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## Management Strategies to Reduce Transport Losses in Market Weight Pigs

### Introduction

Transport losses in market-weight pigs (dead and non-ambulatory pigs) represent animal welfare, legal, and economic concerns [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 [2]. Second, 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]. Third, transport losses represent direct financial losses to producers and packers. These losses have been estimated to cost the U.S. swine industry approximately \$50 to \$100 million annually [5].

### Objectives

- Terminology of transport losses
- U.S. incidence of transport losses
- Symptoms and metabolic characteristics of fatigued pigs
- Pre-disposing factors for transport losses
- Seasonal variation in transport losses
- 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 U.S. 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 [1]. 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 U.S. commercial conditions: fatigued and injured [1]. Fatigued pigs are pigs without obvious injury, trauma, or disease that are unable to walk or keep up with contemporaries 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].

## U.S. incidence of transport losses

### Dead pigs

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 U.S. plants was very low in 1991 (0.08%) and 1992 (0.07%). However, the percentage of dead pigs at U.S. 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 swine management practices such as the genotype of the pigs, increased slaughter weights, and increased size of production operations [5]. From 1998 to 2001, the percentage of dead pigs remained relatively constant (range: 0.28% to 0.30%). From 2001 to 2002, the percentage of dead pigs at U.S. 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 regarding factors associated with deaths during transportation. From 2002 to 2007, the percentage of dead pigs at the plant has remained relatively constant (range: 0.21% to 0.22%) [10-11].

