ONTARIO CARCASS APPRAISAL PROJECT

C.A. Aker(1), J.A.B. Robinson(1), R.O. Ball(2), B.E. Uttaro (2) and R.A. Kemp(3)
(1) Ontario Swine Improvement Corp, RR#2 New Hamburg, Ontario N0B 2G0
(2) Dept. of Animal and Poultry Science, University of Guelph, Guelph, Ontario N1G 2W1
(3) Research Station, Agriculture Canada, Box 1000A RR#3 Brandon, Manitoba R7A 5Y3

SUMMARY

The Ontario Carcass Appraisal Project was undertaken to provide the Ontario pork industry with measures of meat and carcass quality and provide the necessary information to potentially develop a breeding program for improving carcass and meat quality traits. Over 3000 animals have been tested, weighed, ultrasonically probed and slaughtered for carcass cut-out information related to feed efficiency, lean yield, distribution of primal cuts, colour and texture to identify and quantify measures of carcass and meat quality. Differences between breeds and sexes were found for many of the measures.

INTRODUCTION

The breeding goal in the Canadian pork industry is efficient production of high quality lean meat. Since 1986, the hog grading system in Canada has used electronic probes to estimate the muscle and fat depth at the third /fourth last rib on the carcass which is used to estimate the lean yield of the carcass. Producers are paid on the basis of an index computed using a combination of the estimated lean yield, dressed weight of the carcass (kidneys and viscera removed) and the current pool price. National genetic evaluations for backfat thickness and growth rate have provided the tools necessary to achieve a significant decrease in backfat thickness of animals marketed (Trus and Sullivan, 1992). However, selecting for reduced backfat does not address the overall goal of improved carcass merit which involves many more factors. To meet this overall breeding goal, the Ontario pork industry has been interested in developing live-animal predictors of carcass quality to be able to performance-test potential breeding stock. In November 1990, the Ontario Pork Carcass Appraisal Project began; a four year project involving all segments of the Ontario swine industry. The objectives of the project were:

- to assess the lean meat yield and carcass and meat quality traits across all major breeds of swine in Ontario,
- to determine phenotypic, genetic and environmental parameters for carcass and meat quality traits,
- to examine the use of live animal measures to predict carcass and meat quality traits, and
- to evaluate the feasability of a genetic improvement program for carcass and meat quality and potentially develop the program.

The data collection and analysis aspects of the project, especially the analysis of the real-time ultrasound live-animal measures continue. This study analysed preliminary results from the project.

MATERIAL AND METHODS

Ontario purebred breeders submitted litters of purebred pigs to the provincial swine test station at New Hamburg. Litters consisted of two boars, a barrow and a gilt with emphasis on submitting at least two litters from the same sire over the test period. Litters were placed on test once the average

weight of pigs in the litter reached 30 kg and housed in randomly assigned pens of two with the barrow and gilt paired and the two boars paired. The test station has capacity for 64 pens or 128 pigs per room in each of four rooms filled on a one-room-per-month basis. Each pen is fed *ad libitum* on a corn and soybean diet of at least 18.5% crude protein and pen feed intake was measured. The traditional measures of backfat thickness (using A-mode ultrasound) and growth rate were recorded at approximately 100 kg live weight (± 15 kg). All pigs were also evaluated using real-time ultrasound which displayed and captured a cross-sectional image from various sites on the live animal. Video-taped images were then analysed using image-processing software to identify and measure fat depth, muscle depth and muscle area at each site (Liu 1991). Probe sites were the last rib 5 cm off the mid-line and the loin 15 cm posterior to the last rib 5 cm off the mid-line paired on both sides of the animal and also at the shoulders. An average of 3.2 pigs per litter were slaughtered from the program with the remainder being boars sold for breeding in the test station sale. Carcasses were weighed (hot and cold) and measured for length and the three measures of mid-line fat depth.. The left side of the carcass was further cut down into primal cuts; loin, belly, shoulder and ham. These cuts were further separated into fat, lean meat and bone. Between the third and fourth last ribs the fat thickness and longissimus area measurements were recorded. These cuts were also subjectively scored for colour, structure and marbling. In all, over 100 measurements were taken per slaughter animal with over 3000 animals in the study.

RESULTS AND DISCUSSION

The preliminary analysis of the data from 2207 animals is presented in Tables 1 and 2 below. Least-squares means were computed for each of the carcass measures adjusted for the live weight of the animal at slaughter.

