



Canadian Animal Health Coalition
Promoting a collaborative approach to animal health

Coalition canadienne pour la santé des animaux

ANIMAL HEALTH EMERGENCY MANAGEMENT PROJECT

PROJET DE GESTION DES URGENCES EN SANTÉ ANIMALE

Lessons Learned

2017 Manitoba PED Outbreak

Prepared for
Manitoba Pork

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Facilitated By
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RE: LESSONS LEARNED – 2017 MANITOBA PED OUTBREAK

The following document summarizes the results of the information collected and analysis conducted regarding lessons learned by the Manitoba pork sector and their stakeholders during the 2017 PED outbreak. Outbreak demographics and the disease epidemiology are not included as part of the scope of this report. Rather, the focus is on activities taken by the stakeholders to contain the disease, prevent its spread, and return the sector to a business as usual condition.

Information was obtained through a series of one-on-one interviews with individuals representing different facets of the stakeholder group. This included representatives from the: public sector; service sector; feed industry; independent producers; integrated production facilities; processors; and assembly yards.

We have summarized the views expressed and grouped the specific responses into a broader analysis of what worked well, areas for improvement, as well as individual recommendations that may be considered for future planning.

Please note that this report is not intended to be a consensus review of the response to the PED event, but rather documentation that creates a record of distinct issues that surfaced and subsequent learnings. Ultimately, our goal was to provide useful and timely information that will assist in the development of a more effective emergency response plan in the future.

Undertaken as a pilot, this report clearly demonstrates that the Canadian livestock sector is functionally capable of facilitating Lessons Learned initiatives after animal health emergencies; and that the Manitoba swine sector is actively reflecting on areas for growth and improvement.

Yours truly,
SERECON
and
CANADIAN ANIMAL HEALTH COALITION

Enclosure

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In particular we note the role of Manitoba Pork in electing to conduct this worthwhile initiative as an investment in the sector's future, and the support provided by Manitoba Agriculture to this same objective.

Funding for this project has been provided through the Agri-Marketing Program under Growing Forward 2, a federal-provincial-territorial initiative.

1.0 Introduction

Background

As part of the overall pork sector disease prevention and risk management strategy in Manitoba it was felt necessary to review the actions taken to date to assess the lessons learned, so that a more effective and efficient emergency management approach could be designed in the event of other disease outbreaks.

The interest in capturing and reflecting on the lessons learned was clearly articulated by swine sector stakeholders in the fall of 2017, and this question fit well within the scope of a broader national project 'Enhancing animal health emergency management capabilities within Canada's livestock industry administered by the Canadian Animal Health Coalition (Coalition, CAHC).

Preparing *Lessons Learned* studies is an essential step, if stakeholders are to learn from the experience of major outbreaks and be better prepared for future outbreaks. The Coalition is pleased to be partnering with Manitoba Pork by facilitating this particular study, a pilot for similar work proposed as an essential action to be undertaken by the livestock sector after all future outbreaks.

Context

The first Canadian case of Porcine Epidemic Diarrhea (PED) was confirmed in Ontario on January 22nd, 2014. PED is a virus that causes severe dehydration and diarrhea in pigs and is generally fatal in younger animals. It is a reportable disease in Manitoba and has had a significant impact on the pork sector in that province.

There has been a total of 90 confirmed positive premises since 2014 in Manitoba. This includes 4 cases in 2014, an additional one in 2015 and 5 more in 2016. A significant increase occurred in 2017 with a total of 80 additional premises testing positive, including 2 in the South-Central region, which had previously remained free of the disease.

All stakeholders in the pork sector have been working hard to contain and eradicate PED, and the Chief Veterinary Officer for the province of Manitoba (CVO) has committed to continue to work with the sector to address the disease. This event has had a significant impact on both the operating reality and the financial returns from the sector.

Project Objectives

The specific objectives of this analysis include:

1. Design of an effective survey tool that could be used to solicit information sector stakeholders on what worked well and what needed to be improved during the 2017 outbreak;
2. Work with Manitoba Pork to conduct surveys with sector stakeholders and summarize the information and group the findings into broader based categories of intervention;
3. Use the information obtained as the basis on which to design and facilitate a working session with sector stakeholders to test the framework for the lessons learned; and
4. Prepare a written report that summarizes all findings in a way that facilitates action to address the next steps and critical success factors in being more prepared for future disease outbreaks.

The project was also intended as an opportunity to develop experience and expertise within the Coalition, in assisting industry groups and their supporting governments, in preparing 'lessons learned' reports that address industry's role in disease related sector wide emergencies.

Scope

It is important to note that this review is directly associated with the PED outbreak and the corresponding actions taken. While the PED outbreak has occurred over a multi-year period, the focus is on the 2017 events.

While there are likely several findings that could be used in other provinces, or for other diseases and/or other emergency situations, the focus of this analysis is PED in Manitoba.

2.0 Approach and Activities

This study was conducted in two distinct phases of activity. Phase 1 involved the development of a survey and discussions with several stakeholders regarding their thoughts on how the response to PED unfolded. This information was compiled and presented at a facilitated session in Winnipeg on March 23rd, 2018.

Survey Design

Significant efforts were made to identify various topic areas, stakeholder groups and potential discussion points relating to the PED outbreak and response. This ultimately involved outlining topics from four different perspectives: government, sector stakeholders (processors, truckers, feed providers), Manitoba Pork Council, and producers.

The main premise was that each entity would have their own view on each topic and the goal was to keep these perspectives separate. Three central repeating questions were used as part of the process:

- 1) What worked well?
- 2) What could have been improved?
- 3) What would you recommend be done next time?

Several specific topic areas were identified by specific stakeholder groups to streamline the process. This helped ensure that each segment was asked questions that were relevant to their experience.

The goal was to ensure that participants could express their opinions freely, so a formal set of questions was not provided. Given that there was a need to aggregate opinions from several individuals into a single *Lessons Learned* document, the project team grouped the “lessons” into three main topic areas and asked that the participant consider framing their input into:

- **Operations and impacts on day-to-day (in barn/facility) activities** – relating directly to things that stakeholders did as part of normal business operations and how they were impacted;
- **Notification and coordination** – how stakeholders were informed of decisions that directly affected them and how this may have helped develop or modify Standard Operating Procedures;
- **On-going communication** – how stakeholders were informed of what was happening within the rest of the sector.

Participants were informed that the purpose of the interview was to obtain input from stakeholders to better equip the sector for future outbreaks by identifying changes to producer practices, sector policies, government regulations and legislation that will assist in: reducing the introduction of disease to herds, amplification within herds or spread from herds.

In addition, participants were instructed to detail specific examples that would help give context to the comments they were making. They were also asked if they provide an indication of how/if this factor changed over time as the event unfolded. Specific areas of focus by sector category are provided below.

