Impact of Piglet Birth Weight on the Eating Quality of Pork

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SUMMARY

Data was collected from 98 litters to determine if birth weight affected the final eating quality of pork. Except for constant monitoring during farrowing and periodic measurements of body weight, farrowing and piglet management were according to normal barn practises. From 24 litters, selected because they had at least 12 piglets born alive and which represented a range of body weight, 4 pigs were sent to Lacombe Research Station when they reached 120 kg, for extensive meat quality and sensory analysis.

Except for some minor (and probably non-relevant) exceptions birth weight had no effect on carcass quality, weight of primal cuts, overall palatability, chemical properties, or histological properties of the meat ($P > 0.05$).

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INTRODUCTION

Piglets born in large litters are, on average, smaller (PSC Annual Research Report 2006; p. 36-38). Low birth weight has been associated with fewer total muscle fibres at birth and larger fibres at market weight. It has been suggested that this may affect the eating quality of pork.

In our previous paper we showed that birth weight had no effect on carcass quality. This paper extends these results and examines the effect of birth weight on the chemical and sensory properties of pork which may influence eating quality. The specific objective of this portion of the study was to determine if the eating quality of pork obtained from pigs with low birth weight differed from that of their larger litter-mates.

MATERIALS AND METHODS

Birth order, birth weight, total number born and total number born alive were recorded for 98 farrowings at PSC Elstow (n=1114 piglets born alive). Farrowing and piglet management, including cross-fostering, iron injections, castration and tail docking followed normal barn procedures. Birth weight was divided into 4 quartiles: Q1, 0.8 to 1.2 kg; Q2, 1.25 to 1.45 kg; Q3, 1.50 to 1.70 kg and Q4, 1.75 to 2.50 kg. Pigs ≤ 750 grams BW were excluded (n=48 piglets). Detailed meat composition data were obtained from a subset of 24 litters; 1 pig per quartile per litter. Animals were slaughtered and dressed in a simulated commercial manner at AAFC Lacombe Research Centre. Full grade and carcass dissection data were collected 24 h and 48 h post-mortem and eating quality data was measured using a trained taste panel.

DISCUSSION AND RESULTS

Birth weight had no effect on the proportions of total lean, bone or fat ($P > 0.10$; Table 1). Except for flavour desirability which was reduced in the middle-weight pigs ($P < 0.02$), the sensory qualities of pork were unaffected by birth weight ($P > 0.10$, Table 2). Moisture (mg/g) was reduced, and intramuscular fat was increased in lower birth weight pigs ($P < 0.04$; Table 3). Cooktime (sec/g) was reduced in middle weight pigs ($P = 0.03$; Table 3). Twenty-four hour pH, crude protein, shear force, and pork colour were all similar among birth weight quartiles ($P > 0.20$). Sarcomere length was increased in the highest birth weight pigs (Table 4, $P < 0.02$), however, proportions (Table 4) and mean area (data not shown) of slow oxidative, fast oxidative glycolytic, and fast glycolytic muscle fibres were unaffected by birth weight ($P > 0.20$).

CONCLUSIONS AND IMPLICATIONS

There was no effect of birth weight on carcass quality, physical, or histological properties of the meat or overall eating quality. Selecting pigs at birth based on body weight would allow producers to sort pigs based on days to market, but would not be an effective critieria to predict final eating quality of the meat. Increasing litter size can be used by producers to increase productivity with no adverse effect on pig performance or meat quality.

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Table 1. The effect of birth weight on proportions of lean, bone, and fat[1]

	Birth Weight, kg					
	0.80-1.20	**1.25-1.45**	**1.50-1.70**	**1.75-2.00**	**SEM**	**P-Value**
Total Lean	622.81	634.46	641.96	629.67	7.61	0.33
Total Bone	98.84	101.62	102.45	100.96	1.54	0.67
Total Fat	277.34	263.91	255.59	269.38	7.54	0.22
Body cavity	7.72	7.77	7.00	7.92	0.32	0.17
Intermuscular	61.67	57.48	54.06	58.75	2.14	0.09
Subcutaneous	207.95	198.66	197.53	202.71	5.79	0.40

[1] g kg pig-1. Data obtained from 96 pigs, 24 from each weight quartile.

Table 2. The effect of birth weight on the sensory qualities of pork[1]

	Birth Weight, kg					
	0.80-1.20	**1.25-1.45**	**1.50-1.70**	**1.75-2.00**	**SEM**	**P-Value**
Flavour intensity	4.31	4.22	4.20	4.16	0.06	0.39
Flavour desirability	4.40[a]	4.09[b]	4.19[b]	4.26[ab]	0.07	0.02
Juiciness	4.66	4.57	4.61	4.76	0.08	0.42
Connective tissue	6.97	6.99	7.01	7.07	0.05	0.61
Tenderness	5.33	5.38	5.33	5.54	0.11	0.46
Palatability	4.04	3.85	3.94	4.07	0.09	0.16

[1]Data obtained from 96 pigs, 24 from each birth weight quartile.
[2]1=bland, 8 = intense; [3]1=undesirable, 8=desirable; [4]1=dry, 8=juicy;
[5]1=abundant, 8=none detected; [6]1=extremely tough, 8=extremely tender;
[7]1=extremely undesirable; 8=extremely desirable
[ab]Row means with different superscripts differ (P < 0.05).

Table 3. The effect of birth weight on pH, chemical properties and colour of pork[1]

	Birth Weight, kg					
	0.80-1.20	**1.25-1.45**	**1.50-1.70**	**1.75-2.00**	**SEM**	**P-Value**
pH, 24-Hour	5.69	5.71	5.67	5.68	0.03	0.70
Proximate Analysis, mg/g						
Moisture	743.80[a]	746.43[ab]	749.76[b]	749.31[b]	1.41	0.01
Intramuscular fat	35.12[a]	30.07[b]	25.75[b]	29.09[b]	0.18	0.04
Crude Protein	218.99	220.34	220.21	217.49	0.11	0.23
Shear, kg	5.61	5.22	5.66	5.24	0.17	0.13
Cooktime, sec/g	7.41[a]	6.88[ab]	6.57[b]	7.52[a]	0.25	0.03
L*, 48-hour	52.68	51.96	52.09	52.72	0.52	0.64
Chroma, 48-hour	13.52	13.47	13.37	13.08	0.31	0.77
Hue, 48-hour	30.61	29.48	29.80	29.31	0.63	0.49

[1]Data obtained from 96 pigs, 24 from each birth weight quartile.
[ab]Row means with different superscripts differ (P < 0.05).

Table 4. The effect of birth weight on the histological properties of pork[1]

	Birth Weight, kg					
	0.80-1.20	**1.25-1.45**	**1.50-1.70**	**1.75-2.00**	**SEM**	**P-Value**
Sacromere length, µm	2.00[a]	1.97[a]	1.97[a]	2.06[b]	0.02	0.02
Porportion of						
Slow oxidative	18.4	17.9	19.5	18.8	0.58	0.23
Fast oxidative	27.1	27.3	26.5	27.0	0.94	0.94
Fast glycolytic	54.5	54.8	53.9	54.3	0.97	0.94

[1]Data obtained from 96 pigs, 24 from each birth weight quartile.
[ab]Row means with different superscripts differ (P < 0.05).