

Iowa African Swine Fever State Response Plan



This is a draft plan and is subject to change

November 11, 2019

Table of Contents:

1. Introduction
 2. Pre-Outbreak Actions
 - i. Biosecurity
 - a. General Recommendations
 - b. Outdoor Access
 - c. Personnel policies
 - Hunting
 - International travel
 - Clothing
 - Shower-in Shower-out
 - Outside food
 - Outside materials
 - d. Mechanical vectors
 - ii. Premises Registration
 3. Classifications of an ASF Outbreak in relation to Iowa
 - i. Continental: ASF outbreak in Canada or Mexico but not in the U.S.
 - ii. Domestic: Confirmation of the first ASF case in the U.S. but not in Iowa.
 - iii. In-State: Surveillance shows a positive case in Iowa or epidemiologic evidence proves a connection of an Iowa herd to an infected herd.
- Appendix 1: Standstill Order
- Appendix 2: Epidemiological Investigation and Surveillance
- Appendix 3: Mitigation
- i. Quarantine
 - ii. Control Area
 - iii. Permitting
 - iv. Mass Depopulation
 - v. Carcass Disposal
 - vi. Cleaning and Disinfection
 - vii. Vaccination

1. Introduction

Since there is no treatment for or vaccination against ASF, the primary strategy to mitigate its impact on Iowa's agricultural economy is to prevent it from entering Iowa or eradicating it as quickly as possible if it does enter. This may be accomplished through instituting restricted and/or controlled movements of swine if the virus is detected in the U.S. and stamping-out positive or epidemiologically linked herds in Iowa. Identifying all premises before a potential outbreak would greatly increase IDALS' ability to control and mitigate an ASF introduction into Iowa.

In the event of an outbreak the primary transmission risk to Iowa herds is direct transmission from infected pigs to susceptible pigs or indirect transmission from fomites (contaminated people, supplies, or equipment). Due to the range of soft ticks (*Ornithodoros* spp.) in the U.S., the climate of Iowa, and the majority of Iowa swine operations being closed systems, transmission from infected ticks is unlikely [1] [2] [3]. While feral swine are reported in three bordering states (Missouri, Illinois, and Wisconsin); with the exception of Crawford County, Wisconsin (separated from Iowa by the Mississippi River), no county directly borders Iowa and the introduction of ASF from feral swine is unlikely at this time [4]. The risk of intentional release of ASF into an Iowa herd is unknown.

During any foreign animal disease (FAD) outbreak IDALS will work collaboratively with USDA to respond. The goals of any FAD response include: (1) detecting, controlling, and containing the disease as quickly as possible; (2) eradicating the disease using strategies that seek to stabilize animal agriculture, food supplies, the economy, and to protect public health and the environment; and (3) providing science- and risk-based approaches and systems to facilitate continuity of business for non-infected animals and non-contaminated products.

2. Pre-Outbreak Actions

i. Biosecurity

- a. IDALS places the responsibility of implementing good biosecurity practices on the producers and owners of a premises. At a minimum IDALS recommendations premises utilize existing enhanced biosecurity outbreak guidance available in the [NAHEMS Guidelines for Biosecurity](#) [5] and those outlined in the [Secure Pork Supply \(SPS\)](#), but also practice increased biosecurity practices, where appropriate, on a daily basis.
- b. IDALS further recommends:
 - Premises that do not allow pigs to have outdoor access utilize guidance available in the [Self-Assessment Checklist for Enhanced Pork Production Biosecurity: Animals Raised Indoors](#) [6];
 - Premises that allow pigs to have outdoor access utilize USDA biosecurity recommendations as highlighted in the [USDA Biosecurity Checklist for Pigs with Outdoor Access](#) [7] and well as

the [Self-Assessment Checklist for Enhanced Pork Production Biosecurity: Animals with Outdoor Access](#) [8];

- All premises implement personnel policies that restrict employees (and visitors) from:
 - returning for work for 5 days after hunting feral pigs and interacting with their carcasses or waste;
 - entering a premises for a minimum of 5 days after arriving in the U.S. after visiting any country or area of the world experiencing active ASF cases;
 - bringing any clothing (including footwear) that was worn when hunting feral swine or visiting a country or area of the world experiencing active ASF cases before it is completely washed and laundered;
 - entering a premises without showering-in and showering-out (when possible);
 - when this is not possible completely changing or covering all outerwear, including footwear, with PPE provided at the premises and not worn on any other premises;
 - eating pork products produced off-site on the premises due to the longevity of the virus in pork meat [9];
 - Bringing cellular phones and other outside materials that have not been properly disinfected onto a premises; and
- Controlling potential mechanical vectors (such as flies) that may be present on the premises.

ii. Premises Registration

Premises registration of all livestock premises (including those housing swine) and assignment of a premises identification number will greatly enhance IDALS' ability to respond to and mitigate an ASF outbreak.