Government

This category included all public-sector stakeholders including the provincial lab. The specific topics that were discussed with this category of stakeholder included:

Operations and impacts on in-barn activities:

- Specific coordination activities in the office and in the Emergency Operation Centre
- Laboratory Diagnostics
 - o Submissions – samples and forms
 - o Equipment availability and functionality
 - o Linkages to other labs and leveraging resources
- Mapping, disease tracking, risk analysis, cataloguing information
- Centre administration
 - o Staffing
- Distribution of test results

Notification and coordination:

- Adjustments to biosecurity on-farm; service sector; abattoir etc. and the roles and responsibilities of all stakeholders
- Notification and diagnosis
- Route planning and mapping
- Diagnosis activities
- Control of site access
- The need for follow-up with positive farms and/or negative premises surveys

On-going communication:

- MCDR (Manitoba Coordinated Disease Response)
- Communication with:
 - o Veterinarians
 - o MPC
 - o Producers
- Conference calls
- Emails/notifications
- Out-of-province communication

Service Industry

This rather broad category included all groups providing services to the sector such as feed companies, manure haulers, assembly yards, private sector veterinarians and numerous others. The specific topics that were discussed included:

Operations and impacts on in-facility/equipment activities:

- Feed movement
- Animal movement
- Manure management
- Deadstock removal
- Disease containment and control activities in the barn and/or on the farm property
- Impacts on staffing/family
- Marketing and working with processor

Notification and coordination:

- Changes to biosecurity status
- Revisions to and/or development of SOPs
- Notification and diagnosis
- Route planning and mapping
- Diagnosis
- Control of site access

On-going communication:

- MCDR (Manitoba Coordinated Disease Response)
- Communication with:
 - o Veterinarians
 - o MPC
 - o Producers
- Conference calls
- Emails/notifications
- Out-of-province communication

Manitoba Pork

Manitoba Pork was responsible for a significant number of actions during the outbreak. Specific topics that were discussed with this stakeholder included:

Operations and impacts on in-barn activities:

- Specific coordination activities in the office and in the Emergency Operation Centre
- Mapping, disease tracking, risk analysis, cataloguing information
- Centre administration
- Staffing
- Establishing communication schedules and establishing producer meetings
- The development and/or need for SOP's for various elements of the sector

Notification and coordination:

- Notification and diagnosis
- Route planning and mapping
- Diagnosis activities
- Control of site access
- The need for follow-up with positive farms and/or negative premises surveys

On-going communication:

- MCDR (Manitoba Coordinated Disease Response)
- Communication with:
 - o Veterinarians
 - o MPC
 - o Producers
- Conference calls
- Emails/notifications
- Out-of-province communication

Producers

As would be expected, primary producers were a key component of this assessment. This included both independent production units and those that were part of an integrated supply chain. The specific topics that were discussed with this category of stakeholder included:

Operations and impacts on in-barn activities:

- Feed movement
- Animal movement
- Manure management
- Deadstock removal
- Disease containment and control activities in the barn and/or on the farm property
- Impacts on staffing/family
- Marketing and working with processor

Notification and coordination:

- Notification and diagnosis
- Route planning and mapping
- Diagnosis
- Control of site access

On-going communication:

- MCDR (Manitoba Coordinated Disease Response)
- Communication with:
 - o Veterinarians
 - o MPC
 - o Producers
- Conference calls
- Emails/notifications
- Out-of-province communication
 - o Veterinarians
 - o MPC
 - o Producers
- Conference calls
- Emails/notifications

Interviews and Analysis

A total of 11 independent interview sessions were conducted, with input coming from over 30 individuals. Interviews ranged from 1.5 to 3.25 hours and all participants were extremely cooperative.

Participants were sent a letter outlining the purpose of the discussion and the structure of the specific questions that were going to be asked – as outlined in the previous section. The interviews were then either conducted via conference call and/or in-person over a two-week period in March 2018.

Workshop

A formal workshop was held at the Four Points Sheraton, Winnipeg on March 23rd, 2018. A total of 19 participants attended the session, representing all the stakeholder categories that were identified for interview.

After a short presentation of the findings, the stakeholders were provided the opportunity to discuss the results and add additional context to the analysis. Discussion comments and suggestions have been included as part of the following summary.

3.0 Findings

Findings from the one-on-one consultations and the workshop have been combined into several broad categories. For each case we have identified how the category was defined, and then what specific elements are included. We have also outlined the specific decisions and/or actions that need to be considered.

Overarching Themes

While the section below contains detailed information and distinct examples related to the above categories, there were also several predominant messages that emerged during discussions with stakeholders.

- **There are lessons to be learned.** Sector leaders and their organizations were very supportive of this process, viewing it as an investment for the future.
- **In general, the sector collaborated well.** The disease management process was coordinated and communicated as effectively as could be expected.
- **Disease response activities generally improved as time went on and more production became infected.** This is likely due to reduction in the stigma faced by individuals leading to a more cooperative approach.
- **There were significant capital and operational costs.** Several stakeholders incurred significant capital and operational costs to deal with the disease, and the burden of this cost was not necessarily shared evenly across stakeholders even though the potential benefits were in many cases.
- **There is a need to formalize processes.** Many of the activities undertaken by the stakeholders to address the disease concerns – cooperation and coordination, increased biosecurity, capital expenditures etc. - occurred rather “organically” in 2017. These things may need to be formalized, as has occurred in other provinces and sectors, given that the extent of the relational goodwill across the sector may change as individuals exit the sector over time.
- **There is now heightened disease awareness across the sector.** Disease management has been given more attention, new jobs were created, and a new disease tracking platform, the Manitoba Coordinated Disease Response (MCDR), was developed in MB.

Specific Category Analysis

After considering all of the comments and input, the information was grouped into five main categories based on the nature of the key factor and/or issue involved. The following categories are not in order of priority:

- **Surge Capacity**
- **Communication and Collaboration**
- **On-farm and Sector Biosecurity**
- **Continued Risk Areas**

Since in many cases multiple stakeholders noted similar issues, comments have not been separated out by stakeholder category. Instead, the focus remained on determining what worked/didn't work and then identifying specific recommendations based on these findings.

Surge Capacity

As with most production/manufacturing industries, the operating reality of the pork sector has evolved over time and the related infrastructure is based on a typical business as usual cycle.

A disease event like PED creates a significant disruption to this business cycle and a significant strain on the infrastructure at a number of specific pinch points. While the whole sector is under stress, the capacity of the related infrastructure to address these surges in activity is more limited in some areas than others. This became clear during the 2017 PED experience.

The general feeling is that Manitoba has limited surge capacity to deal with this size of outbreak. The following key points were noted specifically:

- Trailers and feed trucks are limited, mostly due to time required for Cleaning and Disinfection (C&D), forcing people to prioritize what gets cleaned.
- Staff is limited in the sector due to segregation, etc., and limited in MB Ag and Manitoba Pork Council.
- Veterinarians are stretched thin and may struggle to get communications to all their producers in a timely fashion.
- The provincial lab (VDS) has limited staff and overtime capacity.
- Biosecurity supplies can become limited.

The section below outlines some of the specific challenges that were faced during the surge. During the discussion with various stakeholder groups creative ideas used to address surge capacity surfaced. Some of these were quite effective, while others met with more limited success.

Provincial lab – sample flow

One of the main focal points during a disease outbreak is the need to obtain lab test results as quickly as possible. Not only do these results influence the design of biosecurity and/or biocontainment activities at a given premise, but they also have a significant impact on required routing of products and services across premises. This process involves both the lab test itself as well as the activity of collecting the sample and getting it to the lab.

The number of samples

The actual number of tests for PED increased dramatically in 2017. In May the monthly total was 2,772 and by August this figure peaked at 6,799. This peak represented a 978% increase over the average monthly number of 695 PED tests in the first quarter of 2017, prior to the first positive of 2017.

Further complicating the impacts of the “surge” is the fact that it went on for the entire summer of 2017 and into the fall. This created significant staffing issues as personnel began to get exhausted from working overtime to deal with the increased volume of requests.

