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Vets to Vets Meeting on African Swine Fever

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Prepared by:

Dr. Rachel Schambow
scham083@umn.edu

Prof. Andres Perez
aperez@umn.edu

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SUMMARY

• **Speed and time are critical for effective ASF response.** Production systems must have a management structure and ASF response protocol in place prior to an outbreak for timely decision-making. Turnaround time for diagnostic testing is particularly important.

• **Traceability is still difficult to achieve in many ASF-affected countries.** Movement permits are sometimes used, with diagnostic testing requirements pre-movement or on a regular basis. Movements of small and backyard producers are often difficult to monitor and control.

• **Many important biosecurity techniques and protocols were identified, including:**

· **Preventing access to farms by outside individuals or vehicles**, such as by separation between clean-dirty areas by using on-farm "lockdown areas" and selling pigs through off-site transfer stations.

· **All items brought onto the farm are disinfected** through UV light boxes/rooms, fumigation, ozone rooms or ozone in water. Single-use and disposable equipment, such as tarps, ropes, and other supplies, are used where possible. Items like snares are disinfected between each pig.

· **Entry protocols for personnel** onto farms included up to 4 showers with overnight quarantine, and a minimum 48-72 hours of downtime between sites. Employee schedules are designed for long on-farm stays of four to 30 days at a time. Some sites use campus-style living arrangements.

· **Personnel compliance** is monitored through AI-assisted CCTV camera systems and sensors.

· **Outside food is not allowed on farms in some companies**. Others allow non-beef and non-pork products but require decontamination using ozone in water or ozone room.

· **Tunnel ventilatio**n is used to control airflow and prevent the entry of outside animals.

· **Systems consolidate pigs onto larger farms** to offset increased biosecurity costs.

· Washing and disinfection is required for all **trucks** entering farms, sometimes also with bakers (30 minutes at 70 °C). Truck segregation protocols are commonly used to maintain separation between the farm and external sources. Truck traceability remains difficult.

· **Feed biosecurity** commonly involves the use of mitigants, such as formaldehyde or fatty acids, and hold times up to 30 days, sometimes off-site. Feed ingredients may be sourced from ASF-free countries.

· **Water** management includes chlorine treatments and weekly PCR testing. Deep wells are preferable.

• **Surveillance and early detection protocols** on sow farms involve daily observation for reduced feed consumption, fever, and recumbence. Abnormal sows and her neighbors are removed. In farrowing rooms with a suspect, all piglets are culled. The attenuated strains are more difficult to detect clinically. In finishing herds, clinical presentations include recumbency, sores, respiratory problems, skin/joint issues, reddish skin, sudden death, and bloody nasal discharge upon death. Early detection in finishers is difficult.

• **Diagnostic testing** is typically conducted on all ASF-suspect animals. Whole blood and PCR are used for sows and oral fluids for finishing farms. Environmental sampling with PCR is routine. Some companies have their own private laboratories to expedite results for internal use. Many countries also have mandatory sampling programs to move and sell pigs.

• **Disinfectants** vary based on what is available in large quantities, but include caustic soda, soda bicarbonate, lime, and calcium hypochlorite. Carcass disposal methods include on-site pits, burning, and composting. For euthanasia, sodium nitrate via foaming was recommended. Wait time protocols before repopulation vary between two weeks to two months and may be regulated.

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1. General Organization

1.1 Introduction and objectives

Arguably, the greatest emerging foreign animal disease threat to the US swine industry is African swine fever (ASF). ASF is a viral, hemorrhagic disease of swine that can cause up to 100% mortality in affected herds and for which there is no treatment or readily available vaccine. ASF is currently globally widespread, being present in Europe, Asia, Africa, and in the Dominican Republic and Haiti. The impact of a potential ASF outbreak in the US would be catastrophic. Reports have estimated that due to lost export markets, an ASF outbreak could cost the US swine industry up to $50 billion USD over 10 years.

US swine veterinarians and producers need detailed, practical knowledge and protocols to prepare for a potential ASF epidemic before it occurs. Much knowledge has been gained in ASF-positive countries about controlling the disease but is inaccessible in the US for many reasons. The objective of Vets to Vets was to connect US swine veterinarians to international veterinarians and producers with extensive, first-hand ASF-experience through an in-person workshop to share important information for biosecurity, surveillance, and more. This knowledge transfer will give US swine veterinarians and producers the tools needed to prepare immediately for a potential ASF outbreak, maintain business during an epidemic, and protect this important US industry.

