Effects of pre-sorting and pen size on stress responses and transport losses in market weight pigs

L. Gesing*[1], A. Johnson[1], K. Stalder[1], J. Selsby[1], M. Faga[2], C. Feuerbach[2], H. Hill[2], A. Whiley[2], R. Bailey[3] and M. Ritter[4]

[1]Department of Animal Science, Ames, IA,
[2]Iowa Select Farms, Iowa Falls, IA,
[3]JBS Swift and Co., Marshalltown, IA,
[4]Elanco Animal Health, Greenfield, IN

Introduction

- Novelty can be a profound stressor to pigs (Grandin, 1997)
- Body has developed physiological mechanisms to adapt;
  - Acute (short-term)
  - Chronic (long-term) stressors
- How an individual pig copes with aversive stimuli can affect its performance and meat quality (Geverink et al., 1998; Hambrecht et al., 2004)

Additive stressor model

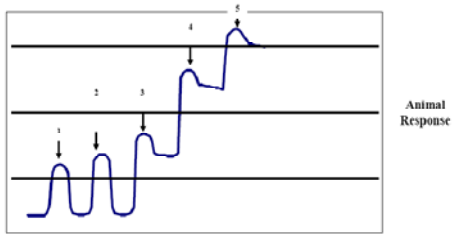


Figure 1. Adapted from Broom and Johnson (1993); Responses to a series of stimuli which, individually have moderate effects but which can be lethal in combination. 1 = Movement from home pen along alley way, 2 = Electric prod use 3 = Loading 4 = Transport 5 = Unloading.

Pre-sorting

- Pre-sorting pigs into resting pens for 2-h prior to loading allowed;
  - Heart rate to return to baseline values
  - 25 % reduction in transport deaths

  (Chevillon, 1998; 2000)
- Pre-sorting may minimize additive stressors at the time of loading

Objective

To determine the effects of pre-sorting on stress responses (during loading and unloading) and transport losses at the packing plant for market weight pigs

MATERIALS AND METHODS

Materials and Methods

- Study dates: December 23, 2008 to March 25, 2009
- Three commercial wean to finish sites used
- Facility design treatments were randomly assigned to one side of the aisle within each room at each site
- 5,802 mixed sex pigs
- Pigs 195 ± 16 d of age, 120.3 kg (265.2 lbs)

NON

- No pre-sorting (NON)
  - ~292 pigs / pen
  - Floor space = 0.65 m^2 / pig (7.21 ft^2 / pig)
  - Back gates of 9 consecutive pens kept open to combine 9 small pens
  - Not pre-sorted prior to loading; sorted at time of loading

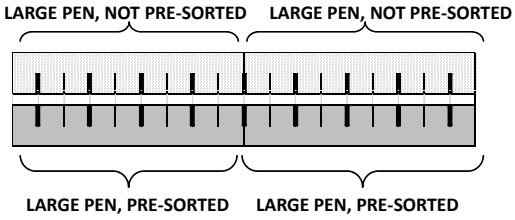
(Swing gates closed) (Swing gates open)

PRE

- Pre-sorted (PRE)
  - ~292 pigs / pen
  - Floor space = 0.65 m^2 / pig (7.21 ft^2 / pig)
  - Back gates of 9 consecutive pens opened to combine 9 pens
  - Internal swing gates used to pre-sort market weight pigs

(Swing gates closed) (Swing gates open)

Pen design



Materials and Methods

- Two days prior to loading, market weight pigs were uniquely marked by treatment
- Marked pigs in PRE pens were pre-sorted approximately 18 h prior to loading
- Pigs were loaded by the same four man loading crew
- During loading, facility design treatments were randomly assigned to trailer decks

Trucks / Travel

- Only straight deck trailers were utilized
- Stocking density was standardized across decks 0.41 m^2 / pig (4.40 ft^2 / pig)
- Pigs were transported ~1 h to a commercial harvest facility in Iowa

Event times (in minutes)

- Loading
- Wait at farm
- Transport
- Wait at plant
- Unloading
- Loading time by treatment
  - Time the first pig in treatment stepped on truck until the last pig in treatment stepped on truck

Farm observations

- Physical signs of stress
  - Open-mouth breathing
  - Skin discoloration
  - Muscle tremors

