

# The Micro-Environment in Trailers Transporting Market-Weight Pigs in the Midwest during Warm Weather

## A.S. Leaflet R2912

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### Summary and Implications

The objective of this pilot study was to determine how the micro-environment trailers transporting market-weight pigs' change during different transport events in Iowa during warm weather. This study was conducted using 4 trailer loads carrying 680 mixed sex market weight (average 128 kg) pigs from commercial finishing facilities to a commercial processing plant all in Iowa. Data loggers were placed in 4 locations inside the trailer and a fifth data logger was placed on the outside of the trailer close to the cab of the truck on the driver's side. Events of interest were loading, transport, wait time and unloading. Data from the logger placed on the outside of the trailer was used as a covariate in the regression. PROC REG of SAS was used to calculate the  $R^2$  value for temperature and relative humidity. Density, outside temperature or relative humidity, and time (minutes) were used as covariates in the models. Graphs were produced using the predicted values from SAS. Temperature increased during all events. Relative humidity increased during loading, but decreased during all other events. During loading, temperature inside the trailer increased by  $< 1^\circ\text{C}$  and relative humidity increased by  $\sim 1.5\%$ . During transport, temperature inside the trailer increased by  $\sim 10^\circ\text{C}$  whereas relative humidity decreased by  $\sim 23\%$ . During wait time at the plant and unloading, temperature inside the trailer increased by  $\sim 9^\circ\text{C}$ . During wait time at the plant, relative humidity inside the trailer decreased by  $\sim 11\%$ . During unloading, relative humidity inside the trailer decreased by  $5\%$  whereas temperature increased  $\sim 8^\circ\text{C}$ . In conclusion, during warm weather, temperature increased during all transportation events. Therefore, it is important to manage the internal trailer environment to meet the pigs' thermal comfort zone during transportation.

### Introduction

The trailer micro-environment is important for market weight pig welfare during transport to the packing plant. Trailers used in the U.S. rely on passive ventilation meaning airflow is dependent upon thermal buoyancy, truck speed, and wind speed. Pigs struggle with high temperatures due to an inability to sweat effectively. Previous studies have used data loggers mounted inside the trailer to determine

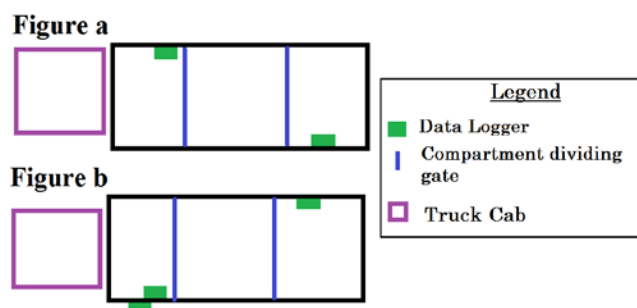
temperature and relative humidity during key transport events. Additionally, previous studies have reported that location within compartments in the trailer may have different air flow, which may alter both temperature and relative humidity. Therefore, the objective of this pilot study was to determine how the micro-environment trailers transporting market-weight pigs' change during different transport events in Iowa during warm weather.

### Materials and Methods

**Animals and housing.** This study was approved by the Iowa State University Institute for Animal Care and Use Committee. Four trailer loads carrying 680 mixed sex market weight (average 128 kg) pigs from commercial finishing facilities to a commercial processing plant in Iowa.

**Environmental equipment and acquisition.** Data loggers were placed in four locations inside the trailer and a 5<sup>th</sup> data logger was placed on the outside of the trailer close to the cab of the truck on the driver's side (Figure 1).