1.2 Participant selection and preparation

Expert participants were selected from partners of ongoing international ASF research and collaborations with UMN CAHFS. Moderators were selected from UMN CAHFS team members and collaborators with experience facilitating workshops and discussions. US participants were invited using a snowball sampling technique, whereby initial nominations were received from the National Pork Board's (NPB) Foreign Animal Disease Task Force. Initially invited US veterinarians were asked to nominate additional US veterinarians to attend the workshop. To facilitate a "safe" environment to share information and encourage transparency, regulatory officials were excluded from eligibility. In total, 22 participants attended the workshop, which included six moderators, six experts, and ten US participants.

Prior to the workshop, moderators and experts were convened on the morning of Saturday, September 16 at the RiverCentre in St. Paul, MN. Instructions and information were reviewed for the upcoming event, with emphasis on the roles and expectations for them during the workshop. US veterinarian participants received a narrated PowerPoint of the workshop format and expectations and a reference guide of potential topics. Confidentiality forms were also signed and collected from all participants. Generally, the confidentiality agreement prevented participants from discussing or revealing information or names from the workshop prior to authorization by the NPB and UMN CAHFS. This agreement was intended to foster trust between participants and create a "safe space" to share potentially sensitive information.

1.3 Workshop Format

The Vets to Vets: African Swine Fever (V2V) workshop was held on the evening of Saturday, September 16, 2023 in the private dining room of the Downtowner Woodfire Grill in St. Paul, MN. The event took place from approximately 6-9:30pm (approximately 3.5 hours duration). Participants were assigned seats so that each table consisted of one international expert, one moderator, and two US participants. The groups were then reintroduced to the general topics for the evening, and the dinner discussion was started. US participants rotated once during the workshop so that they would meet experts from different countries and diversify their discussions. A whole group discussion was conducted at the end to review. Moderators highlighted key points discussed at their table, while experts and US veterinarians were able to add additional information and expand on the discussions until the workshop was concluded.

1.4 Discussion Topics

The participants were presented with six general topic areas, based on high priority topics initially identified by the NPB Foreign Animal Disease Task Force (Table 1).

Table 1. List of topic areas from V2V discussion.

Topic	Description
Topic 1: **Traceability of movements**	Responsibilities of the vet, producers, government. Impact on producers and market. Experiences from areas with regionalization.
Topic 2: **Clinical presentation and surveillance**	Clinical presentation of the disease, differences in strains. Surveillance and sampling protocols including for early detection in domestic and feral swine. Partial depopulation and tooth-extraction methods. Diagnostic testing methods for animals and environment.
Topic 3: **Biosecurity Management and Epidemiological Separation for Swine Units**	Biosecurity to keep swine units epidemiologically separate within a farm, including within a network/system of farms. Biosecurity of handling semen. ASF vaccine use.
Topic 4: **Biosecurity management for feed, wild boar/feral swine, and manure**	Biosecurity management of feed and water. Feral swine/wild boar issues. Manure applications/treatment.
Topic 5: **Biosecurity management for personnel and vehicles**	Biosecurity protocols on and off-site personnel. Maintaining compliance with protocols. Protocols for vehicles and trucks. Managing movements between farm and slaughter facilities.
Topic 6: **Disinfection and carcass disposal**	Recommended disinfectants and protocols for: Cleaning after an ASF case. Bringing materials onto the farm. Reset of the manure containment structures. Recommended carcass disposal methods.

2. Summary of Discussions

2.1 Traceability and movement permits

Generally, participants described many countries as lacking clear traceability systems. It was thought that this is likely a low priority where they are not predominantly exporting pork. Typically, movements are recorded because of the movement permit system, but there is no real-time government tracing. Outbreak investigations require personnel to go through movement permits manually. In some countries, it was reported that they do have an equivalent of health papers, and shipping paperwork is used for slaughter animals. However, this paperwork would be kept by the company for business purposes and not by the government. In many countries, backyard pig farmers continue to move pigs without documentation illegally.

