RESEARCH ABSTRACT
SWINE HEALTH

Title: Determining the impact of conditioning time and temperature in pelleted diets on porcine epidemic diarrhea virus (PEDv) survivability in complete swine diets – **NPB #14-159**

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SCIENTIFIC ABSTRACT

Feed has been confirmed as a potential vehicle for porcine epidemic diarrhea virus (PEDv) transfer (Dee et al., 2014a). In order to determine the overall magnitude of risk, a two-part study was conducted to identify the minimum infectious dose of PEDv in feed and evaluate the effectiveness of thermal processing in mitigating PEDv infectivity. The first part of the project involved determining the minimum dose of PEDv required to produce infection using a 10-d old pig bioassay model. The PEDv isolate (USA/IN/2013/19338 P7) was 10-fold serially diluted to produce 9 different PEDv doses with corresponding PCR cycle thresholds (Ct) of 14.0 to >45. Aliquots (500 ml) of the dilutions were uniformly mixed into 4.5 kg batches of complete swine diet using a laboratory scale mixer to ensure uniform viral distribution. The inoculated feed was then mixed with PBS overnight before extraction of the supernatant that was subsequently used for a 10-d old pig bioassay. The second portion of the project was designed to determine the effectiveness of thermal processing similar to that used in commercial pellet mills as a mitigation step in controlling PEDv transfer. This study had treatments arranged in a 2x3x3 factorial with two PEDv dosages (low and high), three condition times (45, 90, and 180s) and three temperatures (68.3, 79.4, 90.6°C). Based on the results of the previous bioassay from the minimum infectious dose study, an infectious titer of 1 x 10^2 TCID50/g (low dose) and infectious titer of 1 x10^4 TCID50/g (high dose) of feed was utilized from the same PEDv isolate to conduct the pelleting study. For each concentration, aliquots (500 ml) of the PEDv dilutions were mixed into 4.5 kg batches of complete swine diet. Each batch of inoculated feed was processed at 1 of the 9 potential temperature x time combinations using a pilot-scale single pass conditioner and pellet mill. The inoculated processed feed (100 g) was then mixed with 400 ml of PBS to form a supernatant, which was subsequently used for the bioassay. There was a loss of

approximately 10 Ct values when PEDv cultured media was added to unprocessed feed in both studies. In the minimum infectious dose portion of the study, pigs showed clinical signs of disease when the four most concentrated doses of PEDv were added to feed; the least of which was at a concentration of 5.6X10^1 TCID50/g (Ct=27 in tissue culture media and Ct=37 in feed); thus establishing the minimum infectious dose of PEDv in a feed matrix. Additionally, this study confirmed a detectable PEDv Ct in feed can result in pig infectivity and the Ct related to the infective minimum dose can be above the positive/negative threshold used by some laboratories. Processing infected feed will raise the Ct value regardless of condition time or temperature suggesting there was less PEDv RNA detected after thermal processing. None of the low dose or high dose pigs that were challenged with thermally-processed, PEDv-inoculated feed resulted in evidence of PEDv infection; therefore thermal processing of feed appears to be an effective step to reduce or eliminate infectivity of PEDv contaminated feed.