

Evaluation of time and temperature sufficient to inactivate porcine epidemic diarrhea virus in swine feces on metal surfaces

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Introduction

Porcine epidemic diarrhea virus (PEDV) was first described in England in 1971 (2). On May 17, 2013 PEDV was isolated for the first time from swine in the United States and spread quickly across much of the country (3). The route of entry of PEDV into the US is still unknown, but contaminated livestock trailers represent a significant risk (1) for movement of the virus between and within US swine herds.

The objective of this study was to investigate time and temperature combinations sufficient to inactivate PEDV in swine feces on metal surfaces similar to what is found in livestock trailers after fecal and other organic matter have been manually removed. Combinations of time and temperature evaluated represent options for trailer decontamination that are possible when washing and disinfecting are not possible.

Materials and Methods

Eight 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 15.24 cm by 15.24 cm aluminum tray with 2.54 cm 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-naïve 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. The individual pig was the experimental unit and each treatment group contained 4 replicates.

Results

PEDV swine bioassay results were analyzed using Fisher’s Exact test (SAS® Enterprise Guide 5.1, Cary, NC, USA) for all groups simultaneously as well as pairwise comparisons of all groups. Overall, treatment was found to have a significant effect on PEDV status (p=0.0335). More specifically, the 63C-10M and 20C-7D groups were each found to be significantly different than the Positive Control group (p=0.0286). No other group comparisons were found to be significantly different from one another using p<0.05 as a cutoff for significance.

Table 1. Summary of swine bioassay PEDV results by treatment group.

Treatment Group	Temperature & Time applied	Percentage of PEDV positives (out of 4)
Negative Control	No heat, no time	0% (0/4) ^a
Positive Control	No heat, no time	100% (4/4) ^b
71C-10M	71°C (160°F), 10 minutes	0% (0/4) ^a
63C-10M	63°C (145°F), 10 minutes	25% (1/4) ^{a, b}
54C-10M	54°C (130°F), 10 minutes	25% (1/4) ^{a, b}
38C-12H	38°C (100°F), 12 hours	50% (2/4) ^{a, b}
20C-24H	20°C (68°F), 24 hours	25% (1/4) ^{a, b}
20C-7D	20°C (68°F), 7 days	0% (0/4) ^a

Groups with different superscripts indicate statistically significant differences (p ≤ 0.05)

Conclusions and Discussion

These results suggest that it may be possible to inactivate PEDV in the presence of feces by heating trailers to 71°C for 10 minutes or by maintaining them at room temperature (20°C) for at least 7 days. No other combinations of time and temperature were shown to be effective at inactivating PEDV.

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

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References

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