

## PORK QUALITY

**Title:** Pork Supply Chain Audit, NPB Project #16-115

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**Industry Summary:** The pork supply chain audit surveyed pork processing companies to identify factors that influence quality within their systems. This particular audit focused on the slaughter and fabrication segment of the industry. All federally inspected major pork packers were provided the opportunity to participate. Unlike previous audits, companies were reluctant to share information making summarization of data difficult. Overall, live and carcass weights have increased since the 2003 supply chain audit. In 2016, live weights were 134.4 kg and HCW was 115.3 kg. This represents a 15.3% increase in the last 13 years. Likewise, hams, loins, and Boston butts also increased. Belly weights remained the same. Pork quality is still determined at the packer level using the same historical tools as reported in the 2003 audit. Packers continue to monitor loin muscle pH and evaluate color using visual and instrumental tools. Pale, soft, and exudative pork was among the issues cited in the 2003 supply chain audit that created challenges with consumer acceptability. In 2003, 15.5% of all loins were identified as PSE. Likewise, 1.9% were identified as DFD. Currently, 1.3% of loins are identified as being PSE and 1.3% are identified as DFD. Value from organ meats are captured by various companies and the majority of those are exported. However, most participants in the audit were reluctant to disclose what percentage of by-products were sold nor were they willing to provide information on what percentage were marketed domestically or internationally. Likewise, belly thickness and fat quality were identified in both the 1992 audit and the 2003 audit as challenges to the pork industry. Even though questions were asked about fat quality monitoring programs were posed, companies were hesitant to provide any information regarding those monitoring procedures. Overall, pigs are heavier than they were in 2003, but it appears packers are considerably less willing to share information about their system. This made comparisons among past and present quality audits very difficult.

**Keywords:** Audit, Quality, Qualtrics, Survey, Supply chain

**Scientific Abstract:** The United States pork industry is constantly evolving, and the information available in the supply chain audits published in 1996 and 2003 are now out of date and may no longer be relevant to the industry. This puts key influencers in our industry in a position to potentially make misguided management decisions when it comes to quality and nonconformity issues. The lack of an updated resource limits the ability, as an industry, to position pork as a center of the plate meal option for domestic consumers and prevents further development of our export markets. The pork supply chain audit surveyed pork

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processing companies to identify factors that influence quality within their systems. All federally inspected major pork packers were provided the opportunity to participate. However, unlike previous audits, companies were reluctant to share information making summarization of data difficult. A survey was written in Qualtrics Survey Software that asked packers to provide information about their particular systems. The audit followed the same format used in the previous two supply chain audits. Each participating collaborator was asked to fill out the survey on an individual plant basis using either corporate records or quality control resources. Overall, live and carcass weights have increased since the 2003 supply chain audit. In 2016, live weights were 134.4 kg and HCW was 115.3 kg.

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### **Introduction:**

The United States pork industry is constantly evolving, and the information available in the supply chain audits published in 1996 and 2003 may now be out of date and no longer relevant to the industry. This puts key influencers in the pork industry in a position to potentially make misguided management decisions when it comes to quality and nonconformity issues. The lack of an updated resource limits the ability, as an industry, to position pork as a center of the plate meal option for our domestic consumers and prevents further development of our export markets.

This project attempted to address the key components of nonconformities from the 2003 Pork Quality Audit. The overarching objective was to continue the mission outlined by the 1996 Pork Quality Audit, which was to identify factors affecting the quality of pork, to determine incidence of quality nonconformities, and to quantify numerically and monetarily the incidence of quality defects in the U.S. pork supply. The quality audit attempted to involve collaborators from the meat industry that represent over 75% of the pigs slaughtered in the United States and update the information gained from the initial pork chain quality audits (1996 and 2003). However, many packers were hesitant to participate and therefore provided limited or no information. Even so, the audit attempted to summarize data from each collaborator on carcass characteristics, defects, meat quality, drop value, and other relevant topics identified during the audit and compare that with data with those collected in Benchmarking Value in the Pork Supply Chain reports published in 1996 and 2003.

