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CCSAW

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IMPROVING LIFE

The Campbell Centre for the **Study of Animal Welfare**

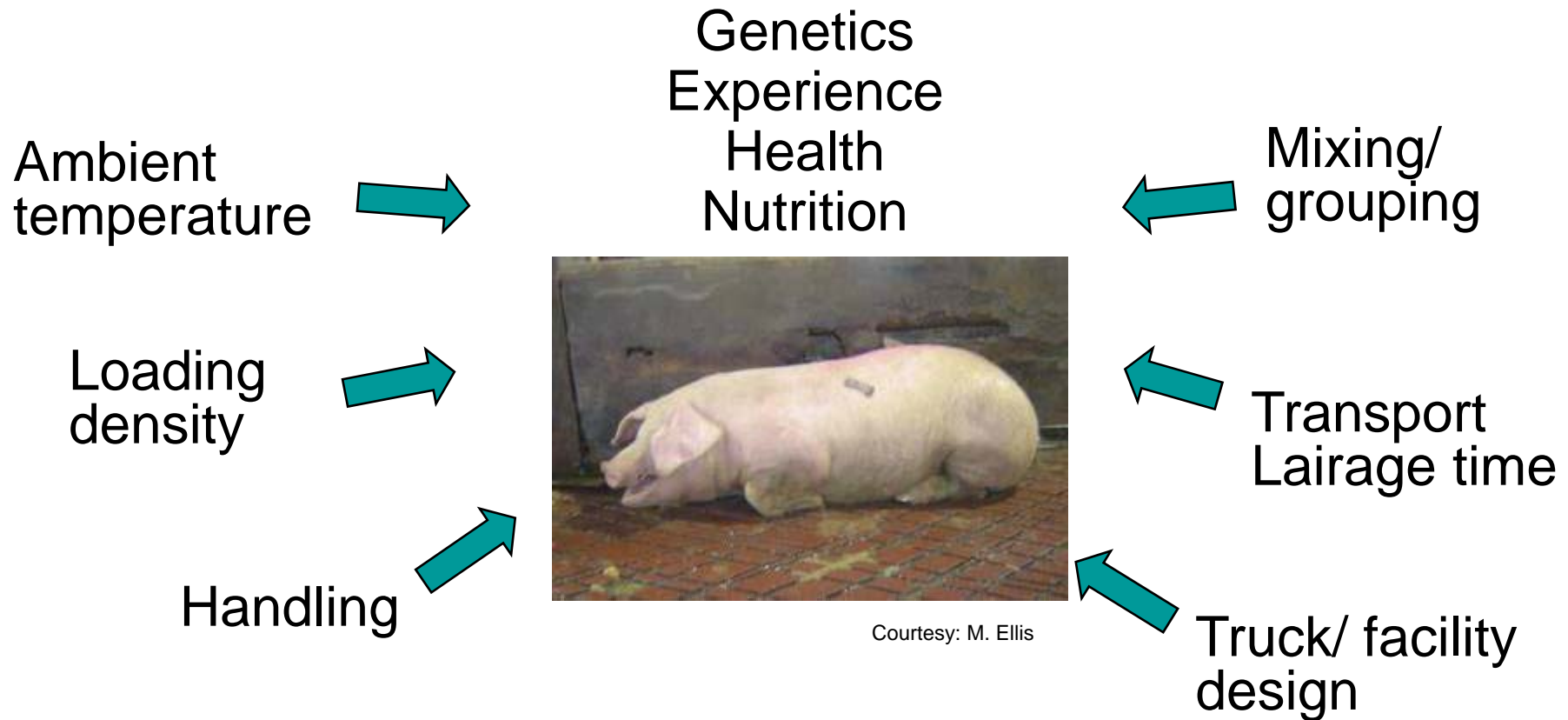
Effects of Handling Procedures and Transport Conditions on Welfare and Meat Quality of Pigs

Tina Widowski

Department of Animal & Poultry Science, University of Guelph

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-
- ~31.5 million pigs were marketed in Canada in 2008 (Stats Canada)
 - Most of these were transported to reach their end market
 - Estimated 0.08 - 0.22% of them died before reaching their destination (Haley et al, 2008)
 - Many more experienced non-fatal stress

Factors Affecting the Stress Response



... Multifactorial



Pot-belly Truck



Recent & ongoing research

- Epidemiological studies on mortality
- Focused studies on behaviour, physiology and meat quality due to
 - Trailer design and transport conditions
 - Pigs and handling practices

In-Transit Losses

Researchers

- Charles Haley
- Cate Dewey
- Bob Friendship
 - Department of Population Medicine, Ontario Veterinary College, University of Guelph
- Tina Widowski

Factors Associated with In-Transit Losses of Market Pigs in Ontario 2001

(Haley et al, CJVR, 2008)

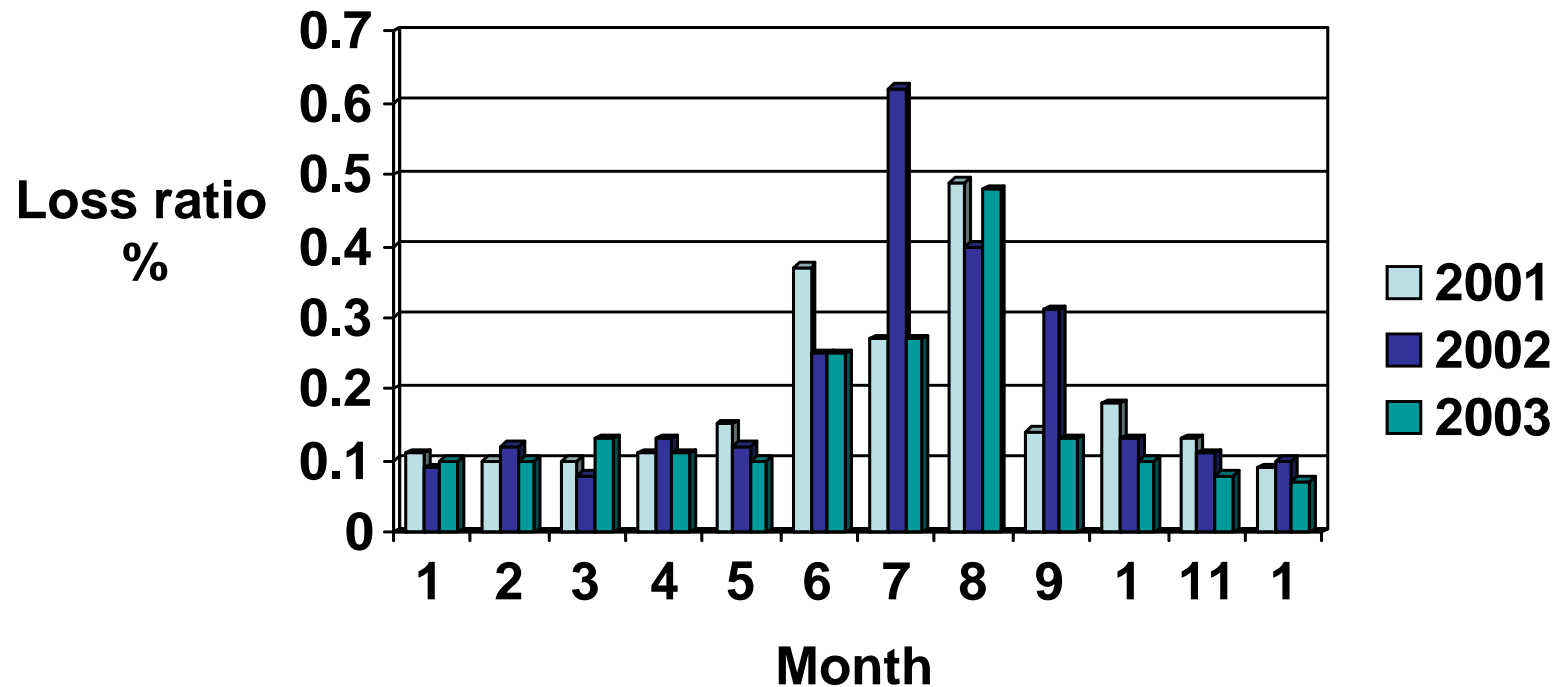
- Retrospective study of transport records from all pigs marketed in Ontario
- 4.76 million pigs from 4159 producers, marketed through 117 transport companies to 33 abattoirs in Canada and USA
- Pigs shipped to Ontario (82%), Quebec (13%), USA (4%), Manitoba (0.08%)

Factors Associated with In-Transit Losses of Market Pigs in Ontario 2001

(Haley et al, CJVR, 2008)

- In-transit loss = 0.017% (16.7/10,000 pigs)
- **Farm of origin (25%)** > abbatoir (16%) > transporter (8%) explained variance in losses
- **Temperature-humidity index** (combination of temperature and humidity) was highly predictive of losses

Transport Losses of Market Pigs in Ontario 2001-2003



The highest losses in occurred in July 2003 - coincided with highest environmental temps (avg. 30.1°C)

Pan-Canadian Pig Transport Project

Effects of Vehicle Design & Handling Procedures

RESEARCHERS:

Harold Gonyou (Lead) - Prairie Swine Centre, Saskatchewan

Luigi Faucitano (Lead), Agriculture Canada, Quebec

Renee Bergeron, Alfred College, Ontario

Trever Crowe, University of Saskatchewan

Laurie Connor, University of Manitoba

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Stephanie Torrey, Agriculture Canada, Quebec

Tina Widowski, University of Guelph

GRADUATE STUDENTS:

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Field Studies

Eastern Trials (Quebec)

Short hauls (2 hours)

