Preliminary estimates of breed differences from recent sampling in the Germplasm Evaluation Project

Larry Kuehn, Warren Snelling, Mark Thallman
Research Geneticists

USDA, ARS, U.S. Meat Animal Research Center

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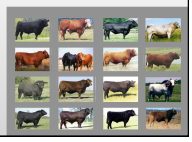


Background - ABEPD

- Across-breed EPD adjustment factors have been computed for BIF since 1993
- Account for differences in EPD base in the genetic evaluations of each breed involved
- Uses USMARC Germplasm Evaluation (GPE) data to adjust for breed differences

SIRE BREEDS USED IN THE GERMPLASM EVALUATION PROGRAM AT THE USMARC

Cycle I 70-72	Cycle II 73-74	Cycle III 75-76	Cycle IV 86-90	Cycle V 92-94	Cycle VI 97-98	Cycle VII 99-00	Cycle VIII 01-02
			F_1 Crosses (Hereford or Angus dams) [a]				
Hereford	Hereford	Hereford	Hereford	Hereford	Hereford	Hereford	Hereford
Angus	Angus	Angus	Angus	Angus	Angus	Angus	Angus
Jersey	Red Poll	Brahman	Longhorn	Tuli	Wagyu	Red Angus	Beefmaster
S. Devon	Braunvieh	Sahiwal	Salers	Boran	Norweg. Red	Limousin	Brangus
Limousin	Gelbvieh	Pinzgauer	Galloway	Belg. Blue	Sw. Red&Wh.	Charolais	Bonsmara
Simmental	Maine Anj.	Tarentaise	Nellore	Brahman	Friesian	Simmental	Romosinuano
Charolais	Chianina		Shorthorn	Piedmontese		Gelbvieh	
			Piedmontese				
			Charolais				
			Gelbvieh				
			Pinzgauer				
3-way crosses							
Hereford	Hereford						
Angus	Angus						
Brahman	Brangus						
Devon	Santa Gertrudis						
Holstein							

[a] Sire breeds mated to Angus and Hereford females, and Composite MARC III (1/4 Angus, Hereford, Red Poll and Pinzgauer) cows in Cycles V, VI, VII and VIII.

Across Breed EPD adjustment factors

- Calculated by scaling the 'current' breed difference (B_i) to Angus EPD base
  - Current breed difference is 2011 this year
  - Base difference calculated by subtracting the 2011 Angus average EPD from the 2011 breed average EPD
- For Breed i:

$$Factor_i = B_i - B_{Angus} - (EPD_i - EPD_{Angus})$$

TABLE 1: ADJUSTMENT FACTORS TO ADD TO EPDs OF EIGHTEEN DIFFERENT BREEDS TO ESTIMATE ACROSS BREED EPDs

Breed	Birth Wt.	Weaning Wt.	Yearling Wt.	Maternal Milk	Marbling Score[a]	Ribeye Area	Fat Thickness
Angus	0.0	0.0	0.0	0.0	0.00	0.00	0.000
Hereford	2.7	-3.5	-23.6	-17.1	-0.32	-0.09	-0.050
Red Angus	3.4	-23.2	-27.9	-3.9	-0.30	-0.08	-0.029
Shorthorn	5.8	11.3	38.8	20.2	-0.16	0.21	-0.142
South Devon	3.2	-4.8	-6.6	-0.3	0.08	0.16	-0.111
Beefmaster	6.3	35.7	29.5	9.9			
Brahman	11.0	42.8	5.9	23.2			
Brangus	4.5	14.6	6.0	5.8			
Santa Gertrudis	6.6	36.2	48.3	12.4	-0.66	-0.05	-0.116
Braunvieh	1.9	-21.6	-42.3	0.1	-0.67	0.22	-0.102
Charolais	8.6	38.1	45.3	6.9	-0.44	1.02	-0.220
Chiangus	2.2	-20.5	-40.2	4.7	-0.45	0.45	-0.157
Gelbvieh	2.7	-18.2	-25.6	3.6	-0.41	0.78	-0.136
Limousin	3.8	-1.8	-35.9	-8.7	-0.71	1.09	
Maine-Anjou	4.2	-15.3	-36.7	-6.8	-0.84	0.95	-0.229
Salers	1.8	-4.8	-19.5	2.2	-0.10	0.79	-0.207
Simmental	3.7	-5.9	-10.9	-0.8	-0.42	0.53	-0.141
Tarentaise	1.7	30.3	20.3	24.1			