3. Classifications of an ASF Outbreak in relation to Iowa

There are three classifications of an ASF outbreak in relation to Iowa that would prompt IDALS to initiate a response. Formal notification of confirmed ASF cases outside of Iowa would be announced by USDA. Any confirmation of ASF within Iowa would be announced jointly by IDALS and USDA.

The three classifications of an ASF outbreak in relation to Iowa are:

- **Continental:** ASF outbreak in Canada or Mexico but not in the U.S.
- **Domestic:** Confirmation of the first ASF case in the U.S. but not in Iowa.
- **In-State:** Surveillance shows a positive case in Iowa or epidemiologic evidence proves a connection of an Iowa herd to an infected herd.

Iowa Code [163.1](#) describes IDALS legal authority to control infectious or contagious diseases affecting animals. Therefore during any ASF outbreak classification, IDALS may take the following actions:

i. Continental: ASF outbreak in Canada or Mexico but not in the U.S.

During this classification IDALS may:

- Receive confirmation of an ASF outbreak in North America (Canada or Mexico) from USDA and receive reports on trade status with the infected country.
- Notify internal staff of the potential threat and initiate frequent communication to ensure stand-by readiness to deploy if necessary.
- Confer with the Iowa Veterinary Diagnostic Laboratory to review submission procedures for the National Animal Health Laboratory Network (NAHLN), including the designated National Veterinary Service Laboratory (NVSL) [Foreign Animal Disease Diagnostic Laboratory \(FADDL\)](#).
- Communicate the threat to stakeholders and the public. IDALS will explain the disease and its effect on susceptible livestock, provide a description of the current response, make recommendations on how producers should protect their herds, explain how to report suspected cases or unusual disease, and provide resources to find more information. Complete details on communication pathways can be found in the *IDALS' Foreign Animal Disease Communications Plan*.
- The State Veterinarian may issue quarantine orders or special import rules/orders in cases where there is a potential ASF threat to Iowa agriculture. Import rules may include:
 - Special import permits or requirements for swine entering Iowa.
 - Negative results to diagnostic tests. Diagnostic tests may be utilized to the highest degree possible to demonstrate a lack of evidence of infection.
- Notify veterinary and other professional associations, licensed and accredited veterinarians, livestock and trade associations, livestock producers, transit companies, and others of any changes to import regulations.
- Conduct historic tracing and surveillance of swine imported from the ASF-affected country within a minimum of two incubation periods (30 days) prior to the date of onset (or best approximation) of the index case.
 - Information may be gathered from a number of sources, including Certificates of Veterinary Inspection (CVIs), entry permits, producer records, and livestock market and slaughter facility records. These may include shipments

from high-risk areas such as the infected country, production systems associated with the outbreak, or from other states with frequent movements from the infected country (e.g., movements from Mexico into Texas).

- Begin a more aggressive surveillance program to try to determine if ASF has been introduced into Iowa. Available diagnostic testing will be utilized to the highest degree possible as a tool to help determine the ASF status of individual animals or herds.

- Tests may be conducted on:

- Animals based on epidemiological link(s);
- Animals showing suspicious clinical signs;
- Recent samples submitted to the Veterinary Diagnostic Laboratory at Iowa State University for diagnosis of illness (i.e. targeted samples); and/or
- Samples collected from concentration points, such as slaughter facilities, buying stations, livestock markets, etc.

- If it is anticipated that the incident may require support beyond IDALS resources, IDALS will notify the Governor's office and coordinate with Iowa Department of Homeland Security and Emergency Management (HSEMD) to review needed resources and purchasing procedures to support a response.

- Continuously update the Governor's Office and HSEMD, and collectively anticipate future needs and evaluate the need for a Declaration of Emergency.

ii. Domestic: Confirmation of the first ASF case in the U.S. but not in Iowa

In addition to the activities and considerations listed for the Continental classification, if ASF is detected in the U.S. but not Iowa IDALS may:

- Be in frequent communication with USDA to confirm:
 - Situational awareness of the ASF status of other states, including current response strategy (stamping-out) and epidemiological links to Iowa and other states;
 - The identity of ASF contacts that may have been transported to Iowa within the last 30 days at a minimum;
 - Status of trade with U.S.'s international trading partners;
 - If USDA is considering a Secretarial Emergency Declaration for the affected state(s).