June-July 2007 and Feb-March 2008

2 different trailer designs

Western Trials (Saskatoon to Brandon)

“Long” hauls (6 hours driving + 2 hours driver rest period)

Jan-Feb 2008 and June-July 2008

Eastern Trials(Quebec)

2 Trailer Designs

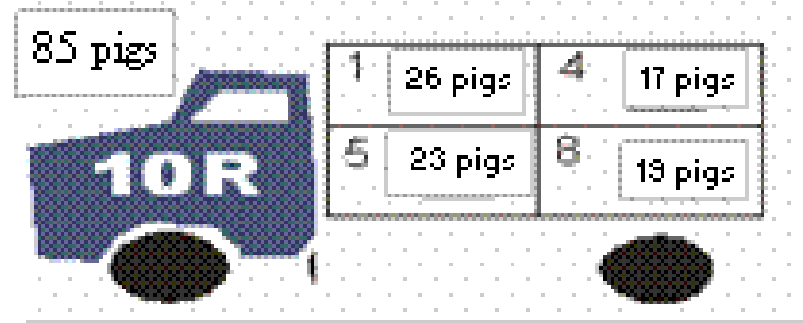
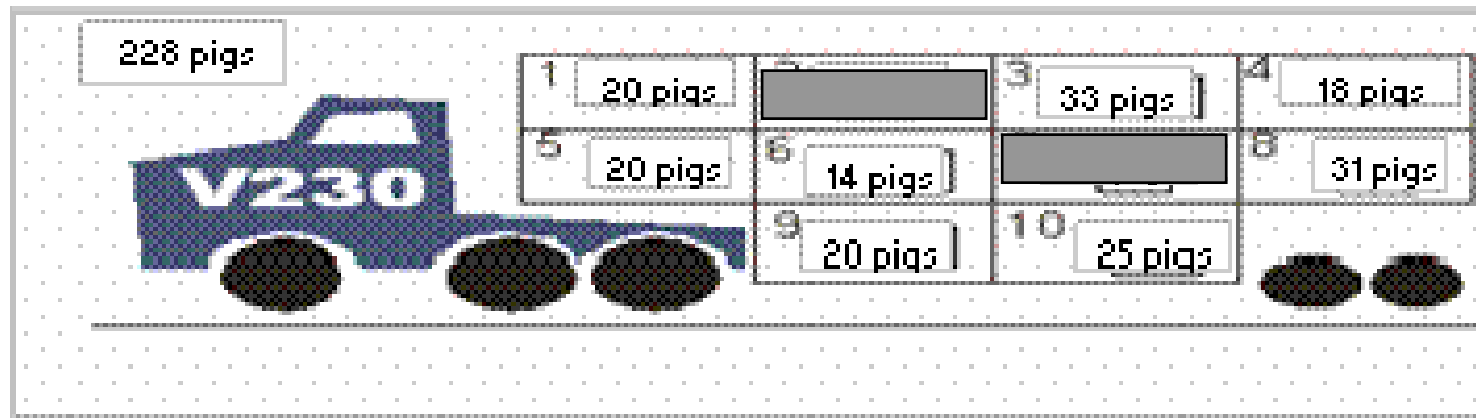
3-deck pot belly (V230)



2-deck hydraulic lift (10R)

Eastern Trials(Quebec)

2 Trailer Designs



- 6 weekly trials each season
- 313 pigs shipped each week (~118 kg)

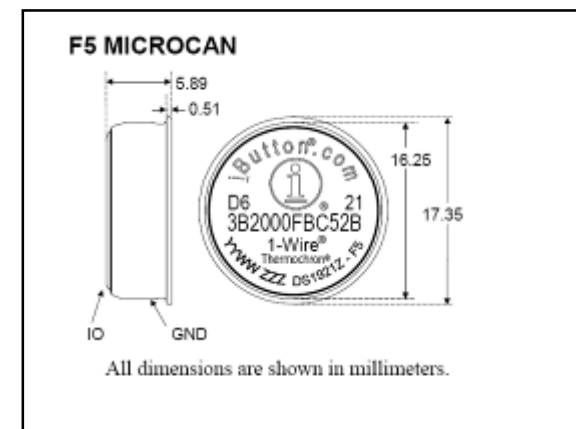
Environmental Temperature



iButtons were suspended from the ceiling in several locations within each compartment

The iButton Data Logger

- Technology developed by Dallas SemiConductor™
- Used in poultry transport (*Crowe, unpublished data*)
- Used once in Missouri for pig transport (*Carr et al 2008,*)
- 17mm X 6mm stainless steel can
- 15 - 46°C range, 0.125°C accuracy
- 2048 loggings, adjustable timing



Behaviour



Behaviour



Behaviour

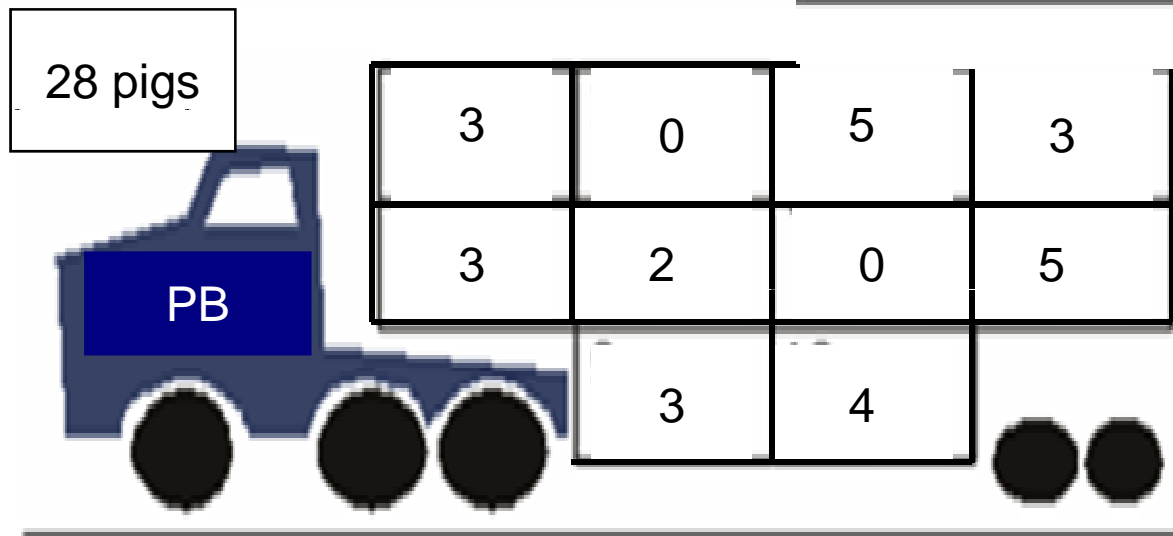
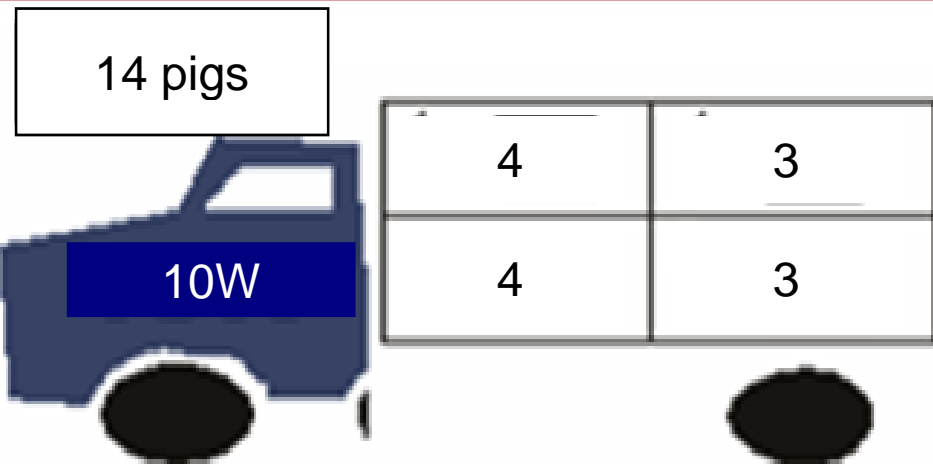


Behaviour



Number of Pigs Sampled Weekly

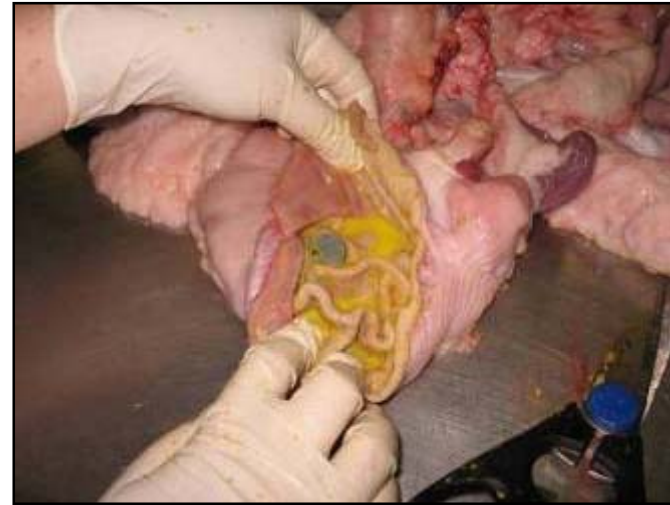
$$14 + 28 = 42$$



Heart Rate



Core Body Temperature



iButton administered orally
and then recovered from
viscera at slaughter

Blood Measures & Meat Quality

Stress Measures
Creatine phosphokinase (CPK)
Lactate
Cortisol



Loin & Ham
pH
Lightness
Drip Loss
Meat Quality Classification



Data Collection Team



Data Collection



Preparation Procedure

Twelve hours prior to loading pigs were:

