Evaluating a dry vs. wet disinfection in boot baths on detection of porcine epidemic diarrhea virus and porcine reproductive and respiratory virus RNA

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Background: Boot baths have been implemented to limit pathogen spread within swine facilities; however, there are concerns regarding the overall efficacy of these methods. The objective of this study was to evaluate the efficacy of boot baths in reducing the quantity of detectable PEDV and PRRSV genetic material using wet or dry disinfectants.

Materials and Methods: The treatments included 1) control; 2) dry chlorine powder; and 3) wet quaternary ammonium/glutaraldehyde liquid. Prior to disinfection, rubber boots were inoculated with 1 mL of co-inoculants of PRRSV (1×10^5 $TCID_{50}$/mL) and PEDV (1×10^5 $TCID_{50}$/mL) and dried for 15 min. After the drying period, a researcher placed the boot on the right foot and stepped directly on a steel coupon (control) or stepped first into a boot bath containing either the wet or dry sanitizer, stood for 3 s, and then stepped onto a steel coupon. After one min, an environmental swab was then collected and processed from each boot and steel coupon. The procedure was replicated 12 times per disinfectant treatment. Samples were analyzed using a duplex qPCR at the Kansas State Veterinary Diagnostic Laboratory.

Results and Discussion: A disinfectant × surface interaction was observed for both the proportion of samples PCR positive ($P < 0.05$) and the quantify of detectable RNA, or Ct value ($P < 0.05$; Table 1). More PCR positive samples, regardless of virus type, were found on the boot and steel coupon of the control treatment and the boot of the wet disinfectant than the steel coupon of the wet disinfectant, leading the detectable viral RNA to follow a similar pattern. There were no PCR positive samples from either surface when the dry disinfectant was used. A boot bath containing the dry disinfectant surpassed the performance of wet disinfectant. While the wet disinfectant reduced the quantity of viral RNA compared to the control, it did not reduce viral RNA of either virus beyond detectable limits. While these results aid in understanding the efficacy of certain boot bath disinfectants, it does not account for the buildup of organic matter in boot bath nor the infectivity of these samples if utilized in a live animal production setting.

Table 1. Detection of viral RNA on boots or subsequent steel surfaces after stepping in a boot bath containing a wet or dry disinfectant[1]

		Boot bath disinfectant type		
Item		Control	Dry	Wet
PCR positive[2]				
	Boot	19/24^{c}	0/24^{a}	21/24^{c}
	Steel	22/24^{c}	0/24^{a}	9/24^{b}
Ct[3]				
	Boot	37.0^{c}	45.0^{a}	38.1^{c}
	Steel	34.0^{d}	45.0^{a}	42.2^{b}

[1]Samples with no detectable RNA were assigned a Ct value of 45.0.
[2]PCR positive: Disinfectant × surface, $P = 0.015$.
[3]Ct is the average cycle threshold value for both PEDV and PRRSV. Disinfectant × surface, $P = 0.0001$; SEM = 0.61.
[abcd] Means with differing superscripts differ significantly.

The full paper can be found at: https://pubmed.ncbi.nlm.nih.gov/36519006/