To manage demand and fatigue, additional staff were brought in from other areas of the lab to help. The provincial lab also worked with industry to bring in a retired tech to assist. *The provincial lab also explored using other labs in SK and BC, however the turnaround times were not feasible and their capacity was limited.*

Sample batching

At the onset of the disease, stakeholders started to batch their processes to ensure that their activities in the infected areas occurred at the end of the day/week/process. While this made sense from a biosecurity perspective, this strategy resulted in the lab receiving the majority of the samples at the end of the day/week.

During the discussion, interviewees suggested that early in the disease outbreak, with a limited number of farms infected, sample submission was more difficult for the producer because of the C&D and downtime requirements. As such, leaving the infected premises until the end of the sample submission run made sense. However, as the number of infections increased, segregating sample collection/submission by disease status was more efficient than leaving all of the lab testing to the end of the week. This strategy also helped spread out the workload at the lab since receiving numerous samples prior to the weekend is never ideal.

Sample mishaps	As time went on and sample numbers increased, the types of containers became less uniform and created some problems for the lab. More specifically, some sample containers were being filled nearly to the top. This created problems as gas built up in the closed environment with some samples exploding out of the container upon opening. Along with causing an unpleasant mess, this also created a contamination risk in the lab.
Sample documentation	With the sample number increase also came more errors and omissions during collection. Submission forms often had missing information or were not included with the sample. These factors contributed to longer sample processing time and delays in results.
Priority ranking	Every sample is of high priority for someone. During the outbreak, some stakeholders were assigned conflicting priority rankings. The absence of a standardized ranking process created significant confusion and frustration in the lab and beyond.
The delivery process	The lab is a central delivery point for all farmers delivering samples. As such, the biosecurity risk naturally escalates due to increased and diverse traffic patterns.

CONSIDERATIONS

Virtually every respondent shared information about how they were affected by the flow of samples to the lab. This included a few creative suggestions for improvement.

Disease timing and adjustments – Ensure that a designated sample batching protocol is in place at the onset of the disease that clearly identifies escalation trigger points. Stakeholders should be made aware of the specific requirements at various stages of the outbreak.

The number of samples required – The need for a larger number of samples is higher at the outset of the disease. Stakeholders indicated that once the number of cases increases, the number of samples required may decline. This approach needs to be clarified so that it is workable and understood by the sector.

Sample ranking process – This is one of the key issues that had to be addressed at the sector level. One interviewee adopted a coding system and this significantly improved their process for prioritizing sample submission. It is important that the sector consider this type of coding to ensure that all stakeholders clearly understand how samples should be prioritized when being submitted.

Use of other labs and/or lab services – The concept of leveraging the resources of other provincial labs is somewhat related to the priority ranking process. The intent would be to conduct the high priority testing in Manitoba, while sending all the other, less time sensitive, tests to an outside lab, including the National Centre for Foreign Animal Disease (NCFAD), as the lab had arranged during the outbreak. A joint discussion about strategies to increase capacity during future outbreak, potential partnerships, and changes to work flow is recommended.

Pre-negotiated lab agreements – Agreements between animal health labs to assist each other in outbreak situation should be made in advance. However, it should be noted that additional laboratory staff are not readily available in any given region, and most animal health laboratories function at or near capacity and may not be able to accommodate additional work without also increasing resources.

Collaborative action – During the discussion it became clear that communication about the sampling process could be enhanced in both directions. There is an opportunity to engage the sector and to identify what can be done prior to an outbreak to facilitate an effective and efficient lab response. One option is to develop clear messaging and information sheets so that barn staff who do not normally sample have a pictorial guideline. This would help ensure better samples, which will benefit both the lab and sector.

Sample courier process – While this is somewhat related to the disease timing, it was addressed separately. The intent was that a courier service be provided to producers from a central location. Not only would this be convenient, but it could also improve the biosecurity considerations at the lab itself. It might also help for the lab to consider alternative driveway options.

Trucks, trailers and other equipment

Shortages of trucks, trailers and other equipment, and difficulties in accessing them when required, is a direct result of the need for significantly heightened biosecurity. The importance of this issue is magnified by the time sensitivities in the swine sector.

Numbers required

The obvious issue is that segregation of equipment results in the need for additional trailers to deal with the “clean” and “dirty” areas in the facilities. In some ways this was even more of an issue at the outset of the event when there were fewer cases. Producers noted that there were not quite enough cases for dedicated equipment yet a change to regular equipment protocol was required.

CONSIDERATIONS

Additional physical infrastructure and assets - In some cases, individual companies who were required to respond to the 2017 outbreak have already addressed this. Accordingly, these companies may now have some of the necessary equipment for future adverse events. Furthermore, this equipment has continued to be used in these operations as it has been found to assist in overall biosecurity.

Negotiated agreements with service providers - Pre-negotiated service contracts with C&D crews that could effectively disinfect any trailers used for the transport of infected animals are an option. This is because it is not necessarily the numbers of assets that is problematic but rather the ability to have enough resources to deal with both infected and non-infected animals during the outbreak.

Service sector issues and options

The service industry and the corresponding stakeholders are integral to the pork sector. In many ways, the issues these providers faced were more difficult than the farmers and processors, since they had to deal with multiple clients, any of whom could be positive, negative, in a 5 km zone, and/or under suspicion.

Animal Movement

The challenges for the service sector relating to surge capacity were generally related to the same issues mentioned above. They have trucks moving from farm to farm, so in an ideal world these would be segregated. Unfortunately, this is not always feasible.

The major transporter in the province did an excellent job of fully segregating their fleet based on disease status and location. Their fleet was segregated into 4 groups: cull sow movements, movements from premises previously infected with PEDv, movements from non-infected premises in southeast Manitoba. Lastly, trucks coming from Western Canada did not enter the buffer areas to reduce risk of moving the disease west. Following a movement, all trailers were cleaned and disinfected with all high risk trailers being baked (held at 71°C for 15 minutes) before they were put back into operation. Surge capacity did come into play when considering number of available trucks, trailers and drivers to operate each segregated line of the operation as there was no crossover. As well for the complete, clean disinfect and bake process, wash facilities were operating around the clock and it was mentioned that it was about at the highest capacity possible.

Provision of Services for Infected Premises

At the start of the PED event there was a need to allocate dedicated resources to address the emerging disease in select independent locations. Unfortunately, there was not enough demand or volume in the infected sites to make this a viable business option for the service sector.

In addition to the above, the potential for negative repercussions on the service provider’s business also presented significant barriers. Faced with the risks of visiting infected independent premises and losing existing clients at other locations, many providers chose to stick with the lower risk option. This in turn, left independent operators to fend for themselves.

**Staffing,
Workload and
Stress**

The scenario is quite problematic. In order to protect the sector as a whole, independent operators must trust that they won't be disadvantaged by disclosing their status early. Stakeholder discussions highlighted that often operators who 'did the right thing' were stigmatized and unsupported as they shouldered the costs and additional workload involved with protecting others. This did little to reinforce that early disclosure was personally beneficial.

The ability to ramp up C&D activity immediately was also discussed. Several interviewees suggested that as time went on, the access to these (as well as other) services improved, but that it was very difficult to access services in the initial, and most critical in terms of preventing spread, phase of the outbreak.