- If USDA is recommended a national standstill order for all swine.
- Conduct surveillance to provide the highest degree of confidence possible that animal and/or animal product movements can occur to support business continuity without spreading infection. This may include monitoring for clinical signs and testing of live animals including, but not limited to, screening serum samples stored at the Iowa Veterinary Diagnostic Laboratory and/or testing animals at packing plants.
- Carefully evaluate the risk of animals and animal products to be imported. Imports that pose a high-risk of introducing ASF will be prohibited from entering Iowa. Imports from certain geographical areas, production systems associated with the outbreak or other locations that may have epidemiological links to ASF Infected Premises will be carefully screened before being allowed to enter Iowa.
- Implement all, or aspects of, the [*IDALS' General Standstill Protocol*](#).
- Investigate imports into Iowa within the last 30 days that may pose a risk to Iowa livestock.
- Continue the surveillance program for ASF to determine any epidemiological links to premises in Iowa.
- Activate a Departmental Operations Center.
- Ready the premises identification database to facilitate the identification of premises that may be at-risk or infected.
- Communicate with veterinary and other professional associations, licensed and accredited veterinarians, livestock and trade associations, livestock producers, transit companies, and others concerning the elevated threat, and provide information on monitoring the health of susceptible animals, and implementing enhanced biosecurity.
- Re-evaluate the threat and take action to protect Iowa livestock. In addition to movement controls, actions may include epidemiological investigations, reminders of reporting requirements, and enhanced surveillance at livestock markets and slaughter facilities, among other activities.
- Confer with USDA to evaluate federal resources that may be available, if needed.
- Request HSEMD to notify appropriate personnel from supporting local and state agencies.
- Reassign and/or pre-position IDALS staff members to locations of anticipated need, such as to the Departmental Operations Center (DOC), the State EOC, the Joint Information Center (JIC), or an existing Incident Command Post.
- Coordinate with HSEMD to anticipate needed resources and purchasing procedures to

- support a response to a potential outbreak.
- Request specific agencies provide support for response activities, which may include implementing a call center to respond to questions from veterinarians, producers, allied businesses, and the public, instituting Just-In-Time Training for response tasks, providing outreach to a variety of audiences to keep them aware of the threat and mitigation measures, and requesting supporting agencies send representatives to the JIC to develop and distribute messages to appropriate stakeholders.
 - Notify all producers, processors, and transit companies about the changes to Iowa's import and movement criteria, and provide information about the permitting system and requirements.
 - Continue to monitor all states.
 - Closely monitor any epidemiologically linked premises to determine what, if any, additional actions need to occur on that premises to stop the outbreak. This would designate a transition from the Continental to In-State classification.
- iii. In-State: Confirmation of ASF in Iowa or Epidemiologic link of Iowa herd to infected herd**
- In the event of confirmation of ASF in Iowa or the epidemiologic link of an Iowa herd to an infected herd IDALS is the lead agency for the emergency response to eradicate the disease and initiate recovery. In addition to the activities and considerations listed for the Continental and Domestic classifications, if ASF is suspected or detected in Iowa IDALS may:
- Receive notification of an epidemiological contact from an Infected Premises, or may be notified of suspicious clinical signs in a pig in Iowa.
 - Conduct epidemiological investigations (with or without the assistance of the USDA) to identify Infected Premises and Contact Premises.
 - Collaborate with USDA to dispatch a state or federal Foreign Animal Disease Diagnostician (FADD) to conduct an investigation and collect diagnostic samples for laboratory submission. Divided samples will be provided to the Iowa State University Veterinary Diagnostic Laboratory in Ames and sent to the designated Foreign Animal Disease Diagnostic Laboratory (FADDL) for confirmation and virus isolation. An FADD investigation is conducted according to [*VS Guidance Document 12001.2 - Policy for the Investigation of Potential Foreign Animal Disease/Emerging Disease Incidents \(FAD/EDI\)*](#).
 - Collaborate with the U.S. Department of Homeland Security (DHS) and Federal Bureau of Investigation (FBI) to determine if ASF was intentionally introduced into Iowa.