Many countries use movement permits. Some regulations and enforcements have included:

- Farms must be out of restricted zones or quarantines and be sampled for ASF.
- Control posts are present on roads where police control pig movements and monitor for permits. Negative results must be presented.
- Permission must be given to move animals between provinces.
- Some countries use permit systems for slaughter plants where testing is not required for each movement, but instead a farm is tested monthly via tissue samples from dead pigs. When declared negative, the farm obtains a one-month movement permission between the farm premise and the slaughter plant. Some plants also are considered "positive plants," and others are negative.
- One example of testing requirements before movement included whole blood samples for PCR five to seven days before the planned movement date, in central official labs

2.2 Biosecurity

2.2.1 General biosecurity management

Overall, biosecurity management used by farms in ASF-infected regions is quite intensive and requires constant enforcement. To manage high biosecurity costs, systems consolidate their pigs onto larger farms. One example was a system where they have approximately 70,000 pigs on a site. They may have barns made of many layers with approximately 3,000 pigs per layer. This is more cost effective than having individual biosecurity facilities (truck washes, feed storage, item disinfection, etc.) for many smaller sites and allows them to maintain strict standards. To prevent between farm spread amongst small producers, in some countries they have pushed for building fences or barriers. They also try to prevent people from buying meat directly from farms, which is common practice in some places.

All items brought onto farms undergo disinfection, with examples of techniques used being UV light boxes for small items or entire UV rooms if large. Many items that cannot be subjected to UV light, such as medications, or very large items that won't fit go through a fumigation process or the ozone rooms/ozone in water for food decontamination. Disposable equipment was advised wherever possible to minimize virus spread and the labor needed for disinfection of equipment. This includes one needle per pig, disposable mats/plastic sheeting to transport live pigs and carcasses on the farm, disposable ropes to restrain pigs for blood collection, and multiple snares which are cleaned between every pig. Additional recommendations include preventing access by pests (flies, birds, roaming animals, etc.), which can be supported through the use of tunnel ventilation to control the air flow.

Many have experienced that once ASF is detected in wean-to-finish farms, it is usually difficult to control and spreads rapidly. High mortality will typically occur after approximately 48 hours of detection in this scenario.

2.2.2 Pig movement biosecurity

Extensive measures are taken to prevent the spread of ASF through the movement of pigs between farms or sale locations. Generally, it is felt that pig brokers/buyers are a major source of ASF spread with limited biosecurity, so they are viewed as high risk. In one country, central aggregation points or transfer stations are used. At these locations, farms bring sale pigs on one side, and buyers enter from the other side. It is assumed ASF is highly prevalent on the buyers' side. Pigs are loaded in via one-way chutes (monitored via cameras) with clean-dirty lines, so that farms do not take ASF back with them, and the pigs go directly to market. It is acknowledged that this system creates some extra unloading stress and pig loss that should be accounted for. Cull sows now mainly go to these transfer stations. Farms wash and test their trucks coming from them.

On the farm itself, many have installed "lockdown areas", or holding pens/transfer areas. They believe this has been the most important biosecurity measure they implemented. These are located inside of the farm, but at some distance from the main barns. Pigs that are going to be sold are walked there, sometimes with disposable mats laid beneath. A clean-dirty line separates employees working internally in the barns from employees working externally to load the pigs, which neither can cross over. Different personnel then load the pigs onto company trucks. If pigs are being sold to a 3rd party, then the trucks will meet at an off-site location and perform an end-to-end transfer of pigs to avoid customer trucks from entering the site. The employees handling the external transfer of pigs will shower in a site built only for the external truck loading assistants and security guards. Clothes and boots in that area are changed on a daily basis. It was generally suggested to lay down disposable tarps when moving pigs and throw them out afterwards.

2.2.3 Personnel

Companies used comprehensive strategies to address personnel biosecurity as it is considered highly important to preventing ASF. Entry onto farms is variable but consistently with strict biosecurity. Generally, showers are required with up to four showers for some sites and an overnight quarantine required before the second shower. Some locations reported that "fogging" of employees was previously used. Some places required a minimum 48 hour downtown, while others required 72 hours. Others use a biosecurity pyramid similar to US-approach. It was noted that the long downtimes and 3-4 showers protocol is more of an added guarantee than a science-based recommendation by some farms. Having a 2-3 day downtime on the farm helps to ensure the person would take at least one (or two) good showers, which has been found to be adequate, before mingling with other farm personnel and working with the pigs.