Plant observations

- Physical signs of stress
  - Open-mouth breathing
  - Skin discoloration
  - Muscle tremors

- Transport losses
  - Dead on arrival (DOA)
  - Non-ambulatory
    - Fatigued and injured
  - Total losses (DOA + Non-ambulatory)

Classifying non-ambulatory pigs

Fatigued
(Stress related)

Injured
(Structure/injury related)

Experimental design

- Study utilized 33 trailer loads of market weight pigs
- Randomized complete block design
- Two treatments:
  - NON (not pre-sorted prior to loading)
  - PRE (pre-sorted 18 h before loading)
- Trailer deck was the experimental unit
- The trailer load of pigs was the blocking factor

Statistical Analysis

- Load time data was analyzed by PROC MIXED of SAS
- Model included the fixed effect of treatment and the random effects of site (date) and load (date × site × trailer)
- Number of pigs loaded was the linear covariate
- P – value of <0.05 considered significant

Statistical analysis

- Data were analyzed by PROC GLIMMIX of SAS
- Model included the fixed effect of treatment and the random effects of date (site) and load (date × site × trailer)
- Number of pigs loaded was used as a linear covariate
- A Poisson distribution was noted and an I-Link was used to transform values for means and standard errors
- *P* value of < 0.05 was considered to be significant

Statistical analysis

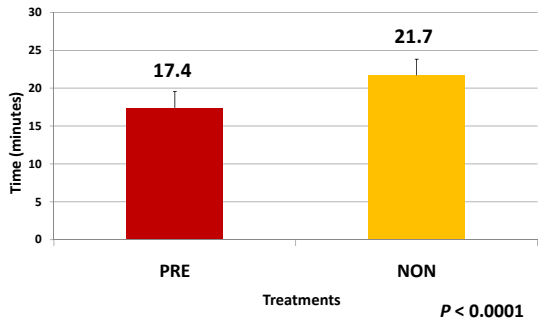
- DOA could not be run because too many zeros existed in the data set
- Will be presented descriptively

RESULTS

Event times

	MEAN	SD	MIN	MAX
Loading, minutes	42	9	28	68
Wait at farm	7	3	3	13
Transport	61	4	51	71
Wait at plant	22	23	3	98
Unload	25	13	11	53
Total Time	155	31	100	225
No. Loads within a day	3.3	1.3	2	6

Time to load by treatment



Farm observations

	Treatment		
	NON	PRE	*P*-values
Measure, %			
Open mouth breathing	12.25 ± 1.71	6.11 ± 0.91	< 0.0001
Skin discoloration	15.25 ± 3.67	8.08 ± 1.97	<0.0001
Muscle tremors	0.17 ± 0.97	0.06 ± 0.14	0.23
Non-ambulatory	0.03 ± 0.03	0.06 ± 0.04	0.53

Plant observations

	Treatment		
	NON	PRE	*P*-values
Measure, %			
Open mouth breathing	0.28± 0.10	0.33 ± 2.36	0.69
Skin discoloration	0.07 ± 0.05	0.11 ± 0.06	0.45
Muscle tremors	0.26 ± 0.11	0.25 ± 0.11	0.96

DOAs

- 2 total pigs from PRE
- 0 total pigs from NON

Plant observations

	Treatment		
	NON	PRE	*P*-values
Measure, %			
Fatigued	0.14 ± 0.07	0.13 ± 0.06	0.94
Injured	0.14 ± 0.07	0.13 ± 0.07	0.88
Non-ambulatory	0.28 ± 0.09	0.26 ± 0.09	0.88
Total losses	0.28 ± 0.09	0.33 ± 0.10	0.68

Summary

- PRE pens loaded 4.3 min faster than NON
- PRE pens had reduced open mouth breathing and skin discoloration during loading
- At the harvest facility there were no differences in physical signs of stress or transport losses between treatments

Discussion

- Low overall incidences of transport losses (0.28% NON; 0.33% PRE)
- Average from 23 field trials is 0.69%
- Pre-sorting not a useful management tool on sites with already very low incidence of transport losses?

Thank you; Questions?

Thank you to Elanco Animal Health, Hatch, State of Iowa and the Department of Animal Science, Iowa State University for funding this project