- 274 • Initiate containment activities on the Infected (or Suspect) Premises. Initially, in most
275 cases this will include quarantine, setting up premises biocontainment, and a review
276 of producer records to trace recent animal movements into and out of the herd (*see*
277 *Appendix 3: Mitigation, subsection ii. Quarantine*).
- 278 • Form a Unified Command with USDA to exercise state and federal authority to
279 protect animal health. Initially, local USDA representatives will participate. Positions
280 may rotate to other USDA representatives over time and as more assistance is
281 requested.
- 282 • Assign personnel to Incident Command System positions to manage the emergency
283 response activities with the help of supporting agencies.
- 284 • Prompted by a positive laboratory result confirming ASF, establish a Control Area
285 around the Infected Premises, and institute movement controls (*see Appendix 3:*
286 *Mitigation, subsection ii. Quarantine and subsection iii. Permitting*), as well as
287 epidemiological tracing (*see Appendix 2: Epidemiological Investigation and*
288 *Surveillance*).
- 289 • Through HSEMD, request supporting agency representatives to report to the SEOC
290 with knowledge of available capabilities and resources.
- 291 • Continue disease surveillance to detect other Infected Premises or potential spread of
292 ASF.
- 293 • Communicate through HSEMD with local emergency managers and officials of the
294 affected areas to determine local resource needs and availability.
- 295 • Based on a stamping-out strategy dependent on the size of the herd, implement a
296 depopulation plan with greatest probability of depopulating the herd in a timely
297 manner with a goal of 24 hours (*see Appendix 3: Mitigation, subsection v. Mass*
298 *Depopulation*).
- 299 • Collaborate with Iowa's Department of Natural Resources (DNR) to approve the
300 animal owner's disposal plan for carcasses and other associated materials (*see*
301 *Appendix 3: Mitigation, subsection vi. Carcass Disposal*).
- 302 • Require biocontainment protocols to prevent spread of ASF from Infected Premises
303 (*see Appendix 3: Mitigation, subsection iv. Biocontainment*).
- 304 • If not already instituted, implement a system of permitted movement to approve and
305 document movements into, within, and out of the Control Area (*see Appendix 3:*
306 *Mitigation, subsection iii. Permitting*).
- 307 • Develop protocols for cleaning and disinfection to decontaminate buildings, areas and
308 articles on the premises after infected animals have been removed. Protocols will be
309 guided by [FAD PReP Guidelines: Cleaning and Disinfection](#).

- Decide the method of releasing a Control Area and restrictions imposed on movements into, out of, and within the Control Area. The Control Area may be released as a whole or in parts to gradually reduce the size. Considerations include:
 - Premises due to be released do not appear to pose a risk for further spread of ASF;
 - Results of epidemiological surveillance and confirmed/suspected cases in the vicinity;
 - Disease status of other neighboring premises;
 - Progress of the eradication effort and current response approach; and/or
 - Reasonable confidence that the non-infected premises due to be released will not be vulnerable to re-exposure (*see Appendix 3: Mitigation, subsection iii. Permitting*).
- Recommend slaughter or euthanasia of any exposed or recovered pigs due to chance that some pigs exposed to low-virulence ASF strains can become carriers [10].
- Allow repopulation once infected/contagious animals have been removed and the environment of a premises is no longer a risk to spread ASF (through cleaning and disinfection or a fallow period - *see Appendix 3: Mitigation, subsection vi. Cleaning and Disinfection*). Conditions for repopulation may change if the response strategy transitions from stamping-out.
- Continue disease surveillance to detect new infections, and also to collect data to prove ASF freedom if possible.
- Initiate regular briefings for the media and for information release to the general public through the JIC.

Appendix 1: Standstill Order

During an ASF outbreak IDALS may implement aspects of the [*IDALS' General Standstill Protocol*](#). While the order is in effect, no unpermitted swine movements would be allowed within the state. Exceptions may be made, depending on the epidemiology of the outbreak, for critical movements (i.e. slaughter, etc.) at the discretion of IDALS.

Appendix 2: Epidemiological Investigation and Surveillance

During an ASF outbreak the following premises definitions will be used:

- **Infected Premises (IP):** any premises with laboratory confirmed ASF
- **Contact Premises (CP):** any premises with an established epidemiological link to a IP in the previous 30 days at a minimum

The following are IDALS' initial goals of an ASF epidemiological investigation conducted in Iowa:

- identify each potential IP through tracing activities, assign a premises classification and investigation priority;
- identify any CP (this includes all potential CP within a production system where sites may be separated by large geographic distances); and
- characterize the nature of the ASF outbreak, identifying any potential lateral transmission pathways and mitigation strategies.

Identifying potential CP within the same production system may include, but is not limited to, IDALS auditing the following aspects of movement onto and off a premises:

- live animal movement logs,
- animal product movement logs,
- feed delivery logs,
- personnel logs,
- visitor logs (both domestic and international),
- list of equipment shared between premises,
- animal disposal logs (i.e. rendering, etc.), and
- supply delivery logs (i.e. fuel delivery, etc.)

In addition to active investigations, the need for statewide ASF surveillance may become necessary. This will take two forms: 1) passive surveillance and 2) active surveillance.

Passive surveillance will occur from veterinarian and producer reporting of suspicious clinical signs and mortalities noted in swine. IDALS will widely communicate that anyone suspecting a possible ASF introduction into Iowa reports it immediately to IDALS and/or the USDA. At which time either an IDALS or USDA FADD will be dispatched to the premises to conduct an investigation.

Active surveillance will occur through screening diagnostic samples that are collected on a regular basis. This would include any swine samples submitted to the Iowa Veterinary Diagnostic Laboratory, for any purpose, as well as samples retained at the Laboratory from the previous 60 days. Swine samples may be screened with the following diagnostic tests:

Test	Sample Types
Virus Isolation	Blood, Tissue
DFA (Direct Fluorescent antibody)	Tissue (tonsil or lymph node)
ELISA (Enzyme-linked immunosorbent assays)*	Serum (10mL Red top tube)
IFA (Immunofluorescence assays)**	Serum (10mL Red top tube)
PCR (Polymerase chain reaction)	Blood or tissue (tonsil or lymph node)

**ELISA is the prescribed test for international trade per OIE*

***IFA is a confirmatory test from ASF free areas with a positive ELISA test per OIE*

At the onset of the surveillance program any sample that screens positive would be sent to a designated National Veterinary Service Laboratory (NVSL) Foreign Animal Disease Diagnostic Laboratory (FADDL) for confirmatory testing. This would continue until testing became decentralized and more widely available at other laboratories.

Depending on the capacity/capabilities of the Iowa State University Veterinary Diagnostic Laboratory in Ames and other reference laboratories, oral fluid testing may also be incorporated into a statewide surveillance program.

Any sample that tests and is then confirmed positive, regardless of the sample type, would prompt an epidemiologic investigation to determine where the infected pig originated and where it could have potentially exposed other pigs.

Appendix 3: Mitigation

i. Quarantine

Any premises with confirmed ASF or that is epidemiologically linked to a confirmed ASF case will likely be placed under a quarantine as established in the [IDALS's General Quarantine Protocol](#). If a premises is part of a large production system, the entire system may or may not be temporarily placed under a quarantine while the epidemiologic investigation of that system is ongoing.

ii. Control Area

During an ASF outbreak a Control Area will be established to contain the infection, target stamping-out activities, and control animal movements. The function and minimum size of the Control Area is explained in the [IDALS General Control and Monitoring Zones Protocol](#). However, during an ASF outbreak IDALS may expand the outer

boundaries of the Control Area or include multiple premises within one production system in the Control Area based on the epidemiology or scale of the outbreak.

iii. Permitting

Premises inside the Control Area may be allowed permitted movements based on protocols established in the [IDALS General Animal Permitting Protocol](#). Any premises of a large production system with an epidemiological link to one of their premises in the Control Area may be designated a CP.

iv. Mass Depopulation

To maximize biocontainment procedures and reduce the overall viral burden of an infected premises the goal is to have all infected and exposed swine on that premises depopulated within the first 24 hours of confirming the first positive pig. The size and strength of pigs compared to other species, necessary animal restraint, as well as the safety and expertise of available responders may factor into IDALS' selection of an appropriate depopulation method. IDALS may consider various methods during an ASF outbreak and the method chosen may depend on resource availability, premises and herd size, and worker safety concerns. However, regardless of the method chosen, if a producer wishes to seek indemnity for depopulated animals, IDALS and USDA APHIS must preapprove the method. Any pig that dies prior to depopulation will not qualify for indemnity.