- weighed
- belted for heart rate measurement
- iButton administered
- ear tagged and individually tattooed
- mixed into shipping pens



Transport Process

- Loading began at 3am
- Duration of loading 3.5 to 4 hours (PB always loaded first)
- No prod usage
- The duration of transport was two hours
- Both trucks left the farm and travelled together

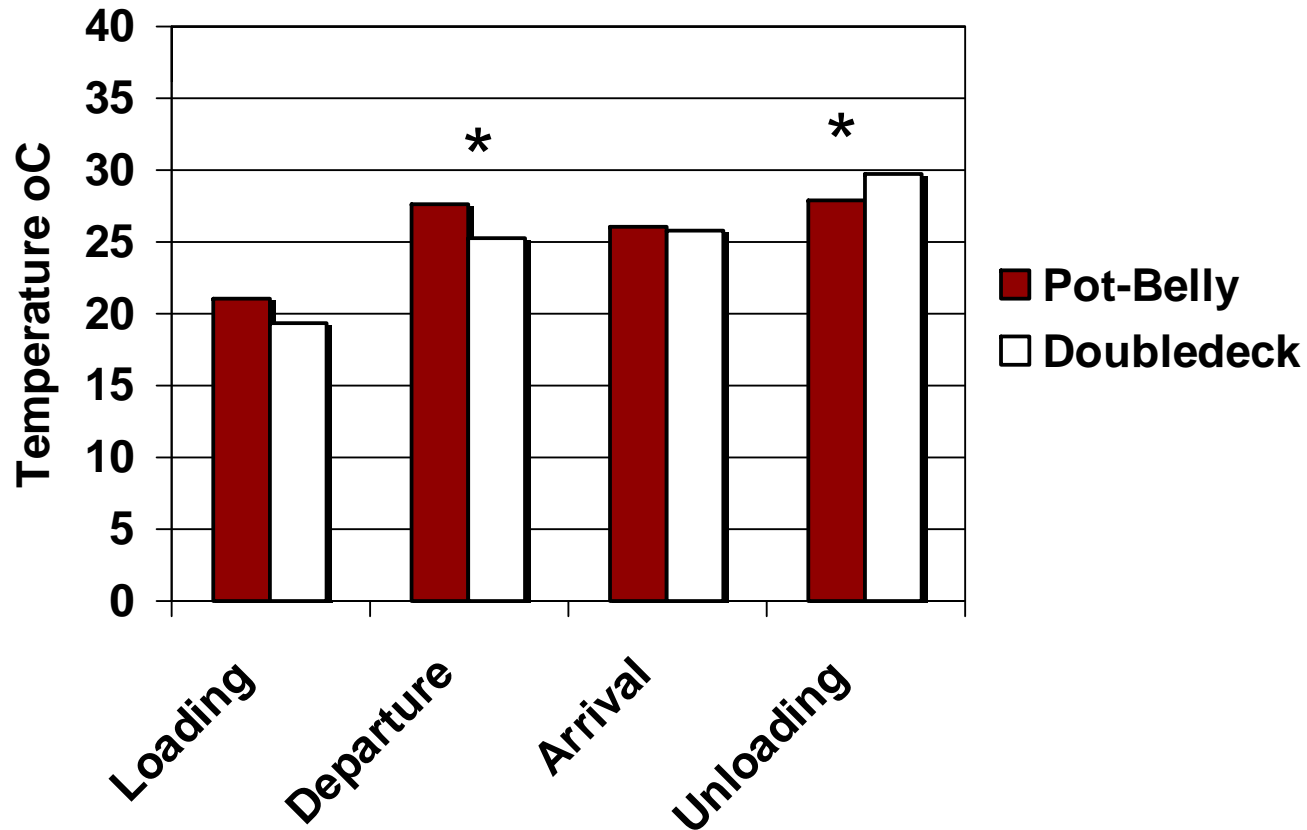


The trucks waited at the plant ~15 minutes
Then were unloaded and the pigs were
lairaged for 1 hour



