concentrations. Weekly to Monthly evaluations will be important to ensure adequate water palatability, volume and quality.
**Pest Control**

**Goal:** Minimize pest populations to prevent the introduction of ASFv via vector introduction

1. Identify level of infestation with an infrared surveillance system and/or performing a manual audit
2. Maintain a minimum of 3 foot gravel barrier around all buildings
3. Mow and maintain weeds, grass and brush to help control rats, mice, and ticks from having easy access to facilities
4. Continuously apply rodenticides and insecticides inside and outside of barns
5. Maintain continuous rotation programs to prevent resistance to active ingredients
6. Evaluate effectiveness by performing monthly manual audits and conducting an infrared surveillance annually

**The Human Element**

**Goal:** Prevent the Introduction of ASFv via human movement

1. Develop a visitor control plan
2. Ensure only invited visitors and employees have access to the premise
3. Ensure all visitors utilize disposable boots, gloves, and coveralls prior to entering the facility
4. Provide farm-specific attire to all visitors and employees who may have access to pigs
5. Require all visitors and employees to follow the following programs where applicable:
   - Shower-in/ Shower-out
   - Vehicle disinfection
   - Boot bath disinfection
   - Supply and equipment disinfection
   - Any other farm-specific biosecurity protocols
6. Require that no personal items are brought into the facility
7. Perform regular evaluations and trainings to ensure all employees are aware of the biosecurity protocols on site
# Biosecurity Audit

## Audit Date:  
Auditor:  
Barn Name:

**This column lists the Biosecurity standard being checked and asks questions that are related to each standard, which you must answer.**

**Answer the questions by selecting the answer in these columns.**

**In this column:**
- List the supporting documents and records you keep and where they are located in your system to substantiate that you met the standard, AND
- All corrective actions (dated) that you have taken to meet the standard.

<table>
<thead>
<tr>
<th>Movement of pigs and other livestock/animals</th>
<th>Yes</th>
<th>No</th>
<th>Corrective action(s) (are reactive - something has gone wrong and these are the actions taken to deal with and eliminate the problem to ensure it will not happen again)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you permit drivers and other transport personnel to enter buildings that house pigs?</td>
<td></td>
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</tr>
<tr>
<td>Are vehicles banned from entering ‘clean’ areas unless otherwise instructed?</td>
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<tr>
<td>Do you receive transportation records prior to authorizing vehicles from entering ‘clean’ areas?</td>
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<tr>
<td>Do you keep records of movement documents, including records of pigs movements between properties, including their farm of origin?</td>
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<tr>
<td>Do you quarantine all introduced animals until they have been acclimated and cleared of any diseases?</td>
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<tr>
<td>Do you prohibit the reintroduction of livestock or show pigs on your farm?</td>
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<tr>
<td>Do you clean and disinfect trucks between movements after transporting pigs to slaughter houses?</td>
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<tr>
<td>Do you separate your farrow to wean trucks from your market trucks?</td>
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</tbody>
</table>

Comments:
<table>
<thead>
<tr>
<th>2.0 People, Equipment and Vehicle Movements</th>
<th>Yes</th>
<th>No</th>
<th>Corrective action(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is a visitor log completed by all persons entering a production system?</td>
<td></td>
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<tr>
<td>Do visitors identify their last known contact with pigs?</td>
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<tr>
<td>Do you deny access to pigs if visitors have had contact with other pigs within a 72 hour window?</td>
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<tr>
<td>Do you disinfect and dry any and all equipment or supplies prior to bringing them into the barn?</td>
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<tr>
<td>Do you have a vehicle disinfection station on the premise?</td>
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<tr>
<td>Do you require all visitors to change out of street clothes and into farm-specific attire?</td>
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<tr>
<td>Do you require all visitors to shower-in and shower-out of the facility?</td>
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</tbody>
</table>

Comments:

<table>
<thead>
<tr>
<th>3.0 Feed</th>
<th>Yes</th>
<th>No</th>
<th>Corrective action(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is prohibited feed (swill) or any food scraps that contain meat, other matter from animals, or any other substance prohibited under state legislation, fed to pigs?</td>
<td></td>
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<tr>
<td>Do you have records for all feed ingredients to ensure they do not contain chemicals and are not contaminated?</td>
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<tr>
<td>Do you know where your feed or feed ingredients are originally sourced?</td>
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<tr>
<td>Do you have a feed decontamination program in place?</td>
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</tbody>
</table>

Comments:
## Biosecurity Audit (continued)

### 4.0 Cleaning and Disinfecting

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Corrective action(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you dry clean by scraping and brushing organic matter prior to wet cleaning?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Do you use an effective detergent to degrease or descale surfaces?</td>
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<tr>
<td>Do you rotate detergents based on acidic and alkaline formulations when necessary?</td>
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<td></td>
</tr>
<tr>
<td>Do you rinse and power wash surfaces to remove all organic material prior to disinfecting?</td>
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<tr>
<td>Do you use an effective, EPA registered disinfectant?</td>
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<tr>
<td>Do you dry or heat surfaces prior to moving animals in?</td>
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</tr>
</tbody>
</table>

Comments:

### 5.0 Pest Control

#### 5.1 Insect Control

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Corrective action(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you follow an integrated insect management program?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you apply insecticides inside barns?</td>
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<tr>
<td>Do you feed through insecticides?</td>
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<td></td>
</tr>
<tr>
<td>Do you apply insecticides outside barns?</td>
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<tr>
<td>Do you rotate active ingredients to minimize resistance?</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

#### 5.2 Rodent Control

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Corrective action(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you follow an integrated rodent management program?</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Do you apply rodenticides inside barns?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you apply rodenticides in attics, crawl spaces or pits?</td>
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</tr>
<tr>
<td>Do you apply rodenticides outside the barn?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you rotate active ingredients to minimize resistance?</td>
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<td></td>
</tr>
</tbody>
</table>

#### 5.2 Wildlife Control

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Corrective action(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are domestic pigs separated from feral pigs, domestic poultry and other animals of risk, where possible, by secure containment in buildings and/or perimeter fencing or other suitable means?</td>
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<td></td>
</tr>
</tbody>
</table>

Comments:
### 6.0 Management

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Corrective action(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have an on-farm Biosecurity Plan?</td>
<td></td>
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<tr>
<td>Do you have a controlled entrance to the barn through which visitors, animals and transport movements are admitted?</td>
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<tr>
<td>Do you provide shower facilities and farm specific boots and clothing prior to all authorized visitors contact pigs?</td>
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<tr>
<td>Do all your staff sign an employee Biosecurity Declaration confirming their adherence to the farm biosecurity procedures?</td>
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<tr>
<td>Do you ensure all equipment used with pigs or brought into barns are cleaned?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you ensure all equipment used with pigs or brought into barns are disinfected?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are warning signs displayed on entry gates and/or shed doors, along with locked entrances where appropriate, to discourage unauthorized entry by pig and feed truck drivers or unauthorized visitors?</td>
<td></td>
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</tr>
<tr>
<td>Does the barn have a documented herd health plan to manage the risk of infectious diseases entering the barn and to treat existing disease problems?</td>
<td></td>
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<tr>
<td>Do you inspect all pigs at least once daily and more frequently when needed?</td>
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</tr>
<tr>
<td>Are pigs with illness identified and treated with an appropriate treatment as soon as practicably possible?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you maintain detailed health and treatment records including mortalities and cases of disease?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have policies and procedures been put in place to ensure that for all introduced semen, the disease free status of the boars and type of extenders used have been verified and supported, where possible, by a vendor declaration?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments: