Special Report

An overview from the 2019 Swine Fever Exercise for Agriculture Response in Iowa

Andrew K. Hennenfent DVM, MPH

Katie A. Rumsey DVM, MPH

Robin D. Pruisner BS

Jeff J. Kaisand DVM

From the Animal Industry Bureau, Iowa Department of Agriculture and Land Stewardship, Des Moines, IA 50319.

Address correspondence to Dr. Hennenfent (Andrew.Hennenfent@IowaAgriculture.gov).

ABSTRACT

Iowa leads the United States in pork production, housing approximately one-third of the country's swine population. This puts Iowa at great economic risk if an outbreak of African swine fever, a disease that limits international trade opportunities, were to occur anywhere in the United States. To hone emergency response plans to combat an outbreak, the Iowa Department of Agriculture and Land Stewardship in September 2019 participated in a 4-day exercise with representatives from the other 13 top pork-producing states. This exercise involved a mock foreign animal disease response and helped to concisely summarize what pork producers could expect should a foreign animal disease be detected in Iowa. *J Am Vet Med Assoc* (2020;257:607–612)

African swine fever, a viral disease affecting pigs, was first identified in Kenya in 1921.[1] The disease then spread throughout Africa and beyond the continent, reaching Portugal in 1957 and 1959, where it remained endemic on the Iberian Peninsula until 1994.[2,3] During the 1970s and 1980s, outbreaks occurred in the Americas, with cases of ASF reported in Brazil, Cuba, the Dominican Republic, and Haiti.[4] Elimination of the disease from Europe in 1994 marked the containment of ASF to Africa until its 2007 detection in the Republic of Georgia and subsequent spread within the region.[5] In 2018, ASF reached China and has since spread throughout Asia and Europe, with 26 countries or territories impacted as of January 3, 2020. This current outbreak has not reached the Americas.[6,7]

The ASFV can infect all types of swine and, depending on the strain, induce a hemorrhagic fever with a 100% mortality rate or a subclinical infection resulting in seroconversion and little morbidity.[8,9] However, the virus does not infect humans and poses no zoonotic disease risk.[9] Warthogs and soft ticks of the genus *Ornithodoros* can carry the virus, contributing to circulation of ASFV in parts of Africa.[9,10] This transmission cycle poses control challenges in areas of the world where wild pigs, soft ticks, or both serve as vectors. This creates the potential for rapid spread in US regions where both types of vectors are present should the virus be introduced.[10–12] However, tick transmission in Iowa is unlikely given that the current range of *Ornithodoros* spp does not extend into the state and Iowa does not have sustained feral swine populations.[10–13]

ABBREVIATIONS

ASF	African swine fever
ASFV	African swine fever virus
EMRS	Emergency management response system
FAD	Foreign animal disease
FADDL	Foreign Animal Disease Diagnostic Laboratory
IDALS	Iowa Department of Agriculture and Land Stewardship
NAHLN	National Animal Health Laboratory Network
SFEAR	Swine Fever Exercise for Agriculture Response

Infected pigs shed large amounts of the ASFV into the environment in all secretions and excretions.[9] The virus survives most environmental conditions, facilitating direct pig-to-pig and indirect fomite transmission between herds.[9,10] No vaccination or treatment is available, leaving prevention through biosecurity the only means of protecting domestic pigs.[9,10]

With most of the US swine-finishing capacity in Iowa, millions of pigs raised out of state are relocated to Iowa annually. This creates numerous opportunities for direct pig-to-pig contact or indirect contact through fomites,[9,10,14] putting Iowa's swine industry and economy at greater peril than those of any other state if an outbreak were to occur in the United States. Therefore, the IDALS has adopted strategies to quickly detect, contain, and eliminate ASF if it enters Iowa. The IDALS was able to test these strategies in September 2019 during a 4-day series of functional preparedness activities hosted by the USDA APHIS. The present report describes IDALS participation in the exercise, outcomes, and lessons learned.

Disclaimer

This report does not represent an actual outbreak or an actual case of ASF diagnosed in the United States. Everything described herein was part of a fictional scenario developed for exercise purposes.

SFEAR

From September 23 to 26, 2019, the USDA APHIS, with the assistance of SES Inc, coordinated the SFEAR for the 14 top swine-producing states: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Carolina, Ohio, Oklahoma, Pennsyl-

vania, South Dakota, and Texas. Day 1 (September 23, 2019) focused on conducting an FAD investigation and coordinating with the NAHLN for sample testing. Day 2 (September 24, 2019) focused on states supporting a USDA national movement standstill recommendation. Day 3 (September 25, 2019) emphasized on-farm planning and resource coordination for depopulation and disposal of infected or exposed pigs. Day 4 (September 26, 2019) exercised a system to allow state-authorized movements to resume on and off quarantined premises within a control area.[15]

A total of 125 people participated in Iowa at the incident command center, with an additional 16 in the field (6 producers, 8 IDALS responders, and 2 USDA APHIS responders). To create broader access for Iowa producers, the Iowa Pork Producers Association set up virtual observation sites where an additional 91 people observed over the 4-day period. The following summarizes the experiences of Iowa participants only and not those participating in other states.

Daily Summaries

Day 1: FAD investigation

The IDALS has developed 3 classifications for a North American introduction of ASF: continental (detection in Canada or Mexico but not the United States), domestic (detection in the United States but not Iowa), and in-state (detection or epidemiological link in Iowa). Owners of 3 Iowa farms volunteered their properties to serve as point sources of infection in Iowa to simulate an in-state detection event. The 3 farms were located in Hardin, Lucas, and Washington counties and represented 3 companies with various stages of swine production ranging from nurseries to finishing units. Two farms made use of shower-in shower-out facilities.

The day began with participating producer players from each farm contacting the IDALS to report observing pigs with clinical signs consistent with ASF, indicating potential in-state detection. To investigate, the IDALS dispatched FAD investigation teams of 2 people, comprised of 1 IDALS and 1 USDA APHIS staff member, 1 of whom had previously completed the FAD diagnostician course at the USDA FADDL. As teams mobilized, veterinarians located in the incident command center conducted epidemiological phone interviews with the reporting producer players at each site.

Once the FAD investigation teams reached their assigned farms, they followed strict biosecurity practices when entering the site. They assessed the herd, inspecting pigs that appeared healthiest first, working toward those that appeared ill. Teams collected duplicate blood samples from pigs into tubes containing EDTA and tissues (spleen, gastrohepatic lymph nodes, and tonsil) from necropsied pigs. However, because no pigs were actually ill on any farm, 2 to 3 healthy pigs were examined and blood samples were collected from them, and then tissue samples were obtained from pigs that had died of causes unrelated to the exercise.

On the basis of the exercise scenario and prompts, teams reported a suspected case of ASF. This caused the incident command center to issue mock quarantine orders to each farm, prohibiting anything (eg, live pigs, carcasses, feed, and equipment) from moving on or off the farm without the IDALS authorization. Additional IDALS staff members were dispatched to transport collected samples to the NAHLN. To receive samples, an FAD investigation team member held the sample (sealed in a sample bag) across an established biosecurity line of separation and dropped it into a clean sample bag held by a different IDALS staff member on the other side of the line. Double-bagged samples were then placed in a box, sealed, and driven to the NAHLN.

The standard protocol for any FAD investigation in Iowa is to send one set of samples directly to the NAHLN laboratory at the Iowa State University Veterinary Diagnostic Laboratory in Ames, Iowa, and the other to the FADDL on Plum Island, NY. The suspicion of ASF in this exercise prompted a high priority designation. Therefore, the IDALS consulted with the USDA APHIS about (hypothetically) chartering a plane to expedite sample transportation to FADDL. One set of samples arrived at the Veterinary Diagnostic Laboratory in the early afternoon, was rapidly tested, and for exercise purposes was deemed non-negative (although, in reality, all samples yielded negative results). No samples were sent to the FADDL, but the APHIS approved the use of an imaginary charter plane. Sample delivery to the plane was simulated. On the basis of delivery times from all 3 farms, the plane would have arrived at the FADDL in the early evening and test results finalized around midnight. Less than 24 hours after the samples were collected, the IDALS would have had confirmation of positive test results from both laboratories.

Day 2: National movement standstill

The storyline reset on the second day, disregarding the positive farms from day 1. Activity started with a National Assembly of State Animal Health Officials phone call with all state veterinarians announcing that a (hypothetical) case of ASF had been detected in Mississippi. During the call, the APHIS representative announced that because of this case, they were issuing a national movement standstill order recommendation. The order prohibited the movement of live swine of any kind (domestic, feral, or pet) as well as semen and embryos in the United States for 72 hours. The standstill order did not include swine products that passed federal or state meat inspection. The purpose of the order was to stop further disease spread that may have occurred during routine commerce and give federal and state investigators time to identify and then quarantine ASF-positive and epidemiologically linked farms. The APHIS recommendation was not legally enforceable and instead estab-

lished a framework for participating player states to adopt and enforce the order within their respective jurisdictions.

