Temperatures Within a Truck Transporting Pigs During Winter and Summer Months in Western Canada

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SUMMARY

This study investigated the temperatures within a truck transporting pigs in western Canada, during summer and winter months. Pigs were transported from PSC Elstow Research Farm, and involved approximately 8 hours of travel to the Maple Leaf plant in Brandon. The temperature conditions pigs were exposed to during transport varied considerably between seasons and among compartments within the vehicle, and pigs were exposed to temperatures as low as -15 °C or as high as 30 °C.

INTRODUCTION

Transportation, which is an unfamiliar and threatening episode in an animal's life, is one of the most critical periods in pig handling before slaughter. It involves economic losses due to deaths, 'suspect' animals on arrival at the processing plant, and reduced meat quality. Death losses during transportation in Canada are reported to range from 0.05 to 0.17%, which accounts for approximately 16,000 pigs per year. Losses are reported to be higher in summer and vary among compartments within a truck. However, little is known about micro-environmental conditions that develop within compartments during transportation and its relationship to pig welfare and quality of meat. As part of a larger project on handling and transport of pigs, we examined the temperature conditions in trucks to determine if differences exist among compartments during summer and winter months.

EXPERIMENTAL PROCEDURE

All animals used in the study were market animals weighing approximately 115 kg. Animals included both males and females and were assembled from multiple pens. The pigs were transported from the PSC Elstow Research Farm to the Maple Leaf plant in Brandon and it involved approximately 8 hours of travel. Pigs were loaded in the evening and transported overnight to arrive at the packing plant at 6 am. Trials were conducted in both winter and summer months and the range of outdoor temperatures encountered were 7.7 to 22.9 °C for summer and -24.5 to -3.8 °C for winter. The truck used for transportation was a dual (cattle and pigs) purpose, pot-belly trailer. Compartments in the upper deck were numbered from 1, at the front, to 4, at the back and in the middle it was numbered from 5 to 8 (fron to back). The bottom was numbered from 9 at the front, to 10, at the back. Compartment 6 was not used due to load limitations. Loading density was 0.41 m^2/pig. Eleven loads of 195 pigs (six loads in the summer and five loads in the winter) were used in the study. The temperature and humidity within each compartment were measured using iButtons. Five iButtons per compartment were mounted 5-6 cm below the ceiling. These were positioned in the centre of the compartment, and 15 cm in from the centre of each wall of the compartment. The values of temperature and humidity were recorded at 5 minute intervals. Temperatures reported here represent the mean of all five sensors within each compartment. Temperatures were determined at the time each compartment was filled with pigs (loading), at the time the vehicle left the farm (departure), at arrival at the processing plant (arrival), and at the time of unloading of each compartment (unloading).

"During transport pigs can be exposed to temperatures as low as -15°C or as high as 30°C depending on season and compartment."

RESULTS AND DISCUSSION

There were significant differences between summer and winter truck temperatures for all time periods assessed (Table 1). The temperatures were highest during loading and at departure from the farm, and then cooled during transport. In the summer temperatures tended to increase while waiting to unload, however, they decreased in the winter.

Table 1. Average temperatures at the time of loading, departure from the farm, arrival at the processing plant, and unloading for summer (6 loads) and winter (5 months) months

Season	Loading	Departure	Arrival	Unloading
Summer	20.3*	21.7*	15.0*	19.1*
Winter	11.8	12.3	1.6	-1.8

* indicates a significant difference between summer and winter ($P < 0.05$)

The temperatures within each compartment of the truck during summer and winter trials are presented in Figures 1-4. At the time of loading, during the winter, compartment 5 was considerably colder than the rest, with compartments 9 and 10 being intermediate. Compartment 5 is at the front of the truck and its divider is relatively solid. Warm barn air being ventilated through the truck 30 minutes prior to loading in winter does not effectively reach this compartment. The compartment is generally the first to be loaded, and is considered to be difficult to fill. The very cold temperatures that exist here in the winter may add to the difficulty. Compartments 9 and 10 are also likely to be poorly ventilated during the warming period, but they are not loaded until the entire upper deck has been filled. By this time the heat from the pigs has warmed the trailer considerably. By the time of departure, the compartments in the middle deck and compartment 10 were the warmest in both summer and winter. All of these compartments have pigs immediately above them, and compartments 7 and 10 have low ceilings. These factors would contribute to their warming from the heat of the pigs. By the end of the journey, temperatures in all compartments had decreased significantly.

In both seasons the middle and the bottom decks remained the warmest. The temperatures in the top deck fell below freezing during the winter. These decks had no pigs above them to warm the ceiling and heat loss through the roof was likely considerable. Between arrival at the plant and unloading, approximately 30 minutes in these trials, the truck is stationary and the compartments warm up in the summer. The hottest temperatures are seen in compartments 5 and 10. Compartment 5 has relatively poor ventilation as the front of the compartment is solid. It also is immediately above the tractor drive wheels and transmission which will be dissipating heat. Compartment 10 is also poorly ventilated and has a low ceiling. During the winter the temperature in the warmer compartments decreases during the waiting period prior to unloading. This is surprising as we could assume that heat loss would be greater while the truck was in motion. It may be that pigs begin to arouse themselves during this stationary period and this facilitates heat loss from the compartment.

