Transporting more dollars to the bank

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**Recommended Citation**

Ritter, Matt; Ellis, Mike; and Johnson, Anna, "Transporting more dollars to the bank" (2009). *Animal Science Conference Proceedings and Presentations.* 29.  
[https://lib.dr.iastate.edu/ans_conf/29](https://lib.dr.iastate.edu/ans_conf/29)

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Transporting more dollars to the bank

Abstract

Introduction

Transport losses in market weight pigs (dead and nonambulatory pigs) represent animal welfare, legal, and economic concerns to the US swine industry. 1 First of all, improving the well-being of pigs during transport and reducing the incidence of dead and non-ambulatory pigs are animal welfare priorities for the US swine industry. 2 Secondly, non-ambulatory livestock are the subject of increased rules and regulations. For example, United States Department of Agriculture (USDA) inspectors and plant welfare auditors evaluate how non-ambulatory pigs are handled at the packing plant. Improper handling of non-ambulatory pigs at the plant can result in a USDA non-compliance report and/or a failed plant welfare audit.3•4 Thirdly, transport losses represent direct financial losses to pork producers and packers, and these losses have been estimated to cost the US swine industry approximately $50 to $100 million annually.5 The objectives of this paper are to: 1) define transport losses; 2) estimate the US incidence of transport losses; 3) describe the symptoms and metabolic characteristics of fatigued pigs; 4) discuss pre-disposing factors for transport losses; 5) illustrate the seasonal variation in transport losses; and 6) outline management strategies to reduce these losses.

Disciplines
Agricultural Economics | Agriculture | Animal Sciences

Comments
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Introduction
Transport losses in market weight pigs (dead and non-ambulatory pigs) represent animal welfare, legal, and economic concerns to the US swine industry.¹ First of all, improving the well-being of pigs during transport and reducing the incidence of dead and non-ambulatory pigs are animal welfare priorities for the US swine industry.² Secondly, non-ambulatory livestock are the subject of increased rules and regulations. For example, United States Department of Agriculture (USDA) inspectors and plant welfare auditors evaluate how non-ambulatory pigs are handled at the packing plant. Improper handling of non-ambulatory pigs at the plant can result in a USDA non-compliance report and/or a failed plant welfare audit.³,4 Thirdly, transport losses represent direct financial losses to pork producers and packers, and these losses have been estimated to cost the US swine industry approximately $50 to $100 million annually.⁵ The objectives of this paper are to: 1) define transport losses; 2) estimate the US incidence of transport losses; 3) describe the symptoms and metabolic characteristics of fatigued pigs; 4) discuss pre-disposing factors for transport losses; 5) illustrate the seasonal variation in transport losses; and 6) outline management strategies to reduce these losses.

Terminology
Dead and non-ambulatory pigs are most commonly observed during unloading at the packing plant, but these losses can occur at any stage of the marketing process from loading at the farm to stunning at the plant.⁶ Transport losses at US packing plants include: dead on arrival, dead in yard or dead in pen, and non-ambulatory pigs. A dead on arrival refers to a pig that died during transportation. A dead in yard or dead in pen refers to a pig that died after unloading at the packing plant.⁶ A non-ambulatory pig is a pig that is unable to move or keep up with contemporaries at the plant.⁷ Several terms are used throughout the industry for non-ambulatory pigs and these include: cripples, downers, slows, stressors, and subjects. There are two types of non-ambulatory pigs observed under US commercial conditions: fatigued and injured.¹ Fatigued pigs are pigs without obvious injury, trauma, or disease that refuse to walk at any stage of the marketing process from loading at the farm to stunning at the plant.⁸ Meanwhile, injured pigs are pigs that have a compromised ability to move due to structural unsoundness or due to an injury sustained during the marketing process.⁹