Throughout the interview process for all stakeholders including the public agencies and Manitoba Pork Council (MPC) it was noted that staffing became an issue. As the outbreak progressed, both workloads and stress increased. There were limited pools of people to draw from across all parts of the sector to assist in the efforts. It should be noted that staff needs and wellbeing were always considered. Vacation time was given, regular communication of workload with added assistance at all levels when needed, staff were not asked to perform tasks they were not properly trained to do or unprepared for. The focus on personnel was evident, and how much the sector valued the people that were faced with this crisis.

CONSIDERATIONS

Continued education and communication – *The stigma of having a positive premises is real and it needs to be mitigated at a sector level. Most of the participants in the working session agreed that continued work on sector education was a critical success factor. Individuals and/or companies that help early in the outbreak should not be isolated or forced to face adverse business consequences alone.*

Pre-approved agreements – *In addition to enhanced communication, it was also suggested that pro-active agreements be negotiated. This way, in the event of another outbreak, individual companies would be assigned the responsibility of working with the infected premises and all the equipment involved so that proper C&D can be accomplished.*

This type of strategy would help ensure services were made available to those who need them most, and reduce cross contamination risks. Having a list of experienced/qualified service providers who are responsible for dealing exclusively with infected premises during an emergency does however raise additional questions about training requirements and partnerships within the sector to manage regular business needs.

Communication and Collaboration

As in any adverse/emergency event, one of the critical success factors is effective communication and collaboration among stakeholder groups. In some cases, this occurs in a formal arrangement through well-established emergency plans and Emergency Operations Centres (EOC). In others it is a more informal process.

There was a consensus across interview participants that communication was quite good other than in a couple of specific situations. Perhaps more impressive was just how well the sector worked together and collaborated in addressing the disease event. While obviously more easily accomplished in the integrated operations, there was an overall tacit agreement that the sector just did what had to be done to deal with the situation at hand.

Speed vs Confidentiality

There is always a trade-off between the speed of communication and the producer’s right to confidentiality. This is especially true while waiting for preliminary confirmation test results.

Disclosure and ongoing communication about results

There were some concerns expressed about how to let the service industry know about premises that were not formally under suspicion but that had submitted tests and were awaiting results.

One of the main concerns is how to share positive test results with stakeholders, and how best to convey that results were negative IF the sector has chosen to disclose that tests were in process. This became a serious issue for those involved in the communication process as the situation evolved. Keeping track of exactly who had what information became more difficult as the number of cases increased in the summer.

Equipment repair and maintenance

During the outbreak there were a couple of examples where farm equipment needing maintenance was sent off site. It was suggested that this requires additional vigilance in order to ensure that the shop understands which, if any, equipment is coming from infected premises.

CONSIDERATIONS

Timing during the disease outbreak - There may be a need to separate actions based on the disease status. As the disease progressed, the likelihood of a test being positive was much higher than in the early and/or later stages. This may need to be taken into consideration via the development of triggers and communication strategies.

Using the Manitoba Coordinated Disease Response (MCDR) structure - There were some who expressed the thought that maybe the MCDR is the key to the issue of speed versus confidentiality. Producers with signed agreements can access information about disease status on other premises.

Geofencing and other innovative technology – There is potential to improve contact tracing and limit disease transmission using technology. Geofencing applications that incorporate PID can facilitate timely information sharing while protecting confidentiality and minimizing stigma. This technology would allow service providers to not only take extra precautions if they are in a known higher risk area, but also retrace their steps following exposure.

Early vs Later Stage Response Issues

A key discussion point identified in both the interviews and the facilitated session, is that it became easier to deal with the disease as the outbreak spread to an increasing number of producers. This is related to the stigma attached to disease outbreaks, and the fact that larger numbers allowed for the development of processes and brought together a larger pool of resources that allowed for more options.

Cost/Benefit	<p>During an outbreak, disease mitigation falls heavily on affected individuals while the benefits extend to the sector as a whole. This is an unfortunate reality for virtually any livestock disease, and it has a significant impact on the efforts made to address the outbreak in the early stages.</p> <p>If the Manitoba pork sector is to change the reporting culture and encourage operators to take swift and responsible action, there must be mechanisms in place that support affected farms. The feedback received was that independent operators were left feeling quite vulnerable and alone. This does little to encourage people to 'do the right thing'.</p>
Service support	<p>Difficulty procuring services at independent operations was specifically mentioned. Service providers were fearful that working with infected premises would cause other customers to switch providers. This competitive threat detracted from the potential for a collaborative response. Market access for affected animals from independent operations was also difficult in early stages.</p>
Response Uncertainty	<p>The interviews clearly suggested that there is still a need to clarify different approaches to addressing the issues that arise during an outbreak. There was confusion about communication channels, roles and responsibilities as well as the required response at various stages of the disease.</p>
Coordinated approach	<p>It has already been mentioned how well the sector as a whole worked together during this outbreak. It should also be noted the importance of those interactions with the CVO and MPC. The EOC structure worked well to coordinate the response and communicate out to the sector.</p> <p>A strong working relationship between the CVO and MPC was essential to an effective response to this disease event; collaboration was evident throughout the outbreak and continued while tracking disease elimination from premises. The sector demonstrated how well it can collaborate in an outbreak setting. Maintaining these relationships is key to success in the future.</p>

CONSIDERATIONS

Encouraging early disclosure/swift action - This would involve development of specific key messages, communication channels and clearly identifying roles and responsibilities. This is an important consideration as people move in and out of the sector, so a formal, documented approach would be useful.

Service agreements - There is a need to negotiate several agreements that clarify stakeholder expectations during a disease event. Not only will this clearly define necessary actions at the operation, but also the key agencies, contacts and communication channels that will support those dealing first hand with the disease.

Having the sector agree to work together and eliminate the competitive environment under very specific disease related conditions greatly facilitates a rapid disease response. Moreover, there is a need to clearly define and communicate the specific trigger point that determines when business as usual is no longer possible.

These types of agreements would need to be in place not only at the processing level, but for all service providers. The intent would be to establish a set of standards to ensure individuals have access to a "hit squad" to assist them so that the potential for disease transfer is limited as is the cost to the affected producer.

Develop a set of decision trees outlining relevant scenario options - Given the experience of 2017, there is significant knowledge available in the stakeholder group. While this document identifies a number of these lessons, it is important that information about very specific tactics used is captured before the intellectual capital departs the sector. The intent here would be to have a few specific decision trees (scenarios) developed based on successful strategies used in 2017. While these would largely be based on the experience of those groups with access to additional resources, the decision process would still be valuable to the sector in general.

Do the legwork in peacetime – As a result of the 2017 outbreak MPC developed the Manitoba Coordinated Disease Response to track disease and communicate out to the sector. This involved the development of the online platform, creating the agreements and working in a high stress time to get producers signed on. Doing work like this in peacetime would help to move things along more quickly if faced with the situation again.

Build relationships – Knowing key individuals and understanding the stakeholders they represent will help when working in a disease outbreak, whether PED or other. These can be developed through professional relationships and regular dialogue, as well as meetings or conference calls with multiple stakeholders, or ‘Town Hall’ calls with a broader audience. In many cases, these relationships will remain after the event because of the desire to keep communication channels open.

Integrated Operations vs Independents

There is a general consensus that integrated operations can communicate and coordinate their processes and the necessary adjustments more efficiently than independents. This was quite apparent early in the outbreak when independent farms tested positive. Not only did they feel somewhat isolated, the logistics of handling the situation were more complex. On the contrary, when the integrated operations had confirmed positives, they were able to immediately adjust their supply chain so that they could more easily isolate the barn yet continue to deal with their production.