One downtime protocol discussed was as follows:

- 4 nights total: 2 nights with no pig contact, outside the farm + 2 nights of downtime inside farm (dormitory).
    - Minimum 3 showers before getting contact with pigs: Shower in before entering the farm, shower during the 2-night downtime inside farm, and shower in before entering the pig area.

Different types of employee schedules are used. One system requires employees to live on their farms, and employees are given four days a month to spend at home. They are then required to quarantine for three nights before reentering the farm, following showering procedures. For this situation, the farms provide dorms on-site in a "campus"-like setup, where meals, exercise equipment, games/fun-related activities are provided for employees. This system did report that most of their employees are younger. Another system from a different country reported using a less-intensive approach of four days on, four days off for workers. Employees working in ASF-positive barns have been required to stay and sleep in those barns until disinfection and disposal. The employees are provided with all necessary amenities needed during their stay in the barns and a monetary bonus for this work.

Many large systems do not allow employees to bring food onto farms. Meals are provided, sometimes using pork from pigs raised and slaughtered on site. Others only used non-pork products. Systems that allow outside food consumption of non-beef and non-pork products the food be decontaminated through ozone in water or an ozone room process. Outside pork is never allowed on farms. It was also emphasized that workers should not be allowed to take meat home from animals that are euthanized, which sometimes is attempted by employees.

Monitoring personnel compliance is also a priority. One system uses an AI-assisted camera system (commercially available) for monitoring protocol compliance by employees. The system uses CCTV cameras with software that recognizes when employees break protocol or biosecurity, such as whether employees are changing boots, crossing over clean/dirty lines, and more. When this occurs, the camera automatically takes a photo and sends it to a manager/supervisor for review. They find this to be more cost-effective and accurate than hiring employees to monitor cameras. Some systems also used sensors in showers (not cameras that record footage, to protect privacy) that would not allow water to flow unless the employee was directly under the shower. The shower itself is then operated on a set timer to ensure they shower following the protocol.

2.2.4 Trucks

Generally, trucks are felt to be major spreaders and fomites of ASF. Disinfection of trucks has included the following strategies:

• Washing and disinfection of trucks used for pig movements or feed was commonly reported. On large sites, some companies spray disinfectant within an enclosed shelter, then hold the truck for 30 minutes to dry. This is followed by a biodry/bake of 30 minutes at 70°C.

• Truck biodry/bakers are used to bake all trucks coming onto farms using dedicated bays, 30 minutes at 70°C. The trucks also have GPS controls in them to track where they have gone and confirm they went to the baker. It was noted that they are unsure of the wear on the trucks from this process as the trucks are contracted out. They also commented that in their situation, big trailers are not used there because of the size of the roads.

Many large systems with adequate access to trucks also implement a truck segregation protocol, whereby trucks are given designated purposes. For example, trucks used for slaughter plants are only ever used for slaughter movements and never for internal movement of pigs. Feed trucks would exclusively be used for feed and not pig movements. This helps maintain biosecurity and separation.

Across countries, truck traceability remains an issue. Small farms often mix loads on trucks, which is difficult to determine where infected animals may have come from or been. This is much easier to track with large farms that can fill an entire truck. Some provinces in some countries inspect trucks as they cross borders, but this has led to concerns about how much time animals will be held on the truck and how many times they will be tested.

2.2.5 Feed

Feed biosecurity and management strategies discussed included:

• Group of producers purchasing an animal feed plant for their own use and sourcing all corn from non-ASF affected countries.

• Treating all feed with formaldehyde treatment. It was noted that this is because it is most cost-effective (cheaper than fatty acids), and because it works for the duration of the product's travel chain. This is followed by storing the feed for three days before it is consumed.

• Not allowing feed delivery vehicles on farms. Some companies instituted a 2nd layer around the farm where feed trucks would go to drop off feed in the bins, and they would then disinfect that area frequently with a lime solution. They would do this on the road in front of each farm.