US incidence of transport losses
The percentage of dead pigs at USDA inspected plants are reported by the Food Safety Inspection Service (FSIS) as "swine condemned ante-mortem for deads", and these national statistics are available to the public via the Freedom of Information Act. The yearly incidence of dead market pigs at USDA-inspected plants for the calendar years 1991 through 2007 are presented in Figure 1.¹⁰,¹¹ The incidence of dead pigs at US plants was very low in 1991 (0.08%) and 1992 (0.07%). However, the percentage of dead pigs at US plants increased three-fold between 1993 and 1998 (0.10% and 0.30%, respectively). It is unclear why this value increased over this period, but some potential explanations include changes in genetics, increased slaughter weights, and increased size production operations.⁵ From 1998 to 2001, the percentage of dead pigs peaked and remained relatively constant (range: 0.28% to 0.30%). From 2001 to 2002, the percentage of dead pigs at US plants decreased from 0.29% to 0.22%. This decrease might be attributed to greater industry awareness of losses during the marketing process. In 2002, the National Pork Board's Transport Quality Assurance™ (TQA™) program was made available, and there was a concerted focus on research that yielded important knowledge. From 2002 to 2007, the percentage of dead pigs at the plant has remained relatively constant (range: 0.21% to 0.22%).¹⁰,¹¹

Unfortunately, national statistics are not available for the percentage of non-ambulatory pigs at the plant, and thus, commercial field trials are currently our best indicator of this class of transport losses in the US. A total of 22 commercial field trials have reported data on transport losses from 27,240 trailer loads of pigs transported in the US between the years of 2000 to 2007. The results from these studies have recently been sum-

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Figure 1. Percentage of dead market pigs at USDA inspected plants for the calendar years of 1991 to 2007. 

The weighted averages for the percentage of dead pigs, non-ambulatory pigs prior to the weigh scale at the plant (the point at which ownership of the pigs normally changes from the producer to the packer), and total losses (dead and non-ambulatory) at the plant for the 22 commercial field trials (n = 4,607,567 pigs) were 0.25% for deads (range: 0.00% to 0.77%), 0.37% for non-ambulatory pigs (range: 0.11% to 2.34%), and 0.62% for total losses (range: 0.14% to 2.39%). Non-ambulatory pigs were classified as fatigued or injured in 17 of these field trials (n = 2,913,417 pigs). The weighted averages for fatigued and injured pigs were 0.24% (range: 0.05% to 1.98%) and 0.06% (range: 0.04% to 0.45%), respectively. 

Fatigued pigs – symptoms and metabolic changes

As discussed above, the majority of non-ambulatory pigs at the packing plant are classified as fatigued. A study conducted in 2002 measured several metabolic parameters in 35 normal and 35 fatigued pigs during unloading at the packing plant. Compared to normal pigs from the same trailer load, fatigued pigs had higher blood lactate, ammonia, sodium, potassium, cortisol, epinephrine, and norepinephrine concentrations, while having lower blood pH, bicarbonate, base excess, calcium, partial pressure of carbon dioxide, and insulin values. Additionally, fatigued pigs had lower liver glycogen concentrations and lower glycolytic potential values in the longissimus dorsi and semitendinosus muscles than normal pigs. These researchers concluded that fatigued pigs display signs of acute stress (open-mouth breathing, skin discoloration, and/or muscle tremors) and are in a metabolic state of acidosis. Despite these large metabolic responses to handling and transportation, recent research has demonstrated that the vast majority of stressed and fatigued pigs will recover, if the stressors are removed, and pigs are allowed to rest for 2 to 3 hours.

Pre-disposing factors for transport losses

Transport losses are a multi-factorial problem and these losses can be influenced by people (handling intensity and handling tools), pig (genetics, live weight, muscling, gender, diet, gut-fill, health status, and previous handling experiences), facility design (aisle width, distance from pen to trailer, and loading ramp design), management (pre-sorting market weight pigs prior to loading), transportation (trailer design, mixing unfamiliar pigs during transport, transport floor space, and transport time/distance), packing plant (waiting time...
prior to unloading, unloading procedures, and lairage time), and environmental factors (season, temperature, and relative humidity).\textsuperscript{1,5,7} Of these factors, it is well established that transport losses are increased by the HAL-1843 mutation (a.k.a. porcine stress syndrome, stress gene, halothane gene), aggressive handling with electric prods, crowding pigs during transport, and extreme weather conditions (heat stress and cold stress).\textsuperscript{1}

**Seasonal variation in transport losses**

It is well documented that the percentage of dead pigs at packing plants is highest during the summer months (Figure 2).\textsuperscript{10,11} However, the rates of non-ambulatory pigs and total transport losses (dead and non-ambulatory pigs) have been reported to be high during the late fall and early winter months in the Midwestern region of the US (Figure 3).\textsuperscript{14,15} It is currently unclear why the rate of non-ambulatory pigs increases during the late fall and early winter months, but some possible explanations include: temperature stress, heavier market weights, increased numbers of pigs being harvested, and possible changes to the health status of the pigs.\textsuperscript{14}