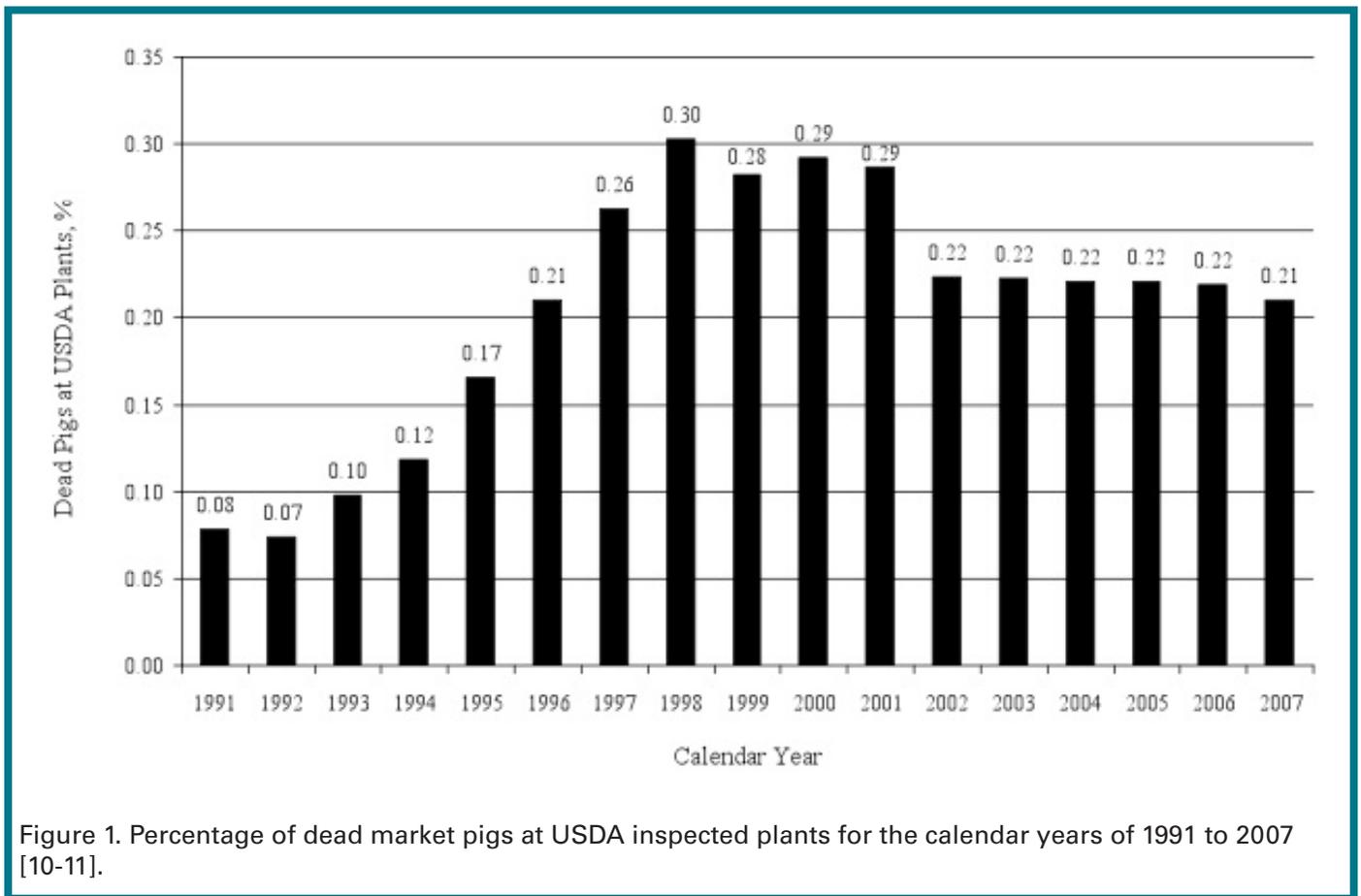


Figure 1. Percentage of dead market pigs at USDA inspected plants for the calendar years of 1991 to 2007 [10-11].

### Non-ambulatory pigs

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 estimate of the incidence of this class of transport losses in the U.S. A total of 23 commercial field trials have reported data on transport losses. These studies included data from 39,572 trailer loads of pigs transported in the U.S. between the years of 2000 to 2007. The results from these studies have recently been summarized [1]. The weighted averages for the incidences 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 from these commercial field trials (n = 6,660,569 pigs) were 0.25% for deads (range: 0.00% to 0.77%), 0.44% for non-ambulatory pigs (range: 0.11% to 2.34%), and 0.69% for total losses (range: 0.14% to 2.39%). Non-ambulatory pigs were classified as fatigued or injured in 18 of these field trials (n = 4,966,419 pigs). The weighted averages for fatigued and injured pigs were 0.37% (range: 0.05% to 1.98%) and 0.05% (range: 0.04% to 0.36%), respectively [1].

## Fatigued pigs – symptoms and metabolic changes

As discussed above, the majority of non-ambulatory pigs at the packing plant are classified as fatigued [1]. Fatigued pigs display signs of acute stress (open-mouth breathing, skin discoloration, and/or muscle tremors) and are in a metabolic state of acidosis characterized by low blood pH and high blood lactic acid values [7, 12]. Also, fatigued pigs may have elevated body temperatures [13]. 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 [7, 14].

## Pre-disposing factors for transport losses

Transport losses have been shown to be influenced by a multitude of factors including 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) [1, 5, 7]. 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) [15]. However, recent work has demonstrated that the incidence of the HAL-1843 mutation is very low in the U.S. commercial pig population and, thus, the HAL-1843 mutation is not a major cause of transport losses in the U.S. [16].

## 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) [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 U.S. (Figure 3) [17-18]. 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: cold stress, heavier market weights, increased numbers of pigs being harvested, and possible changes in the health status of the pigs [17].

## 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 [19].

### Implement training programs

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. 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, these protocols should be utilized to train all new employees. Also, it is a good practice to conduct internal audits to check for compliance and to re-train handlers and drivers for any areas of non-compliance [19].