Before the exercise and also in the simulation, the IDALS worked closely with the Iowa Office of the Attorney General to draft a written legal order, including an emergency proclamation from Iowa's governor, to enforce a standstill order during a domestic ASF detection. As a result, Iowa was the first state to issue a written standstill order. It included a 12-hour grace period before going into full effect. This allowed movements already in progress to reach their destinations or return to their point of origins but prohibited new movements. After the grace period expired, any peace officer in Iowa with the authority to stop vehicles (eg, Iowa State Patrol, Iowa Department of Transportation, Iowa Department of Natural Resources, or local law enforcement) would have had the authority to stop and inspect vehicles in violation, with violators facing a misdemeanor charge, a fine, or both.

This was the most highly attended day in Iowa, with observers from industry groups, academia, state and federal legislative offices, and the media present. The most discussed issue was how to address feed movements during the standstill order. Because it has been shown that some imported feed ingredients from China could serve as a competent fomite for ASF transmission,[16–18] concern was expressed that moving feed during the order could further propagate an outbreak if it was the point source.

Day 3: Depopulation and disposal planning

The storyline from day 1 resumed on day 3, and field teams returned to the respective farms to which they were previously assigned. Teams worked with the same producer players from the first day to complete herd inventories and assess the farm's ability to initiate mass depopulation and disposal as part of an eradication strategy. Day 2 activities focused on planning only, and no swine were euthanized during the exercise.

In the incident command center, discussions took place between the producer players, USDA APHIS, and IDALS regarding indemnity for depopulated pigs. Producers cannot be mandated to euthanize their animals without receiving compensation. In Iowa, the USDA, not the IDALS, pays indemnity during disease responses and only if the depopulation method is first approved by the USDA APHIS. During the exercise, field teams relayed the farm-specific herd inventories and depopulation assessments to the incident command center. The incident command center then served as a liaison between the producers and USDA to reach a financial agreement.

To ensure any animal disposal in Iowa meets environmental standards, disposal plans must be approved by the Iowa Department of Natural Resources before implementation. During the SFEAR, producer players and field teams interfaced with local Department of Natural Resources representatives to use water-table maps, statewide burial maps, and other resources to create approved disposal plans tailored to each participating farm. Producers discussed various disposal methods, including in-barn composting, standard composting, and burial.

Day 4: Permitting movements in a control area

The last day of the exercise focused on permitting movements within, out of, and into established disease control areas. During an ASF outbreak, the USDA APHIS and IDALS would work together to establish control areas based on geographic boundaries around farms infected with, or epidemiologically linked to, ASF. Within control areas, heightened surveillance would occur on all farms housing pigs, whereas biocontainment, potentially including depopulation and disposal, would occur on ASF-positive and ASF-exposed farms.

For all swine farms within the control area, movement of live pigs, carcasses, their products, and husbandry materials would be prohibited without express written authorization from the IDALS. To obtain authorization, producers would apply for a movement permit. During the exercise, participating producer players submitted permit applications using either the USDA EMRS Permitting Gateway platform or the IDALS Permit Request Platform (which was based on a commonly used online research application[a]).

The EMRS is a USDA web-based application used for reporting data from routine FAD investigations as well as surveillance and control efforts during outbreaks. Federal and state animal health officials have access to the EMRS, and during an actual outbreak, the APHIS would create individual EMRS accounts for producers. However, the number of requests for producer accounts could quickly overwhelm the APHIS ability to quickly grant access. To address this potential gap, the IDALS Permit Request Platform was created. During the SFEAR, information collected with this system was directly uploaded into the EMRS, allowing all producer players the ability to immediately submit applications electronically and securely.

To make widely available the requirements to receive a movement permit and access to the IDALS Permit Request Platform, the IDALS created a mock web page explaining the requirements. For exercise purposes, these requirements included valid premises identification numbers for both the origin and destination of the movement, completion of an authorization form signed by the applicant that contained a certification statement previously agreed on by state veterinarians stating that pigs included on the permit were free of clinical signs of disease, and negative diagnostic test results (including those of oral-fluid testing for ASFV) for live pigs before movement. Movements initiated outside Iowa required the completion of a risk assessment survey.

