Quality of fresh pork from pigs finished in confinement and hoop systems

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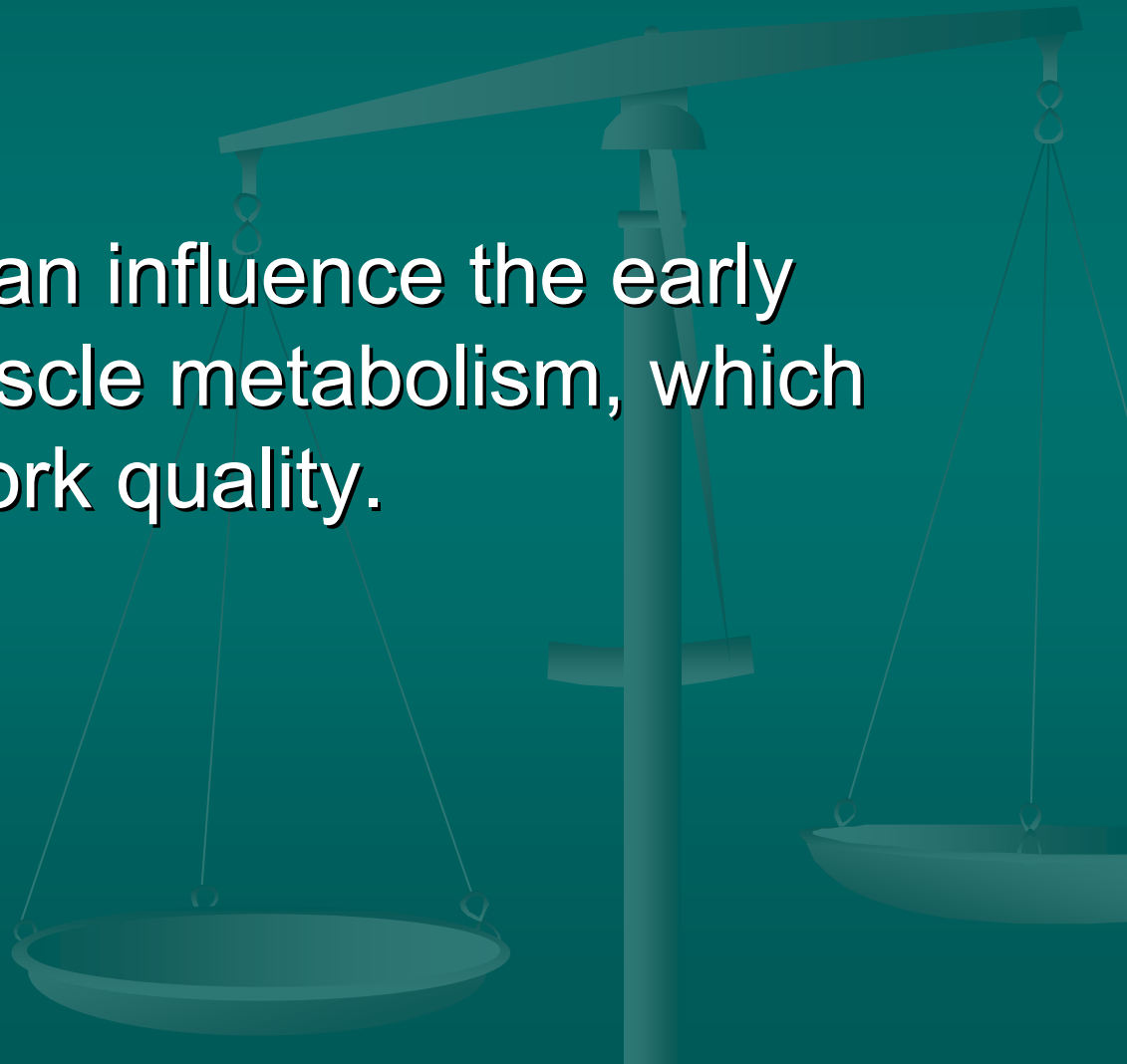
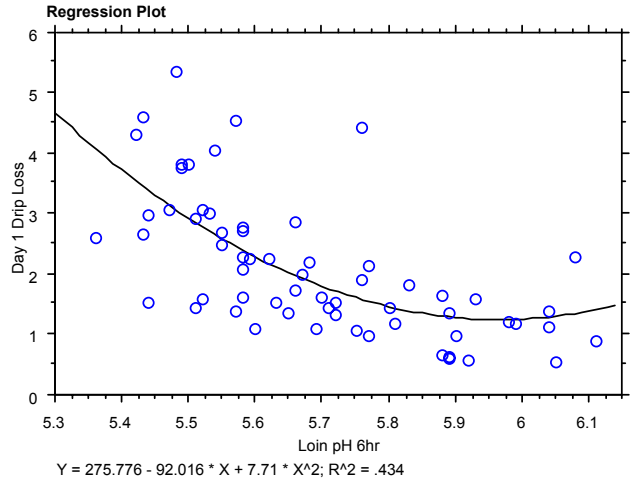
Can Rearing System influence Pork Quality?

