Safe and effective animal movement

M. J. Ritter, M. A. Klassen, N. S. Pudenz, P. J. Rincker, and S. N. Carr
Elanco Animal Health, Greenfield, IN, USA

Iowa Pork Congress
Des Moines, IA
January 26, 2012
Areas to Discuss

• Importance of pre-harvest handling
  – Transport losses in market weight pigs
  – Carcass bruising and trim loss
  – Pork quality defects
  – Economic implications

• Discuss pre-disposing factors for transport losses

• What can you do to reduce transport losses?
Importance of Pre-harvest Handling

• Humane handling is the right thing to do, and it is the responsibility of every handler to ensure all pigs are handled and transported in a humane manner.

• Pre-harvest handling has important implications for animal well-being and economics.

• Pig handling / transport methods can impact:
  – Transport losses at the packing plant
  – Carcass bruising and trim loss
  – Fresh pork quality traits

Photo provided by: Pork Magazine
Transport Losses: Definitions

• Dead on arrival (DOA):
  – A pig that died during transport

• Dead in Yard (DIY) or Dead in Pen (DIP)
  – A pig that died after unloading (usually in the lairage pen)

• Non-ambulatory pig:
  – A pig unable to move or keep up with contemporaries
  – Subjects, slows, suspects, cripples, and stressors

• Transport losses:
  – The sum of dead and non-ambulatory pigs at the plant
Classifying Non-ambulatory Pigs

Fatigued
(Stress related)

Injured
(Structure/injury related)

The Fatigued Pig Syndrome

• Signs of acute stress
  – Open mouth breathing
  – Skin discoloration
  – Abnormal vocalizations
  – Muscle tremors

• Metabolic state of acidosis
  – High blood lactic acid (32.2 vs. 11.1 mmol/L)
  – Low blood pH (7.11 vs. 7.35)
  – High body temperature?

• Majority recover with 2-3 h rest

• 98% are HAL-1843 negative

Yearly Incidence of Dead Pigs at USDA Inspected Plants (1991-2010)

FSIS. 2008. Market swine condemned ante-mortem for deads in USDA inspected plants for the calendar year of 2007. FOIA Case #08-120.
Non-ambulatory Pigs at the Plant

- National statistics are not available for non-ambulatory pigs

- A summary of 23 commercial field trials (2000-2007)
  - 6,660,569 market weight pigs
  - 39,572 trailer loads of pigs

<table>
<thead>
<tr>
<th>Plant Losses</th>
<th>Mean</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deads, %</td>
<td>0.25</td>
<td>0.00</td>
<td>0.77</td>
</tr>
<tr>
<td>Non-ambulatory, %</td>
<td>0.44</td>
<td>0.11</td>
<td>2.34</td>
</tr>
<tr>
<td>Total losses, %</td>
<td>0.69</td>
<td>0.14</td>
<td>2.39</td>
</tr>
</tbody>
</table>

~1 pig per load dies or becomes non-ambulatory at the plant

Carcass Bruising and Trim Loss

- Carcass bruising can be caused by:
  - Rough handling
  - Poorly maintained facilities
  - Overcrowding pigs during transport
  - Fighting


Variation in Fresh Pork Quality

PSE
Pale, soft, exudative

Normal
Red, firm, non-exudative

DFD
Dark, firm, dry

Photo provided by Floyd McKeith
Pre-harvest Stress and Pork Quality

- Long term stress → DFD pork
  - Low muscle energy (glycogen)
  - Normal rate of pH decline
  - Meat has high ultimate pH

- Short term stress → PSE pork
  - Elevated body temperature
  - Metabolic acidosis (high lactic acid)
  - Increased rate of muscle pH decline

## Economic Implications

<table>
<thead>
<tr>
<th>Defect</th>
<th>Incidence, %</th>
<th>Cost, $/head</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transport Losses</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dead pigs</td>
<td>0.22%</td>
<td>$0.28</td>
<td>Ritter et al., 2009</td>
</tr>
<tr>
<td>Non-ambulatory pigs</td>
<td>0.44%</td>
<td>$0.17</td>
<td>Ritter et al., 2009</td>
</tr>
<tr>
<td><strong>Pork Quality Defects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carcass bruising</td>
<td>6.5%</td>
<td>$0.08</td>
<td>Stetzer &amp; McKeith, 2003</td>
</tr>
<tr>
<td>PSE pork</td>
<td>15.5%</td>
<td>$0.90</td>
<td>Stetzer &amp; McKeith, 2003</td>
</tr>
<tr>
<td>DFD pork</td>
<td>1.9%</td>
<td>$0.00</td>
<td>Stetzer &amp; McKeith, 2003</td>
</tr>
</tbody>
</table>


Pre-disposing Factors for Transport Losses

• Transport losses are a multi-factorial problem

• It is well established that transport losses are impacted by:
  – HAL-1843 mutation (stress gene)
  – Handling methods
  – Facility design
  – Crowding pigs during transport
  – Extreme weather conditions

Handling Tool

- McGlone et al., 2004
  - Evaluated moving pigs with a sorting board, an electric prod, or a paddle.
  - Concluded that a sorting board is the single most effective handling device
  - Therefore, all handlers should use a sorting board when moving pigs

