



Effects of trailer design on animal welfare parameters and carcass and meat quality of three Pietrain crosses being transported over a short distance



A.V. Weschenfelder^{a,b}, S. Torrey^{a,1}, N. Devillers^a, T. Crowe^c, A. Bassols^d, Y. Saco^d, M. Piñeiro^e, L. Saucier^b, L. Faucitano^{a,*}

^a Agriculture and Agri-Food Canada, Dairy and Swine Research and Development Centre, Sherbrooke, QC, Canada J1M 0C8

^b Department of Animal Sciences, Université Laval, Quebec City, QC, Canada G1V A06

^c University of Saskatchewan, Saskatoon, SK, Canada S7N 5A2

^d Departament de Bioquímica i Biologia Molecular, Universitat Autònoma de Barcelona, Bellaterra (Cerdanyola del Vallès), 08193 Barcelona, Spain

^e PigCHAMP Pro Europa S.A., Gremios de los Segovianos, 13, Pol. Ind. Hontoria, Hontoria, 40195 Segovia, Spain

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ABSTRACT

The objective of this study was to evaluate the effects of trailer design on the stress responses and meat quality traits of 3 different pig crosses: 50% Pietrain breeding with HAL^{Nn} (50Nn), 50% Pietrain breeding with HAL^{NN} (50NN) and 25% Pietrain breeding with HAL^{NN} genotype (25NN). Market barrows ($n=360$), as a subset of 12 trailer loads of pigs, were transported from farm to slaughter on 6 dates in 2009 for 45 min in either a pot-belly (PB) or flat-deck (FD) trailer, with 120 pigs/genetic group being represented. Temperature (T) and relative humidity (RH) were recorded by data loggers mounted in both trailers. Behaviours and handler interventions were video-taped at loading, unloading and in lairage. At exsanguination, blood samples were collected for the assessment of lactate, cortisol, creatine kinase (CK), haptoglobin and Pig-MAP concentrations. Meat quality was measured in the longissimus dorsi (LD), semimembranosus (SM) and adductor (AD) muscles of all pigs. Temperatures were warmer in compartments 6 and 11 at loading ($P<0.001$), compartment 11 during travelling ($P=0.05$), and in compartment 5 at unloading ($P=0.01$) of the PB trailer. Pigs unloaded from the FD trailer overlapped more ($P<0.001$), whereas ($P<0.001$) the frequency of jamming was noted for pigs unloaded from the PB trailer. Pigs with 50% Pietrain genetics overlapped and jammed more ($P<0.001$) than pigs with 25% Pietrain genetics, regardless of HAL status. Greater ($P=0.03$) CK levels were found in 50Nn pigs transported in the PB trailer, while 50Nn and 50NN pigs had greater ($P=0.028$) lactate levels than 25NN pigs. Carcasses from 50Nn and 50NN pigs were leaner ($P=0.04$), and the skin damage score was lower ($P=0.04$) in 25NN carcasses. Overlap-type bruises were greater ($P=0.02$) in pigs transported in the FD trailer. Pigs transported in the PB trailer had greater ($P=0.05$) pHu in the SM and AD muscles ($P=0.013$). Except for pHu in the SM muscle, all meat quality parameters were affected by the Hal gene ($P=0.04$). The use of a PB trailer for short distance transportation of pigs to slaughter negatively affected stress responses and meat quality. The greater

* Corresponding author. Tel.: +1 819 780 7237; fax: +1 819 564 5507.

E-mail address: luigi.faucitano@agr.gc.ca (L. Faucitano).

¹ Present address: Agriculture and Agri-Food Canada, Department of Animal and Poultry Science, University of Guelph, Guelph, ON, Canada N1G 2W1.

proportion of Pietrain genetics in the selection resulted in leaner carcasses, but also in pigs being more difficult to handle. Crossbreeding appeared to have a greater impact on animal welfare and meat quality than vehicle type, but trailer type may emphasize these negative genotype-related defects.