The IDALS received 45 permit requests during the exercise: 39 (87%) submitted via the EMRS platform and 6 (13%) via the IDALS platform. Regardless, all permit requests were successfully captured in the EMRS. However, 32 (71%) permit requests were denied for failure to meet all requirements, and 1 (2%) out-of-state request was submitted after the exercise ended in Iowa and not processed. Common reasons for denial included omission of the premises identification number for the destination, omission of the signed applicant authorization form, failure to simulate (on paper) the completion of ASF testing to screen live animal shipments before requesting movement, and omission of the completed risk assessment survey for out-of-state movements.

Feedback Survey

To gain additional feedback after the SFEAR concluded, the IDALS issued a postexercise survey to everyone who participated at the incident command center or in the field. Responses were collected by means of an online survey tool.[b] Respondents were asked to score the IDALS's ASF response strategy from 1 to 5 for each day (with 1 being the lowest possible rating and 5 the highest). Overall daily scores were calculated for each day of the SFEAR as total points awarded by all respondents that day/(number of respondents that day X 5). Final scores are reported as a percentage of total possible scores.

Overall, 49 (35%) of the 141 Iowa SFEAR participants completed the survey. This included everyone in Iowa who participated on any day in the field or at the incident command center. Respondents consisted of players (n = 26), observers (16), evaluators (5), and facilitators (2; **Table 1**). For day 1 (FAD investigation), the mean score was 77% (139/180; n = 36 respondents). Respondents frequently mentioned that the IDALS rapidly mobilized field teams and communication with outside stakeholders was excellent. Common concerns raised were the swine experience of field staff, total staff numbers at the federal and state levels, and variability in biosecurity practices implemented on different farms.

For day 2 (national movement standstill), the mean score for the IDALS's response was 76% (122/160; n = 32 respondents). Respondents stated that the Iowa standstill order was communicated promptly. Reported concerns focused on how states were going to consistently issue and enforce the order and how to reduce the risk associated with animal feed movements.

The mean score for the IDALS's response on day 3 (depopulation and disposal planning) was 75% (112/150; n = 30 respondents). Respondents stated that there was good coordination between state and federal officials. However, logistic concerns were raised about the methods used to rapidly depopulate infected herds. Because of the potential for ASFV to survive in the environment and infected carcasses for several months,[9] respondents reported concern regarding the timeframe until a farm would be allowed to restock after the disposal of a high number of infected carcasses and materials, followed by the subsequent cleaning and disinfection of the site.

For the IDALS's response on day 4 (permitting movements in a control area), the mean score was 70% (84/120; n = 24). The IDALS Permit Request Platform was highlighted as a strength. Feedback included concerns regarding the capacity to test live pigs as a permit requirement, specifically the need to validate the oral-fluid ASFV test in the United States. Additionally, respondents struggled to find the appropriate balance for selecting between a practical sample size to detect ASF in a herd without overwhelming collection or testing capacity and a sufficient sample size to allow detection of ASF with a sufficient confidence level if it were present.

Table 1—Professional background and role of participants in the 2019 SFEAR in Iowa, as reported by those who responded to a postexercise survey conducted by the IDALS.

Background	Player* (n = 26)	Observer (n = 16)	Evaluator (n = 5)	Facilitator (n = 2)
IDALS (n = 14)	12 (46)	1	0	1
Non-IDALS state agency (n = 6)	5 (19)	1	0	0
Academia (n = 6)	0	3	2	1
Commodity group (n = 4)	1 (4)	3	0	0
Industry organization (n = 3)	0	3	0	0
Nonagricultural emergency management (n = 3)	2 (8)	1	0	0
USDA (n = 3)	3 (12)	0	0	0
Private veterinarian (n = 3)	0	0	3	0
Law enforcement (n = 2)	2 (8)	0	0	0
Meat packer or processor (n = 2)	0	2	0	0
Pork producer (n = 2)	1 (4)	1	0	0
Federal legislative office (n = 1)	0	1	0	0

Values represent number of respondents in the indicated role, with values in parentheses representing the percentage of players.

*Players included IDALS and USDA staff members, other state government agency representatives, swine producers who volunteered their farms for the exercise, and swine commodity groups.

Lessons Learned

The SFEAR provided the IDALS with the opportunity to put current ASF response plans to the test, discover gaps, gather real-time input from a diverse group of stakeholders, and identify needed improvements. Data mining of the daily notes from participant discussions and evaluations, the postexercise feedback survey conducted by the IDALS, and the after-action report from a day-long debrief session for participants in Iowa held after the SFEAR allowed the IDALS to identify further opportunities for improvement.