**Management strategies to reduce transport losses**

Transport losses can be influenced by growers, loading crews, truck drivers, and handlers at the packing plant. Therefore, reducing transport losses requires teamwork and communication amongst all of the parties involved in the marketing process. Management strategies to reduce transport losses include implementing training programs for handlers and drivers, better preparing pigs for transport, and minimizing stress throughout the marketing process.\textsuperscript{16}

Reductions in transport losses can be accomplished by implementing training programs and developing standard operating procedures for pig handling and transportation. The National Pork Board's TQA™ program is recognized as the swine industry's best practices for handling and transportation, and thus, all handlers and drivers should become TQA™ certified handlers. Standard operating procedures (SOPs) set the expectations and standards for a production system and are designed to ensure consistency across all loading crews and drivers. If SOPs for handling and transportation are developed, make sure that these protocols are being utilized to train all new employees. Also, it is a good practice to conduct...

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**Figure 2:** Percentage of dead market pigs at USDA inspected plants by month for the calendar years of 1991 to 2007.\textsuperscript{10,11}
Figure 3: Percentage of dead pigs, non-ambulatory pigs, and total losses at the packing plant by month (adapted from Rademacher & Davies, 2005).15

internal audits to check for compliance and to re-train handlers and drivers on any areas of non-compliance.16

Swine finishing facilities typically range in length from 200 to 400 feet and usually the loading chute is located at one end of the building. As a result, pigs from the back of the barn may have to move distances of 200 to 400 feet during loading. Therefore, swine producers need to better prepare finishing pigs for the marketing process. Strategies to better prepare pigs for load-out include walking pens daily, routinely moving pigs from their home pen to the load-out area during the grow-finish period, pre-sorting market weight pigs from pen mates prior to loading, and withdrawing feed for 16 to 24 hours prior to loading.17,18,19,20

Recent research has demonstrated that pre-harvest stressors have additive effects on the physiological responses of market weight pigs during handling and transportation, and thus, removing just one stressor during the marketing process can reduce the stress responses of the pigs.21 Just as importantly, recent research has demonstrated that the vast majority of stressed and fatigued pigs will recover after 2 to 3 hours of rest.7,13 Therefore, it has been recommended to designate a resting pen prior to loading that can be used to sort off any pigs that are showing signs of stress (open-mouth breathing, skin discoloration, and/or muscle tremors) and/or having difficulties walking.16

In order to minimize stress during loading, handlers and drivers should load pigs in groups of 4 to 6 pigs at a slow and calm pace by using sorting boards and plastic livestock paddles.1,16 It is well established that aggressive handling with electric prods increases the rate of non-ambulatory pigs.22 Therefore, electric prods should only be used as a last resort to move pigs. The acceptable number of shocks administered to market weight pigs from an electric prod during the loading process is currently unknown. Results from a recent study that utilized 16 pigs per treatment reported no differences in rectal temperature or blood acid-base values for market weight pigs moved at their own pace for 164 feet through a handling course with a plastic livestock paddle or with two shocks from an electric prod.23 However, additional research involving a larger number of pigs is necessary to confirm these results.

Strategies to minimize stress during transport include not mixing unfamiliar pigs during transport (if feasible), using transport loading densities of 55 to 58 lbs/ft², optimizing the environment inside the trailer, and avoiding unnecessary stops during transport.16,20,24 Before every load, drivers need to evaluate the weather conditions at the farm and adjust trailers accordingly in order to provide a safe and comfortable environment for the pigs during transport. For detailed information
Conclusions
It has been estimated that approximately 0.6% of all market weight pigs die during transport or become non-ambulatory at the packing plant. In other words, over 99% of the pigs transported, walk off the truck, walk through the plant and are processed without delay. Despite the large percentage of pigs that are unaffected, these transport losses have been estimated to cost the US swine industry approximately $50 to $100 million annually. These losses are a multi-factorial problem and can be influenced by growers, loading crews, truck drivers, and handlers at the packing plant. Management strategies to reduce transport losses include implementing training programs for handlers and drivers, better preparing pigs for transport, and minimizing stress throughout the marketing process.

References

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