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Beef Cattle Breeding Project Progress Report: Body Composition EPD Determined from Ultrasound Measures

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Abstract

The Iowa State University beef cattle breeding project was initiated in 1996 and is being conducted at the Rhodes and McNay research and demonstration farms. The project uses the field data of the American Angus Association (AAA) along with the research resource cattle of the farms to study questions that will enhance the genetic investigations using the field data.

Disciplines
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Introduction

The Iowa State University beef cattle breeding project was initiated in 1996 and is being conducted at the Rhodes and McNay research and demonstration farms. The project uses the field data of the American Angus Association (AAA) along with the research resource cattle of the farms to study questions that will enhance the genetic investigations using the field data. Research objectives are:

1) To estimate genetic and environmental parameters for economic characteristics from the analyses of AAA data coupled with analyses of the Angus sample, the two-line selection experiment for high quality and increased retail product, and the search for quantitative trait loci (QTL).

2) To validate the use of ultrasound on live cattle to make genetic change in the body composition traits of external fat cover, ribeye area, percentage intramuscular fat %IMF (marbling), percent retail product, and total retail product.

3) To develop and evaluate new ultrasound methods to measure other quality and retail product traits on live cattle and carcasses.

Two selection lines are being developed, with a target 200 breeding females in each line. One line (Q) is dedicated to the genetic study of beef quality traits and is being selected primarily on the trait of %IMF. The other line (R) is dedicated to the genetic study of beef retail product and is being selected primarily on the trait of ribeye area. The purpose of this report is to summarize the current body composition EPD levels for the bulls and heifers that have been produced in birth years 1998–2000.

Materials and Methods

The yearling bulls and developing heifers used in this study are from the Iowa State University Beef Cattle Breeding Project resources located at the Rhodes Research and Demonstration Farm in central Iowa. They include all of the 1998, 1999, and 2000 born calves from each of two selection lines. Many of the 1998-born heifers were produced through an extensive embryo transfer program in 1997 at the Rhodes and McNay research and demonstration farms. All male calves in the project are maintained as intact animals. After weaning, the bulls are placed on a development program where the goal is to have the bulls gain 3–3.5 lb/day. A portion of the bulls from each line is saved back for breeding, and the remaining bulls are harvested at a target age end-point of 400 days. All heifers are developed for breeding. The bulls and heifers are scanned serially using a Classic Scanner 200 at approximately 30-day intervals. Harvested bulls are scanned six times, and the breeding bulls and heifers are scanned seven times. Rump fat, 12–13th rib fat thickness, ribeye area, and a minimum of four IMF images were collected on each animal. All bulls were repeat-scanned on the following day to collect an additional four IMF images. Other measures being made on the bulls at each scan session included hip height, weight, and scrotal circumference. The bulls kept back for breeding were backed down in diet energy after the other bulls were harvested following the sixth scan.

The yearling ultrasound measures on the bulls and heifers are processed through a centralized

ultrasound processing laboratory, in accordance with the AAA protocol. These measures are included in the AAA database used for national cattle evaluation programs and development of expected progeny differences (EPDs).

Results and Discussion
The 1998, 1999, and 2000 calf crop body composition EPDs presented are those calculated for the AAA Spring 2002 National Cattle Evaluation Report. The breeding project yearling bull EPD levels of marbling for the Q line and EPD levels of ribeye area for the R line are above breed average. However, it is too

early to detect any genetic trend in either trait. Evidence of genetic trend in response to the selection objectives is not anticipated for at least two to three more years because there are not currently enough bulls being produced to have a sufficient level of selection intensity.

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Table 1. Distribution of EPD for body composition traits in the breeding project yearling bulls.