[a] Marbling score units: 4.00 = Sl^{00}; 5.00 = Sm^{00}

Adjusting sample for current EPD

- Across-breed EPD program
  - Estimate breed differences (B_i) from GPE using animal model
  - Adjust records for bull EPD

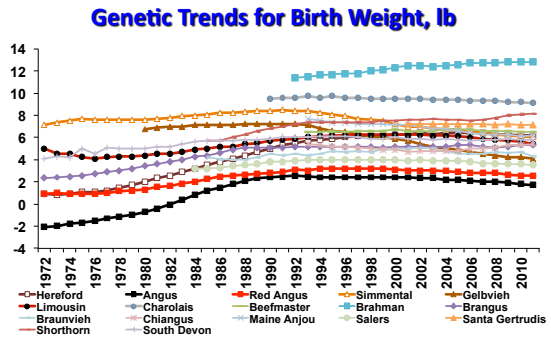
$$B_i = USMARC_i / b + (EPD_{i,YY} - EPD_{i,USMARC})$$

- $EPD_{i,YY}$ is the breed average EPD (current)
- $EPD_{i,USMARC}$ weighted average USMARC sire EPD
- b is a scaling factor to convert USMARC ($USMARC_i$) solution to an industry scale

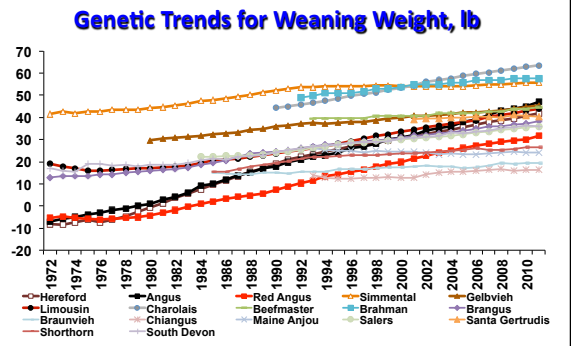
TABLE 2: BREED OF SIRE MEANS FOR 2011 BORN ANIMALS UNDER CONDITIONS SIMILAR TO USMARC

Breed	Birth Wt.	Weaning Wt.	Yearling Wt.	Maternal Milk	Marbling Score*	Ribeye Area	Fat Thickness
Angus	87.3	577.0	1045.3	565.3	6.09	13.12	0.611
Hereford	91.7	571.5	1009.7	543.2	5.36	12.87	0.552
Red Angus	88.1	561.5	1013.0	558.3	5.71	12.77	0.570
Shorthorn	93.7	556.5	1022.9	564.8	5.45	12.98	0.448
South Devon	91.4	566.0	1030.0	564.9	6.11	13.07	0.500
Beefmaster	92.1	575.6	1002.9	554.2			
Brahman	98.3	587.7	989.3	571.9			
Brangus	90.8	568.2	1008.4	559.3			
Santa Gertrudis	92.6	570.5	1013.9	555.4	4.96	12.66	0.487
Braunvieh	89.9	549.4	981.8	576.4	5.46	13.63	0.432
Charolais	94.7	592.4	1047.7	556.1	5.22	13.92	0.381
Chiangus	90.9	546.2	987.0	557.9	5.37	13.24	0.449
Gelbvieh	89.6	575.4	1027.1	571.4	5.26	13.78	0.422
Limousin	90.8	574.7	1007.7	555.7	4.90	14.33	
Maine-Anjou	91.8	554.1	1000.8	555.2	4.99	13.80	0.372
Salers	89.0	566.4	1019.5	564.0	5.73	13.52	0.394
Simmental	91.5	586.1	1038.8	564.4	5.29	13.82	0.402
Tarentaise	89.1	576.2	1008.2	567.0			

*Marbling score units: 4.00 = SI^{00}; 5.00 = Sm^{00}



Adapted from Spring 2013 Genetic Trends from Breed Associations and 2013 AB-EPD factors