Initial problems for independents cause lingering damage

During the initial phases of the outbreak there were a few independent producers who were “burned” due to disclosure. Respondents indicated that there are still issues and sensitivities around how to treat stored manure and C&D. These unresolved matters may affect the ability of the lessons learned to be properly implemented.

Communication Disparities

It was also noted that while there was great communication and cooperation between the major companies and their herd veterinarians, independent producers and key service providers are often left without the same level of information. This needs to be addressed to minimize total sector risk.

CONSIDERATIONS

Special focus on affected farmers – There was a consensus that a focused and coordinated effort should be made by the sector to work with independent farmers who experienced the disease event first hand.

Their perspective is integral in understanding how the disease impacted not only the operation, but also willingness to be transparent about their situation. If behaviour change around early disclosure is the ultimate goal, it is essential that the sector learns how to better support those people who will play a key role in protecting the sector at large. One option was to encourage them to sign up for notification by giving a guarantee that their manure would be taken, etc.

Motivate appropriate behaviour - Most participant suggestions focused on the balance between speed and confidentiality. Essentially, people will be more easily convinced to allow an earlier notification if they believe that they will not be punished for doing so.

Ensure timely/consistent communication - Complete communications need to go out to all affected stakeholders (faster). The key stakeholders include service providers such as livestock transports, manure applicators and feed companies. There is some interest to communicate suspicious cases with key stakeholders, even before test confirmation.

On-Farm and Sector Biosecurity

Biosecurity and bio-containment are critical success factors for any disease plan. While some measures make sense and can be relatively easily implemented on a business as usual basis, many are simply too expensive to consider until the threat of disease is high. The key is to clearly identify and develop the trigger points for their implementation.

Throughout the interview process, stakeholders outlined the significant changes that they made in terms of segregation (animals, trucks, people, etc.). In many cases these are permanent changes to the operating reality of the business.

The general consensus was that:

- There are critical biosecurity gaps in on-farm activities;
- A number of premises and other service providers lacked the high risk biosecurity protocols needed to carry out the range of activities involved in the complete business cycle during an outbreak; and
- Management of feed and trailers or other equipment, and knowledge of the disease itself, can also be improved.

Pre-Approved Protocols and Routing

It was noted in a couple of interviews that once animals were suspected of being infected that the producer immediately closed the herd, implemented segregation and/or other disease related protocols. By doing this, the farm was relatively successful in limiting the spread of the disease. This also resulted in the need to change transportation routes to, from and around the premises.

On farm protocol development

While some premises had strengthened biosecurity protocols ready to put in place, others had nothing prepared. Given the nature of outbreaks, it is critical that all stakeholders develop a suitable plan so that it can be quickly implemented if need be.

Protocols at the plant

Specific protocols for receiving previously infected animals at the federal plants were developed and included end of day/week delivery to designated docks. Procedures for traffic flow and subsequent cleaning and disinfection were developed.

There was some discussion regarding confusion at the plants in terms of how to communicate the expected biosecurity practices that were implemented with the transporters. For example, there were some issues or confusion regarding truck movement on and off the site, and designated docks.

Routing Options

A final issue involved the need to change routes to allow livestock and service vehicles to bypass infected and/or suspect premises. This became a problem when routes were designated that were not feasible given the size of truck and weight restrictions.

A second element associated with this point is the fact that weigh scales can become contaminated. In one case, a truck with PED positive animals was weighed on clean scales creating a risk for subsequent users.

Biosecurity Escalation

Biosecurity in high risk areas needs to be increased immediately the risk is known to prevent disease spread. However, these biosecurity practices were only being ramped up when the risk was obvious across the sector.

Cleaning and Disinfection

Cleaning and disinfection protocols differed across the sector depending on the companies or groups involved. No differences were noted on the effectiveness of each C&D protocol.

CONSIDERATIONS

Pre-approved on-farm biosecurity plans – A number of farms have well established plans that appear to have worked during the 2017 outbreak. These might provide a useful starting point for the rest of the sector to consider. Biosecurity plans should consider differing risk levels and be able to be readily implemented. Historic timelines of breaks should be considered and enhanced biosecurity practices be put in place in times of the year when risk is deemed higher.

Biosecurity protocols that address high-risk scenarios should incorporate the following:

- Reduced herd contact by limiting number of animal movements per week
- Dedicated equipment/supplies per barn
- Having additional RAZ biosecurity, e.g. showers
- Limiting unnecessary contacts on the CAZ and RAZ, e.g. production management visits, hydro meter reading, facility maintenance, etc

RAZ biosecurity – This is the most critical factor to keep the virus out of the barn. If biosecurity is practiced at a consistently high level, sites can remain negative. PED virus will readily capitalize in insufficient protocols and/or in breaches in protocol. Loadout biosecurity was an early focus for change due to the likelihood of virus being walked/washed back into the barns.

Staff segregation – Staff flow is key to protecting on-farm biosecurity. It is best to not allow sharing of staff between any site in a buffer area (positive or negative) with any other site. Staff working in positive barn(s) should not go to negative barns as part of their work schedule during an outbreak. This could be managed if staff were sequenced from negative to positive barns in a day, but never the other way. With full segregation, some producers managed to keep certain barns negative even though they were on infected premises.

Internal biosecurity/biocontainment (e.g. McREBEL principles in sow barns) – These factors are key to eliminating the virus and many producers continued these practices after achieving “presumptive negative” status because of the production benefits that were seen.

Cleaning & disinfection - Effective C&D on positive sites is essential. All equipment should be disassembled for thorough cleaning and disinfection. Disposable or broken equipment must be discarded and replaced.

Standard Operating Procedures (SOP) for going to the plants – The processors have well-established protocols for traffic flow on their sites. This information can be shared with the sector so that the non-integrated production units can be better prepared. The same information needs to be developed for the assembly yards to reduce confusion when animals are being delivered.

Pre-existing routing options and the use of technology – It is critical that designated routes be accessible. This involves knowledge about the nature and state of the route being suggested. While some of this should be negotiated directly with transporters, there is a need to work closely with the Rural Municipality (RM) to ensure that the road is open and that the transport vehicle can actually be accommodated.

Stakeholders indicated that the logistical knowledge of Manitoba’s major transporter combined with the information from the provincial government helped in this area, but there is room for improvement. One suggestion was to use electronic file transfers from the rural municipality and provincial government directly to the transporters and service sector, so that they knew exactly where they could go and how they could get there.

This type of approach would also address the issues with scales and the need to maintain segregation. Sharing information electronically will not only ensure up-to-date information as the situation unfolds, it will minimize the potential for miscommunication and errors. It would be helpful to have better integration on mapping between all stakeholders.

Geofencing - The idea is that this type of mapping would not require a disclosure of which premises were infected, but instead it would highlight which roads and 5 km zones were fit for travel. This approach may facilitate routing and minimize stigma.

Traceability

Premises ID is essential to establishing high risk buffer areas, and conducting biosecure routing for animals, inputs, equipment or personnel. It is also the key to understanding the population of animals at risk (max capacity) and to contacting premises at risk.

The pig sector has made a significant investment and gone to considerable effort in adopting traceability as a means of addressing emergencies like PEDv. Pig Trace Canada, the industry-led live animal traceability initiative, played an important and positive role in managing the response.

