

**Title:** Establishing Bedding and Boarding Requirements for Finisher Pigs Through Scientific Validation – Micro-study – **NPB #10-175**

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### Abstract

Forty-three monitoring trips were completed to assess the thermal micro-environment experienced by pigs during all seasonal weather conditions, including cold, mild, and hot weather conditions, with a special focus on extreme hot and cold outside temperature ranges. Specifically, the data collected were used to assess the occurrences of hot and cold extremes experienced by the pigs on the trailer, general ventilation patterns, and the effectiveness of existing TQA bedding, boarding, and misting recommendations.

An instrumentation system was designed, constructed and validated for quantifying the thermal environment within a commercial swine trailer during transport. The instrumentation system consisted of six zones in the trailer, each equipped with 14 air temperature sensors in a cross section just above pig level, a central temperature and relative humidity combination sensor for zone-centered thermal environmental profile, an infrared radiometer for pig skin temperature measurements, and temperature sensors in the bedding on the floor. Thermal environment data (temperature at various locations in the trailer to represent a three-dimensional distribution) were collected in the six zones described above over a range of outside temperatures 7 to 100 °F (-14 to 38 °C). With trailer management corresponding to TQA guidelines for bedding, boarding, and misting, 43 monitoring trips were completed from May 2012 to February 2013. The trailer was managed by the cooperating driver according to TQA guidelines for bedding, boarding, and misting. Placement of the boarding was altered for 12 of the trips to assess the impact of boarding distribution.

The monitoring trips observed road-transport duration ranging from 0.2 h to 1.5 h for before transport period, 0.8 h to 4.2 h for during transport period, and 0.1 h to 1.9 h for after transport period.

Results revealed that for current TQA recommendations, extreme and potentially detrimental thermal conditions were observed within the trailer for outside temperature below 20°F (-7°C) and above 90°F (32°C). The duration of the extreme cold events were limited (0.1 to 3.4% of the observations during trips observing  $T_{in} < 5^{\circ}\text{F}$  (-15°C), but the extreme hot was a larger portion of the trip (19.3 to 68.5% of the observations during trips observing  $T_{in} > 95^{\circ}\text{F}$  (35°C)). Emergency Livestock Weather Safety Index was observed on the trailer when outside temperature was above 50°F (10°C) (0.1 to 63.7% of observations with Emergency conditions) despite having much less occurrence of corresponding extreme hot temperature inside the trailer.

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The skin temperature assessment revealed that the rear zones consistently resulted in the warmest pig skin temperatures on the trailer, and the middle zones consistently resulted in the coolest pig skin temperatures on the trailer, regardless of outdoor weather conditions. The same general trend was observed when skin temperature was separated out by other weather conditions and boarding percentages. These results highlight the potential micro-environmental challenges encountered with thermal extremes within the trailer and the need to achieve more thermal uniformity throughout the trailer.

Animations representing the temporo-spatial thermal conditions were created to visualize extreme conditions for location and severity over the course of the trips. These animations were compared to the summary variables for consistency.

A summary of recommendations for modifications to TQA were assembled, as well as several areas requiring further research.