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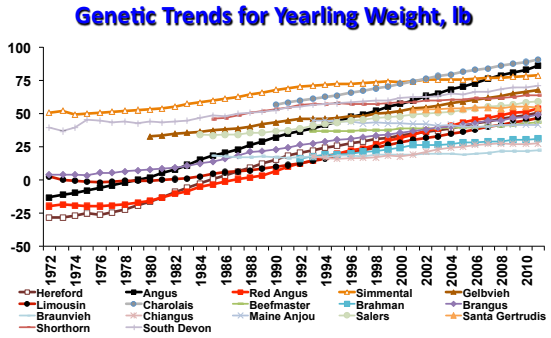

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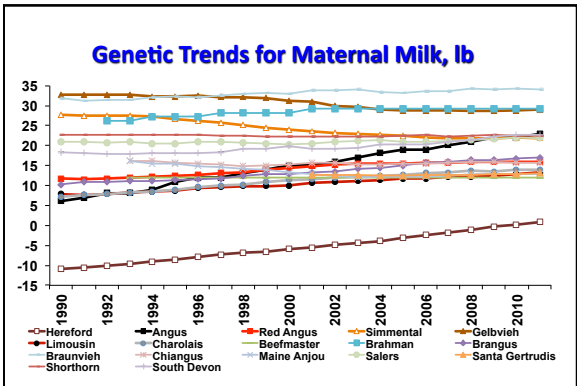

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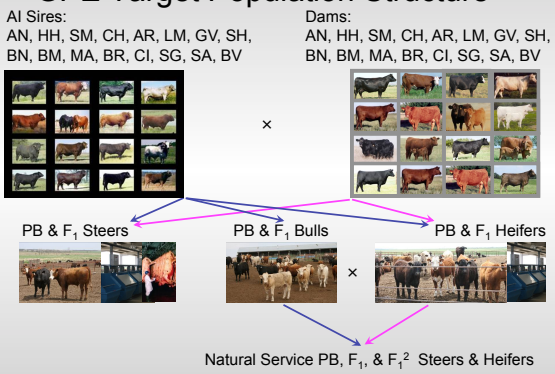
Breed differences

- Some inquiry into ABEPD system
- Since we're using the whole GPE database, are we biasing 'current' breed difference with old bulls?
- We rely on the genetic trend to estimate current breed differences from older bulls
  - Use weighted average of EPDs from bulls we've used to adjust USMARC data

Breed differences

- Can we address concern by looking only at recent sampling for GPE
  - Continuous evaluation of GPE in 2006
    - Shift from exotic germplasm to influential breeds
  - Began resampling breeds
    - 14 of 18 in 2006-2007
    - Added Brangus and Beefmaster in 2008-2009
    - Added South Devon and Tarentaise in 2011

GPE Target Population Structure



Current AI-sired Calves Produced

Breed	1/2	3/4	7/8	PB	Total
Angus	131	70	16	205	**422**
Beefmaster	178	30	1		**209**
Brahman	189	43			**232**
Brangus	184	38	3		**225**
Braunvieh	185	61	7		**253**
Charolais	92	46	14	243	**295**
Chiangus	184	76	8		**268**
Gelbvieh	97	139	51	2	**289**
Hereford	132	45	8	235	**420**
Limousin	95	140	48	2	**285**
Maine Anjou	223	55	3		**281**
Red Angus	95	134	46	5	**280**
Salers	184	77	4		**265**
Santa Gertrudis	181	68	7		**256**
Shorthorn	200	86	7		**293**
Simmental	140	58	11	190	**399**
Total	**2490**	**1166**	**234**	**882**	**4772**

Analysis of New GPE data only

- Compared to cumulative GPE data
- Used same analysis as ABEPD
- Results are shown relative to Angus
- Breed of sire differences
  - 1/2 of actual breed effect
  - Shown as differences from Angus
- These results are PRELIMINARY
  - They will likely change soon