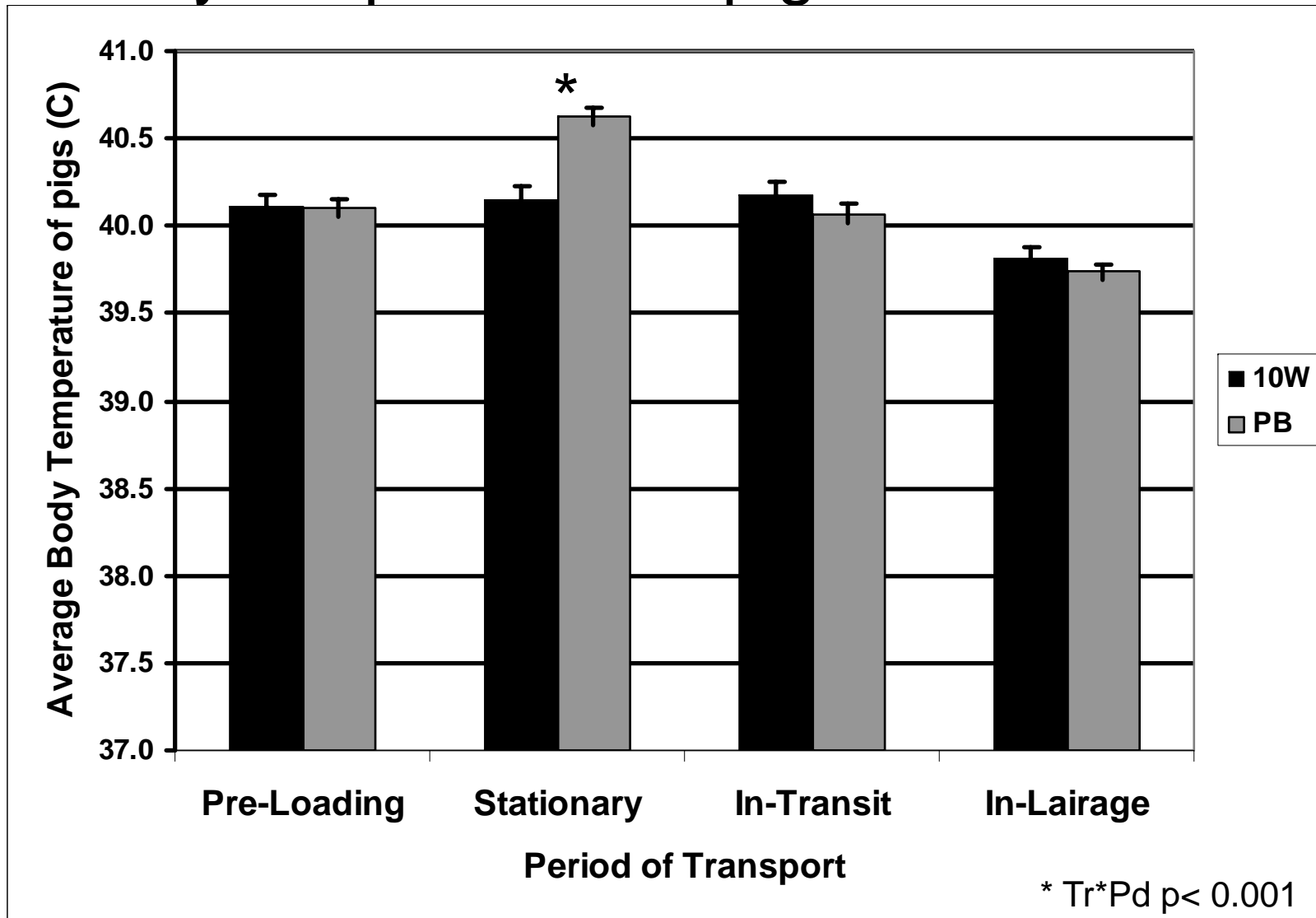
Trailer Temperatures

Average for all compartments at single point in time



*Trucks were different $P < 0.05$
Gonyou et al, unpublished

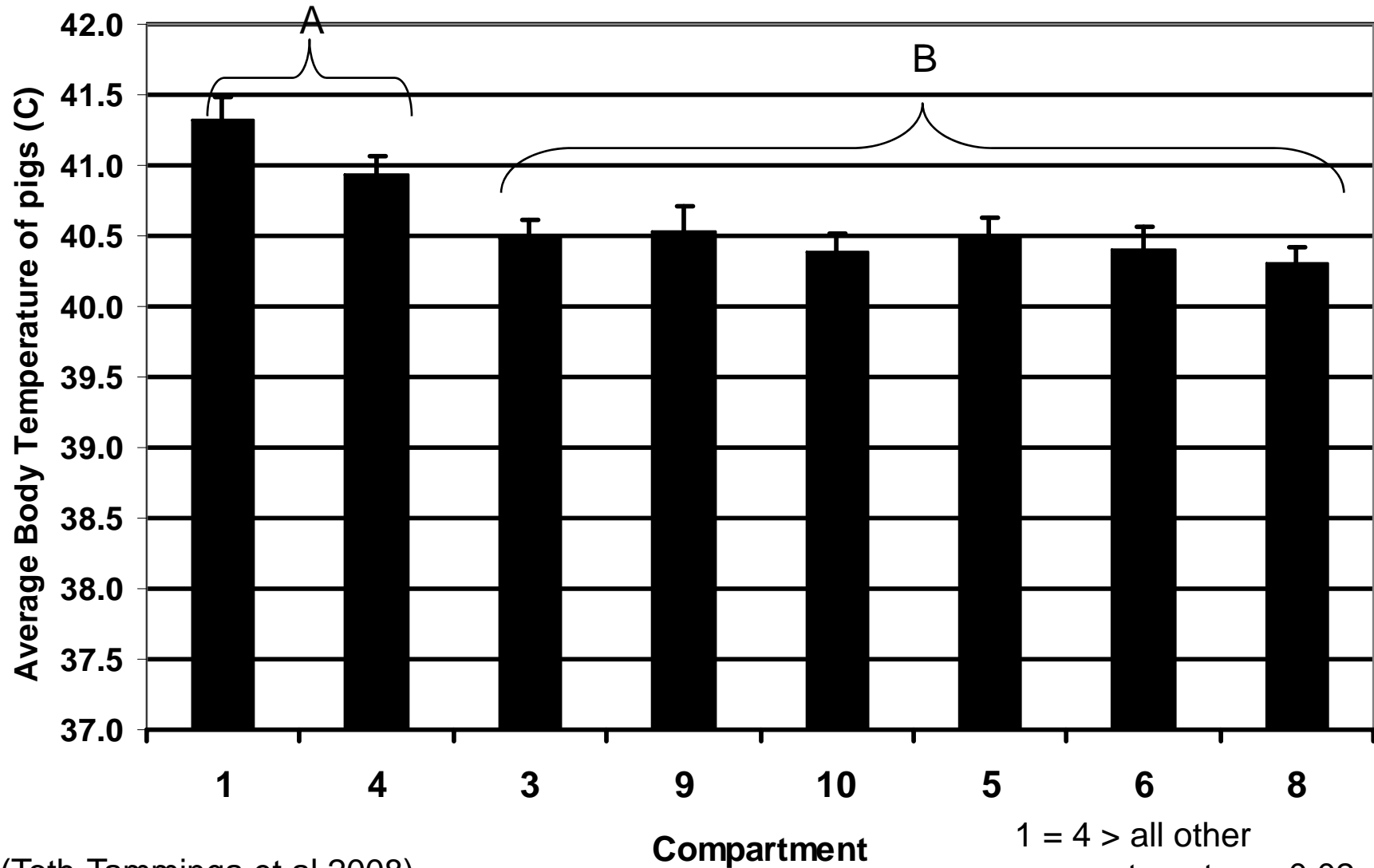
The effect of the period of transport on mean body temperature of pigs in two trucks



PB always loaded 1st with wait of ~ 1 hour

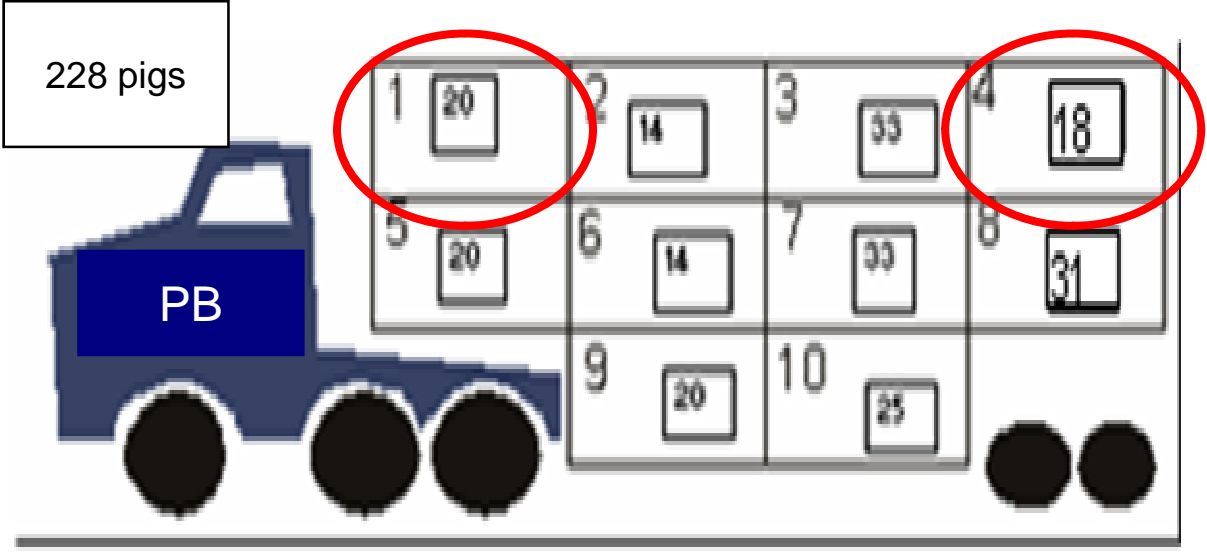
(Toth-Tamminga et al 2008)

The effect of compartment within the PB during “Stationary”

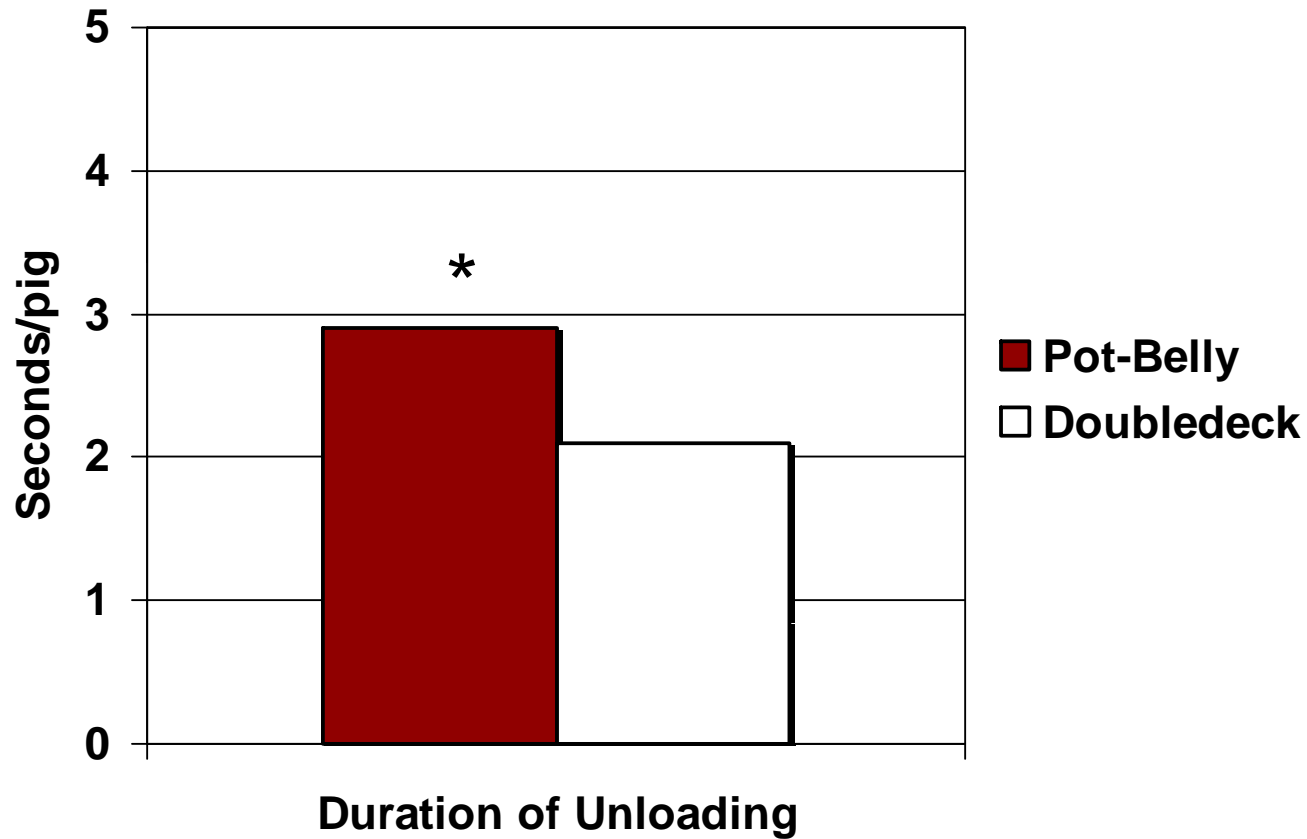


(Toth-Tamminga et al 2008)

1 = 4 > all other
compartments p < 0.02



Duration of Unloading



(Torrey et al 2008)