Definitely!

Rearing system can influence the early postmortem muscle metabolism, which can influence pork quality.



pH Decline



Measure	*Conventional*	*Free Range*	*P-Value*
pH 1h	6.33 ± 0.05	6.52 ± 0.04	<0.01
pH 4h	6.02 ± 0.06	6.19 ± 0.04	0.02
pH 24h	5.61 ± 0.02	5.55 ± 0.02	0.03
Glucose – 1hr	9.8 ± 0.5	7.7 ± 0.4	<0.01
Glycogen – 1hr	25.4 ± 2.4	34.9 ± 1.9	<0.01

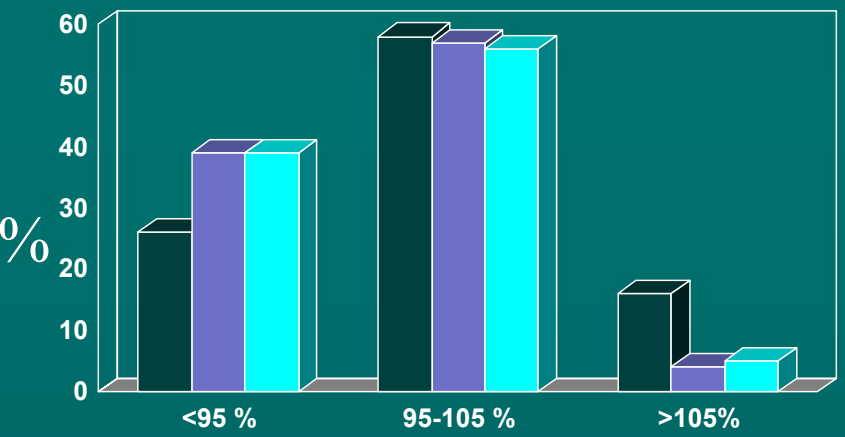
Lambooij et al. 2004. Meat Science 66:855-862

Fresh Pork Quality

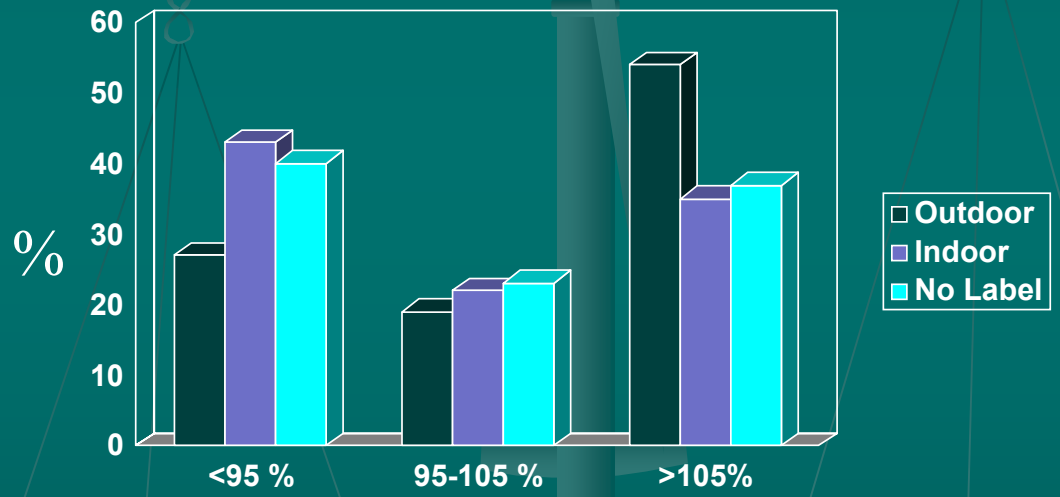
- Outdoor system does appear to result in slightly firmer pork
  - Gentry et al, JAS, 80:1781
- “Enriched” systems resulted in pork with better water- holding capacity
  - Klont et al., JAS, 79:2835