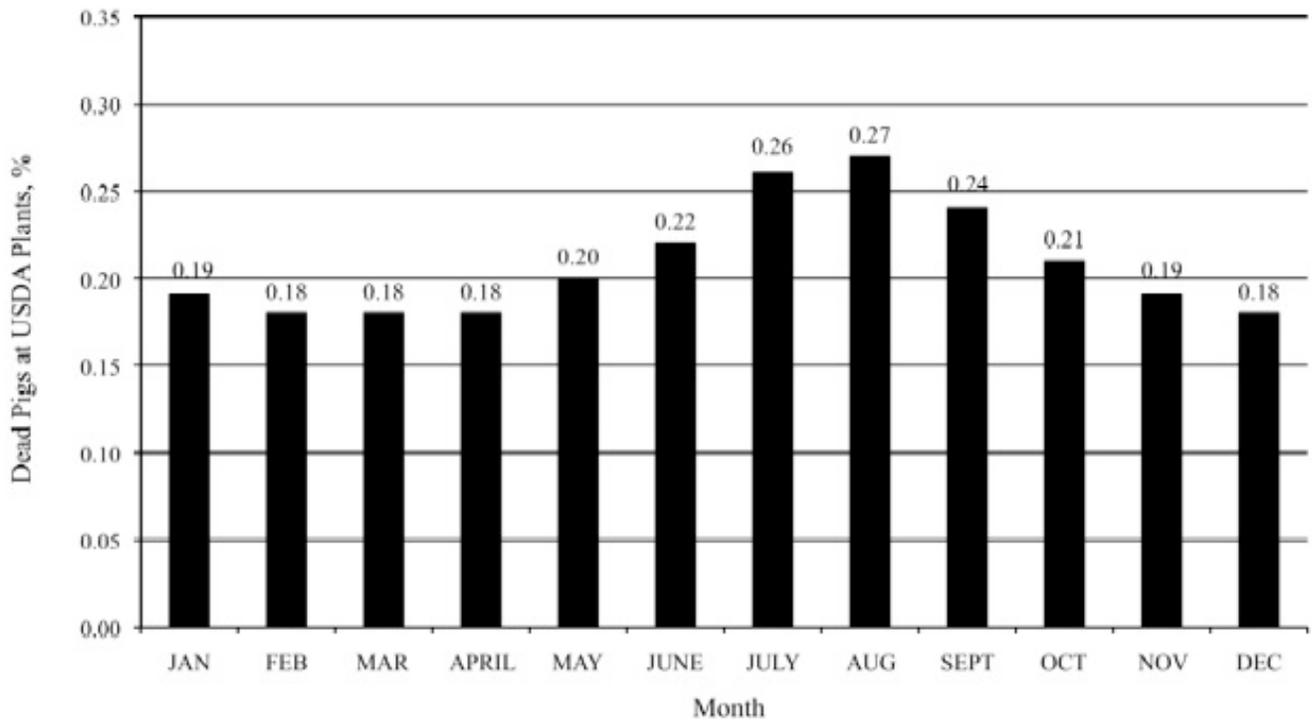


Figure 2. Percentage of dead market pigs at USDA inspected plants by month for the calendar years of 1991 to 2007 [10-11].