Trait	Class	Line	Birth year	Mean EPD	Std	Low	High
% IMF, %	Bulls	Q (42)*	1998	0.10	0.20	-0.31	0.69
		Q (42)	1999	0.07	0.18	-0.26	0.56
		Q (65)	2000	0.15	0.20	-0.20	0.69
		R (40)	1998	0.02	0.17	-0.34	0.48
		R (37)	1999	0.14	0.22	-0.33	0.64
		R (49)	2000	0.03	0.17	-0.35	0.47
	Breed	Ave.	1998	.00	.12	-.49	.85
	Breed	Ave.	1999	.00	.12	-.46	.75
	Breed	Ave.	2000	.01	.12	-.54	.73
Ribeye Area, sq.in.	Bulls	Q (42)	1998	0.03	0.2	-0.33	0.51
		Q (42)	1999	0.10	0.16	-0.34	0.52
		Q (65)	2000	0.05	0.19	-0.33	0.48
		R (40)	1998	0.11	0.22	-0.38	0.50
		R (37)	1999	0.14	0.23	-0.70	0.60
		R (49)	2000	0.15	0.23	-0.28	0.61
	Breed	Ave.	1998	.02	.20	-.82	1.01
	Breed	Ave.	1999	.03	.20	-.94	1.00
	Breed	Ave.	2000	.05	.20	-1.09	.95
Scanning Wt, lbs	Bulls	Q (42)	1998	-0.37	19.22	-33.22	42.75
		Q (42)	1999	0.62	25.12	-66.42	45.08
		Q (65)	2000	1.32	20.83	-46.00	58.51
		R (40)	1998	-3.50	22.34	-51.84	40.17
		R (37)	1999	2.73	28.34	-82.6	52.14
		R (49)	2000	5.18	19.33	-28.30	51.48
	Breed	Ave.	1998	3.59	21.23	-125.62	162.39
	Breed	Ave.	1999	4.31	21.35	-128.76	130.46
	Breed	Ave.	2000	5.17	20.22	-106.25	173.34
Fat Thickness, in.	Bulls	Q (42)	1998	.00	0.02	-0.03	0.05
		Q (42)	1999	.00	0.02	-0.03	0.04
		Q (65)	2000	.00	0.02	-0.03	0.05
		R (40)	1998	-.01	0.01	-0.03	0.02
		R (37)	1999	.00	0.01	-0.03	0.03
		R (49)	2000	.00	0.01	-0.04	0.04
	Breed	Ave.	1998	.00	.02	-.06	.09
	Breed	Ave.	1999	.00	.02	-.06	.10
	Breed	Ave.	2000	.00	.02	-.06	.09

*Number of animals in parenthesis.

Table 2. Distribution of EPD for body composition traits in the breeding project yearling heifers.

Trait	Class	Line	Birth year	Mean EPD	Std	Low	High
% IMF, %	Heifers	Q (86)*	1998	0.10	0.18	-0.31	0.61
		Q (34)	1999	0.04	0.22	-0.33	0.47
		Q (51)	2000	0.19	0.20	-0.39	0.56
		R (92)	1998	0.04	0.17	-0.3	0.72
		R (36)	1999	0.10	0.20	-0.36	0.54
		R (75)	2000	0.04	0.17	-0.30	0.45
	Breed	Ave.	1998	.00	.12	-.49	.85
	Breed	Ave.	1999	.00	.12	-.46	.75
	Breed	Ave.	2000	.01	.12	-.54	.73
Ribeye Area, sq. in.	Heifers	Q (86)	1998	-0.08	0.27	-0.60	0.52
		Q (34)	1999	0.04	0.18	-0.44	0.41
		Q (51)	2000	0.08	0.19	-.31	0.54
		R (92)	1998	0.03	0.28	-0.65	0.58
		R (36)	1999	0.17	0.22	-0.41	0.56
		R (75)	2000	0.14	0.22	-0.41	0.61
	Breed	Ave.	1998	.02	.20	-.82	1.01
	Breed	Ave.	1999	.03	.20	-.94	1.00
	Breed	Ave.	2000	.05	.20	-1.09	.95
Scanning Wt, lbs	Heifers	Q (86)	1998	-3.03	25.23	-125.62	59.84
		Q (34)	1999	-0.14	20.44	-41.26	34.09
		Q (51)	2000	5.53	23.18	-46.62	58.11
		R (92)	1998	2.12	20.43	-50.15	60.77
		R (36)	1999	-1.49	25.17	-60.63	46.5
		R (75)	2000	2.31	21.38	-70.18	55.71
	Breed	Ave.	1998	3.59	21.23	-125.62	162.39
	Breed	Ave.	1999	4.31	21.35	-128.76	130.46
	Breed	Ave.	2000	5.17	20.22	-106.25	173.34
Fat Thickness, in.	Heifers	Q (86)	1998	0.01	0.01	-0.02	0.04
		Q (34)	1999	0.00	0.02	-0.04	0.05
		Q (51)	2000	0.00	0.01	-0.02	0.04
		R (92)	1998	0.00	0.02	-0.03	0.05
		R (36)	1999	-0.01	0.02	-0.04	0.04
		R (75)	2000	.00	0.01	-0.04	0.03
	Breed	Ave.	1998	.00	.02	-.06	.09
	Breed	Ave.	1999	.00	.02	-.06	.10
	Breed	Ave.	2000	.00	.02	-.06	.09

*Number of animals in parenthesis.