Transport losses in market weight pigs: a review of definitions, incidence, and economic impact

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Areas to Discuss

• Definitions

• Incidence of transport losses in U.S.

• Why are transport losses important?

• Economic impact of transport losses

• Pre-disposing factors for transport losses

• Management strategies to reduce transport losses
Transport Losses in Market Weight Pigs: I. A Review of Definitions, Incidence, and Economic Impact


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

• Killed on arrival (KOAP)
  – A non-ambulatory pig that was humanely euthanized on the trailer or immediately after unloading in order to prevent suffering and distress

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

- **Fatigued pigs**
  - Pigs without obvious injury, trauma, or disease, that refuse to walk or keep up with contemporaries at any stage of the marketing process from loading at the farm to stunning at the plant

- **Injured pigs**
  - Pigs that have a compromised ability to move because of structural unsoundness or an injury sustained before or during the marketing process

The Fatigued Pig Syndrome

- 98% are HAL-1843 negative

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

- Metabolic state of acidosis
  - High blood lactate (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

Yearly Incidence of Dead Pigs at USDA Inspected Plants (1991-2008)

Calendar Year

Dead Pigs at USDA Plants, %


Yearly Incidence of Dead Pigs at USDA Inspected Plants (1991-2008)

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

Fatigued and Injured Pigs at the Plant

• A summary of 18 commercial field trials (2000-2007)
  – 4,966,419 market weight pigs
  – 29,837 trailer loads of pigs

<table>
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<tr>
<th>Plant Losses</th>
<th>Mean</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigued, %</td>
<td>0.37</td>
<td>0.05</td>
<td>1.98</td>
</tr>
<tr>
<td>Injured, %</td>
<td>0.05</td>
<td>0.04</td>
<td>0.36</td>
</tr>
</tbody>
</table>

Majority of non-ambulatory pigs are classified as fatigued

Why are transport losses important?

- Transport losses represent many growing concerns to the U.S. swine industry:
  - Animal welfare priority
  - Increased regulations
  - Proposed legislation
  - Economic losses
Animal Welfare Priority

• Reducing the incidence of transport losses and improving the well-being of pigs during transport are industry priorities

• Westland-Hallmark incident demonstrated the importance of:
  – Transporting only animals that are physically fit for transport
  – Proper handling of non-ambulatory livestock at the plant

• NPB Animal Welfare Committee and NPPC
  – Sponsored today’s swine handling and transportation forum
  – Currently developing a transport losses prevention kit
  – Funding research in the areas of pig handling and transportation
  – Developed the TQA and PQA-Plus Programs
  – Worked on capital hill to differentiate fatigued pigs from non-ambulatory cows
Welfare Audits

• AMI Plant Welfare Audits
  – Evaluates how non-ambulatory pigs are handled
  – Two of the 5 “willful acts of abuse” pertain to the handling of non-ambulatory pigs
  – These “willful acts of abuse” include:
    • Dragging conscious, non-ambulatory pigs
    • Driving normal pigs over the top of a non-ambulatory pig

• AMI Transportation Audits
  – Dr. Ashley Peterson will discuss the swine transportation audit

Increased Regulations

• USDA evaluates how non-ambulatory pigs are handled and inspects all non-ambulatory pigs for health prior to harvest

• Improper handling of non-ambulatory pigs at a processing plant can result in a USDA noncompliance report (NR)

• Inhumane acts that are considered by the USDA inspector to be of an “egregious nature” will result in suspension of inspection at the processing plant


Other Considerations

• Non-ambulatory pigs on the trailer and non-ambulatory pigs that have a low likelihood of recovering (e.g., pigs with broken legs; pigs with rectal temperatures greater than 106°F) are being euthanized to prevent suffering and distress.

• Meat from non-ambulatory animals cannot enter government food programs (e.g., school lunch programs and military commissaries).

Proposed Legislation in 2007

• Downed Animal Protection Act (H.R. 661 & S. 394)
  – Allows the Secretary of Agriculture to enforce regulations for handling and disposition of non-ambulatory livestock
  – Prevents movement of non-ambulatory livestock while animals are conscious
  – Requires non-ambulatory livestock to be humanely euthanized
  – Prohibits non-ambulatory livestock from entering the food chain

• If this bill passes, fatigued and injured pigs will have zero value!

• Dr. Jen Greiner will give us an update on the political landscape
Transport Losses – Economic Impact

• Producer
  – Complete loss of value on dead pigs
  – Potential disposal fees for dead pigs
  – Discounts on non-ambulatory pigs at the plant
    • Vary by region and plant, but can be as high as 30% of total value
  – Carcass bruising and trim loss

• Packer
  – Increased labor costs for handling non-ambulatory pigs
  – USDA and plant welfare audits evaluate how non-ambulatory pigs are handled
  – Meat from non-ambulatory pigs cannot be used in government food programs
  – Potential pork quality defects (DFD, PSE)

Transport Losses – Economic Impact

- Economic losses experienced by pork producers in 2006 for dead and non-ambulatory were calculated as follows:
  - Direct financial losses
    - Price paid for transport losses – farrow-to-finish cost of production
  - Indirect financial losses
    - Lost profit opportunities = average net profit per pig