System of production does influence consumers willingness to pay

British consumers



French Consumers



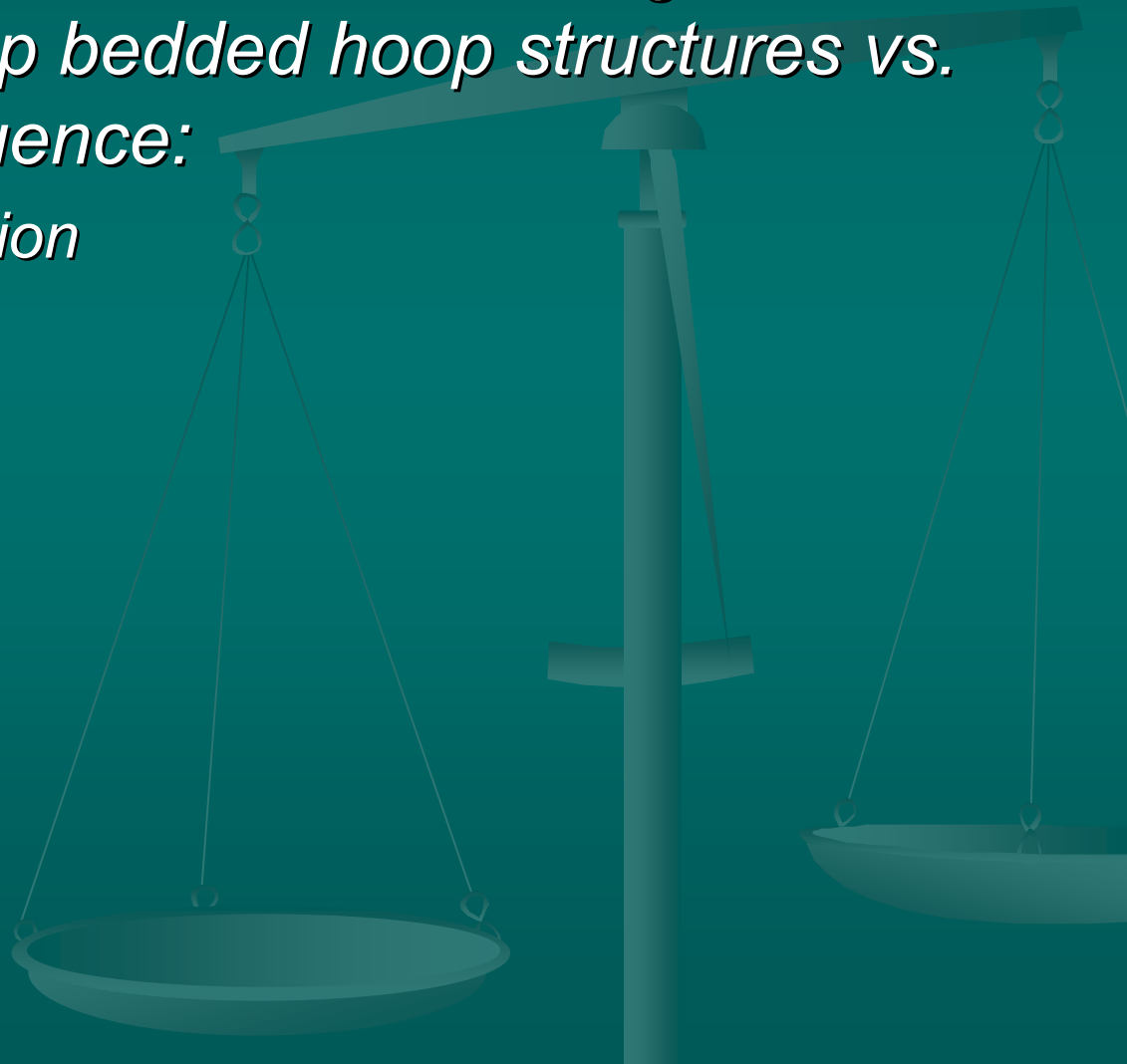
Dransfield et al., 2004.
Meat Science (In press)

Research Question

- *Does finishing environment influence processing and consumer quality of fresh pork?*

Research Objective

- *Determine the extent to which finishing environment (Deep bedded hoop structures vs. Confinement) influence:*
  - *Carcass composition*
  - *Fresh pork loin:*
    - *pH*
    - *color*
    - *firmness*
    - *marbling*



Materials and Methods

- Live Animal Selection
  - 400 crossbred *(Musclor x Duroc sires and Large White X Landrace dams)* pigs finished during the months of July – September of 2003 in northwestern Iowa.
  - All pigs farrowed indoors in a conventional facility
  - Nursery pigs weighing approximately 27kg assigned to finishing system.
    - ventilated confinement systems (CON)
    - hoop structures (HOOP)

Materials and Methods

- Nutrition, genetics, and management were standardized between the two groups and fed to 123 kg live weight.
- Groups of 100 pigs from each system were transported 81 miles (1.3 hours) on two different days to Farmland Foods, Inc, Denison, IA.