### **Objectives:**

**Objective 1:** Compare information collected during the 1996 and 2003 audit with data collected in the 2016 audit.

**Objective 2:** Conduct an economic loss assessment based on identified quality issues and carcass nonconformities.

**Objective 3:** Add further processed product and by-product quality to the supply chain audit.

### **Materials & Methods:**

A survey was written in Qualtrics Survey Software that asked packers to provide information



*Marketing programs* - Proportions of domestic and exported product by primal and subprimal piece

Value added or premium based programs and what proportions are being used to add value such as: **Antibiotic free, free range, ractopamine free, Improvest treated, sow housing programs, locally raised, quality premiums such as color or marbling specifications, other value added programs**

### Results and Discussion:

Pigs in the 2016 National pork supply chain audit traveled approximately 2.5 hours from the farm to the processing facility in trucks with an average of 154 pigs on each truck. Reported dead on arrivals were 0.61% and fatigued pig rates were reported as 0.70%. The average lairage time spent at the plant prior to slaughter is 4.5 hours. Reported ranges were from less than 2 hours to up to 10 hours. This is consistent with the 2003 supply chain audit. In 2003, 43% of all pigs were lairaged between 3 and 5 hours. Pigs are walked an average of 3.28 meters from the pens to the stunning area and are immobilized with via electrical stunning or CO<sub>2</sub> asphyxiation. The average time from immobilization of the pigs until the carcasses reach the cooler is 39 minutes. Carcasses are chilled either in blast chillers or spray chillers.

**Table 1.** National pork supply chain audit estimates of carcass traits from U.S. market hogs.

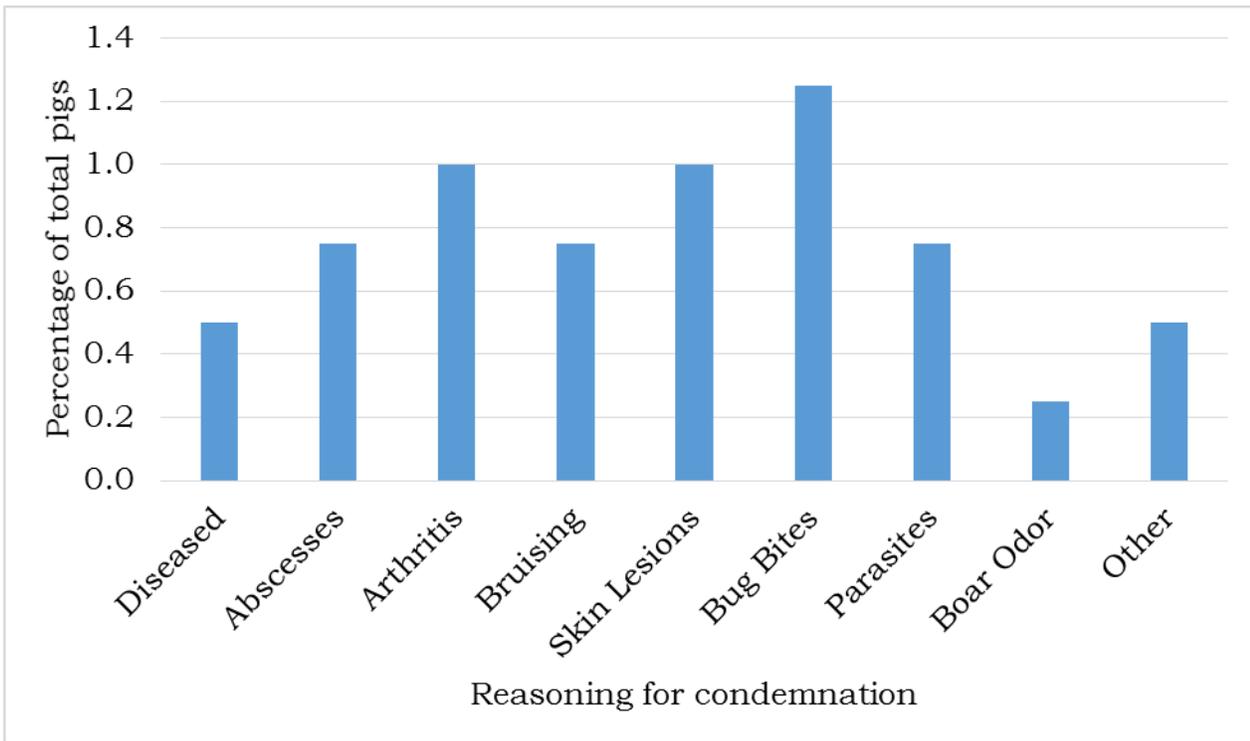
Trait	Mean		
	1993	2003	2016
Live wt, kg	111.2	116.0	134.4
Hot carcass weight, kg			115.3
Backfat thickness, mm	27.5	17.6	
Carcass muscle, %	49.5	55.5	
Ham weight, kg	9.9	11.8	13.6
Loin weight, kg	7.8	9.5	11.4
Boston butt weight, kg	2.8	2.7	6.4
Picnic weights, kg			6.4
Belly weight, kg	6.7	6.8	6.5