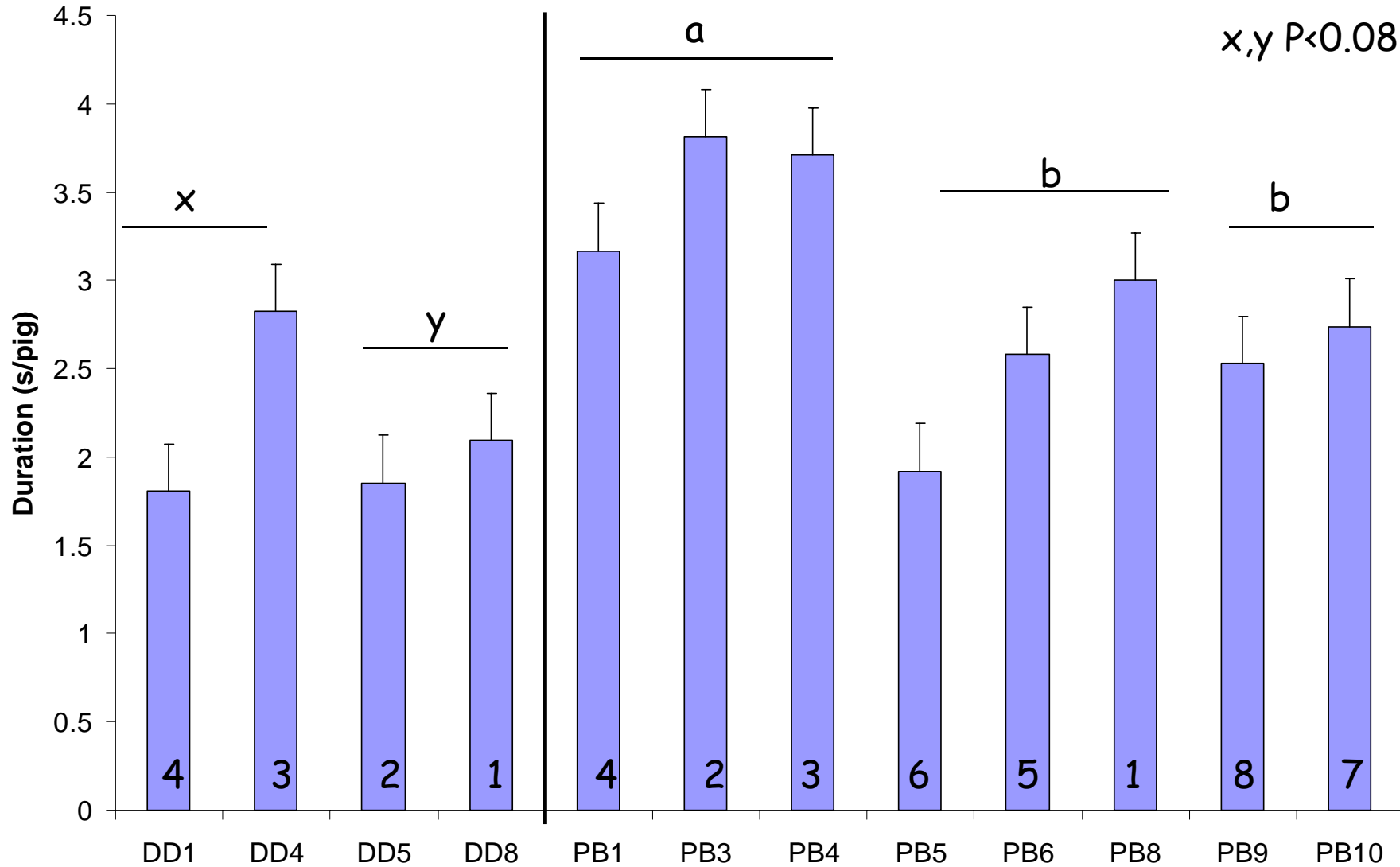
*Trucks were different $P < 0.01$

(Torrey et al 2008)

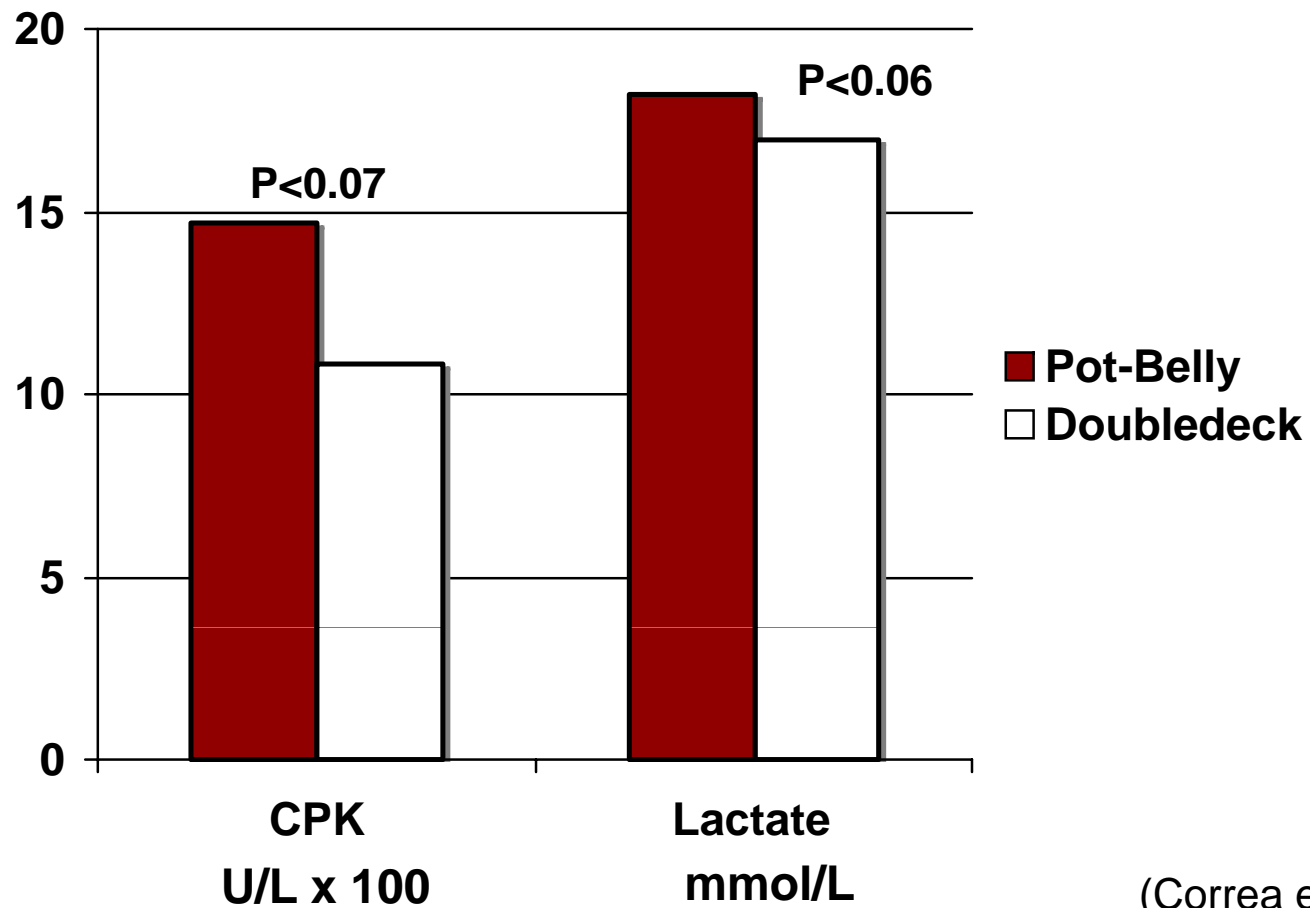
Duration Unloading

a,b P<0.04

x,y P<0.08



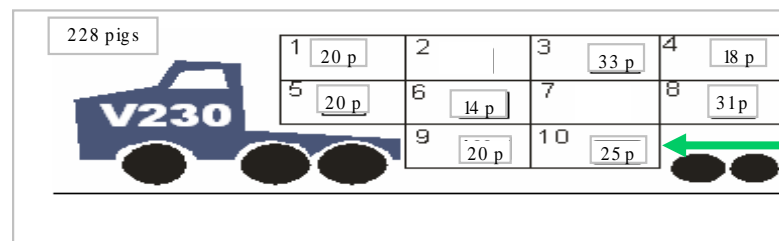
Blood Values



(Correa et al 2008)

Meat Quality

| Compartment | 1 | 3 | 4 | 5 | 6 | 8 | 9 | 10 |
|--|----|----|----|----|----|----|----|----|
| N | 30 | 42 | 29 | 30 | 24 | 42 | 30 | 36 |
| Quality category in the longissimus dorsi (%) | | | | | | | | |
| PSE | 0 | 0 | 0 | 0 | 4 | 5 | 7 | 3 |
| MODERATE PSE | 0 | 3 | 0 | 3 | 0 | 5 | 7 | 3 |
| PFN | 33 | 21 | 41 | 30 | 17 | 14 | 33 | 30 |
| NORMAL | 60 | 71 | 52 | 60 | 71 | 71 | 50 | 64 |
| MODERATE DFD | 7 | 5 | 7 | 7 | 4 | 5 | 3 | 0 |
| DFD | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 |



(Correa et al 2008)

Factors Leading to Variation in Pork Quality

RESEARCHERS:

Peter Purslow

Kees deLange

Ira Mandel

Jim Squires

Andy Robinson

Tina Widowski

GRADUATE STUDENT:

Jennifer Brown



Experience



Walking the Pens

- 0, 1, 2 or 3 times per week beginning ~12 weeks prior to shipping
- Handler entered the pen and while holding a pig board, made one complete circuit around the pen
- Average time in the pen was $39 \pm .3$ seconds



(Brown et al, 2006)

