

Overview of Transport Losses

ELANCO Animal Health

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Areas to Discuss

- Definitions
- Why are transport losses important?
- Fatigued pigs
 - Incidence
 - Symptoms
 - Metabolic characteristics
 - Recovery?
 - Pre-disposing factors
- What can you do to reduce transport losses?

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Terminology

- Deads on arrival (DOA):
 - Pigs that die during transport
- Non-ambulatory pig:
 - A pig unable to rise and move or keep up with contemporaries
 - Downers, subjects, slows, fatigued, injured
- Transport losses:
 - Deads on arrival and non-ambulatory pigs at the plant

Anderson, D. B., D. J. Ivers, M. E. Benjamin, H. W. Gosyon, D. J. Jones, K. D. Miller, R. K. McGuffey, T. A. Armstrong, D. H. Mowry, L. F. Richardson, R. Sereitz, J. R. Wagner, L. E. Watkins, and A. G. Zimmermann. 2002. Physiological responses of market hogs to different handling practices. Pages 399-400 in Proceedings of the American Association of Swine Veterinarians, Kansas City, MO. SBU2044

Classifying non-ambulatory pigs



Fatigued
Non-ambulatory, non-injured
(Stress related)



Injured
Non-ambulatory, injured
(Structure/injury related)

Ellis, M., F. McKeith, and M. Ritter. 2004. Handling Non-Ambulatory Pigs. Proceedings of the International Meat Animal Welfare Research Conference, Kansas City, MO. SBU2044

Overview of Transport Losses

- Not a new issue to the industry (stress gene)
- Losses can occur at any stage of the marketing process
- Transport losses represent many growing concerns:
 - Animal Welfare
 - Legal
 - Economic

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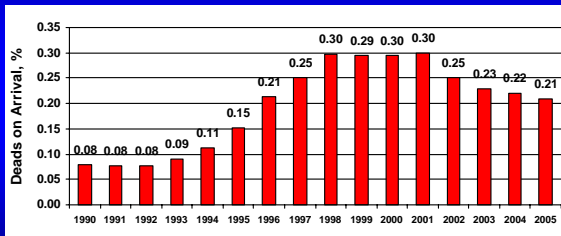
Potential Legal Issue

- Downed Animal Protection Act
 - (H.R. 2519 & S. 1298)
 - Allows the Secretary of Agriculture to enforce regulations for handling and disposition of non-ambulatory livestock
 - Prevents movement of non-ambulatory livestock while these animals are conscious
 - Requires non-ambulatory livestock be humanely euthanized
 - Prohibits non-ambulatory livestock from entering the food chain

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(www.house.gov)

U.S. Incidence of Deaths (1990-2005)



(FSIS, 1990 -2005)

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Incidence of Non-ambulatory Pigs?

- National statistics are not available
- Field studies suggest ~ 0.2% to 1.0%
- Ratio of fatigued to injured = ~2:1
- Total transport losses = ~0.5 to 1.3%

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Ellis, M., and M. Ritter. 2006. Impact of season on production: transport losses. Pages 205-207 in Proceedings of the Allen D. Lemun Swine Conference 2006, St. Paul, MN.

Economic Impact of Transport Losses

- Economic losses associated with:
 - Producer
 - Loss of value on DOAs
 - Severe discount on non-ambulatory pigs at the plant
 - Pig/carcass disposal fees?
 - Carcass trim loss and bruising
 - Packing Plant
 - Increased labor costs for handling non-ambulatory pigs
 - Pork quality defects (DFD, PSE)
 - **Negative public perception**

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Ellis et al., 2005; Ellis, M., F. M. Keith, D. Hamilton, T. Burrell, and M. Ritter. 2003. "Analysis of the current situation: what do downers cost the industry and what can we do about it?" Pages 1-3 in Proceedings of the 4th American Meat Science Association Pork Quality Symposium, Columbia, MO.

Ritter, M., M. Ellis, M. Benjamin, E. Berg, P. Dalbois, J. Marchant-Foote, A. Green, P. Marzai, P. Morimoto, T. Moyer, K. Pilaygrat, M. Siemens, J. Sterle, T. Whiting, B. Wolter, and A. Johnson. 2005. The fatigued pig syndrome. *Journal of Animal Science*. 83(Suppl. 1):258. (Abstr.)

