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Manitoba's PEDv research supports local industry

Survivability and infectivity of PEDv in infected manure storage lagoons

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Manitoba's hog producers are not alone when it comes to addressing the potential challenges of the PED virus. An ongoing study, led by the University of Manitoba's Department of Animal Science and funded by the Manitoba Livestock Manure Management Initiative and Manitoba Pork, is looking specifically at how the virus survives and remains infective in manure storage lagoons. While research in the northern U.S. has already confirmed that PEDv can survive in minus degree temperatures, little is known about how PEDv survives in open lagoons over extended periods of time. By ascertaining how the virus fares in typically cold and damp Manitoba conditions, local producers with infected lagoons will gain valuable information. The research will also add to the growing body of knowledge to assist producers in other Western provinces and in the northern U.S. where climates are similar.

Beginning in mid-September and continuing to mid-November 2014, and in collaboration with Prairie Agricultural Machinery Institute (PAMI), manure samples were collected from two lagoons from different sites known to be PEDv positive. Lagoon one had been infected five months prior to the beginning of the study while lagoon two was identified as PEDv positive in mid-September. A sample collection system was developed which included a grid layout of twelve locations at three depths in lagoon one, and sixteen locations at two depths in lagoon two. Temperature and pH of both lagoons were monitored continuously at three depths in three locations during the study period. Manure samples were analysed for total solids and examined for PEDv survivability and infectivity. Fresh feces and pit manure samples were collected from each positive barn to test the status of PEDv shedding before sites were completely emptied of pigs.

Strict biosecurity procedures were followed in planning, working on site, transporting samples off-site, leaving the site, and during de-commissioning. Samples were taken to the "Gut Microbiome Laboratory" at the University of Manitoba's Department of Animal Science where Dr. Ehsan



PAMI staff shown collecting manure samples



Manure samples from upper and lower lagoon depths contain different percentages of solids

Khafipour, Assistant Professor, and his team including Dr. Hein Min Tun, Post-doctoral Fellow, and Ms. Jacqueline Donogh, Technician, tested samples for the survivability and infectivity of PEDv.

For clarification purposes, the survivability of a virus refers to its presence or absence within an environment. Infectivity refers to the ability for the virus to enter and replicate within a host. The survivability of PEDv was examined and resulted in 99.5% of lagoon samples showing high copy numbers of

the virus. Pit samples showed varying levels of the virus. Only a single type of virus, the virulent PEDv strain, was present in both lagoons and pit samples. The amount of viral load increased over time, with the highest amount of the virus present in the top layer in early weeks transitioning to the bottom layer in later weeks. This trend was consistent at both lagoons. Due to the unequal distribution of viral particulate, it is likely that other external environmental factors may have played a role in the survivability of the virus.

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Testing for PEDv survivability would conclude that the virus is capable of survival within the lagoon environment for an extended period of time under Manitoba weather conditions. This conclusion is based on sampling occurring at multiple locations and time points over a period of seven weeks in the first lagoon and four weeks in the second. Sampling was halted in mid-November due to lagoon freeze-up. Therefore, little is known about how the virus will over-winter.

The infectivity of PEDv within the lagoons was also examined in laboratory cell lines, with preliminary results generated from a limited number of sites and samples to date. Within lagoon two, the PED virus was still infective four weeks after the last shedding pigs left the barn, at which point sample collection was terminated due to winter freeze-up. Therefore, the period of infectivity may be much longer.

The percentage of infective samples and the infectivity potential of PEDv in the top layer of the lagoons were lower than those in the bottom layer, which was also where higher viral survivability occurred. Among the limited number of samples tested so far, less than 10% of top layer positive samples were infective while the percentage of infective samples in the bottom layers was closer to 20%. This may be attributed to the direct exposure of the viral particles in the

top layer to environmental influences, especially sunlight. “This project not only improves our understanding of the risks posed by viable PEDv manure in lagoons, but also starts to answer our questions about whether the virus’ infectivity diminishes with time. Hopefully we get to the point where we are confident in saying that it no longer poses a threat to healthy animals,” said Mark Fynn, Animal Care Specialist with the Manitoba Pork Council. Fynn cautioned, “Hog producers also need to be diligent in ensuring their on-farm biosecurity procedures are in place”. All manure should be washed off manure-handling machinery and equipment after usage, and disinfectants should be used as well. Whenever possible, they should also be thoroughly dried afterwards. Producers should establish clear lines of separation at their sites and communicate these with the manure applicators so that they are never crossed.

Communication is vital in limiting the spread of PEDv. Producers should communicate with neighbouring farms, especially if they are spreading PEDv positive manure nearby. This will allow for alternative pumping arrangements to be made as required.

Manure applicators should follow a specific pumping sequence beginning with clean sites (PEDv negative), followed by sites with the longest time period after a PEDv outbreak, and lastly sites where PEDv was most recently reported. Since PEDv survival diminishes in warm temperatures, the optimum time to spread PEDv positive manure is likely during warm and dry days. ■


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