The following is a list of some depopulation methods in alphabetical order IDALS may chose during an ASF outbreak:

- Carbon dioxide and other gasses,
- Firearms,
- Penetrating captive bolt,
- Ventilation shutdown

Potential depopulation methods:

- *Carbon Dioxide and Other Gasses:* Carbon dioxide (CO₂) has been used commercially in harvesting poultry and swine to stun the animal prior to exsanguination. Asphyxiates such as carbon dioxide, nitrogen, argon, and carbon monoxide exclude oxygen. An animal exposed to an atmosphere which is completely devoid of oxygen will lose consciousness very rapidly. Some farms use carbon dioxide as their primary method of euthanasia for suckling or nursery pigs (up to 70 lb [154 kg]). The AVMA has categorized the use of CO₂ as “preferred method” for the depopulation of swine [11].

Personnel involved in the procedure must be trained. Safety procedures along with appropriate safety equipment must be utilized according to guidelines reviewed or established by the Safety Officer.

- *Firearms:* When firearms (gunshot) is the method of choice, it is important that firearm handlers use a caliber of firearm, projectile, and propellant load that are

appropriate for the species being euthanized, the location of the procedure, and the overall situation. The shooter should comply with all guidelines established by the Safety Officer such as the use of protective head and eye gear. The AVMA has categorized the use of firearms as a “preferred method” for depopulation of all swine other than suckling pigs [11]. However, for large herds this may take a substantial amount of time and labor to complete.

For reference purposes in choosing a suitable firearm for euthanasia of livestock, [FAD PReP/NAHEMS Guidelines: Mass Depopulation and Euthanasia](#) provides the weight of the projectile, muzzle velocity, and muzzle energy available with various cartridges that are in common use. This document also describes the proper use, target area, and safety considerations in the use of firearms for euthanasia.

- *Penetrating Captive Bolt*: Euthanasia by penetrating captive bolt is appropriate for most hoofstock. This method targets the cerebral region and the brainstem. In the hands of trained and experienced personnel, this method produces rapid and humane death and is especially useful in field situations to euthanize numerous animals and/or avoid carcass residues associated with some chemical methods.

Penetrating captive bolt devices are placed in contact with the skull to deliver a lethal blow to the animal through direct trauma to the brain. The use of an extended length penetrating captive bolt is usually fatal when properly conducted. Personnel must be prepared to administer an adjunct measure such as pithing or IV KCL administration to ensure rapid death if the use of the penetrating captive bolt fails to result in death.

For large herds this may take a substantial amount of time to complete as well as be labor intensive. For example, with the approximate onsite of cardiac arrest taking 2 to 8 minutes [12], a 1,000 head gestation/breeding barn may take at a minimum between 33 hours to 5.5 days to depopulate.

Refer to [FAD PReP/NAHEMS Guidelines: Mass Depopulation and Euthanasia](#) for the proper use, target area, and safety considerations in the use of penetrative captive bolt for euthanasia.

Non-penetrating captive bolts are intended to deliver concussive trauma to render an animal unconscious, and have not been specifically designed to result in death. They should be used with an adjunct measure to ensure death. The AVMA has categorized the use of non-penetrating captive bolt guns as a “preferred method” for depopulation of all swine [11].

- *Ventilation Shutdown (VSD)*: While AVMA preferred methods will first be considered in an ASF response, VSD may be considered if these methods will not achieve depopulation of infected herds (based on the presumptive positive result) within a timely manner or be accomplished in a way that assures human safety.

VSD is an adjunct method that may be considered by IDALS for depopulation of infected swine based on the defined policy and considered on a premises-by-premises basis. However, VSD should be used only after a full consideration of the epidemiologic threat posed concludes that no other method can be completed in a timely manner to minimize the chance of the virus spreading. Timely implementation would significantly reduce virus amplification and the risk of ongoing transmission while also protecting nearby and epidemiologically linked production facilities [13]. However, depending on weather conditions and facility design, VSD may require supplement heating for buildings during colder seasons and/or an added source of CO₂ gas. The AVMA has categorized the use of VSD as “permitted in constrained circumstances” for depopulation of all swine [11].

v. Carcass Disposal

In most cases during an ASF outbreak IDALS will require on-site disposal of animal carcasses and other associated materials. On-site disposal eliminates the need to move carcasses great distances and eliminates potentially moving live virus off the premises. During an ASF outbreak in most cases IDALS will require the animal owner to utilize one of the following on-site disposal methods:

- above ground burial,
- burning,
- composting,
- incineration, or
- natural in-place decomposition.

Explanations on disposing of carcasses using burial, burning, composting, and incineration can be found in the [NAHEMS Guidelines: Disposal](#).