Birth Weight – breed of sire effect

Breed	New GPE	Cumulative GPE	Diff
Angus	0.0	0.0	0.0
Hereford	4.4	4.5	-0.1
Red Angus	0.2	0.8	-0.7
Shorthorn	5.1	6.5	-1.3
Beefmaster	3.5	4.8	-1.4
Brahman	11.9	11.1	0.8
Brangus	3.4	3.5	-0.1
Santa Gertrudis	4.7	5.4	-0.6
Braunvieh	2.3	2.6	-0.3
Charolais	7.1	7.5	-0.4
Chiangus	3.0	3.6	-0.6
Gelbvieh	2.5	2.4	0.1
Limousin	2.6	3.6	-0.9
Maine Anjou	2.2	4.5	-2.3
Salers	0.2	1.8	-1.6
Simmental	3.8	4.3	-0.5

Weaning Wt – breed of sire effect

Breed	New GPE	Cumulative GPE	Diff
Angus	0.0	0.0	0.0
Hereford	-21.5	-5.5	-16.0
Red Angus	-11.5	-15.4	3.9
Shorthorn	-28.6	-20.4	-8.2
Beefmaster	-8.3	-1.3	-7.0
Brahman	4.2	10.8	-6.6
Brangus	-11.6	-8.7	-2.9
Santa Gertrudis	-9.4	-6.5	-2.9
Braunvieh	-26.6	-27.5	0.9
Charolais	1.9	15.5	-13.6
Chiangus	-26.2	-30.7	4.5
Gelbvieh	-14.0	-1.5	-12.4
Limousin	-9.2	-2.3	-6.9
Maine Anjou	-22.1	-22.9	0.8
Salers	-17.0	-10.5	-6.5
Simmental	4.1	9.2	-5.0

Yearling Wt – breed of sire effect

Breed	New GPE	Cumulative GPE	Diff
Angus	0.0	0.0	0.0
Hereford	-44.4	-35.6	-8.8
Red Angus	-28.7	-32.3	3.6
Shorthorn	-42.2	-22.4	-19.8
Beefmaster	-44.1	-42.5	-1.7
Brahman	-42.8	-56.0	13.2
Brangus	-44.7	-36.9	-7.8
Santa Gertrudis	-29.5	-31.4	1.9
Braunvieh	-59.6	-63.5	3.9
Charolais	-17.9	2.4	-20.3
Chiangus	-55.3	-58.3	3.0
Gelbvieh	-10.8	-18.2	7.3
Limousin	-38.1	-37.7	-0.5
Maine Anjou	-55.6	-44.5	-11.1
Salers	-49.6	-25.9	-23.7
Simmental	1.2	-6.5	7.7

Milk – breed of sire effect

Breed	New GPE	Cumulative GPE	Diff
Angus	0.0	0.0	0.0
Hereford	-13.3	-22.1	8.7
Red Angus	-7.8	-7.0	-0.9
Shorthorn	1.1	-0.5	1.6
Beefmaster	5.5	-11.1	16.6
Brahman	2.2	6.6	-4.4
Brangus	1.8	-6.0	7.8
Santa Gertrudis	-0.4	-9.9	9.4
Braunvieh	22.0	11.1	10.9
Charolais	-7.4	-9.2	1.8
Chiangus	-3.7	-7.4	3.6
Gelbvieh	24.6	6.1	18.6
Limousin	0.4	-9.6	10.1
Maine Anjou	-21.3	-10.1	-11.2
Salers	3.7	-1.3	5.0
Simmental	3.4	-0.9	4.3

Marbling – breed of sire effect

Breed	New GPE	Cumulative GPE	Diff
Angus	0.00	0.00	0.00
Hereford	-0.91	-0.73	-0.18
Red Angus	-0.43	-0.38	-0.05
Shorthorn	-0.75	-0.64	-0.11
Santa Gertrudis	-1.08	-1.12	0.05
Braunvieh	-0.59	-0.63	0.04
Charolais	-0.93	-0.87	-0.06
Chiangus	-0.66	-0.72	0.05
Gelbvieh	-0.87	-0.83	-0.04
Limousin	-1.17	-1.19	0.02
Maine Anjou	-1.23	-1.09	-0.13
Salers	-0.27	-0.36	0.09
Simmental	-0.76	-0.80	0.04

