

National Muscle Quality Evaluation

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Summary and Implications

Breeders will be affected as packer and processor payment programs for quality continue to evolve. Breeders should consider how their pork producer customers will market their products in the future when selection priorities are set and selection decisions are made. Results from this test and other muscle quality evaluations show that large differences exist in the industry for most of the muscle quality traits. These differences demonstrate the need for breeders to monitor muscle quality traits, as well as growth and carcass traits, in their breeding programs.

Expected Progeny Differences (EPDs) for muscle quality parameters should be used by breeders to place selection emphasis on these traits. Incorporation of them into selection indexes will be a major step in meeting the needs of the pork industry of the future.

Introduction

The National Muscle Quality Evaluation was an innovative project sponsored by National Swine Registry and the Iowa Swine Testing Station that was designed to focus on the importance of muscle quality and enable purebred breeders to lead the pork industry in identification of genetics with superior muscle quality characteristics.

The stated objectives of the project were:

- 1) Allow a purebred breeder to gain knowledge of his herdsire's ability to generate muscle quality, growth rate, leanness, and feed efficiency.
- 2) Enable breeders to identify and sample other breeders' genetics that are proven to be superior in muscle quality and performance.
- 3) Use the muscle quality evaluation — and information gathered — as the basis for a public relations campaign that will raise the profile of individual breeders, and the purebred seedstock industry, as the superior source for predictable swine genetics that combine performance and muscle quality.

Materials and Methods

A total of 40 breeders from nine states entered 40 pens of three boars and 42 progeny pens of eight market pigs. Breeds represented in the evaluation were Duroc, Hampshire, Yorkshire, Berkshire, and Chester White. Progeny pens were barrows and/or gilts. Pigs entered the Segregated Early Weaning (SEW) unit at Iowa State University at 10—19 days of age and were moved to the Iowa Swine Testing Station when they weighed approximately 45—50 pounds.

After an adjustment period at the test station, pigs were placed on test when the pen averaged approximately 80 pounds. When each pen of boars averaged approximately

250 pounds, the boars were weighed off test and scanned for 10th rib backfat and loin muscle area.

Progeny test pens were housed in groups of four pigs per pen. Pigs were weighed off test weekly and when individual pigs reached approximately 250 pounds, they were weighed off test and slaughtered at Hormel Foods, Austin, Minnesota. In addition to carcass measurements taken at the packing plant, the following muscle quality traits were evaluated:

Minolta color (MIN). - This measurement was taken using a Minolta Chromameter DP-301 after the fresh loin surface was allowed to bloom. The value measures light reflectance of the loin muscle. Lower values indicate darker loin color and higher values indicate a paler, lighter colored meat.

Ultimate pH (PH). - This measure of the acidity of the loin muscle was taken 24 hours after slaughter using a pH meter. Higher pH is associated with low drip loss, darker color, more firmness, and increased tenderness of the loin chop -- all positive attributes.

Intramuscular Fat (IMF). - Intramuscular fat or lipid content was measured in the laboratory on a loin muscle sample taken in the plant. This trait is very important for consumer satisfaction with pork. Sensory panel scores for juiciness are improved with higher levels of IMF and extremely low values usually indicate poorer eating quality characteristics.

Water Holding Capacity (WHC). - The amount of exudate or moisture on the cut loin surface was estimated using the Kaufmann filter paper method. A pre-weighed piece of filter paper was placed on the loin muscle and allowed to absorb moisture on the surface. It was reweighed and the difference in weight is the WHC estimate. Lower values are more desirable.

Results and Discussion

The average weight at entry into the SEW unit was 10.1 pounds and the average weight out was 48.3 pounds. Average daily gain in the SEW unit was .83 lb/day, performance that is comparable to that of pigs tested in several previous NPPC trials.

Table 1 lists test averages by breed for all pigs included in the evaluation. Test averages for all boars evaluated are included in Table 2.