Behaviour in Home Pen

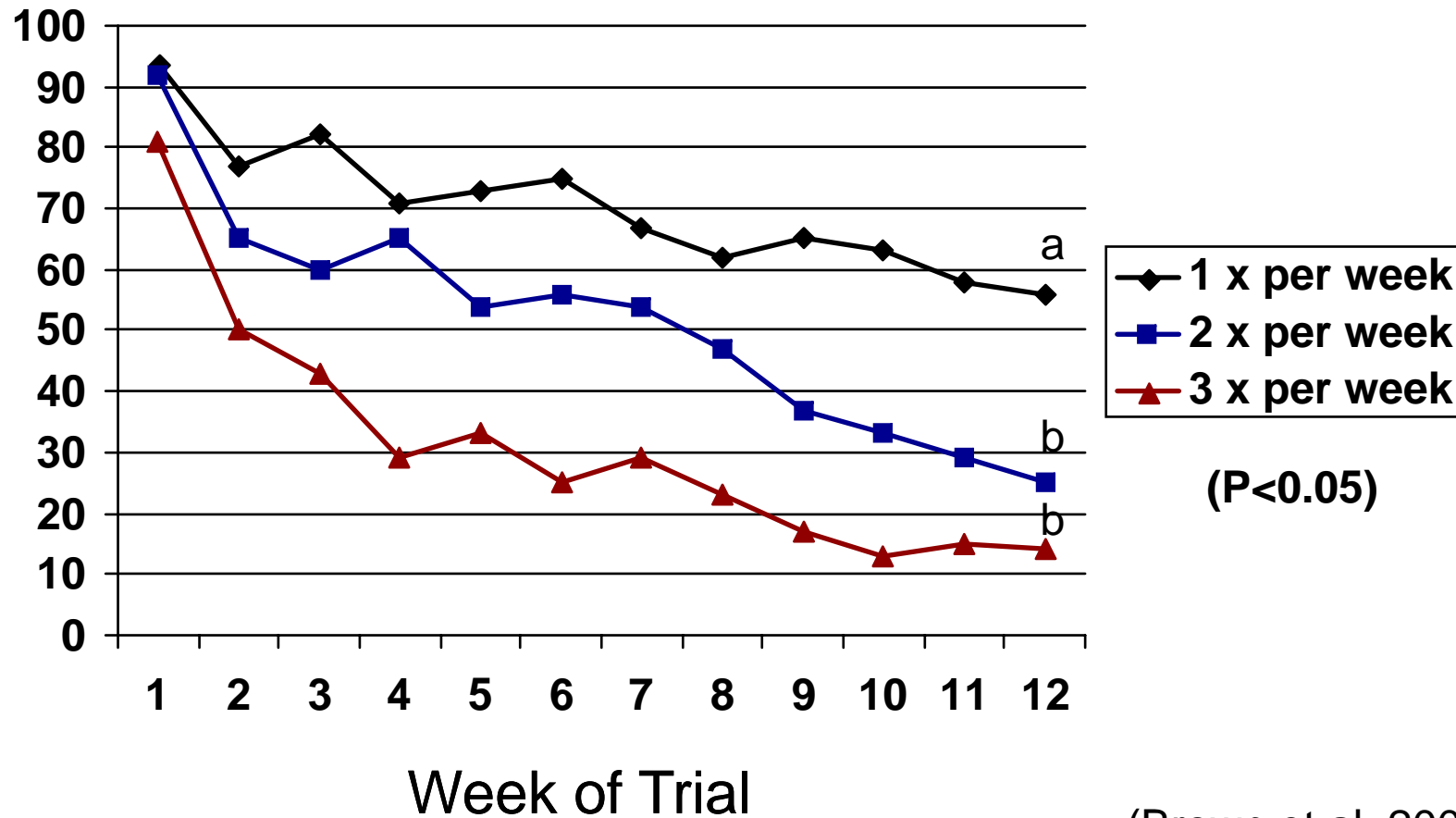
- One day each week, the responses of pigs to the handler entering the pen were recorded

% of pigs that showed “escape” - pigs rapidly moved away from the handler often piling along the back of the pen

% of pigs that “approached” - pigs attempted to nose the board, boots or legs of the handler

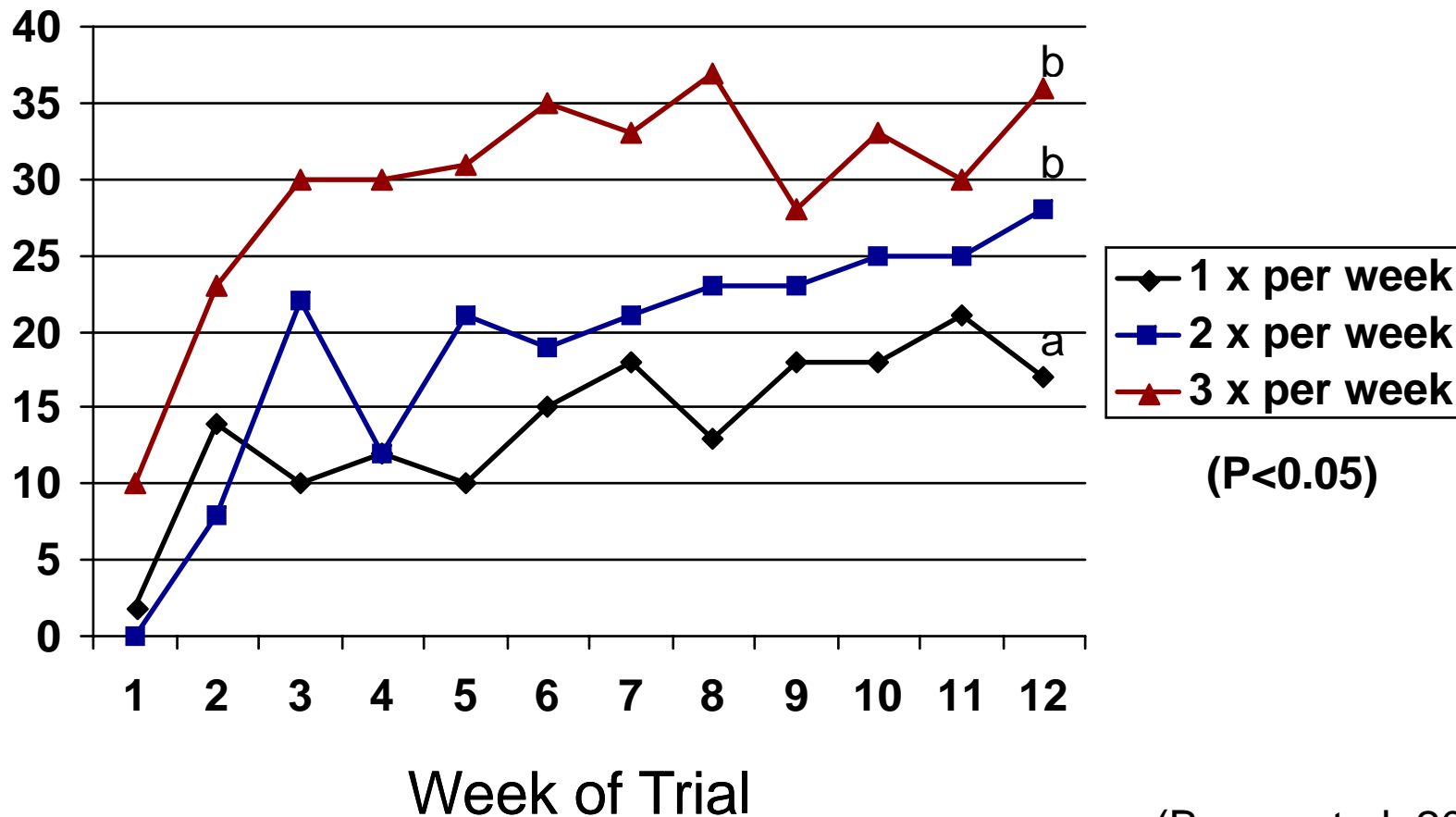
(Brown et al, 2006)

% Pigs Showing “Escape” As Handler Entered Home Pen



(Brown et al, 2006)

% Pigs “Approaching” As Handler Entered Home Pen



(Brown et al, 2006)