Materials and Methods

- Slaughter, Fabrication and Evaluation
  - Pigs rested an average of 18 hours prior to slaughter
  - On two slaughter days, carcasses from each group were chosen for evaluation of pork quality.
    - Last rib backfat, loin eye depth and percent lean by a grading probe.
    - Hot carcass weights (HCW) were recorded.
    - Right side loins were excised 24 hours postmortem and cut along the blade end at the 4th thoracic vertebrae.

Materials and Methods

- **Loins from each group were evaluated at the *Longissiumus dorsi***
  - National Pork Board color score (1= extremely pale, 6=extremely dark)
  - Firmness and Wetness (1 = soft and wet, 3 = very firm and dry)
  - Marbling (1=devoid of marbling, 6 = extreme quantity of marbling)
  - Ultimate pH (pHu) was measured using a Hanna 9025 pH/ORP meter (Hanna Instruments, Woonsocket, RI)
  - CIE L* a* b* was measured at the 4th rib using a Hunter MiniScan (Hunter Lab Associates, Reston, Va) with settings of illuminant D65 and 0º viewing angle.
  - Hue angle and saturation index were then calculated as hue angle = (Tan^{-1} b*/a*) and saturation index = $(a2 + b2)^{0.5}$.

Least Squares Means of Live Weight, HCW, BF, LE Depth, and percent lean of HOOP and CON pigs (n=200 per treatment)

	HOOP	*CON*	*SEM*
Live Weight (kg)	126.67[a]	120.31[b]	5.22
HCW (kg)	95.41[a]	92.73[b]	0.10
BF (mm)	18.82	18.21	0.02
LE Depth (mm)	58.42	56.64	0.06
Percent Lean	54.20	54.99	0.66

Means within a row lacking a common letter differ significantly (P<.05)

Least squares means of pork quality parameters
(n=80 per treatment)

Factor	*HOOP*	*CON*	*SEM*
pHu	5.78	5.76	0.016
Color (NPB)	2.16	2.26	0.184
Firmness	1.81[a]	1.59[b]	**0.045**
Wetness	1.68	1.58	0.034
Marbling	1.79	1.88	0.144
L*	57.8	57.7	0.02
a*	8.24	8.44	0.016
b*	14.39	14.52	0.059
Hue Angle	60.26	59.95	0.002
Saturation Index	16.63	16.84	0.055

Means within a row lacking a common letter differ significantly (P<.05)

Discussion

- Observation that firmness is influenced by finishing system has been reported by others.
  - *Gentry et al, JAS, 80:1781*
- Possible that pH decline influences firmness.
- Adipose tissue firmness?

Ambient Temperature and Adipose Tissue Traits

- Environmental temperature influences adipose tissue traits

- Firmness decreases with a decrease in SFA and increase in PUFA

Lefaucheur et al., 1991. Journal of Animal Science 69:2844 -2854
Lebret & Mourot. 1998. Productions Animales 11:131-143

Ambient Temperature and FA Profile

	Outer Layer			Inner Layer		
Temp	12ºC	28ºC	P-Value	12ºC	28ºC	P-Value
UFA (%)	57.4	52	<0.01	54.9	51	<0.001

Lefaucheur et al., 1991. Journal of Animal Science 69:2844 -2854

Temperature, environment and FA profile

Lipid %	*I (17 C)*	*I (24 C)*	*Outside - W*	*Outside – S*	*P-Value*
SFA, %	36.0^{ab}	36.8^{b}	35.1^{a}	38.5^{c}	<0.001
Firmness (ffp)	616^{ab}	649^{b}	578^{a}	714^{c}	<0.01

Lebret et al., 2002 Meat Science 63:447-455

Conclusion

- Pork quality traits are clearly multi-factorial traits.
- Production system did not alter overall pork quality.
- The observation that production system does influence lean texture deserves attention.

Future Objectives

- Determine the extent to which stocking density within hoops influences product quality.

  Lean quality

  pH decline

  Fat Firmness

  Fatty acid profile

  Volatile chemical compounds in adipose and muscle