Tracking movement

Getting ahead of any disease involves being able to determine the most likely path that the infection has taken and being able to identify the critical risk path that it might now follow. One of the key successes in the Manitoba PED outbreak involved the ability to trace movements as a result of work completed before the disease event occurred. This clearly demonstrates the importance of planning and preparedness.

CONSIDERATIONS

Traceability Programming - PigTrace Canada's participation in the EOC was a huge asset, enabling the use of Premises ID information to contact premises in buffer areas, establish high risk buffer areas and identify biosecure routing. It is key to understanding the population of animals at risk (max capacity) and to contacting premises at risk. Pig Trace data was used to successfully verify information found in 'trace in / trace out' investigations and clearly demonstrated its value in getting ahead of the disease spread faster than might be the case when relying solely upon producer records.

Feed

Ensuring that farmers have access to feed is critical to any emergency planning process. While this appears to have been coordinated and managed well in 2017, there were some additional suggestions.

The need for biosecurity vigilance

The most obvious issue is related to the need for a continued focus on biosecurity during disease events. Delivery option flexibility is one component, as is work with the CVO to ensure that the most appropriate strategies are in place and being followed.

During the outbreak, feed companies improved their biosecurity practices associated with on farm feed delivery (and incurred extra costs) to deal with both negative and positive premises in the buffer areas. Examples of improved biosecurity measures included, segregated trucks, regular C&D on trucks, shuttling feed and scheduling delivery based on risk. However preliminary review of on-site feed mill traffic and milling practices, suggests that these continue to be a factor in the control of PEDv.

CONSIDERATIONS

Re-visit the feed mill audit - While the Animal Nutrition Association of Canada (ANAC) is working on a national assessment tool, the consensus was that an audit would help to identify biosecurity gaps that may improve the response to future outbreaks.

PED Virus

There were important lessons learned about the virus itself. It is possible to keep some groups negative at a premises (within a barn or between barns) when other groups are positive for PED. Internal biocontainment onsite had varying levels of success.

While not always successful different types of protocols on different premises seemed to play a role on containing the disease within specific areas of a premises including keeping it out of other barns. Pigs from negative groups within positive premises should not move out of buffer areas unless moving directly to slaughter or to endemic areas willing to receive them (e.g. the USA).

Infectious Period

Various issues surfaced regarding shedding of the virus, lactogenic immunity and recommended farrowing.

Environmental Factors

There was a trend where a number of premises became positive linked to wind direction speed from other positive premises. This was not found to be statistically significant.

CONSIDERATIONS

Shedding - Growing pigs may shed virus periodically over an extended amount of time (>49 days), therefore should be treated as if they are positive until they go to slaughter. A possible explanation for grow-finish is that this occurs due to passive exposure in which some animals are not exposed sufficiently, whereas sow herd exposure is much more strategic and intentional. However, this has not been verified.

Lactogenic immunity - In weaned piglets this is short lived therefore they need to be removed from positive sites immediately after being weaned.

Farrowings - Sow barns require a break in farrowings to allow for the sows' immunity to develop and for proper cleaning (6 weeks; could be shorter if effective C&D can be completed in a shorter amount of time).

Trailers/Equipment

Livestock movement is integral to daily operations. Equipment and trailers may travel within a farm/operation or into the broader community as part of the business cycle. Since these items can be vehicles for disease transmission, it is important that operators are aware of risks and take appropriate steps to minimize infection.

Maintenance, Cleaning and Disinfection

From the beginning of the outbreak, producers, transporters and service providers worked to limit the risk of spreading the virus from equipment contamination. Over the course of the outbreak, changes were made to C&D protocols for more effective results.

CONSIDERATIONS

Baking - This form of thermally assisted drying, known as "baking," must achieve a temperature of 71°C for at least 15 minutes on all pig contact surfaces of the trailer in order to be effective. More importantly, transportation equipment needs to be fully segregated by disease status, to ensure trailers that transported positive pigs are not used to transport any other pigs.

Equipment segregation - Segregation and dedication of equipment (trailers, rendering trucks, etc.) between different risk categories of sites/pigs is key to preventing the spread of the virus to negative farms.

Continuing Risk Areas

The continued risk of certain operations or components of the supply chain was an area of significant concern, both in the interviews as well as in the working session. Discussions regarding these areas was initially quite sensitive; however, these sensitivities declined as the discussions continued in a cooperative and collaborative environment.

There are continued risks associated with the following areas of activity, each of which are essential to the supply chain:

- Assembly yards, and their location, layout and procedures;
- Manure management, including the handling, storage and spreading, and cleaning and disinfection of equipment;
- Deadstock management, and handling of potentially infectious carcasses; and
- External factors that can negatively affect disease control efforts, including road weight restrictions and limitations on routing.

Assembly Yards

While these facilities are integral to the sector, they are higher risk areas due to comingling of animals from different farms/premises.

Assembly yard risks are largely determined by farmers delivering

A perfectly clean assembly yard with biosecurity protocols in place can be contaminated by one farmer delivering infected animals.

Animal flow/Yard Configuration

Discussions with assembly yards highlighted that during the PED event, animal flow became the main focus of their biosecurity activities. The idea being that animals only move in one direction once received. This also had impacts on personnel as they were segregated between shipping and receiving of animals.

The yard operators subsequently adjusted their process to ensure that animals were not kept for an extended period of time. The assembly yards also changed their yard configuration to segregate incoming and outgoing animals, as well as by the status of disease.

The nature of multiple farm delivery vehicles

Assembly yards in Manitoba receive animals of varying health status from across Western Canada. Movements from the yards therefore create an inherent risk for those in the surrounding area. Traffic from the yards past swine premises has been suggested to be a high risk.

Geographic location

Two of the main assembly yards are rather inconveniently located in terms of disease management. While a good strategic location when they were built in terms of delivery convenience, there is no doubt that this now creates issues from a disease containment consideration.

Manure management

Handling manure is always a significant risk, and manure from an assembly yard is even more challenging because the health status of the animals is somewhat less certain. It was suggested that a move to on site composting of the straw/manure could be beneficial in this setting.

CONSIDERATIONS

There is room for improvement on the manure management practices, and the location and design of assembly yards in SE Manitoba. While limited by location and facility design, the assembly yards are mitigating risk through C&D of intake docks, controlling traffic flow, increasing the rate of turnover onsite, communicating biosecurity procedures and participating in ongoing surveillance.

Animal flow and yard configuration – All animal flow should be one way, and yards should be configured to support this movement. It is equally important that staff do not move back and forth between infected and non- infected areas.

Changes to yard location – This is a longer-term solution, but one that will be assessed by the sector on a go-forward basis. It would obviously have to make business sense.

Assessment of the potential for composting manure – Given the risks at the assembly yard, there was a suggestion that composting of manure on site be considered. In this way, the risk of disease transfer is significantly reduced/eliminated.

Continued sector consultation with assembly yards – Stakeholders agreed that significant sector consultation and further discussions with assembly yards are critical success factors.

Slaughter Plants

Similar to the assembly yards, some abattoirs tend to be higher risk premises. The issue is how best to ensure that they are actively involved in the process.

Sensitivity | There are sensitivities around regulation with some of the abattoirs. As a result, they need to be strategically engaged.

CONSIDERATIONS

Direct stakeholder engagement – It was felt that the best way to engage this group was through a coordinated sector-led approach. Framed in this way, the initiative would not perceive as a legislative imposition, but rather a sector-led process that respects their operating reality.