**BUT does a difference in fearfulness
of people in the home pen translate
into better handling when pigs are
shipped?**



Behaviour at the Abattoir

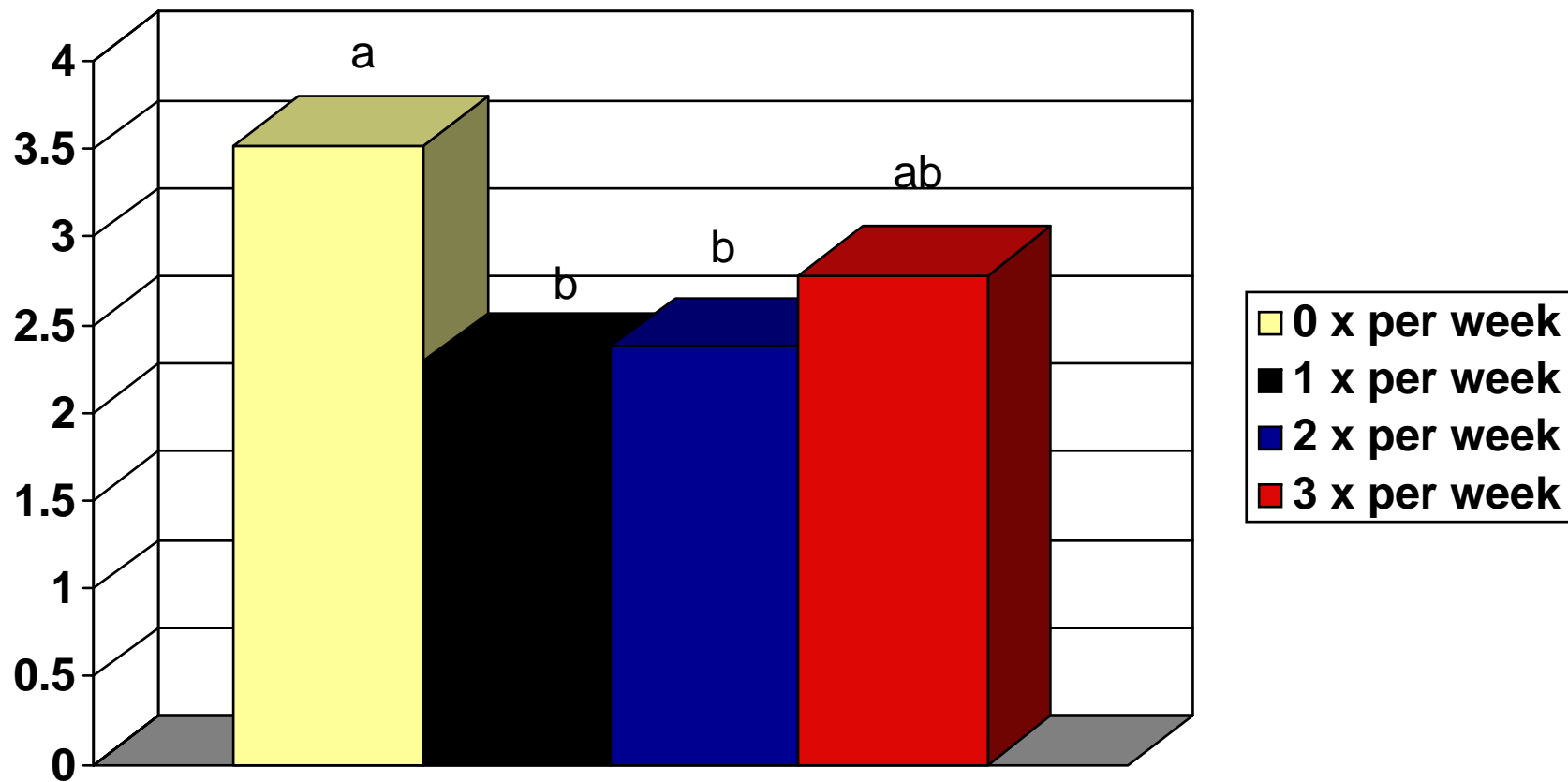


Behaviour Measures At Plant

- Time in the pen (seconds)
- Pig behaviour in pen (frequency)
Avoidance, falling, jamming
- Human intervention (frequency)
Pushes, slaps, prods

(Brown et al, 2006)

Effect of walking pens on frequency of jamming in the crowd pen

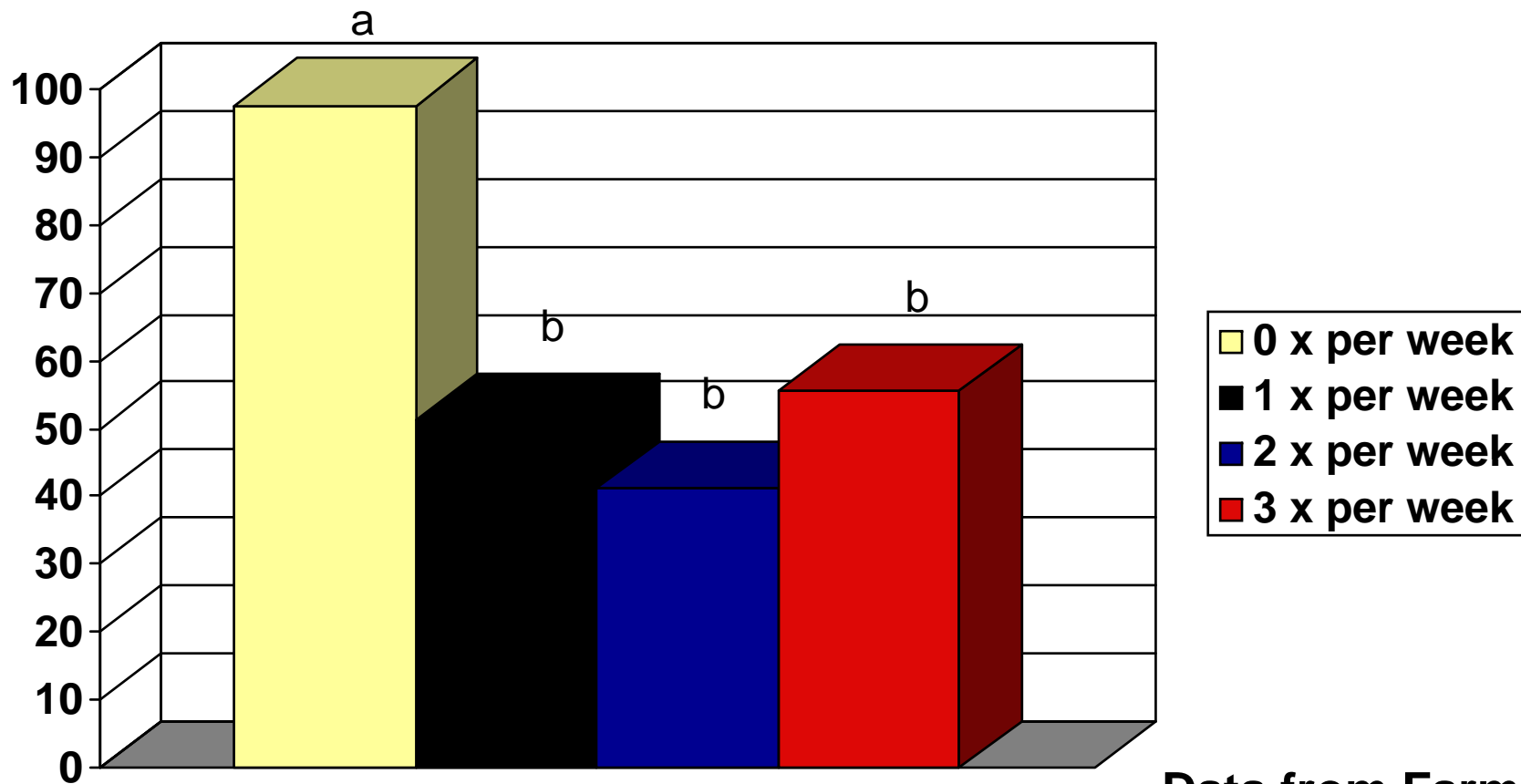


a,b Means are different $P < .05$

Data from Farm 1

(Brown et al, 2006)

Effect of walking pens on time in the crowd pen (seconds)



a,b Means are different $P < .05$

Data from Farm 2

(Brown et al, 2006)

Individual Differences in Pig's Behaviour



Behaviour Tests

24 pigs tested on each of 26 Commercial Farms

To determine whether behaviour at the farm predicts behaviour, stress, meat quality at the plant

Standardized tests:

- Human approach test

Time to approach and contact person

- Novel object test

Time to approach and contact object

- Open door test

Time to voluntarily exit pen

(Brown et al, 2008)



Open Door Test

Pen door is opened and the time for individual pigs to leave the pen is recorded

- exit < 60 sec = 'Bold'
- exit 61-180 sec = 'Intermediate'
- remain after 180 sec = 'Shy'



(Brown et al, 2008)

Individual Identification

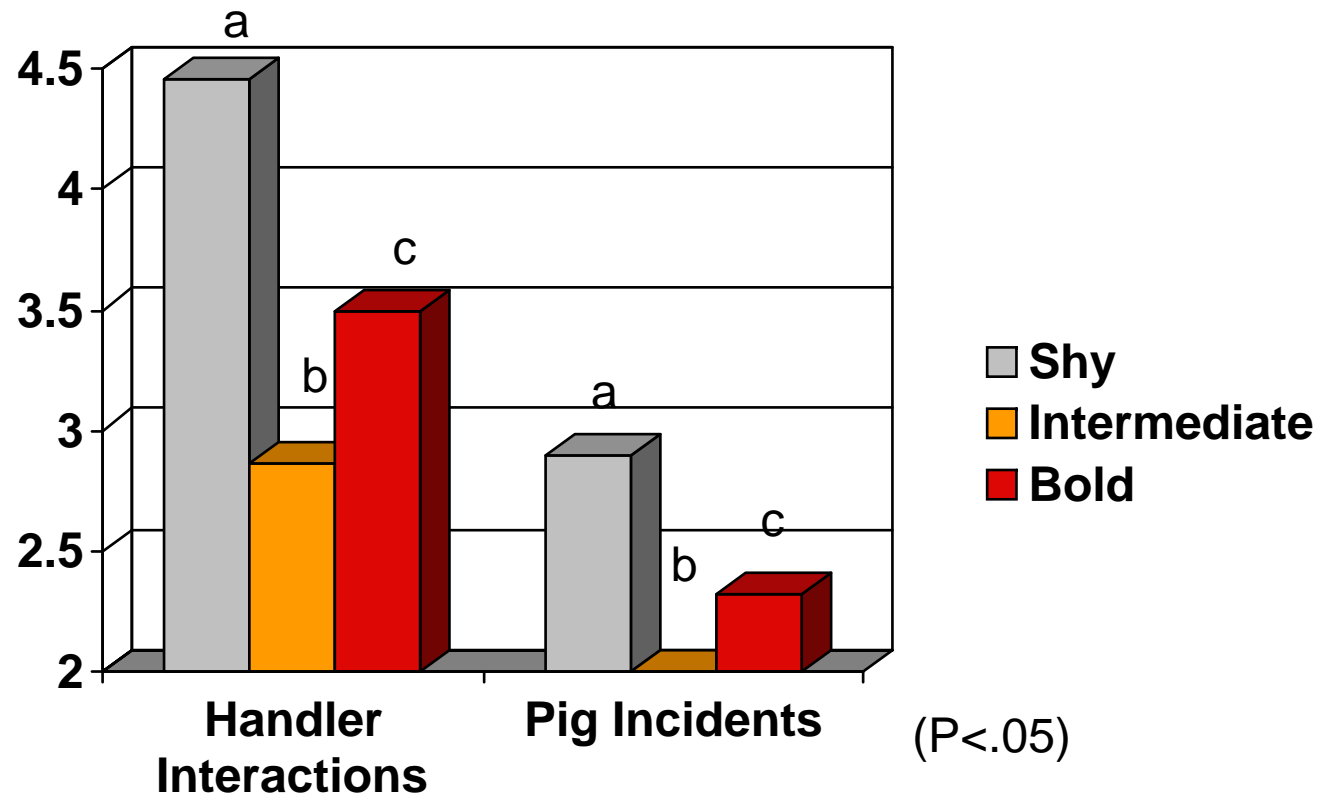
Combination of coloured ear tags, spray paint markings, unique slap tattoo