Figures 5 and 6 indicate patterns of temperatures within each compartment during the first 90 minutes of travel during warmest summer and coolest winter days. Within 30 minutes of travel the pattern of temperatures seen at the time of arrival at the packing plant has become evident. All the compartments cool somewhat, however, the compartments in the upper deck and compartment 8 (rear, middle deck) are the coolest during travelling. During the coolest day of travel, temperatures in the 'cool' compartments averaged -10°C, with that in compartment 3 going below -15°C.

IMPLICATIONS

The temperature conditions pigs are exposed to during transport vary considerably between seasons and among compartments within a vehicle. It may be possible to better standardize these temperature variations by changing ventilation and insulation values in each section/compartment of the trailer. The results found in this study will provide direction for important studies in the future.

ACKNOWLEDGEMENTS

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Figure 1. Temperatures at Loading

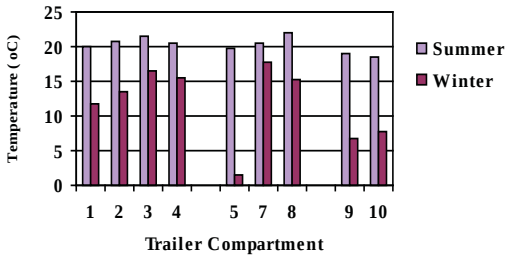


Figure 2. Temperatures at Departure

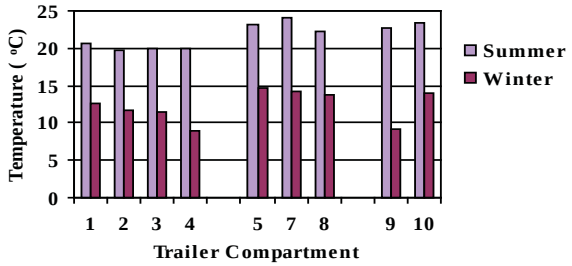


Figure 3. Temperatures at Arrival

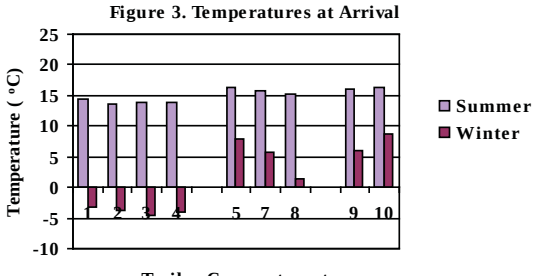
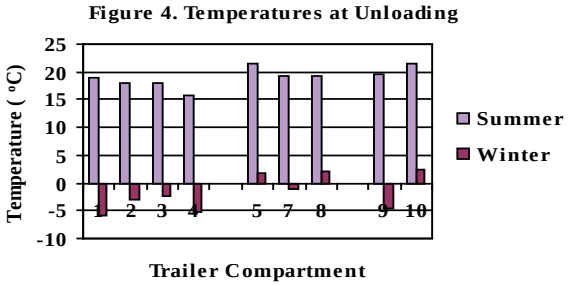


Figure 4. Temperatures at Unloading



Figures 1 - 4. Temperatures at loading, departure, arrival and unloading of each compartment during winter (5 loads) and summer (6 loads)

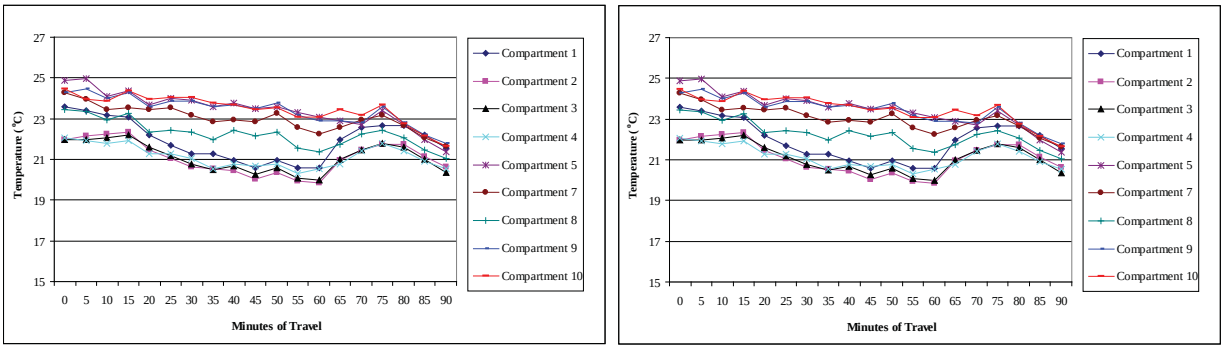


Figure 5 and 6. Compartment temperatures during the first 90 minutes of travel in a warm summer and cooler winter day.