Ribeye area – breed of sire effect

Breed	New GPE	Cumulative GPE	Diff
Angus	0.00	0.00	0.00
Hereford	-0.26	-0.25	-0.01
Red Angus	-0.05	-0.35	0.31
Shorthorn	0.23	-0.14	0.37
Santa Gertrudis	-0.21	-0.46	0.25
Braunvieh	0.89	0.51	0.38
Charolais	1.39	0.80	0.59
Chiangus	0.37	0.12	0.25
Gelbvieh	0.94	0.66	0.28
Limousin	1.45	1.21	0.24
Maine Anjou	0.59	0.68	-0.08
Salers	0.60	0.40	0.20
Simmental	0.85	0.70	0.16

Fat thickness – breed of sire effect

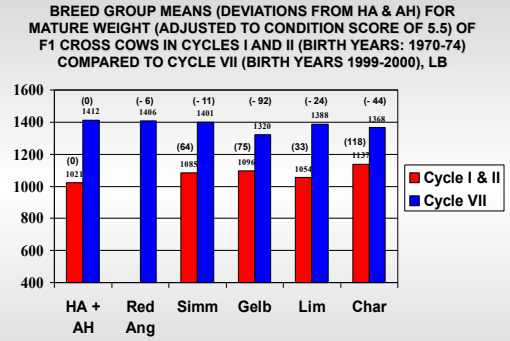
Breed	New GPE	Cumulative GPE	Diff
Angus	0.000	0.000	0.000
Hereford	-0.087	-0.058	-0.029
Red Angus	-0.035	-0.041	0.006
Shorthorn	-0.174	-0.162	-0.012
Santa Gertrudis	-0.112	-0.124	0.012
Braunvieh	-0.192	-0.179	-0.014
Charolais	-0.211	-0.230	0.019
Chiangus	-0.155	-0.162	0.007
Gelbvieh	-0.160	-0.189	0.029
Maine Anjou	-0.246	-0.239	-0.007
Salers	-0.199	-0.217	0.018
Simmental	-0.163	-0.209	0.045

Why differences?

- EPD on bulls not accounting for differences in sampling between 'old' cycles of GPE and new sampling
  - TREND and connectedness
  - Accuracy structure of new GPE
- Cycle VII not included
  - 1990s samples of bulls – better connected
- Error structure of breed differences (USMARC) and EPDs (accuracy)
- Need to look further!

Differences in Cow Weights

Are we changing efficiency through selection for growth?



Cow weight differences same?

- Compare Cycle VII females to new GPE sampling
  - ~8 years between bull sampling
  - Oldest cows only 5.5 in new GPE sampling
  - Mature weight limited
    - Earlier weights are a proxy (highly correlated)
    - Weights at ~550 and 920 d (1.5, 2.5 yr)
    - Data not precise yet but give an indication

Palpation weight (~1.5 yr)

Breed	New GPE weight	Cycle VII weight
Angus	950	923
Hereford	913	956
Red Angus	921	921
Charolais	952	969
Gelbvieh	960	907
Limousin	916	912
Simmental	949	979
Beefmaster	917	
Brahman	950	
Brangus	941	
Braunvieh	807	
Chiangus	886	
Maine Anjou	895	
Santa Gertrudis	948	
Salers	880	
Shorthorn	926	

Palpation weight (~2.5 yr)

Breed	New GPE weight	Cycle VII weight
Angus	1192	1166
Hereford	1171	1199
Red Angus	1154	1141
Charolais	1225	1211
Gelbvieh	1183	1120
Limousin	1144	1154
Simmental	1178	1213
Beefmaster	1126	
Brahman	1187	
Brangus	1134	
Braunvieh	991	
Chiangus	1124	
Maine Anjou	1171	
Santa Gertrudis	1150	
Salers	1126	
Shorthorn	1111	

Cow Weights

- Some breeds have moderated while others are larger than at Cycle VII
- Seems to be a real opportunity for breed complementarity
- These results are preliminary
  - Would like a few more years of data.

Thoughts

- Demonstrates need for continued research for breed differences
  - USMARC GPE not enough
    - More to the country than central Nebraska
    - Southern location most important
    - Use of common sires between locations will strengthen overall power
- Exploring options to improve delivery of ABEPD

Questions