Allows Tracking

Farm
↓
Handling at Plant
↓
Blood Collection
↓
Meat & Tissue Samples



Effect of Temperament on Handling at the Abattoir – Data from 26 farms



(P<.05)

(Brown, unpublished data)

Shy pigs had paler loin muscle than Bold pigs $L^*=45.9$ vs 45.2 $P<0.05$

Effect of Temperament and Handling Handling at the Abattoir

- Two commercial farms
 - Prior trials - one had good, the other had poor meat quality measures
- 36 pens/farm with ~ 20-25 pigs/pen
- Pens randomly assigned to 3 treatments for the 8 weeks prior to shipping
 - Control
 - Walking Pens
 - Crowd

Handling Treatments

- Pen walk
 - 2 x per week a handler walks through pen encouraging pigs to move away (~ 50 sec)
- Crowd treatment
 - 2x per week a handler drives pigs through narrow passage (~2 min)



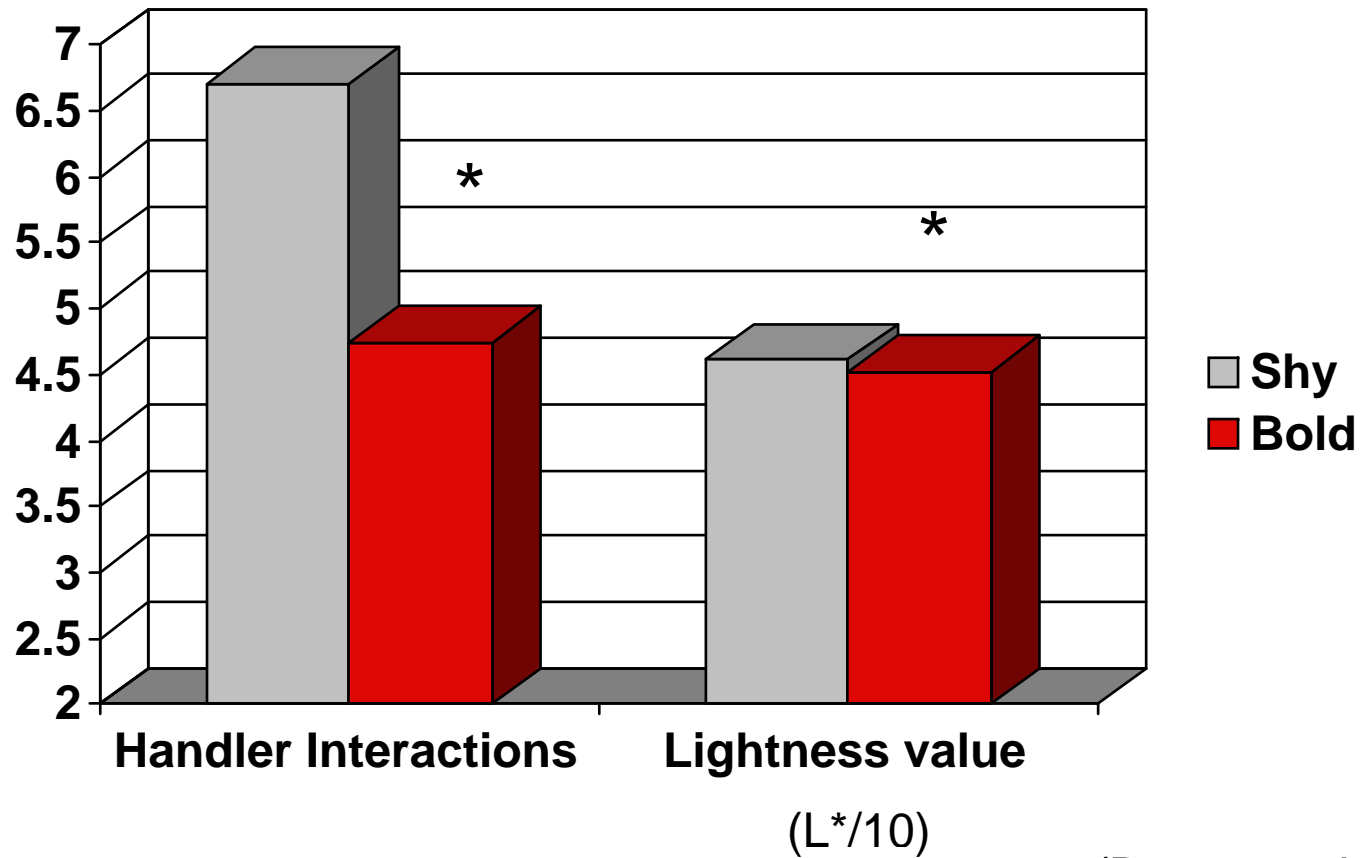
Methods

- At end of 8 weeks ~27 pigs/treatment (80/farm) selected and marked for meat quality analysis
- For each farm pigs from each treatment were slaughtered on 3 separate days
- Before shipping, 'Open Door Test' was used to identify 'bold' and 'shy' pigs (temperament) within each treatment group

Meat Quality Measures

- For both the loin and ham
 - Colour - lightness (L^*) where higher score means paler pork
 - % Drip Loss
 - Final pH - lower value means more lactic acid which can lead to PSE pork

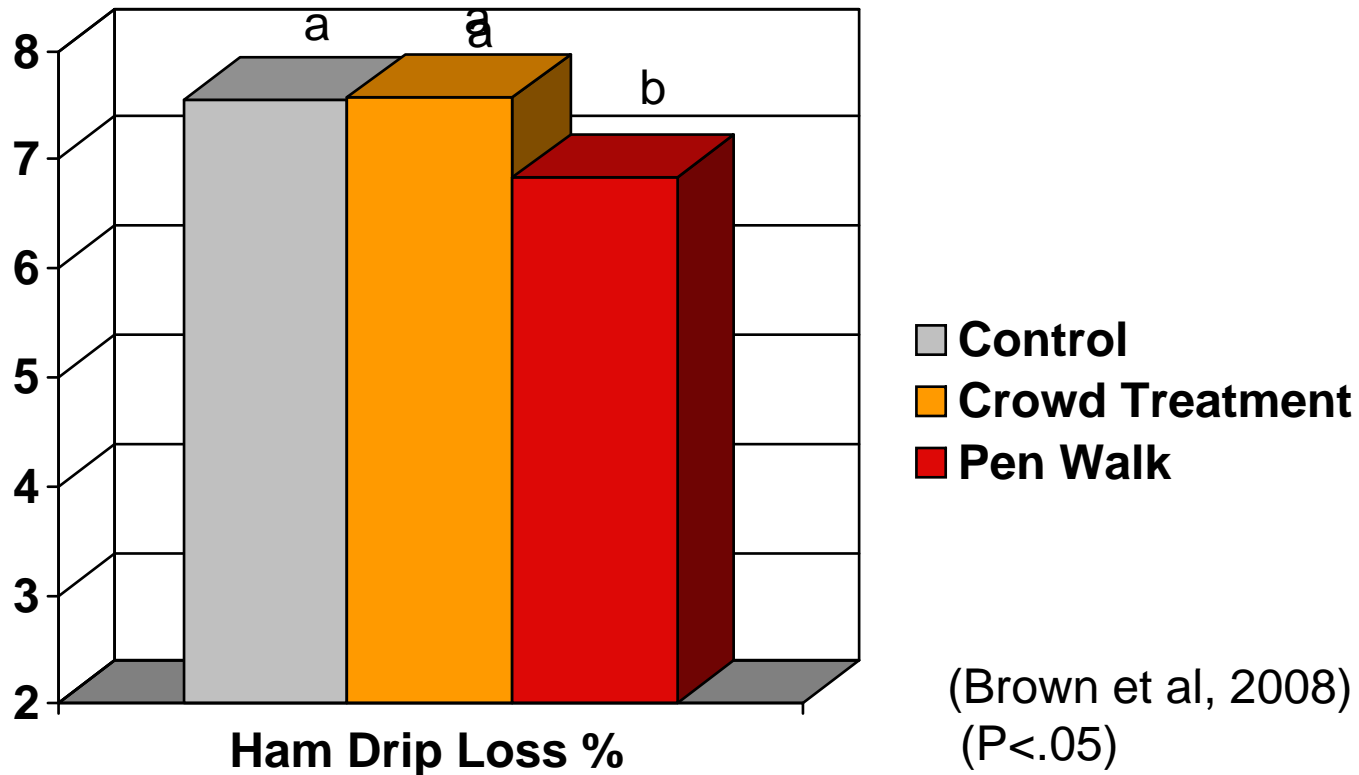
Effect of Temperament on Handling at the Abattoir



(Brown et al, 2008)

(P<.05)

Effect of Handling Treatment on Ham Drip Loss



Pigs in the "Crowd" treatment were more difficult to handle

Acknowledgements

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Alberta Pork

Federation of Quebec Pork Producers

Manitoba Pork

Ontario Pork

Sask Pork

F. Menard, Inc.

Maple Leaf Fresh Foods

Animal Compassion Foundation (Whole Foods)