• Having feed deliveries sit for 30 days before coming onto the farm premises.

• No feed bags allowed to enter farms.

• Silo systems and automatic feeding systems used in farms.

• Some countries have voluntary holding time of raw feed materials imported from higher risk countries before the ingredients are sent to feed mill or used for feed.

Swill feeding is still mentioned as a concern because there are not bans in all areas and it is used by small farms. For airports, incineration has been used on airplane waste to dispose of it. Previously it went to backyard producers that fed it as swill.

2.2.6 Manure

One system reported that they do not do much with manure. When removing sows for partial depopulation, they do not clean the manure pits under her and have not had an issue from it. In their manure lagoon, they let the fermentation process kill ASF, because they are required to collect biogas anyways and presume the liquid part will be clean. They are left with approximately 20% solids, which is not spread there, but instead is bagged and sold off-site. This is done far away from the barns and isolated by brick walls with a separate road to access it. No farm employees can access the area. Their pits are cleaned every six months.

2.2.7 Water

Consideration must be given to the water source used, especially in places where it is not possible to access deep groundwater and rain and other above-ground sources are commonly used. If possible, sourcing water from deep wells is preferred. Water treatments have included chlorine (bleach) treatment to all water with weekly PCR testing. One concern though is giving enough time for the chlorine to be effective before water is made accessible to pigs.

Additionally, it was noted that ASF incidence seems to increase in the rainy season. It is felt that the virus contaminates water and is nearly impossible to eliminate from places like truck cabins where there is a lot of in-and-out movement into wet and muddy areas.

2.2.8 Semen/Boars

It was felt that many are still doing live service on small farms, but generally moving to boar studs and testing some semen. They believe it is hard to detect in semen, but they still do it. Another system uses high tech boar stud operations that have filters and air condition, three layers of biosecurity, and are located in very remote zones. Generally, truck and personnel movement into these sites is low. For companies using this method, they haven't had boar studs break with ASF. They have also sourced boars from ASF-free countries.

2.3 Clinical presentation

Generally, the clinical signs reported by the various experts were consistent with known clinical signs of ASF, though more specific information was made available about the presentation of clinical signs in the farm setting.

In sow herds, the first clinical sign in most or all outbreaks in countries was reduced feed consumption. This was followed by abortions, but not in a way or frequency that initially caused concern. Abortions at the start of the outbreak

tend to remain within expected limits. Another report was consistent, saying that reproductive problems can be big but take six months to be noticeable. In one country, some report more and new aggressive clinical signs, one such being "heart attack".

In finishers, poor-doing, respiratory problems, skin and joint issues, reddish skin, sudden deaths, and bloody nasal discharge upon death were reported. In one country, most attenuated disease is seen in fattening farms. For these pigs, they are recumbent and exhibit sores.

2.4 Surveillance and early detection

Various surveillance methods are being employed, both as company/farm strategies for early detection to minimize production losses and as part of government-mandated programs. Official veterinary services/governments have varied strategies, including:

- Mandatory sampling of 30 whole blood samples every 21 days (collected and sent by producers).
- Blood samples taken every 30 days, at the expense of the farmer.
- Mandatory submission of tissues from mortalities on a monthly basis.
- For new farms without disease-free certification, mandatory sampling every 10 days in farms. If selling breeders and slaughter pigs, farms need to submit 60 blood samples for testing (collected and sent by producers), at the expense of the farmer. This is done for a year until the farm has been established free of the disease.
- Slaughter surveillance, of which it was noted is often what ultimately detects infected pigs.
- Areas that have been depopulated due to their zone (such as infectious zones) require six months of surveillance. If no further cases are found, they can change the status of the zone.

It was also noted that in some cases, producers were sending in non-swine samples to official veterinary laboratories as part of their regular or pre-movement sampling. This was highlighted in the context of needing enforcement and compliance. Some have had discussions about testing at particular checkpoints in the swine transport chain, but this could be complicated. In one country, it was noted that many cases are reported to the government because of human disputes (an individual reports another), and there is likely a lot of underreporting otherwise.

2.4.1 Early detection for partial depopulation strategies

Generally, it was felt that looking for early clinical signs on farms is difficult. However, many farms will look for nonspecific signs in sow herds, particularly off-feed, recumbency, fever, and generally appearing "off". This level of early detection is needed for successful partial depopulation strategies. Bonuses for employees that find ASF-infected pigs have been used to encourage clinical observation.