**Figure 1.** Schematic of data logger placement on top (a) and bottom (b) deck



The data loggers were accurate within 5% for relative humidity and  $1^\circ\text{C}$  for temperature. The data loggers were set to record every 5 minutes. The loggers were placed  $\sim 1$  meter above the floor of the trailer to allow the parameters to be taken near pig level, but to prevent the pigs from chewing on them. Two loggers were placed on the top deck; one in the front most (FT) and one in the rearmost compartment (RT). Two loggers were placed on the bottom deck, one in the front most (FB) and one in the rearmost compartment (RB). An additional logger was placed on the outside of the trailer near the truck cab. A logger was placed on opposite side in reference to the logger on the same deck. If the FB was placed on the left side of the trailer, the RB would be placed on the right side of the trailer. A logger was placed opposite of the corresponding logger on the other

deck. If the FT device was placed on the left side of the trailer the FB was placed on the right side of the trailer.

**Events:** **Loading** was defined as the time from when the first pig stepped onto the trailer until the last pig stepped onto the trailer. **Transport** was defined as the time from when the last pig stepped onto the trailer until the trailer arrived at the plant. **Wait time** was defined as the time from when the trailer arrived at the plant until the first pig stepped off the trailer. **Unloading** was defined as the time from when the first pig stepped off the trailer until the last pig stepped off the trailer.

**Statistical Analysis:** Data from the four loggers inside the trailer were combined. This was done only after the data from loggers inside the trailer proved to be very similar. Data from the logger placed on the outside of the trailer was used as a covariate in the regression. PROC REG of SAS was used to calculate the  $R^2$  value for temperature and relative humidity. Density, outside temperature or relative humidity, and time (minutes) were used as covariates in the models. The predicted values for each regression were saved and used to make graphs of each event. Additionally, SAS was used to obtain predicted values for temperature and relative humidity; these predicted values were then exported into Microsoft Excel where graphs were made.

### Results and Discussion

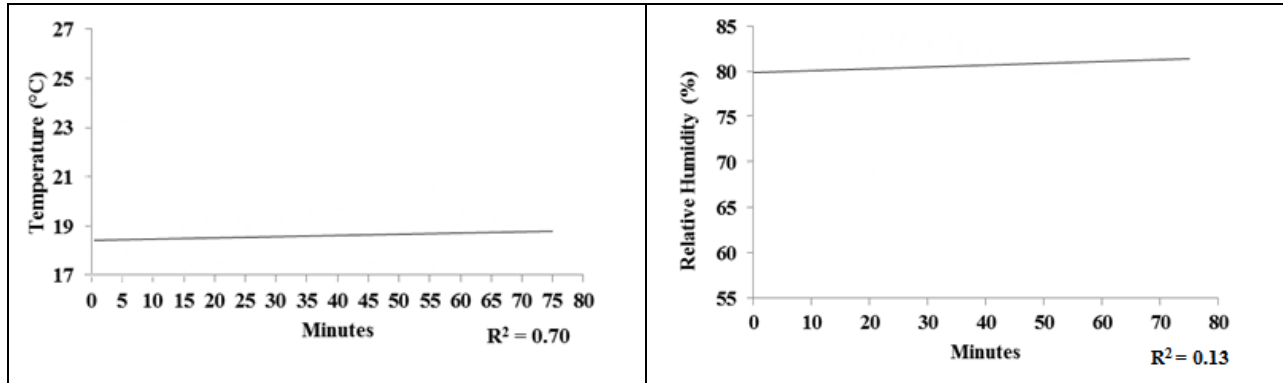
Temperature increased during all events (Figures 2a to 5a). Relative humidity increased during loading, but decreased during all other events (Figures 2b to 5b). During loading, temperature inside the trailer increased by  $< 1^\circ\text{C}$  and relative humidity increased by  $\sim 1.5\%$ . During transport, temperature inside the trailer increased by  $\sim 10^\circ\text{C}$  whereas relative humidity decreased by  $\sim 23\%$ . During wait time at the plant and unloading, temperature inside the trailer increased by  $\sim 9^\circ\text{C}$ . During wait time at the plant, relative humidity inside the trailer decreased by  $\sim 11\%$ . During unloading, relative humidity inside the trailer decreased by  $5\%$  whereas temperature increased  $\sim 8^\circ\text{C}$ . In conclusion, during warm weather, temperature increased during all transportation events. Therefore, it is important to manage the internal trailer environment to meet the pigs' thermal comfort zone during transportation.

