PEDV Research Updates
2013

Porcine Epidemic Diarrhea virus (PEDV) has caused significant challenges to the swine industry. The virus had not been previously identified in the United States prior to April of 2013. To assist producers and their veterinarians in the management, control and potential elimination of the virus, the National Pork Board funded key research projects to better understand PEDV. In order to provide timely information to producers from those projects, the objectives and initial updates will be periodically reported.

NOTE: The updates from the proposal represent interim information only and are not intended to be a final report. The final and formal reports will be provided at the end of the terms of the projects and then posted online at pork.org. The update information is intended to inform stakeholders of progress but are not intended to be the final outcome. For further information, please contact Dr. Lisa Becton at lbecton@pork.org .

#13-227: Iowa State University
Evaluation of time and temperature sufficient to kill PEDV in swine feces on metal surfaces

Objectives: The objective of this study was to investigate time and temperature combinations sufficient to inactivate porcine epidemic diarrhea virus (PEDV) in swine feces on metal surfaces similar to what is found in livestock trailers after fecal and other organic matter has been removed by scraping and sweeping. Combinations of time and temperature evaluated represent possible options for trailer decontamination when washing and disinfecting are not possible.

Update: 11-25-13
Evaluation of Time and Temperature Sufficient to Inactivate PEDV in Swine Feces on Metal Surfaces

Paul Thomas, Derald Holtkamp, Locke Karriker, Alex Ramirez, Josh Ellingson, Jianqiang Zhang.

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Methods. Seven treatment groups representing different combinations of time and temperature were evaluated. Five ml of undiluted PEDV-positive feces (or negative feces for the Negative Control group) was spread evenly on the bottom surface of a 6 inch by 6 inch aluminum tray with 1 inch sides, made to replicate a trailer floor. Following treatment as outlined in Table 1, the feces was re-collected from the tray, diluted and passed into PEDV-negative 4-week old pigs via oral-gastric tube. These pigs served as a bioassay to detect the presence of infectious PEDV. Pigs were monitored for clinical signs consistent with PED and fecal swabs were collected on days 3 and 7 post-challenge. Swabs were tested via PEDV RT-PCR.
Each treatment group contained 4 replicates of the treatment with passage into separate pigs for the bioassay. Individual pig was the experimental unit. The 7 treatment groups and negative control are described in Table 1.

Table 1. Summary of treatment groups

Group	Description of Treatment	Treatment Simulates:
Negative Control	No treatment, pigs received a gavage of PEDV-negative feces	No exposure to PEDV
Positive Control	No treatment, pigs received a gavage of PEDV-positive feces	Exposure to a PEDV-contaminated hog trailer with no decontamination attempted.
160F10M	PEDV-positive feces was placed on an aluminum tray and heated to 160F in an incubator and held at this temperature for 10 minutes.	Exposure to a PEDV-contaminated hog trailer that was heated via thermo-assisted drying and decontamination (TADD) to a temperature of 160F and held at this temperature for 10 minutes. This is consistent with TADD protocols in some systems.
145F10M	PEDV-positive feces was placed on an aluminum tray and heated to 145F in an incubator and held at this temperature for 10 minutes	Exposure to a PEDV-contaminated hog trailer that was heated via TADD to a temperature of 145F and held at this temperature for 10 minutes. This is consistent with TADD protocols in some systems.
130F10M	PEDV-positive feces was placed on an aluminum tray and heated to 130F in an incubator and held at this temperature for 10 minutes.	Exposure to a PEDV-contaminated hog trailer that was heated via TADD to a temperature of 130F and held at this temperature for 10 minutes. This was done to demonstrate a TADD protocol that is not reaching a temperature that we feel is sufficient to inactivate PEDV.
100F12H	PEDV-positive feces was placed on an aluminum tray and heated to 100F in an incubator and held at this temperature for 12 hours	Exposure to a PEDV-contaminated hog trailer that was heated to a temperature of 100F and held at this temperature for 12 hours. This would simulate leaving a trailer in a heated garage or bay overnight at a temperature that could be maintained by most standard furnaces in a well-insulated building.
68F24H	PEDV-positive feces was placed on an aluminum tray and left at room temperature for 24 hours	Exposure to a PEDV-contaminated hog trailer that was not heated, but left to sit for

		24 hours at room temperature between loads.
68F7D	PEDV-positive feces was placed on an aluminum tray and left at room temperature for 7 days	Exposure to a PEDV-contaminated hog trailer that was not heated, but was left to sit unused for 1 week at room temperature between loads.

Results. Preliminary results are summarized in Table 2.

Table 2. Summary of pig bioassay PEDV results by treatment groups.

Group	Percentage of PEDV positives (out of 4)
Negative Control	0% (0/4)
Positive Control	100% (4/4)
160F10M	0% (0/4)
145F10M	25% (1/4)
130F10M	25% (1/4)
100F12H	50% (2/4)
68F24H	25% (1/4)
68F7D	0% (0/4)

Conclusions and Implications. These results suggest that it may be possible to inactivate PEDV in the presence of feces by heating trailers to 160F for 10 minutes or by maintaining them at room temperature (68F) for at least 7 days. The other combinations of time and temperature evaluated were not sufficient to kill the virus as at least one pig out of 4 was infected.

The investigators do not propose that this is a preferred alternative to thoroughly washing, disinfecting, and drying trailers after hauling PEDV-positive animals. Rather, this work demonstrates the value of possible alternatives when proper washing and disinfection absolutely cannot be accomplished as a means to reduce the risk of transmitting PEDV between groups of animals.

Update: 11-11-13

Project data analysis is ongoing. Please see the update from 10/28 for more details on initial study results.

Update: 10-28-13

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Update: 10-16-13

Please note: Some results have not been confirmed and are subject to change.

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Update: 10-3-13
The time and temperature treatments were performed and the pigs inoculated on September 27th. These pigs will be necropsied on Friday October 4th and results reported as they return and are analyzed.

Update: 9-21-13
Quick update on the PEDV time and temp study. We have IACUC and IBC approval, pigs will arrive on the 23rd (Sep), pigs necropsied on Oct. 4.

Update: 9-2-13
The project has been approved by IACUC and is still in the final approval phase. Once complete university approval has been granted, then the project will immediately begin.
Quick Take

- The objective of this study is to investigate the combinations of time and temperature sufficient to kill PEDV in swine feces on metal surfaces of a model trailer used to haul live pigs.

Update: 8-21-13
There is no report as the project is working through the final IACUC approval and will start as soon as approval is granted.