Various partial depopulation or "test and cull" strategies have been used with reported success. In one system on their sow farms, prior to their current detection method, they would lose an estimated 10-12% of sows by the time of ASF detection. Best performing farms may reduce this to 5-6%, while worst performers are typically around 25-30% losses. To improve their performance, some systems have updated their protocols to daily visual observations to detect any sow with a slight temperature increase or being off-feed, followed by immediate removal of that sow and her neighbors (one sow on either side of the suspect sow). They still take blood for PCR testing, but they do not wait for the test result to remove the sow. They also disinfect the area under the sow with lime. They have found this decreased their ASF losses to 5%. They also use thermoguns for temperature monitoring, and in some farms sensors are mounted in the barns for continuous monitoring.

In the farrowing room, one company initially tried culling only the suspect sow and her piglets but found this did not work due to pen-to-pen contacts between piglets. Now, they cull the entire room's piglets if a pig is suspected of having ASF. For sows in the nursery room, they cull off-appearing and/or febrile sows and their neighbors. The remaining sows will be closely monitored. The decision for sow removal depends also on the feeder design. If sows have individual feeders and drinkers, removal of suspected sow and the neighboring sow on each side can be done. For sows with shared feed trough, more sows in the same line as the suspected sow are considered for culling.

Other farms also report monitoring for decreased feed consumption, and generally culling anything that looks abnormal in any way. Some noted that because of ASF vaccine use, serology can cause confusion of being ASF-positive during selective depopulation.

2.5 Diagnostic testing

Generally, whole blood and PCR are commonly used for ASF detection, especially in sows and for official government surveillance programs. Some collect blood via ear or tail prick to reduce the stress, time, and labor needed for blood collection. Oral fluid rope testing is used in grow-finish operations, via a protocol of hanging ropes for 20 minutes in pens then testing with PCR. Environmental samples are commonly used for ASF detection and to understand potential high-risk sources/fomites (surfaces, water, items, trucks, etc.). Testing for attenuated and vaccine strains is felt to be difficult, with primer modifications needed for PCR.

Large companies in multiple countries have their own laboratory for ASF testing, because for them it is crucial to have fast results for any partial depopulation strategies and early detection. With their own lab, they can get results in ~3 hours with the use of on-site equipment. These labs are quite sophisticated, with their own hired staff, and they are able to run PCR and even have adjusted their own primers for attenuated strains to improve detection. Portable PCRs can be used and transferred to a large farm unit to monitor ASF spread on a daily basis.

2.6 Vaccine

Current commercially available vaccines are recommended only for growing pigs but not for breeders based on manufacturer's recommendations. For multiple site farms where the sow site (breed-to- farrow) is separate from the growing pigs (nursery, finishing or wean to finish sites), the vaccine may be considered for use for the growing pigs. But on a breed-to-finish site, the vaccine may not be recommended for use since vaccine will be used for the growing pigs but cannot be given to breeders and replacement pigs.

Generally, the vaccine is regarded as very new and not known whether it will prove to be a useful tool or not. Some considered it too expensive to want to use at approximately $2 a pig in their situation. Companies have mixed feelings and a lot of uncertainty about the safety and efficacy of the vaccines.

2.7 Wild boar/feral swine

The risk of wild boar or feral pigs differs depending on various factors, such as their density and geographic distribution relative to domestic pig production. Feral pigs near garbage sites have been completely culled in some places. In some countries, they do not perceive wild boar as a significant risk because the population is limited only to mountainous areas where no commercial pig farms are located.

2.8 Disinfection and decontamination

Commonly used disinfectants were caustic soda and calcium hypochlorite. It was noted that often the choice of disinfectant is often limited by which one is available in the needed quantity. Additionally, the use of ozone on trucks with down time and disinfectant (70% or 90% alcohol) is applied. Some felt that UV lights are relied upon too much.

One system's cleaning protocol after ASF detection was:

- Clean using hot water and soda bicarbonate, then let the barn sit for two weeks. No high-pressure hosing is used as it will further pathogen spread.
- Test using environmental samples and PCR.
- If this sample is negative, retest one week later.
- If still negative, they release the barn for repopulation. This is because they cannot, due to financial constraints, wait two months without production.