Overall, live and carcass weights have increased since the 2003 supply chain audit. In 2016, live weights were 134.4 kg and HCW was 115.3 kg. This represents a 15.3% increase in the last 13 years. Likewise, hams, loins, and Boston butts also increased. Belly weights remained the same.

**Table 2.** National pork supply chain audit estimates of loin quality.

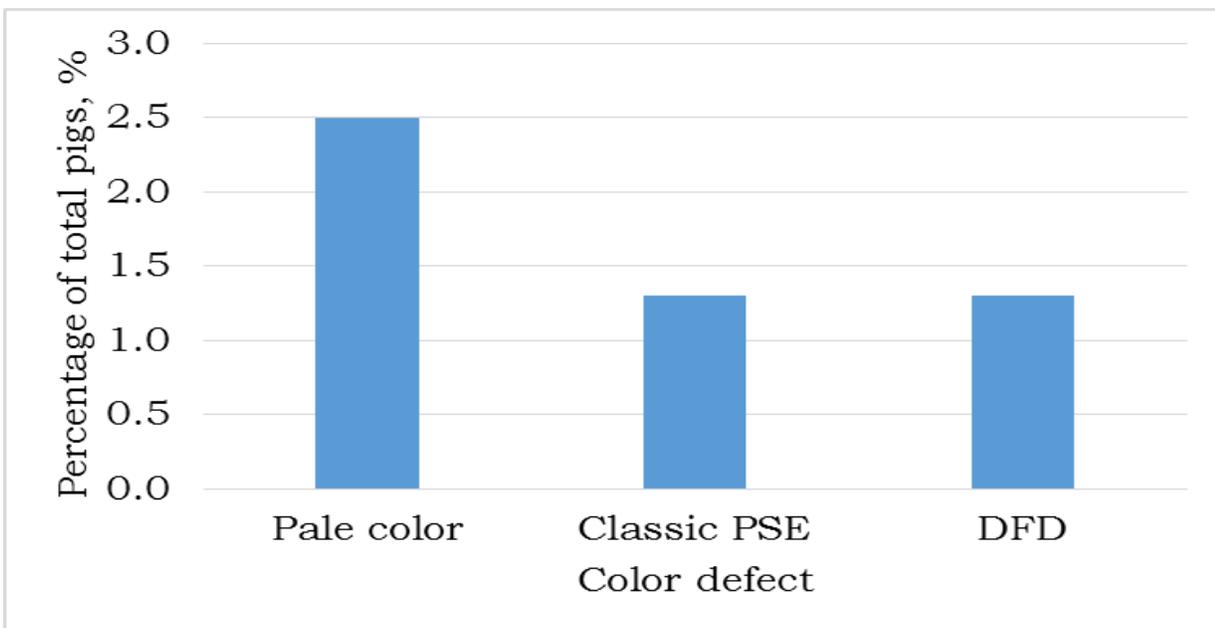
Trait	Avg. reported value
Ultimate pH <sup>1</sup>	5.74
Lightness, L*	46
NPPC color	3.0
NPPC marbling	3.0

<sup>1</sup>pH values collected between 20 and 24 h postmortem.



**Figure 1.** National pork supply chain audit percentage of pigs or carcasses condemned due to nonconformity.

Nonconformities were decreased in the 2016 audit relative to the 2003 audit. Currently, bug bites results in the greatest percentage of pigs being condemned, but only represents 1.3% of the total population. This is dramatically different than reported estimates from 2003. In 2003, 52% of pigs were condemned due to issues with disease. Arthritis and skin lesions each represented a 1% incidence rate of condemnation of carcasses.



**Figure 2.** National pork supply chain audit percentage of loins identified as pale, classical PSE, or DFD.

In 2003, 15.5% of all loins were identified as PSE. Likewise, 1.9% were identified as DFD. Currently, 1.3% of loins are identified as being PSE and 1.3% are identified as DFD.