If IDALS elects to go with natural in-place decomposition several factors need to be considered. The first is the amount of time it will take for the carcasses to reach a point where they are easier to move. With pig carcasses indoors and not exposed to the elements, decay rates will be slowed [14] [15]. In addition, pigs weighing more than 50 lbs may take 3 times as long to decompose as pigs weighing less [16] [17]. This would require more time for facilities housing pigs larger than nursery piglets, with gestation barns potentially taking the longest to reach the ideal decomposition phase. While no studies have been performed on the rate of natural carcass decay inside a swine facility it has been shown that on average swine carcasses left outdoors during the spring, summer, and fall take approximately 2 weeks to reach skeletonization to a few months during the winter [18]. Therefore when ambient temperatures fall below 60°F it may become necessary to heat facilities to expedite the decomposition process. If facilities are kept at 60°F or higher, carcasses >50 lbs should reach skeletonization and be removed after approximately three weeks with carcasses <50 lbs taking approximately two weeks. At this stage, remains can be disposed of using another method.

The second is the potential occupational safety issues when entering a barn where natural in-place decomposition has occurred. When entering the barn to remove decomposed carcasses personnel should wear appropriate PPE including respirators.

Lastly proper insect control should be implemented to prevent flies and other insects as serving as mechanical vectors and carrying the virus to other premises.

vi. Cleaning and Disinfection

In general Cleaning and Disinfection (C&D) protocols for ASF should follow the basic principles outlined in the [*IDALS's General Cleaning and Disinfection Protocol*](#). The following are disinfections currently approved for ASF [19]:

- Virkon S
- Clearon Bleach Tablets
- Klor-Kleen
- Klorsept
- Klorkleen 2

Additional information on these disinfectants can be found on the [USDA APHIS webpage](#).

vii. Vaccination

To-date no vaccination against ASF exists and vaccines previously tried at most resulted in partial immunity [3].

References

- [1] M.-L. Penrith and W. Vosloo, "Review of African swine fever: transmission, spread and control.," *Journal of the South African Veterinary Association*, vol. 80, no. 2, pp. 58-62, 2009.
- [2] T. G. Donaldson, A. A. P. de Leon, A. I. Li, I. Castro-Arellano, E. Wozniak and W. K. Boyle, "Assessment of the geographic distribution of *Ornithodoros turicata* (Argasidae)," *PLoS neglected tropical diseases*, vol. 10, no. 2, p. e0004383, 2016.
- [3] V. R. Brown and S. N. Bevins, "A Review of African Swine Fever and the Potential for Introduction into the United States and the Possibility of Subsequent Establishment in Feral Swine and Native Ticks," *Frontiers in Veterinary Science*, vol. 5, p. 11, 2018.
- [4] USDA: APHIS, "Feral Swine Populations 2017 by County," 2 February 2018. [Online]. Available: https://www.aphis.usda.gov/wildlife_damage/feral_swine/images/2017-feral-swine-distribution-map-county.jpg. [Accessed 30 November 2018].
- [5] Center for Food Security and Public Health (CFSPH), "NAHEMS Guidelines: Biosecurity," June 2016. [Online]. Available: <http://www.cfsph.iastate.edu/pdf/fad-prep-nahems-guidelines-biosecurity>.
- [6] Secure Pork Supply (SPS), "Self-Assessment Checklist for Enhanced Pork Production Biosecurity: Animals Raised Indoors," 2017 August. [Online]. Available: http://www.securepork.org/Resources/SPS_Biosecurity_Self-Assessment_Checklist-_IndoorProduction.pdf.
- [7] USDA: APHIS Veterinary Services, "Biosecurity Checklist for Pigs with Outdoor Access," December 2017. [Online]. Available: https://www.aphis.usda.gov/publications/animal_health/biosecurity-for-pigs-outdoor-access-checklist.pdf.
- [8] Secure Pork Supply (SPS), "Self-Assessment Checklist for Enhanced Pork Production Biosecurity: Animals with Outdoor Access," September 2019. [Online]. Available: <http://www.securepork.org/Resources/SPS-Biosecurity-Checklist-for-Animals-with-Outdoor-Access.pdf>.
- [9] C. A. Mebus, C. House, F. R. Gonzalvo, J. M. Pineda, J. Tapiador and J. J. Pire, "Survival of foot-and-mouth disease, African swine fever, and hog cholera viruses in Spanish serrano cured hams and Iberian cured hams, shoulders and loins," *Food Microbiology*, vol. 10, no. 2, pp. 133-143, 1993.
- [10] C. Gallardo, I. Nurmoja, A. Soler, V. Delicado, A. Simón, E. Martín, .. Perez, R. Nieto and M. Arias, "Evolution in Europe of African swine fever genotype II viruses from highly to moderately virulent," *Veterinary Microbiology*, vol. 219, pp. 70-79, 2018.
- [11] American Veterinary Medical Association (AVMA), "AVMA Guidelines for the Depopulation of Animals: 2019 Edition," AVMA, Schaumburg, 2019.
- [12] P. Chevillon, C. Mircovich, S. Dubroca and J. Fleho, "Comparison of different pig euthanasia methods available to farmers," *Proc Int Soc Anim Hyg*, pp. 45-46, 2004.
- [13] USDA, "HPAI Outbreak 2014-2015: Ventilation Shutdown Evidence and Policy," 18 September 2015. [Online]. Available: https://www.aphis.usda.gov/animal_health/emergency_management/downloads/hpai/ventilationshutdownpolicy.pdf. [Accessed 12 December 2018].
- [14] B. S. Shean, L. Messinger and a. M. Papworth., "Observations of differential decomposition on sun exposed v. shaded pig carrion in coastal Washington State," *Journal of Forensic Science*, vol. 38, no. 4, pp. 938-949, 1993.
- [15] G. S. Anderson, "Comparison of decomposition rates and faunal colonization of carrion in indoor and outdoor environments," *Journal of Forensic Sciences*, vol. 56, no. 1, pp. 136-142, 2011.
- [16] A. Sutherland, J. Myburgh, M. Steyn and P. J. Becker, "The effect of body size on the rate of decomposition in a temperate region of South Africa," *Forensic science international*, vol. 231, no. 1-3, pp. 257-262, 2013.
- [17] S. Matuszewski, S. Konwerski, K. Frątczak and M. Szafałowicz, "Effect of body mass and clothing on decomposition of pig carcasses," *International journal of legal medicine*, vol. 128, no. 6, pp. 1039-1048, 2014.