The first day of the SFEAR highlighted the need to increase swine-specific trainings for both state and federal field staff. With all food animal industries represented in Iowa, field staff must be generalists capable of investigating diseases in any food animal species at a moment's notice. Moving forward, to strengthen staff members' knowledge about swine specifically, the IDALS is collaborating with the Iowa Pork Producers Association to create both classroom-style and hands-on swine-specific trainings. Furthermore, the exercise highlighted variability in biosecurity practices among swine farms and production types. To standardize and elevate biosecurity practices, the IDALS is encouraging pork producers to use the guidance available in the Secure Pork Supply Plan.[19] Following this plan would not only promote enhanced biosecurity plans for outbreaks but also strengthen biosecurity daily on every farm.

Exercising the Iowa-specific standstill order with in-person and remote stakeholders from other governmental agencies and commodity groups allowed the IDALS to preliminarily test the order in near real time. Major lessons that emerged were the need to further assess which movements should be allowed during an order and the current penalties for violators. When the SFEAR occurred, Iowa Code sections 159.17 and 163.61(2) defined penalties as a misdemeanor charge or a fine up to $1,000. During debrief sessions and in the feedback survey, participants expressed concern that such penalties might not be strict enough to dissuade violations, particularly given that in many instances, the company that owns the pigs, the transporter, and the grower-finisher operation may all be separate legal entities. To address this situation, the IDALS is exploring legislative solutions to strengthen existing penalties. Furthermore, with feed known to be a potential fomite for spreading ASFV, a need exists to address feed movements during a standstill order that balances disease control with husbandry concerns.[16–18]

The IDALS is working with the swine industry on potential solutions. Additional research is needed in this area to identify mitigants that may reduce the ability of feed to carry ASFV and biosecurity practices that greatly reduce the risk of disease transmission associated with feed trucks moving on and off farms.

During the 2014–2015 outbreak of highly pathogenic avian influenza in Iowa, the IDALS learned that the longer infected animals remained on farms shedding virus into their environments, the more difficult it was to control viral spread. Timely depopulation of infected flocks minimized the spread of highly pathogenic avian influenza.[20] Therefore, in the initial phase of an actual ASF outbreak, the IDALS's strategy is to quickly eradicate the virus before it spreads widely. Theoretically, quick action would protect more herds by decreasing overall viral load and exposure opportunities, leading to lower overall morbidity and mortality rates throughout Iowa. During the course of the SFEAR, working through the daily scenarios revealed that the easiest way to rapidly stem an outbreak would be to quickly detect all positive sites. Failure to quickly identify and isolate positive farms would result in a prolonged FAD response, lead to further spread to other farms, and require additional resources. To increase surveillance capacity, the IDALS is exploring screening methods at concentration points (eg, markets and meatpacking plants) and advocating for the validation of oral-fluid tests for ASFV in the United States.

The final day of the SFEAR showed the advantages of having multiple electronic means by which producers can submit movement permit requests. However, the need for clearly outlined permitting requirements was highlighted but may have been an artificiality of exercise play given that communications were not actually posted online or made publicly available and were instead relayed directly to all Iowa participants by use of the contact information they provided. Regardless, this day's activities also reinforced the need for a standardized protocol for screening live animal movements before permitting movements within the United States. When moving live pigs during an ASF outbreak, both state and federal animal health officials will want the highest level of confidence that the probability of spreading ASF is low. Validation of oral-fluid tests for ASFV would greatly benefit this process.

Lastly, a common concern expressed every day of the exercise was the limited number of federal and state personnel available to respond to an outbreak. To address this, the IDALS is exploring how to develop a surge capacity of cross-trained employees from other departments and state agencies.

Conclusions

The SFEAR identified opportunities for improvement as well as areas where Iowa can be a national leader in ASF planning and response. A major strength was the diversity of stakeholders who chose to participate in the 4-day exercise. This high level of involvement and collaboration must continue to protect Iowa's pork production and would be critical during future planning efforts and, ultimately, a real-life response. The SFEAR showed that even during an exercise, government responders cannot accomplish everything alone and will need the support and cooperation of the industry and producers to success-

fully eradicate an FAD if it is introduced to the United States.

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Footnotes

a. REDCap. Available at: www.project-redcap.org/.
b. Google Forms, Google LLC, Mountain View, Calif.

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