Manure Management and Deadstock Removal

Dealing with manure and deadstock removal is yet another critical factor in disease control. These activities present higher risks yet they cannot be avoided. Accordingly, there is a need to focus on how to perform necessary tasks while minimizing risk.

Unknown contamination/infection risk

Although the presence of PEDv is easily confirmed by testing, the risk of infection of PEDv positive manure is unknown. There are still outstanding questions about the length of time that the virus will remain active once shed in the manure.

This is a critical issue, as manure remains on a number of previously infected and now cleared properties (Presumptive Negative). This manure will have to be spread this spring, yet the applicator is not sure how to treat it in terms of risk in the long-term.

Similarly, there were questions posed about the transmission risk of deadstock as some farms still have carcasses that need to be dealt with.

Manure application

The risk associated with the application of PED infected manure needs to be investigated further. A way to test the infectivity of the virus is of primary concern for example in manure from contaminated lagoons. This does include the need for live pig bioassays.

Single access points

Biosecurity is very difficult to maintain when everyone is coming and going through one common access point to a premises, such as manure applicators accessing the premises' lagoon through the same driveway as staff.

CONSIDERATIONS

Additional research – *There was a significant amount of discussion about growing the evidence base around manure risk following infection. One option is to conduct research on PED infectivity at an isolated site. This would yield valuable information while limiting potential for further infection.*

Essentially the key questions that need to be answered include: how long is the site going to stay a “presumptive negative” if the manure has not been removed? How long does the disease continue to stay infective - assuming that it is staying positive in the Polymerase Chain Reaction (PCR) analysis?

Spread fields - *The planning and logistics of locating spread fields close to positive premises and segregating applicator crews/equipment based on infection status was very successful. Sector partners worked collaboratively to get this job done.*

Implementation of a deadstock coordination group – *Noting the success of the coordinated approach to working with service providers on manure issues, participants felt it could be beneficial to also develop a working group for deadstock removal. Biosecurity would be of the utmost importance for this approach.*

Secondary access points for farm premises and assembly yards – *It was felt that a secondary access point for manure applicators and deadstock pick up would be ideal from a biosecurity perspective. However, there were also strong opinions that a secondary access point was virtually impossible due to permission requirements from the Rural Municipality.*

Direct stakeholder engagement – *It was felt that the best way to engage direct stakeholders was through a coordinated sector-led approach. Framed in this way, the initiative would not perceive as a legislative imposition, but rather a sector-led process that respects their operating realities.*

Road Weight Restrictions

This issue was raised several times both in the interviews and the facilitated session. Given the geographic location of the main production area, and the importance of isolation from a biosecurity perspective, there is a need to ensure that all routing options are open.

Weight restrictions on roads

There are only so many routes that can be considered during an emergency. During the outbreak, the imposition of road weight restrictions severely limited routing options in a couple of key areas. It was noted that spring road weight restrictions put high-risk livestock movements in close proximity to pig barns. In order to take the lowest risk route, special exemptions for high-risk movements from assembly yards were granted in 2017 and will be reviewed on an annual basis.

CONSIDERATIONS

Working with public agencies (Manitoba Infrastructure) to ensure critical routes are not impacted by weight restrictions – *During the working session it was suggested that this issue had already been addressed, but still required yearly confirmation. It would be critical to maintain this process, and while permanent solution would be ideal, the annual approach is likely more realistic.*

4.0 Summary and Conclusions

The preceding pages have outlined the findings from one-on-one consultations and workshop regarding the Manitoba's experience with PEDv in 2017. Taking the time to reflect and gather key information from stakeholders following an adverse event is not only good practice, it provides important reference points for future disease management and prevention activities.

The following section outlines the Lessons to be Learned, as perceived from 2 perspectives: First are the Key Lessons, the 'take aways' that are relevant regardless of disease, province or commodity, and having impact in both government and industry; and second are the specific lessons relevant to particular areas of Manitoba's swine sector.

Key Lessons

- **HIGH RISK Biosecurity / BioContainment Protocols and Practices** – Many of these can and should be established in advance. It is essential to address the necessary steps of scheduled activities like feed delivery and/or animal pickup. This may involve dedicated staff / trucks / equipment that can service particular premises with similar levels of risk.
- **Cleaning and Disinfection** - This is more demanding and prescriptive than producers anticipate. Before the next outbreak of PEDv – or other diseases - there is an opportunity to develop and communicate key steps and requirements for effective C&D of infected premises.
- **Sector Communication** – Further develop and clearly identify the channels, mediums and processes found to be most effective for sharing critical information in a timely manner. This requires investment, together with dedicated staff and mechanisms (website / TownHall Systems / etc.).
- **Surge Capacity** – Plan for increased resources required by all, e.g. interprovincial sharing of resources/personnel. This applies to labs, associations, government offices as well as producers. Ultimately it is better to be prepared for the 80 premises testing positive and only have to deal with a smaller number, but in either case it is critical to have as much surge capacity as reasonably possible.
- **Early Disease Management / Response** - Delivering a given activity to a few premises at the outset of an outbreak, comes with its own challenges. It can be difficult to secure resources early on for a small number of infected premises and to segregate them from healthy premises.
- **Traceability** – Traceability in general, and PigTrace specifically, does work. The system clearly enables a faster and more effective response to a disease outbreak. PID registration and movement recording are essential to disease control and eradication. All producers including small operators, should be made aware of the benefits of Traceability and encouraged to register their PID and report all movements.
- **Confidentiality Agreements** – The ability to share information proactively is paramount. A standardized confidentiality agreement may be incorporated as a part of PID registration. This would be acted upon in the event of a Serious Animal Disease.

The significant point common to each of the above is that this work can and should be done in 'peace time,' between or in advance of outbreaks.

Each of these points is relevant in the context of Manitoba's swine sector. Perhaps more importantly however, these Lessons are all relevant:

1. **for highly contagious diseases other than PEDv;**
2. **in provinces other than Manitoba; and**
3. **in commodities other than swine.**

Accordingly, the sharing of this report is encouraged among industry and government organizations and their leaders, beyond the Manitoba swine sector and throughout Canada's livestock industry.

Specific Lessons

The following section provides an overview of lessons having potential to the specific areas considered in the stakeholder discussions conducted during this review.

Table 1: Summary of Suggested Actions – Surge Capacity

Consideration	Potential Action Area
Disease Timing and Adjustments	Establish a process of scaling disease.
Number of Samples	Explore viability of reducing number of samples required depending on the stage of the disease.
Sample Ranking Process	Make sure that everyone understands the criteria for sample ranking and the corresponding timing for turn around.
Use of Other Lab Service Providers	Leverage relationships with other service providers and establish pre-approved agreements.
Collaborative Action	Engage all parties to understand specific barriers and opportunities.
Sample Courier Process	Have a way to streamline and standardize the sample transport process.
Additional Physical Infrastructure and Assets	Ensure that necessary lab equipment is available when required. This may involve purchase of additional equipment or the development of formal agreements so that existing equipment is leveraged more effectively.
Agreements With Service Providers	Address the stigma of the disease so that the services necessary during an outbreak are not withheld from those who need them most due to fear.
Continued Education and Communication	Use proactive communication and education campaigns to dispel myths and reduce stigma.
Pre-Approved Agreements	Develop pre-approved service provider arrangements as well as agreements on budgets, people and other resources.