For repopulation, wait times varied from two weeks to two months. In some places, this time is regulated by the government. Overall, it was noted that farms must first fix their biosecurity issues before repopulating, otherwise they will likely rebreak with ASF.

2.9 Carcass disposal

Generally, producers should consider birds and fomites as a significant risk of pathogen transmission/contamination when considering burial and composting. Measures should be made to prevent access by wild or roaming animals. Composting, on-site pits, and burning have been used to dispose of carcasses. Composting is not used in some places because it takes too much labor, but others do use burial and compost. Some companies used on-site pits for non-ASF mortalities only. Carcass disposal equipment is cleaned and disinfected between farms with proper downtime. A shuttle point is used at the edge of farms to move the equipment.

For euthanasia, farms have used stunner systems or sodium nitrate, with the note that that foaming can increase its efficacy. Depopulation via CO_2 is reportedly not very practical because it requires a significant amount of CO_2 to euthanize a large number of animals.

2.10 Producer behavioral responses to ASF outbreaks

Production actions following ASF outbreaks on their farm or suspicion of an ASF outbreak is influenced by interactions between market prices, indemnity, and social context. Some suggested that indemnity should follow the US poultry model. They stressed compensation is critical but should not be too high or too low.

Some experts talked about examples in their countries where there is no indemnity. Thus, there is no incentive to report ASF cases, and the market chain continues even if pigs are infected because producers need to recoup the cost of production. Generally, those producers will try to sell pigs as soon as possible following first suspicion or detection before large mortalities occur. Buyers influence this by offering decreasing prices on the pigs as the infection continues, knowing that producers are in a difficult situation. Some have even heard stories of buyers using infected meat to sabotage farms, then buying their pigs at 20% (sometimes up to 40-80% depending on the production group) less than the market rate. There is also pressure to sell as quickly as possible cause the producer will still need to spend considerable labor and money to bury dead pigs, so they prefer to sell them to the market while still alive. In some countries, pork is also a highly social thing. Many do not want their pork frozen, so there is high demand for fresh pork. This drives the buyer system, and too much cheap ASF pork depresses market prices for everyone. The sale and

transportation of these sick cull pigs is hard to control because they are often not in big quantities and transport trucks are small and independently owned.

In other areas, because indemnity was only offered for live animals, some producers used antibiotic and antipyretic treatments to reduce mortality until the government provided indemnity.

In many cases, the animals are not detected as positive until at the slaughterhouse because producers are scared to have a positive pig, so they quickly liquidate the farm before they can be closed and depopulated. Often this leads to confusion and questions about where the positive pig came from, the farms or the trucks/transportation system.

There were many comments about interactions and roles between producers and government. It is felt by many that these are not well organized yet. For example, some testing is required to be done by the producers at their cost, but without enough presence of the government, non-swine and other bad samples are sent in instead. Lack of indemnity also drives alternative actions by producers. Additionally, government bureaucracy also prevents implementing important changes.

2.11 Miscellaneous comments

ASF is reported to increase in prevalence during the rainy season and becomes essentially uncontrollable. Cold temperatures also increase incidence. They think it is the spread of contaminated water into vehicles and other fomites. They don't believe that ASF is spreading via aerosolization.

Speed and time are critical. Diagnostic testing turnaround time is vital for any effective decision making. Results are needed in hours, not days. Having a management structure setup in advance and a decision-making plan in place will increase effectiveness and efficiency of ASF response. This is critical to save time and eradicate the disease in a herd.

3. Conclusions

In summary, the first V2V workshop provided many important updates on what is currently being done to prevent and control ASF in endemic regions by veterinarians and producers. The knowledge gained here addresses biosecurity, surveillance, early detection, disinfection, disposal, and more, highlighting the complexity and intensity required for maintaining successful pork businesses in the face of such a significant disease threat. The conversations between international swine experts and US veterinarians created valuable interpersonal connections. Future V2V events may expand on these initial efforts to build a greater, international network of sharing and trust, that ultimately will help the global swine industry to prevent and control ASF and other emerging and foreign animal diseases.

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