Effects of disinfection on the molecular detection of porcine epidemic diarrhea virus

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ABSTRACT

Routine detection of porcine epidemic diarrhea (PEDv) is currently limited to RT-PCR testing, as it is the only test method that can directly detect PEDv. Because RT-PCR only detects the viral RNA, a positive RT-PCR result only indicates the presence of PEDv viral RNA, but does not mean viable and infectious virus is present. Accelerated Hydrogen Peroxide®(AHP®) is a relatively new yet proven technology that is capable of disinfecting PEDv but may still leave inactivated RNA strands on surfaces, and therefore has a history of producing RT-PCR positive test results. In this study AHP was tested along with a number of other disinfectant actives as agents against PEDv using RT-PCR. Positive RT-PCR results were tested to show how AHP was able to fully inactivate any remaining RNA on the surface. Therefore, AHP can be used as an alternative disinfectant that is effective against PEDv without the negative toxicity, environmental, safety and compatibility profiles.

BAKGROUND

Contaminated transportation equipment has been linked to the spread of several other important swine diseases making trailer disinfection common among pork producers. Efficient disinfection for PEDv in animal contact spaces, including trailers is one of the primary methods used to control the spread of disease. Due to the limited testing options and the implications of environmental contamination, individuals are using RT-PCR to test trailers following disinfection to ensure that the equipment is free of PEDv before contact with animals. RT-PCR tends to underestimate disinfection efficacy compared to infectivity assays; meaning, RT-PCR positive results are obtained when in fact the trailer has been effectively disinfected.

STUDY

The purpose of this study was to examine the effect of disinfectants on RT-PCR results for PEDv and explore the practical solutions to produce RT-PCR negative trailers after they have been contaminated with PEDv. Five classes of disinfectants, including AHP, were evaluated at varying concentrations, both in the presence and absence of swine feces. No infectious PEDv was recovered after treatment with evaluated disinfectants. Additionally, all tested disinfectants, except for 0.17% sodium hypochlorite dramatically reduced RT-PCR values. However, no disinfectants eliminated RT-PCR detection of PEDv across all replicates; although 0.52%, 1.03%, and 2.06% solutions of sodium hypochlorite and 0.5% AHP did produce intermittently RT-PCR negatives. To simulate field conditions in a second attempt, PEDv was applied to pitted aluminum trays, which were treated with either 2.06% sodium hypochlorite or 0.5% AHP. Post-treatment surface swabs of the trays tested RT-PCR positive but were not infectious to cultured cells or naive pigs. Ultimately, viable PEDv was not detected following application of each of the tested disinfectants, even though in most cases RT-PCR detection of viral RNA remained.

CONCLUSION

Because PEDv strains are difficult, time consuming and expensive to test using cell culture methods, the pork

industry is relying upon RT-PCR for testing. Ultimately, all the tested disinfectants, including AHP were able to inactivate PEDv but few prevented RT-PCR detection of the Viral RNA. This study also indicates that the use of RT-PCR as a method to indicate the presence of infective PEDv on a surface is not reliable. One must take caution if using sodium hypochlorite as it is known to cause topical chemical burns, respiratory irritation and pulmonary edema, and can cause corrosion of metals and deterioration of rubber objects. AHP can therefore be used as an alternative disinfectant that is effective against PEDv, without the negative toxicity, environmental, safety and compatibility profiles.

REFERENCE

Bowman, A. et al. (2015). Effects of disinfection on the molecular detection of procine epidemic diarrhea virus. Vet. Microbiol. http://dx.doi.org/10.1016/j.vetmic2015.05.027