Symptoms and Metabolic Characteristics of Fatigued Pigs

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Fatigued Pig Symptoms

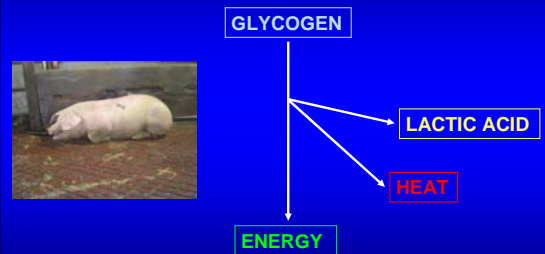
Normal Pig
 ↓ Stress
 Open-Mouth Breathing
 Skin Discoloration
 Refuse to move
 ↓ Stress
 Abnormal Vocalization
 Muscle Tremors
 Collapse = Fatigued
 ↓ Stress
 Death



Ritter, M., M. Ellis, M. Benjamin, E. Berg, P. Dalbois, J. Marchant-Foote, A. Green, P. Marzai, P. Morimoto, T. Moyer, K. Pilaygrat, M. Siemens, J. Sterle, T. Whiting, B. Wolter, and A. Johnson. 2005. The fatigued pig syndrome. *Journal of Animal Science*. 83(Suppl. 1):258. (Abstr.)

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Muscle Energy Metabolism



Hedrick, H. B., E. D. Aberle, J. C. Forrest, M. D. Judge, and R. A. Merkel. 1994. Principles of Meat Science, Third Edition. Kendall/Hunt Publishing Company, Dubuque, IA.

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Metabolic Changes in Fatigued Pigs

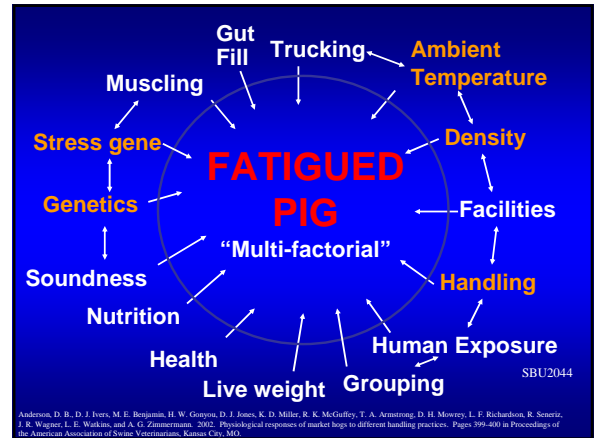
- **Fatigued pigs are in a metabolic state of acidosis**

- High blood lactic acid
 - >20 mmol/L
- Low blood pH
 - 6.9-7.2
- High body temperature?



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Handling



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Handling

- Benjamin et al., 2001
 - Compared aggressive vs. gentle handling in pigs
 - Aggressive: pigs moved rapidly with hot shots
 - Gentle: pigs moved at their own pace with plastic cane
 - 54 pigs per treatment

Handling	Lactic acid, mmol/L	Fatigued, %
Gentle	4.0 ^a	0.0 ^a
Aggressive	25.2 ^b	20.4 ^b

Benjamin, M. E., H. W. Gonyou, D. J. Ivers, L. F. Richardson, D. J. Jones, J. R. Wagner, R. Senciz, and D. B. Anderson. 2001. Effect of animal handling method on the incidence of stress response in market swine in a model system. *Journal of Animal Science*. 79(Suppl. 1):279. (Abstr.)

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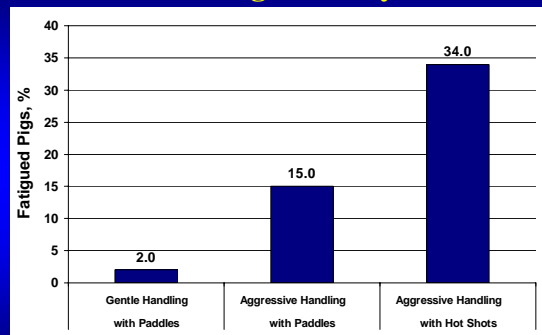
Handling Intensity

- Gonyou (2004) compared moving pigs through a handling course with 3 different handling intensities:

- Gentle handling with livestock paddles
 - Pigs were moved at their own pace
- Aggressive handling with livestock paddles
 - Pigs were encouraged to move rapidly
- Aggressive handling with hot shots
 - Pigs were encouraged to move rapidly