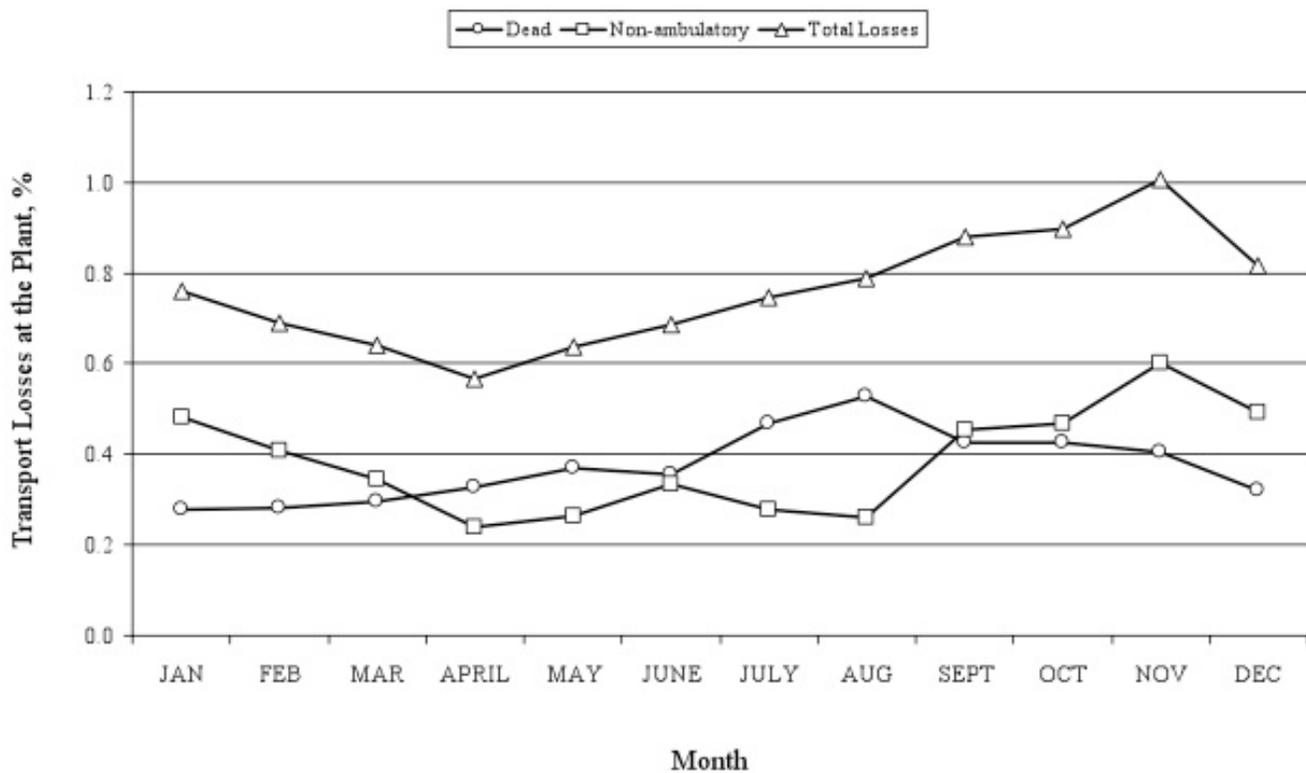


Figure 3. Percentage of dead pigs, non-ambulatory pigs, and total losses (dead and non-ambulatory pigs) at the packing plant by month (adapted from Rademacher & Davies, 2005) [18].

### **Prepare pigs for transport**

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 [20-23].

### **Minimize stress throughout the marketing process**

Recent research has demonstrated that pre-harvest stressors can 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 [24]. Also, recent research has demonstrated that the vast majority of stressed and fatigued pigs will recover after 2 to 3 hours of rest [7, 14]. Therefore, it has been recommended to designate a resting pen close to the loading facilities 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 [19].

*Minimize stress during loading.* 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 using sorting boards and plastic livestock paddles [19]. It is well established that aggressive handling with electric prods increases the rate of non-ambulatory pigs [25]. Therefore, electric prods should only be used as a last resort to move pigs.

*Minimize stress during transportation.* Strategies to minimize stress during transport include avoiding the mixing of unfamiliar pigs during transport (if feasible), using transport stocking densities of 55 to 58 lbs/ft<sup>2</sup>, optimizing the environment inside the trailer (i.e., boarding, bedding, and showering practices), and avoiding unnecessary stops during transport [19, 23, 26]. 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 on proper trailer settings, see the National Pork Board's TQA™ Handbook [27].

## **Summary**

It has been estimated that approximately 0.7% of all market weight pigs die during transport or become non-ambulatory at the packing plant [1]. In other words, over 99% of the pigs transported are marketed and processed without any problems. Despite the large percentage of pigs that are unaffected, these transport losses have been estimated to cost the U.S. swine industry approximately \$50 to \$100 million annually [5]. These losses have multi-factorial causes 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.

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