<table>
<thead>
<tr>
<th>2006 economic assumption</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market hog statistic</td>
<td></td>
</tr>
<tr>
<td>Number of pigs slaughtered&lt;sup&gt;1&lt;/sup&gt;</td>
<td>103,688,100</td>
</tr>
<tr>
<td>Average slaughter wt.&lt;sup&gt;1&lt;/sup&gt; kg</td>
<td>122.15</td>
</tr>
<tr>
<td>Market hog production cost</td>
<td></td>
</tr>
<tr>
<td>Average farrow-to-finish break-even cost,&lt;sup&gt;2&lt;/sup&gt; $/kg</td>
<td>$0.86</td>
</tr>
<tr>
<td>Average farrow-to-finish cost of production,&lt;sup&gt;3&lt;/sup&gt; $/pig</td>
<td>$105.03</td>
</tr>
<tr>
<td>Market hog price</td>
<td></td>
</tr>
<tr>
<td>Average live price paid,&lt;sup&gt;4&lt;/sup&gt; $/kg</td>
<td>$1.03</td>
</tr>
<tr>
<td>Average pig value,&lt;sup&gt;5&lt;/sup&gt; $/pig</td>
<td>$125.50</td>
</tr>
<tr>
<td>Market hog profit</td>
<td></td>
</tr>
<tr>
<td>Average net profit,&lt;sup&gt;6&lt;/sup&gt; $/pig</td>
<td>$20.47</td>
</tr>
<tr>
<td>Price paid for dead and nonambulatory pigs</td>
<td></td>
</tr>
<tr>
<td>Dead pigs,&lt;sup&gt;7&lt;/sup&gt; $/pig</td>
<td>$0.00</td>
</tr>
<tr>
<td>Nonambulatory pigs,&lt;sup&gt;8&lt;/sup&gt; $/pig</td>
<td>$87.85</td>
</tr>
</tbody>
</table>

<sup>1</sup>Value obtained from USDA-National Agricultural Statistics Service (2007b).

<sup>2</sup>Value obtained from Meyer (2008).

<sup>3</sup>Average farrow-to-finish cost of production = average farrow-to-finish break-even cost × average slaughter weight.

<sup>4</sup>Value obtained from USDA-National Agricultural Statistics Service (2007a).

<sup>5</sup>Average pig value = average live price paid × average slaughter weight.

<sup>6</sup>Average net profit = average pig value − average farrow-to-finish cost of production.

<sup>7</sup>Assumes complete loss of value on dead pigs.

<sup>8</sup>Assumes nonambulatory pigs are discounted 30%.
Table 7. Economic impact of transport losses in market weight pigs on the US pork industry in 2006

<table>
<thead>
<tr>
<th>Variable</th>
<th>Transport losses</th>
<th>Direct financial losses</th>
<th>Indirect financial losses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average losses,(^{2,3}) %</td>
<td>Total losses,(^{4}) no.</td>
<td>Average losses,(^{5}) $/pig</td>
</tr>
<tr>
<td>Dead pigs</td>
<td>0.22</td>
<td>228,114</td>
<td>($105.03)</td>
</tr>
<tr>
<td>Nonambulatory pigs</td>
<td>0.44</td>
<td>456,228</td>
<td>($17.18)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>684,341</td>
<td>($17.25)</td>
</tr>
</tbody>
</table>

\(^1\)Values are based on the economic assumptions described in Table 6.

\(^2\)The value for percentage of dead pigs in 2006 was obtained from Figure 1.

\(^3\)The value for percentage of nonambulatory pigs in 2006 was obtained from Table 5.

\(^4\)Calculated by multiplying the percentage of dead or nonambulatory pigs by the total number of pigs slaughtered in 2006.

\(^5\)Average direct financial losses = (price paid for dead or nonambulatory pigs) - (average farrow-to-finish cost of production).

\(^6\)Total direct financial losses = (average direct financial losses) \(\times\) (number of dead or nonambulatory pigs).

\(^7\)Average in-direct financial losses = average net profit per pig (Table 6).

\(^8\)Total in-direct financial losses = (average net profit per pig) \(\times\) (number of dead or nonambulatory pigs).

Economic Impact of Transport Losses

• Ritter et al., 2009
  – Transport losses cost the U.S. swine industry ~$46 million in 2006
  – This translates to approximately $0.44 per pig marketed
Growers, loading crews, truck drivers, and handlers at the plant can impact transport losses!

Review of Pre-disposing Factors

- It is well established that transport losses are increased by:
  - HAL-1843 mutation (stress gene)
  - Aggressive handling with electric prods
  - Crowding pigs during transport
  - Extreme weather conditions

Percentage of dead pigs at USDA inspected plants by month in 2008

Seasonal Variation in the Midwest

Strategies to Reduce Transport Losses

• Implement training programs

• Create SOPs for pig handling and transportation

• Develop databases to monitor transport losses

• Better prepare pigs for transport

• Minimize stress throughout the marketing process
Overall Summary

• Transport losses represent growing animal welfare, legal, and economic concerns to the U.S. swine industry

• ~0.7% of all pigs transported die or become non-ambulatory, and this translated to economic losses of ~$46 million in 2006

• Transport losses are a multi-factorial problem and it is well established that these losses are increased by:
  – HAL-1843 mutation (stress gene)
  – Aggressive handling with electric prods
  – Crowding pigs during transport
  – Extreme weather conditions

• Strategies to reduce transport losses include:
  – Implementing training programs
  – Creating SOPs for pig handling and transportation
  – Developing databases to monitor transport losses
  – Better preparing pigs for transport
  – Minimizing stress throughout the marketing process
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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!