ELANCO Study #APFC0101

Handling Intensity



(Gonyou, 2004)

ELANCO Study #APFC0101

Group Size

- Lewis & McGlone, 2007
 - Compared moving pigs through a handling course in groups of 1 to 10 pigs
 - Key findings:
 - Positive linear relationship between group size and:
 - Heart rate
 - Subjective handling score (more difficult to handle)
 - Time to complete the handling course
 - Conclude that the optimal group size is 5-6 pigs

Lewis, C. R. G., and J. J. McGlone. 2007. Moving finishing pigs in different group sizes: Cardiovascular responses, time, and ease of handling. *Livestock Science*. 107:86-90.

Handling Summary

- Stress responses are minimized when pigs are:
 - Moved with livestock paddles
 - Moved at their pace
 - Moved in small groups
 - Note: optimal group size is dependent upon aisle width

It isn't just handling!

- Handling is critical **BUT!**
- There are many potential stressors that a pig experiences during transportation
- The fatigued pig is a **MULTIFACTORIAL PHENOMENON**

Genetics



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Porcine Stress Syndrome (Stress Gene)

- PSS is associated with deaths during routine handling and transportation
- PSS pigs have similar symptoms to fatigued pigs:
 - Tail and muscle tremors
 - Open-mouth breathing
 - Skin discoloration
 - Increased body temperature
 - Extreme acidosis
 - Collapse
 - Death



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Topel, D. G., E. J. Bicknell, K. S. Preston, L. L. Christian, and C. Y. Matsushima. 1988. Porcine stress syndrome. *Modern Veterinary Practice*. 49:40-41 and 59-60.

Topel, D. G., and L. L. Christian. 1981. Porcine stress syndrome. Pages 647-655 in *Diseases of Swine*, 5th Edition. A. D. Lemna, R. D. Church, W. F. Mullanbach, B. H. Pinner, E. C. Cook, and B. Green, ed. The Iowa State University Press, Ames, IA.

Impact of PSS on Transport Losses

Study	Country	Negative	Carrier	Positive
Fàbrega et al., 2002	Spain	0.02	0.09	2.29
Murray & Johnson, 1998	Canada	0.05	0.27	9.20
McPhee et al., 1994	Australia	0.30	2.20	17.5

- Murray & Johnson, 1998
 - Only 10% of the pigs in Canada carried the stress gene, but the stress gene was responsible for 53% of transport deaths

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Fàbrega, E., A. Diez, D. Carrón, J. Font, and X. Mantecò. 2002. Effect of the halothane gene on pre-slaughter mortality in two Spanish commercial pig abattoirs. *Animal Welfare*. 11:449-452.

Murray, A. C., and C. P. Johnson. 1998. Impact of the halothane gene on muscle quality and pre-slaughter deaths in Western Canadian pigs. *Canadian Journal of Animal Science*. 78:543-548.

What can you do to minimize losses?

- Management
 - Promptly treat sick pigs
 - Correctly identify market weight pigs
- Facility design
 - Use aisle widths of 32" or greater
 - Minimize distance pigs are moved
 - Minimize the number of 90° turns
 - Use loading chutes with ramp angles of 10° or less
 - Replace broken cleats on loading chutes
 - Replace light bulbs regularly

Minimize Stress During Loading

- Move 4-6 pigs at a time using a normal walking pace
- Minimize the use of "hot shots"
- Load pigs farthest from truck on middle or bottom deck
- Load difficult pigs only if walking normally
- Ask yourself "Does this pig really have to go today?"
- If pig needs to be loaded, try to load in last compartment on trailer at a reduced capacity

Preparing Pigs for Transport



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Preparing 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)
- Shower pigs prior to transport in the summer

Overall Summary

- Transport losses represent growing animal welfare, legal, and economic concerns to the U.S. swine industry
- ~1% of all pigs transported die or become non-ambulatory
- Transport losses can occur at any stage of the marketing process and are multi-factorial
- It is well established that transport losses are increased by:
 - Aggressive handling
 - Porcine stress syndrome (stress gene)
 - Crowding pigs during transport
 - Extreme weather conditions

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Overall Summary

- Transport losses can be reduced at the farm by:
 - Promptly treating sick pigs
 - Correctly identifying market weight pigs
 - Improving facility designs
 - Minimizing stress during loading
 - Preparing the pig for transport

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