- [18] J. Wang, Z. Li, Y. Chen, Q. Chen and X. Yin, "The succession and development of insects on pig carcasses and their significances in estimating PMI in south China," *Forensic Science International*, vol. 179, no. 1, pp. 11-18, 2008.
- [19] USDA APHIS, "Disinfectants Approved For Use Against African Swine Fever Virus," [Online]. Available: https://www.aphis.usda.gov/animal_health/emergency_management/downloads/asf-virus-disinfectants.pdf. [Accessed 2019].
- [20] C. Jurado, J. M. Sanchez-Vizcaino, M. Štukelj, M. Martínez-Avilés, A. De La Torre and H. C. D. C. Ferreira, "Relevant measures to prevent the spread of African swine fever in the European Union domestic pig sector," *Frontiers in veterinary science*, vol. 5, p. 77, 2018.
- [21] World Organisation for Animal Health (OIE), "African Swine Fever," April 2013. [Online]. Available: https://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Disease_cards/AFRICAN_SWINE_FEVER.pdf. [Accessed 3 December 2018].
- [22] USDA: National Center for Animal Health Emergency Management, "Classical Swine Fever Response Plan: The Red Book," May 2013. [Online]. Available: https://www.aphis.usda.gov/animal_health/emergency_management/downloads/csf_responseplan.pdf. [Accessed 5 December 2018].
- [23] L. P. Miller, *ASF Carcass Management Considerations*, USDA: APHIS, 2018.
- [24] Center for Food Security and Public Health, "NAHEMS Guidelines: Disposal," December 2012. [Online]. Available: https://www.aphis.usda.gov/animal_health/emergency_management/downloads/nahems_guidelines/disposal_nahems.pdf. [Accessed 11 December 2018].
- [25] J. Roth, "Phases and Types of an African Swine Fever Outbreak in the US," 25 November 2018. [Online]. Available: <https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/training-and-development/video-gallery/2018/african-swine-fever-phases-and-types>. [Accessed 13 December 2018].
- [26] C. Guinat, A. Gogin, S. Blome, G. Keil, R. Pollin, D. U. Pfeiffer and L. Dixon, "Transmission routes of African swine fever virus to domestic pigs: current knowledge and future research directions," *The Veterinary Record*, vol. 178, no. 11, p. 262, 2016.