### Acknowledgements

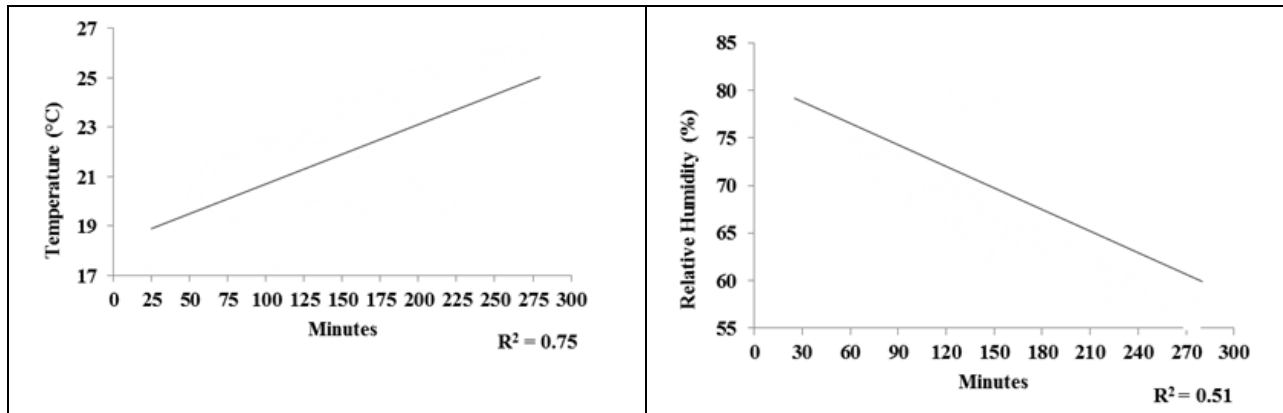
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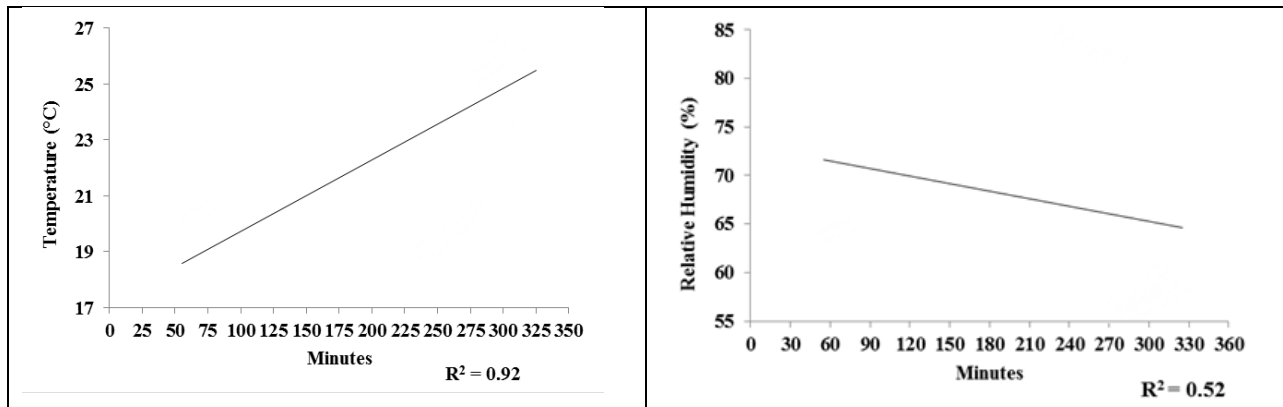
**Figure 2.** Temperature (a) and Relative Humidity (b) inside the trailer during loading for market weight pigs in warm weather



**Figure 3.** Temperature (a) and Relative Humidity (b) inside the trailer during transport for market weight pigs in warm weather



**Figure 4.** Temperature (a) and Relative Humidity (b) inside the trailer during wait time at the plant for market weight pigs in warm weather



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**Figure 5.** Temperature inside the trailer during unloading at the plant for market weight pigs in warm weather