Table 1: LS Means by breed

	Breed			
Trait	Yorkshire	Landrace	Hampshire	Duroc
Back fat @ 100kg	12.65 ± 0.08	13.90 ± 0.10	12.97 ± 0.17	13.85 ± 0.13
Age @ 100kg	160.32 ± 0.37	156.96 ± 0.46	165.02 ± 0.79	159.42 ± 0.61
ADG to 100kg (1)	0.87 ± 0.00	0.88 ± 0.00	0.83 ± 0.01	0.87 ± 0.01
Feed Conversion	2.62 ± 0.01	2.69 ± 0.01	2.76 ± 0.02	2.68 ± 0.01
Dressing %	79.10 ± 0.08	78.53 ± 0.10	78.38 ± 0.18	78.32 ± 0.14
ELY% (2)	51.50 ± 0.05	50.82 ± 0.06	51.16 ± 0.11	50.96 ± 0.08
ALY% (3)	53.61 ± 0.10	52.08 ± 0.13	52.93 ± 0.22	51.87 ± 0.17
Carcass Index	107.74 ± 0.16	106.57 ± 0.20	107.83 ± 0.35	106.65 ± 0.27
Carcass length cm	83.43 ± 0.07	84.35 ± 0.08	81.35 ± 0.14	81.39 ± 0.11
Loin eye area cm^2	42.71 ± 0.19	40.97 ± 0.19	45.23 ± 0.39	39.41 ± 0.32
% Shoulder (4)	28.70 ± 0.05	28.26 ± 0.06	28.91 ± 0.10	29.05 ± 0.08
% Belly	18.32 ± 0.05	19.13 ± 0.06	18.19 ± 0.10	18.07 ± 0.07
% Loin	26.56 ± 0.05	26.77 ± 0.06	26.09 ± 0.11	25.70 ± 0.09
% Ham	26.40 ± 0.04	25.87 ± 0.05	26.74 ± 0.08	27.15 ± 0.06
% Lean in Shoulder	57.04 ± 0.11	57.10 ± 0.14	56.88 ± 0.23	56.30 ± 0.18
% Lean in Loin	50.66 ± 0.15	49.14 ± 0.19	51.00 ± 0.32	49.08 ± 0.24
% Lean in Ham	63.36 ± 0.11	60.71 ± 0.14	61.72 ± 0.24	60.70 ± 0.18

Notes:

(1) ADG - average daily gain in kilograms per day.

(2) ELY% - estimated lean yield percent using the Destron scanner with a single measurement at the third / fourth last rib as used in the slaughter grading process.

(3) ALY% - actual lean yield percent as computed from the cut-out of the left side of the carcass.

(4) Percentage of the carcas made up of each of the primal cuts.

Table 2: LS Means by sex

	Sex		
Trait	Boar	Gilt	Barrow
Back fat @ 100kg	11.64 ± 0.20	13.16 ± 0.21	15.21 ± 0.21
Age @ 100kg	160.87 ± 0.91	162.83 ± 0.95	158.96 ± 0.95
ADG to 100kg	0.84 ± 0.01	0.82 ± 0.01	0.87 ± 0.01
Feed Conversion	2.52 ± 0.02	2.78 ± 0.02	2.79 ± 0.02
Dressing %	77.63 ± 0.20	78.84 ± 0.21	78.42 ± 0.21
ELY%	51.67 ± 0.12	51.47 ± 0.13	50.01 ± 0.13
ALY%	54.44 ± 0.25	53.30 ± 0.26	50.29 ± 0.27
Carcass Index	107.50 ± 0.39	107.94 ± 0.41	105.08 ± 0.41
Carcass length (cm)	82.96 ± 0.16	82.18 ± 0.17	81.32 ± 0.17
Loin eye area (cm^2)	41.68 ± 0.45	42.84 ± 0.45	38.19 ± 0.45
% Shoulder	29.84 ± 0.11	28.19 ± 0.12	28.35 ± 0.12
% Belly	17.63 ± 0.11	18.59 ± 0.12	18.89 ± 0.12
% Loin	25.74 ± 0.13	26.52 ± 0.13	26.29 ± 0.13
% Ham	26.83 ± 0.09	26.78 ± 0.10	26.52 ± 0.10
% Lean in Shoulder	57.88 ± 0.27	57.66 ± 0.28	56.79 ± 0.29
% Lean in Loin	52.05 ± 0.36	50.19 ± 0.38	45.89 ± 0.38
% Lean in Ham	63.51 ± 0.27	61.92 ± 0.28	59.09 ± 0.28

The figures in Table 1 show distinct differences between breeds in the tradional measures of animal performance; backfat thickness and days to 100 kg. However, the breed with the least backfat (Yorkshire) did not reach 100 kg the fastest (Landrace). Looking at the overall breed performance in production of lean meat, the Yorkshire breed showed the highest yield of lean meat in the carcass overall and the loin and ham followed by Hampshire, Landrace and Duroc. It was also interesting to note that the lean yield estimate consistently under predicted the actual lean yield although not by the same relative amount for each breed.

The figures in Table 2 show marked differences between sexes. In the traditional performance measures barrows grew faster but deposited more fat than boars which is reflected in lean yield measures where the boars were superior. Gilts were the slowest growing but deposited medium amounts of fat. Boars concentrated a slightly greater proportion of the carcass in the ham while the gilts and barrows showed a more balanced distribution of carcass percentage across all the primal cuts.

CONCLUSIONS

The results analysed to date were preliminary with much additional analysis to follow. However, distinct differences between breeds for traditional performance measures and more detailed carcass measures have been shown. The challenge remains to relate the slaughter traits to the live-animal performance and real-time ultrasound traits to identify highly heritable traits which can be easily measured on a live animal or combined with litter-mate slaughter and evaluated for inclusion in a Meat Quality Index to provide breeders in Ontario with a selection tool to work toward the overall breeding goal of efficient production of high quality lean meat.

REFERENCES

LIU, Y 1991. AUSKey. Animal Ultrasound Services, Ithaca, N.Y.

TRUS, D. and B.P. SULLIVAN. 1992. Genetic improvement and commercial pig production. Canadian Swine May 1992, p.32.

_____, 1983. Agriculture Canada Pork Carcass Cutability Specification Guide. Agriculture Canada.