Table 2: Summary of Suggested Actions – Communication and Collaboration

Consideration	Potential Action Area
Timing During Disease Outbreak	Set trigger points so that communication is related specifically to the status of the disease and the required actions at that time.
Use Manitoba Coordinated Disease Response (MCDR) Structure	Ensure disclosure documents are signed so that timely action can be taken upon confirmation.
Geofencing and Other Technology	Investigate applications that will facilitate more efficient and effective information transfer.
Encouraging Early Disclosure/Swift action	Explore opportunities to incorporate early disclosure agreements into established processes.
Service Agreements	Have “non-competes” in place under specific trigger points.
Develop Decision Tree Structure	Clearly define disease management options for the stakeholders using various decision trees that show different paths as well as ability to adjust ones approach.
Doing the Legwork in peacetime	Be proactive about disease prevention and promotion.
Build Relationships	Get to know sector stakeholders, building and maintaining professional relationships helps people collaborate in an outbreak setting.
Focus on Affected Farms	Connect and build trust with the farms that were initially affected by the disease. These relationships are integral to understanding the hardships faced by individual operators and to identifying practical disease management protocols.
Motivate Appropriate Behaviour	Clearly communicate that early disclosure is crucial to disease containment and protecting the sector as a whole. Reinforce that stakeholders will be supported throughout the process.
Timely/Consistent Communication	Provide affected stakeholders with the information required to limit disease spread including site names and statuses.

Table 3: Summary of Suggested Actions – On-Farm and Sector Biosecurity

Consideration	Potential Action Area
Pre-Approved On-Farm Plans	Make examples of on-farm plans available to operators.
RAZ Biosecurity	RAZ should be of highest priority during the planning stage.
Staff Segregation	Do not share staff between sites in buffer areas. Staff should only move from negative to positive spaces and not the other way.
Internal Biosecurity/biocontainment	Promote the benefits of biosecurity including prevention of disease movement and improved production efficiencies.
Cleaning and Disinfection	Ensure all equipment is disassembled for thorough C & D and that any broken or disposable equipment is discarded.
SOP for Going to High Traffic Sites	Limit confusion and reduce risk by ensuring that everyone has access to and fully understands the SOP when going to a plant or assembly yard.
Pre-existing Routing	Work with the RMs to determine how best to determine which routes are passable and which (if any) are under construction and/or are no longer maintained.
Traceability	Promote the benefits of traceability in general, and PigTrace in particular, using the experience of this outbreak, and encourage all livestock producers to register for a PID and report all movements.
Develop a Feed Mill Audit Tool	Engage feed suppliers and work collaboratively and proactively on a risk-based audit tool, identifying biosecurity gaps for disease prevention, and for controlling the spread of disease.
Shedding	Growing pigs should be treated as positive until they go to slaughter as they may still be shedding the virus.
Lactogenic Immunity	Remove piglets from positive sites immediately after they are weaned.
Farrowings	Ensure a 6-week break in farrowings to allow for development of sow immunity and for proper cleaning.
Baking	Achieve a temperature of 71°C for at least 15 minutes on all pig contact surfaces of the trailer in order for this form of thermally assisted drying (baking) to be effective.
Equipment Segregation	Segregate and dedicate equipment (trailers, rendering trucks, etc.) between different risk categories of sites/pigs to ensure virus is not spread to negative farms.

Table 4: Summary of Suggested Actions – Continuing Risk Areas

Consideration	Potential Action Area
Changes to Animal flow	Ensure a one-way flow of both animals and staff at assembly yards.
Changes to Assembly Yard Configuration	Explore new strategies to minimize risk during animal delivery.
Assembly Yard Location	Consider the surrounding area, accessibility and potential for heightened disease risk when determining location of new assembly yards.
Potential for Composting Manure on Yards	Explore the possibility for onsite manure composting.
Continued Consultation and Work With Assembly Yards	Enhance the relationship with assembly yards through collaborative discussions and shared priorities.
Direct Stakeholder Engagement	Coordinate sector-led approach to communicate quickly with direct stakeholders.
Additional Research On Manure and Disease Transmission	Undertake research that will determine the safest way to deal with manure that was stored during the outbreak.
Deadstock Coordination Group	Establish specialized working groups that can focus on distinct challenges and solutions.
Secondary Access Points to Premises	Encourage stakeholders to explore viability of establishing alternate access points on their premises for manure applicators and deadstock pick up.
Road Weight Restrictions	Continue to work with Manitoba Infrastructure to ensure that key routes that will facilitate improved biosecurity measures are made available to the sector.

Next Steps

Given the background information and number of ideas expressed by stakeholders and reflected in the document, it is critical that action be taken to further clarify and address the issues identified, clearly specifying roles and responsibilities, necessary actions and related deliverables.

On-Going Secretariat

Manitoba has an opportunity to develop an on-going animal health emergency management Secretariat that could be charged with enacting part or all of the suggestions provided by stakeholders and summarized in this document. In essence, the Secretariat would ensure that Manitoba's swine sector learns the lessons.

While the initial focus could be on PED, there is no reason to limit the Secretariat to this single disease and/or the pork sector. The fact is that being prepared for disease management is of critical importance to all stakeholders. The report could provide initial direction for the Secretariat, working across Manitoba's livestock industry.

The Coalition may be capable of providing start-up funding for such a Secretariat, under a larger animal health emergency management project presently being applied for under AAFC's CAP program. This work is essentially a successor to the current project that funded this study and other emergency management tools for Manitoba livestock industry associations.

Analysis of Costs

As previously mentioned, virtually every stakeholder was impacted financially by PED, and the actions taken to deal with it. To this point in time, there has not been a formal and complete accounting of these costs.

Full knowledge of total cost is a powerful motivator. A complete accounting of the costs may serve several useful purposes, one of which may be to validate the need for the Secretariat. Perhaps the most significant benefit is that it enables a more informed discussion on the relative benefits associated with specific disease reduction activities, all of which will likely result in additional costs. Essentially, the Manitoba pork sector has significant knowledge about what PED cost in 2017. Once quantified, this can be used as the benchmark against which options and cost-benefit scenarios can be developed in preparation for future outbreaks.

Final Comments

Stakeholders in the Manitoba pork sector went through an extremely challenging disease experience in 2017, and it is naive to suggest that there were significant benefits associated with the experience.

On the other hand, learning from this experience, and implementing strategies taken from it, can certainly help mitigate future costs, and in fact help reduce the potential of reoccurrence. Stakeholders quickly realized that biosecurity was a key component to addressing this disease and made significant changes to their own operations and activities that will have long-term benefits on a number of fronts.

Stakeholders have participated in other activities within the CAHC's current AHM project – and which this project is a part of. Collectively, these activities have already established a higher level of awareness, training and the implementation of a robust Manitoba Pork Plan for association staff, and a Manitoba Pork Producer Handbook. All of these activities should help the sector be better prepared in the case of another unfortunate disease event.

There is an opportunity for Manitoba Pork to enhance animal health emergency management within the sector, in a manner that aligns with similar work in other sectors and other provinces. This can be achieved by working through the Coalition's next AHM project that will be carried out over the next 5 years with CAP funding.

If this can be accomplished, then costs incurred in 2017 can more appropriately be deemed as an investment in future productivity and profitability, ensuring the sector's sustainability and resilience relative to its known vulnerability to serious animal disease events like PED.