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1. Introduction

The pot-belly (PB) trailer is the most commonly used trailer for swine transportation in Canada, in large part because of its large load capacity (up to 220 animals per load) resulting in decreased transportation cost per animal. However, this trailer design is raising some concern because of the increased difficulty of handling pigs at loading and unloading, resulting in longer load and unload times and higher incidence of animal losses and meat quality defects (Correa et al., 2013; Ritter et al., 2008; Torrey et al., 2013). These effects appear mostly due to the presence of multiple steep ramps and 180° turns inside this trailer (Torrey et al., 2013). Considering the greater stress responsiveness of leaner and stress-susceptible pigs (Busse and Shea-Moore, 1999), these truck features may have a large impact when the PB trailer is used for the transport of Pietrain pigs with carrier Halothane (HAL) genotypes (Fàbrega et al., 2002, 2004b). According to Fàbrega et al. (2002, 2004b), HAL-free Pietrain crossbreds were less reactive to transport stress than the HAL carriers when using trucks equipped with hydraulic devices for loading and unloading. Given the expected increasing introduction of HAL-free Pietrain terminal sire lines into the North American pig population (Godbout, Genetiporc Inc., personal communication), there is a need to understand their responsiveness to the use of the most common trailers to help stakeholders to adapt the current management practices to the production of these crossbreds.

Based on the results of a previous study (Weschenfelder et al., 2012), Pietrain genetics had a larger impact on animal welfare parameters and pork quality traits than the trailer type when used for long-distance transportation. It appeared that long transportation time had masked the effect of trailer type, because pigs transported long distances under controlled transport conditions (sufficient space allowance) have time to acclimate and recover from the stress of pre-transit loading. However, the effects of PB trailer design on the response to transport stress and meat quality of these genotypes can be emphasized under short distance conditions. Short transportation is generally considered to be more critical than longer durations as pigs have insufficient time to recover from loading stress, resulting in increased risk of animal losses and PSE (pale, soft, exudative) pork (Haley et al., 2008; Pérez et al., 2002).

The objective of this study was to determine the effects of trailer design on the physiological and behavioural responses to transport stress, and on the carcass and meat quality variation in pigs of 3 Pietrain crosses.

2. Material and methods

All experimental procedures performed in this study were approved by the AAFC Animal Care Committee in

Sherbrooke (Quebec, Canada) based on the current guidelines of the Canadian Council on Animal Care (2009).

2.1. Animal management

A total of 360 barrows (BW=115 ± 5 kg) were evaluated as a subset of 12 trailer loads (6 loads/trailer and each load being a replicate) of market pigs transported on 6 dates in June and September (3 dates/month) of 2009. All pigs were transported on the same day for 45 min (44 km) from the same commercial growing–finishing farm to the same slaughter plant located in Eastern Canada using 2 types of trailers, a 3-decked pot-belly trailer equipped with 2 internal ramps or a 3-decked flat-deck trailer with hydraulic decks and no internal ramps (Fig. 1). Pigs were progenies from crosses of Pietrain homozygous halothane recessive (HALⁿⁿ), Pietrain homozygous halothane dominant (HAL^{NN}) and Duroc × Pietrain (HAL^{NN}) sire lines mated to homozygous halothane dominant F-20 sows (Genetiporc Inc., St.-Bernard, Canada) resulting in 3 genetic groups: 50% Pietrain crossbreeding with HAL^{Nn} genotype (50Nn), 50% Pietrain crossbreeding with HAL^{NN} genotype (50NN) and 25% Pietrain crossbreeding with HAL^{NN} genotype (25NN).

2.2. Transportation treatments

Transport groups were prepared 5 days before loading and kept in separate finishing pens (20 pigs/pen) by crossbred and trailer type. In order to avoid mixing of pigs from different pens inside the trailer, the group size in each

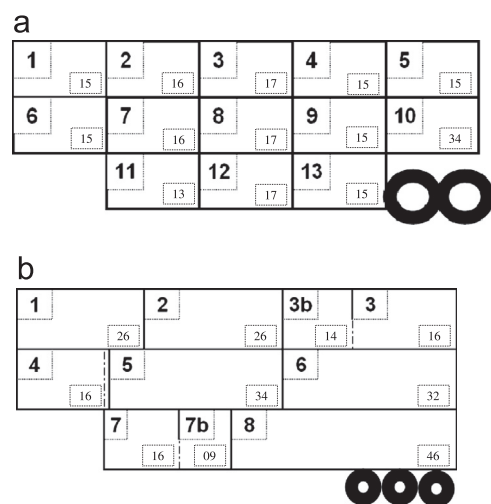


Fig. 1. The location of compartments and distribution of pigs by compartment in the (a) pot-belly (PB) and (b) flat-deck (FD) trailers.

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