

# CSAS Symposium: Issues in North American livestock transport

**940 Effects of vehicle design on the welfare and meat quality of pigs under Canadian transport conditions.** L. Faucitano\*<sup>1</sup>, S. Torrey<sup>1</sup>, R. Bergeron<sup>2</sup>, T. Widowski<sup>2</sup>, T. Crowe<sup>4</sup>, J. A. Correa<sup>3</sup>, J. P. Laforest<sup>3</sup>, E. Tamminga<sup>2</sup>, and H. W. Gonyou<sup>5</sup>, <sup>1</sup>*Agriculture & Agri-Food Canada, Sherbrooke, QC, Canada*, <sup>2</sup>*University of Guelph, Guelph, ON, Canada*, <sup>3</sup>*Laval University, Quebec City, QC, Canada*, <sup>4</sup>*University of Saskatchewan, Saskatoon, SK, Canada*, <sup>5</sup>*Prairie Swine Centre, Saskatoon, SK, Canada*.

It is generally acknowledged that pot-belly (PB) trailers and some specific compartments within this vehicle are worse than others in terms of animal losses. However, there is no real alternative truck with such a large loading capacity (230 pigs). Furthermore, the effect of each compartment on animal welfare has not been clearly established. The effects of the PB trailer design on the stress response and meat quality of pigs was studied between June 2007 and July 2008 within a large pan-Canadian study on swine transportation. Twenty-three transport trials were conducted in Quebec and in the Prairies in 2 different seasons of the year (summer and winter). In the Quebec trials, a PB trailer was compared with a double-decked (DD) truck equipped with a moving upper deck during 2 h transportation. In the Western trials, the PB trailer alone was evaluated during 8 h transportation. In the Quebec trials, higher ( $P < 0.05$ ) digestive tract temperatures (DTT) were recorded in the PB trailer for pigs located on the top deck while waiting at the farm in both seasons, and in pigs located in the rear compartments of the top and middle decks during transport in summer. Unloading from the PB trailer took longer ( $P < 0.001$ ) than from the DD truck and took longer from the upper deck compartments, especially in summer. Higher pHu values were found in the loin and ham muscles ( $P < 0.01$  and  $P < 0.001$ , respectively) of pigs transported on the PB trailer compared with the DD truck. In the Western trials, higher ( $P < 0.05$ ) DDT were recorded in pigs located in the rear compartments of the top deck and of the belly before departure from the farm. Loading took longer ( $P < 0.05$ ) for the bottom-nose and top deck in summer and for the belly in winter. Unloading took longer ( $P < 0.001$ ) from these same locations, regardless of the season. Loin and ham pHu values were higher and drip loss values lower in pigs located in the bottom-nose ( $P < 0.05$ ). In conclusion, it appears that the effects of PB design on animal welfare and meat quality in pigs are related to the greater exertion required to negotiate the multiple internal ramps and poor ventilation at some locations.

**Key Words:** transport, stress, pork quality

**941 Contributions of research to the practical aspects concerning long-term road transport of horses.** C. L. Stull\*, *University of California, Davis*.

Road transport is a common practice in many facets of the horse industry including sport and competitive events, breeding programs, marketing and slaughter channels, and biomedical purposes. The physiological and behavioral responses of horses have been recently studied with contributing factors such as duration, space allowance, cross-tying restraint, feed and water availability, injuries, trailer design, and environmental factors. Data collected (1998) on 306 slaughter horses showed these horses to generally be Quarter Horses or Thoroughbred breeds with a mean age of  $11.4 \pm 0.4$  years old and mean weight of  $432 \pm 3.3$  kg. The number of injuries sustained was 3.5 times greater ( $P < 0.05$ ) in double-deck (29%) compared with single deck semi-trailers (8%). Stress parameters such as cortisol, immune, or body weight showed smaller responses ( $P < 0.05$ ) between pre- and post-transport samples with horses provided with

higher floor area (1.4 to 1.54 m<sup>2</sup>/horse). As trip duration increased from approximately 6 to 30 h, muscle fatigue and dehydration were incrementally increased, especially during trips over 27 h. Both engineering- and performance-based standards were developed from research studies and implemented in the federal regulations to ensure the humane movement of equines to slaughter facilities within the US and into Canada. The practice of cross-tying horses individually in stalls is common during road transport of race and show horses. A study designed to compare cross-tied horses with horses traveling loose in small compartments for 24 h showed elevations ( $P < 0.05$ ) in cortisol concentrations, white blood cell counts, and glucose concentrations in the cross-tied horses during transport and recovery. The study supports allowing horses to travel loose in small compartments without elevating their heads by cross-tying. Data from these studies and previous studies suggest that long-term road transportation compromises immune function, thus predisposing transported horses to respiratory disorders.

**Key Words:** equine, transport, stress

**942 Cattle transport in North America—Current welfare research and future directions.** K. S. Schwartzkopf-Genswein\*<sup>1</sup>, L. A. González<sup>2</sup>, and T. Crowe<sup>3</sup>, <sup>1</sup>*Agriculture and Agri-Food Canada, Lethbridge, Alberta, Canada*, <sup>2</sup>*University of Manitoba, Winnipeg, Manitoba, Canada*, <sup>3</sup>*University of Saskatchewan, Saskatoon, Saskatchewan, Canada*.

