

Evaluation of an accelerated hydrogen peroxide disinfectant to inactivate porcine epidemic diarrhea virus in swine feces on aluminum surfaces under freezing conditions

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ABSTRACT

Aluminum coupons were contaminated with porcine epidemic diarrhea virus (PEDv), and then treated with accelerated hydrogen peroxide (AHP[®]). Samples from these contaminated coupons were subsequently administered to live pigs. AHP[®] reduced, but did not eliminate, the concentration of active virus on the coupons. No pigs who ingested the inoculum treated with AHP[®] developed clinical signs of PEDv, indicating that AHP[®] can effectively inactivate the virus to acceptable levels.

BACKGROUND

PEDv is a coronavirus which causes profuse, watery diarrhea in pigs, and is often transmitted through contact with contaminated livestock trailers. While the ideal disinfection process would involve washing, disinfection, and drying, this may not be feasible during the winter months, when freezing temperatures can interfere with disinfection. Since PEDv is especially prevalent in cooler temperatures, it is important to assess whether disinfection is attainable under freezing conditions. The aim of this study was to test two concentrations of AHP[®] – the Intervention[®] brand - mixed with a propylene glycol (PG) anti-freeze agent to determine whether they could successfully inactivate PEDv on freezing metal surfaces.

STUDY

Forty aluminum coupons were contaminated with swine feces containing PEDv. The researchers tested two volumes of fecal contamination (5 mL and 10 mL), two concentrations of AHP product (1:16 and 1:32) prepared in a 10% PG solution, and two contact times (40 min and 60 min). Intervention[®] was applied as a thick foam, which held its consistency for the duration of the contact times. The treated coupons were placed in a freezer at a temperature of -10 °C for their allotted contact time. The control coupons were also placed in this freezer to ensure that the low temperature was not responsible for killing the virus. Swabs from each coupon were collected after the 10-minute period, and inoculum samples were examined to determine whether the virus had been inactivated.

Following these measurements, the contents of treated coupons were used to prepare samples for a swine bioassay. Samples from contaminated coupons were administered to PEDv-negative pigs via oral gastric gavage, and pigs were monitored for clinical signs. Pigs were euthanized on the 7th day of the study, at which point necropsies were performed to search for gross lesions or abnormal pathology. Rectal swabs from each pig were collected and measured for viral activity.

RESULTS

All 4 of the positive control coupons were positive for PEDv, indicating that the cold temperature alone was not responsible for inactivating the virus. All 32 coupons treated with AHP were positive for the virus, but each showed a significantly reduced viral concentration compared to the controls.

All rectal swabs from pigs who received the AHP[®]-treated inoculum were negative for PEDv, compared to the positive control group, which were positive. This indicates that AHP[®] successfully inactivated the virus to levels at which clinical disease did not develop in live pigs.

CONCLUSION

Although the aluminum coupons remained PEDv-positive after treatment with AHP[®], the findings of this study indicate that viral concentration was sufficiently reduced as not to cause disease in pigs who ingested contaminated contents.

IMPLICATIONS FOR AHP[®]

These findings are significant, since the risk of many porcine infections is heightened during the winter months in which the viruses are exposed to less heat and sunlight. Due to the high volume of transport involved in this industry, the need for a method to minimize the risk of disease transmission through infected trailers is pressing.

REFERENCES

1. Baker KL, Thomas PR, Karriker LA, Ramirez A, Zhang J, Wang C and Holtkamp DJ. (2017). Evaluation of an accelerated hydrogen peroxide disinfectant to inactivate porcine epidemic diarrhea virus in swine feces on aluminum surfaces under freezing conditions. *BMC Veterinary Research*. 13, 372

TABLE 1

	Blank	100% Soil	TB US - 1	TB US - 2	TB US - 3	Prev. -1	Prev. -2	Prev. -3
<i>5-Fluorouracil</i>	< 5.0 ng	40.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng
<i>Cyclophosphamide</i>	< 5.0 ng	65.6 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng
<i>Doxorubicin HCl</i>	< 5.0 ng	30.6 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng
<i>Epirubicin HCl</i>	< 5.0 ng	431.2 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng
<i>Etoboside Phosphate</i>	< 5.0 ng	25.8 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng
<i>Ifosfamide</i>	< 5.0 ng	47.2 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng
<i>Irinotecan HCl</i> <	< 5.0 ng	45.6 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng
<i>Methotrexate</i>	< 5.0 ng	24.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng
<i>Paclitaxel</i>	< 5.0 ng	7.5 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng
<i>Vincristine Sulfate</i>	< 5.0 ng	40.8 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng	< 5.0 ng