Data from this test were combined with data from the seven previous National Barrow Show Progeny Tests and used to calculate EPDs for the muscle quality traits for all pigs tested. EPDs for days/230 and backfat for the boars were calculated using the STAGES program conducted by National Swine Registry. The boars that met all test requirements and screening for soundness were ranked using an index based on both performance and muscle quality traits and offered in the National Test Sale. The index included EPDs for days/230 (DAYS), backfat (BF), loin

muscle area (LMA), intramuscular fat, ultimate pH, and Minolta color. The economic values for days/230 and backfat used in the derivation of the index were those recommended by the National Swine Improvement Federation. Economic values for loin muscle area and the muscle quality traits were estimated using data from the Consumer Preference Study in the National Pork Producers Council (NPPC) National Genetic Evaluation Program. This was the first time ever that boars were sold with EPDs for muscle quality traits and ranked using an index that placed emphasis on those EPDs.

Positive EPDs are more desirable for LMA, IMF, and PH, whereas negative EPDs are more favorable for MIN because we want to avoid paler, lighter colored pork. Just as in any index that combines several traits, different combinations of EPDs may result in similar index values.

Table 3 lists the top two boars from each breed based on their index ranking. Note that Duroc boar #412 had very favorable EPDs for DAYS, BF, LMA, and IMF. His EPDs were near zero for PH, and his positive EPDs for MIN reduced his index value. Hamp boar #8 had favorable EPDs for DAYS, BF, and IMF. He was near zero for LMA and less than desirable for PH and MIN. The top indexing Yorkshire boar (#153) had very favorable EPDs for DAYS, PH, and MIN.

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Table 1. Test averages for all pigs slaughtered.

	All	Yorkshire	Duroc	Hampshire	Berkshire	Chester	White
No. Head	309	122	86	79	15		7
On Test Weight	79.9	81.2	82.4	76.6	71.9		79.6
Off Test Weight	251	255	253	242	249		249
Average Daily Gain	1.87	1.93	1.90	1.70	1.90		1.82
Carcass Weight	185	190	184	180	180		190
Length	32.0	32.4	32.3	31.3	31.8		31.6
Tenth Rib Backfat	.89	.95	.82	.81	1.19		.87
Loin Muscle Area	6.66	6.44	6.50	7.32	5.70		7.02
Minolta Color Score	22.4	22.2	21.6	24.1	19.2		22.6
Ultimate pH	5.60	5.68	5.69	5.33	5.89		5.64
Intramuscular Fat	1.54	1.09	2.45	1.40	.89		.94
Water Holding Capacity	.47	.47	.37	.63	.30		.44

Table 2. Test averages for all boars tested.

	All	Yorkshire	Duroc	Hampshire
No. Head	106	45	37	24
On Test Weight	80.7	80.7	81.4	80.2
Off Test Weight	258	262	260	248
Average Daily Gain	2.07	2.10	2.15	1.91
Adjusted Backfat @ 250 lb	.80	.81	.77	.75
Adjusted LMA @ 250 lb	6.30	6.35	6.20	6.48
EPD Days (DAYS)	-1.42	-1.47	-1.16	-1.78
EPD Backfat (BF)	-.055	-.063	-.052	-.041
EPD Loin Muscle Area (LMA)	.027	.038	.068	-.029
EPD Intramuscular Fat (IMF)	-.003	.019	-.084	.072
EPD pH (PH)	-.002	.001	.013	-.029
EPD Min (MIN)	.107	.106	-.164	.548
Index	101.7	102.1	101.0	102.2

Table 3. Test data for the top two boars from each breed based on their index ranking.

BREED	TAG NO.	EPD DAYS	EPD BF	EPD LMA	EPD IMF	EPD PH	EPD MIN	INDEX
Duroc	412	-3.4	-.08	.316	.245	.007	.386	107.5
Duroc	409	-2.9	-.04	.066	.349	-.011	.192	107.3
Hampshire	8	-5.1	-.03	-.003	.161	-.021	.474	107.5
Hampshire	390	-6.9	.00	.019	-.156	-.033	-.055	106.7
Yorkshire	153	-6.3	.00	-.037	.108	.063	-.469	109.3
Yorkshire	152	-5.1	-.02	-.003	.086	.063	-.469	107.8