The transport of live cattle is known to be stressful and therefore can have a direct impact on animal production and welfare, and on food safety and quality. Consequently, there has been increased focus on animal welfare during transport at an international level, in both legislation and trade discussions. Unfortunately few studies assessing the impact of transport on cattle under North American conditions are available from which to provide science-based information to the industry, policy makers and trade personnel. Understanding the objectives, challenges and constraints of current industry practices is integral in designing relevant scientific studies to assess the effects of transport on animal well-being. The combination of human, animal and environmental factors needs to be carefully considered and include: animal handling at loading and unloading, driver experience and training, delays during transport; cattle age, breed, sex, health and physiological status; climate and microclimate, trailer design, loading density, length and condition of transport and condition. All these factors will affect production, body weight loss, morbidity and mortality during and after transport (e.g., lameness and downer animals, incidence of disease), and meat quality and safety. Research is needed to access the inter-relationships between these factors in a systematic fashion. Simulated as well as commercial transport studies that employ animal and microclimate monitoring will aid in facilitating such research.

**Key Words:** cattle, transport, welfare

**943 Conditions within B-train trailers transporting broiler chickens in Western Canada.** N. A. Burlingquette, J. M. Watts, L. J. Graff, M. L. Strawford, K. P. C. Hui, T. G. Crowe\*, H. L. Classen, and P. J. Shand, *University of Saskatchewan, Saskatoon, Saskatchewan, Canada*.

Conditions within commercial trailers transporting broiler chickens were recorded during travel from production site to processing facility. Data were collected for typical commercial trailer vent and tarp settings

for B-train trailers used in Western Canada, over a range of ambient conditions from  $-20^{\circ}\text{C}$  to  $+10^{\circ}\text{C}$ , on 14 separate occasions. Data loggers, capable of recording temperature and humidity, were positioned throughout the trailers and programmed to record conditions at 1-min intervals. Data were analyzed to characterize the conditions within the trailers and to identify locations where extremes occurred. The difference between the on-truck conditions (temperatures and humidity levels) and the respective ambient conditions were calculated for each sensor and grouped by truck vent and tarp configuration. Temperature and humidity gradients within the trailers were visualized using 3-D mapping software. During the summer, temperatures and humidity levels followed the ambient conditions with modest accumulations of heat and moisture. Minimal gradients in temperature and humidity were present, when both sides of the cargo area were exposed. Gradients in temperature were much more pronounced during the winter, when tarps covered the sides of the loads. While the vent configurations had an effect on the temperatures and humidity levels within the load, some general trends did emerge. When both tarps were lowered (colder ambient conditions), heat tended to accumulate, resulting in a relative warm spot, near the front along the midline of the front trailer. Localized warm conditions developed along the midline, near the rear of the second trailer. Cold regions within the load were restricted to areas adjacent to the side tarps, where cold air could infiltrate into the load, particularly along the sides of the load at the rear and bottom of the front trailer plus the front and bottom of the rear trailer. The air within the load was more humid under cold ambient conditions.

**Key Words:** transportation, broiler chickens

**944 Fatigue: a major cause of commercial livestock truck accidents.** J. A. Woods\*, *J. Woods Livestock Services, Blackie, Alberta, Canada.*

Between 1994 and June 2007, accident reports on 415 commercial livestock truck accidents were tabulated in the United States and Canada.

The objective of the data collection was to establish the most common cause of commercial accidents involving livestock and determine if there were specific high risk loads to provide accident prevention education and identify possible future research needs. Data was collected from internet searches, Google alerts, news reports, newspaper articles, industry sources, and government agencies. Tabulated data included time of day, month of the year, animal species and type, position of trailer following the accident, average death loss, location of the accident, number of vehicles involved, cause of accident and trailer style. Not all of the reports contained all of the information. Fifty-six percent of the accidents involved cattle, 27% involved pigs, 11% poultry and the balance were other species. Double deck, "pot belly" trailers, were the most common trailer configurations accounting for 73%. Double, straight deck trailers were involved in 12% of the accidents. October, followed by November were the most common months for accidents, with July documenting the least amount of accidents. Weather had relatively little effect on the number of accidents compared to other factors. Evaluation of the data showed that 59% of the accidents occurred during the early morning hours between midnight and 9:00 am while 80% involved a single vehicle. Driver error was blamed for 85% of the wrecks. The data showed that in 83% of the accidents the trailer rolled over onto their side and of those, 84% tipped over on their right side. This data is consistent with circumstances linked to fatigue related motor vehicle accidents. It was determined that drivers fatigue was the leading cause of commercial livestock truck accidents in North America. Recommendations from this study are to incorporate fatigue management programs into livestock transporter training programs, industry literature and company policies. Future research recommendations include trailer design modifications and loading configurations.

**Key Words:** accidents, livestock, transportation