Handling Intensity

- Gonyou, unpublished data

```
Fatigued Pigs, %

<table>
<thead>
<tr>
<th></th>
<th>Gentle Handling</th>
<th>Aggressive Handling</th>
<th>Aggressive Handling</th>
</tr>
</thead>
<tbody>
<tr>
<td>with Paddles</td>
<td>2.0</td>
<td>15.0</td>
<td>34.0</td>
</tr>
<tr>
<td>with Hot Shots</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

Elanco Trial #AF7CA0101. Data on file.
Minimal Electric Prod Use?

- Ritter et al., 2008
  - Moved 48 market pigs individually through a 164 ft course
  - Compared 0 (paddles) vs. 2 vs. 4 shocks from a hot shot
  - Pigs were allowed to move at their own pace
  - Shock duration was ≤ 1 second

<table>
<thead>
<tr>
<th>Post-handling Values</th>
<th>Handling Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 Shocks</td>
</tr>
<tr>
<td>Body Temperature, °F</td>
<td></td>
</tr>
<tr>
<td></td>
<td>102.6\textsuperscript{a}</td>
</tr>
<tr>
<td>Blood Lactic Acid, mmol/L</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.96\textsuperscript{a}</td>
</tr>
</tbody>
</table>

\textsuperscript{a,b} Means with different superscripts differ (P < 0.05)

Group Size During Loading

- Used 45 loads to compare loading pigs (BW = 119.9 kg) in groups of 4 vs. 8 when moved through a 76 cm aisle

<table>
<thead>
<tr>
<th>Groups</th>
<th>Dead</th>
<th>Non-ambulatory</th>
<th>Total Losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups of 4</td>
<td>0.19%</td>
<td>0.36%</td>
<td>0.55%</td>
</tr>
<tr>
<td>Groups of 8</td>
<td>0.56%</td>
<td>0.70%</td>
<td>1.26%</td>
</tr>
</tbody>
</table>

P < 0.01  
P < 0.05  
P < 0.01

Handling Summary

• The single most effective handling tool is a sorting board

• Stress responses are minimized when pigs are:
  – Moved at a slow and calm pace
  – Moved in small groups
  – Moved with paddles or with ≤ 2 shocks/pig from an electric prod
Facility Design

- Used 33 loads to compare small pens (32 pigs/pen), not pre-sorted vs. large pens (192 pigs/pen), pre-sorted

![Bar chart showing comparison of dead, non-ambulatory, and total losses between small and large pens.](chart.png)

- Dead: Small pens, not pre-sorted: 0.23% vs. Large pens, pre-sorted: 0.01% (P < 0.01)
- Non-ambulatory: Small pens, not pre-sorted: 0.66% vs. Large pens, pre-sorted: 0.29% (P < 0.05)
- Total Losses: Small pens, not pre-sorted: 0.89% vs. Large pens, pre-sorted: 0.30% (P < 0.01)

Transport Floor Space

- Utilized 42 loads in spring and fall to determine the effects of transport floor space on losses at the plant.

Seasonal Variation in the U.S.

What can you do to reduce transport losses?
Prepare Pigs for Transport

- Walk pens daily
- Routinely move pigs prior to loading
- Pre-sort pigs prior to loading (if feasible)
- Remove feed prior to loading (if feasible)
Minimize Stress

• Minimize the use of electric prods during loading
  – Goal: ≤ 2 shocks/pig from barn pen to trailer compartment

• Move pigs in groups of 4 to 6 pigs at a slow/calm pace
  – Rule of thumb: you need to be able to reach the first pig

• Minimize the distance pigs are moved during loading

• Do not load stressed or fatigued pigs
  – Place these pigs in a recovery pen and allow them to rest and recover

• Use transport loading densities of ≤ 58 lbs/ft²
Overall Summary

• Pre-harvest handling has important implications for animal well-being and economics as improper pre-harvest handling may cause:
  – Transport losses
  – Carcass bruising
  – Pork quality defects

• ~0.7% of all market hogs transported die or become non-ambulatory

• Transport losses are a multi-factorial problem that are impacted by:
  – Porcine stress syndrome (stress gene)
  – Handling methods
  – Facility design
  – Crowding pigs during transport
  – Extreme weather conditions

• Transport losses can be minimized by better preparing pigs for transport and minimizing stress during the marketing process
Free Monthly E-Newsletter

To subscribe go to:
www.hoghandlingupdate.com
Back-up Slides
Postmortem pH Decline and Pork Quality

- In postmortem muscle, glycogen is converted to lactic acid to produce energy
- The more lactic acid that is produced, the lower the pH of the muscle will be
- High carcass temperature and/or low pH $\rightarrow$ pale color and high drip loss

Multi-factorial Problem

- People Factors
  - Handling

- Pig Factors
  - Genetics – PSS

- Transportation Factors
  - Floor Space

- Plant Factors
  - Wait at the Plant

- Facility Design Factors
  - Pre-sorting

- Environmental Factors
  - Season

Growers, loading crews, truck drivers, and handlers at the plant can impact transport losses!

Large Pens and Pre-sorting

- Potential advantages

  - Pigs have more room to exercise during the grow-finish period

  - Pre-sorting allows pigs an opportunity to recover from the stress of being sorted from pen mates

  - Pre-sorting reduces distance moved from pen to truck

  - Feed withdrawal can be implemented on all pigs

  - Little to no mixing of unfamiliar pigs
Transport Floor Space

- Utilized 72 loads of pigs (BW = 128 kg) in summer and winter to determine the effects of transport floor space on losses at the plant

Monthly Incidence of Dead Pigs at USDA Inspected Plants (2010)

Seasonal Variation in Non-ambulatory Pigs

• Rate of non-ambulatory pigs increases in the Midwest during late fall and early winter (Ellis & Ritter, 2006)

• Potential explanations:
  – Temperature stress
  – Heavier pigs
  – Increased number of pigs transported
  – Health status
  – Summer is over!
Prepare Pigs for Transport