Genetic parameters for udder quality in Hereford cattle

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Outline

- Background
- Methods
- Results and Discussion
- Conclusions

BACKGROUND

Longevity

- Average 2.7% of cull cows
- Top reason for culling aged cows
- Better udder quality, retain fewer replacement heifers

Labor

- Newborns had difficulty nursing
  - Pendulous attachment
  - Large teats
  - Small teats
- Increased labor cost

Calf Mortality

Udder Type	Mortality
Small diameter teats	6.1%
Large diameter teats	48.6%
Short teats	7.8%
Long teats	23%

- Later consumption of colostrum

Calf Performance

- 5 to 14 kg lighter
  - Small udders
  - Small teats
  - Large teats
- Udder type x calving difficulty

Mastitis

- Weak suspension greatest risk
- Causes blind (unproductive) quarters
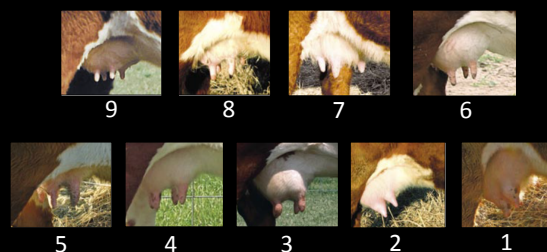- Calves 26 to 31 kg lighter weight

Measurement

- Subjective scores 1 - 9
- 24 hours after calving
- Poorest quality quarter
- Evaluated by 1 person

Overall Score

9   8   7   6

5   4   3   2   1

	Udder Suspension		Teat Size	
Score	Description		Description	
9	Very tight		Very small	
7	Tight		Small	
5	Intermediate /moderate		Intermediate/ moderate	
3	Pendulous		Large	
1	Very pendulous, broken floor		Very large, balloon-shaped	

Objective

- To estimate the heritabilities and genetic correlations for overall score, suspension, and teat size for the AHA

METHODS

Method

- AHA, Kansas City, MO
- Records since 2004
- Cow ages 2 to 15
- Contemporary group (herd-year-season)
  – ≥ 25 head
  – Variance in scores
  – Multiple sires
- ASREML 3.0

Method

Item	Number
Total records	188,524
Total animals	78,556
Pedigree animals	196,540
Contemporary groups	3,079

Model

- Multiple trait animal model
- Random effects
  – Additive genetic
  – Permanent environment
- Fixed effects
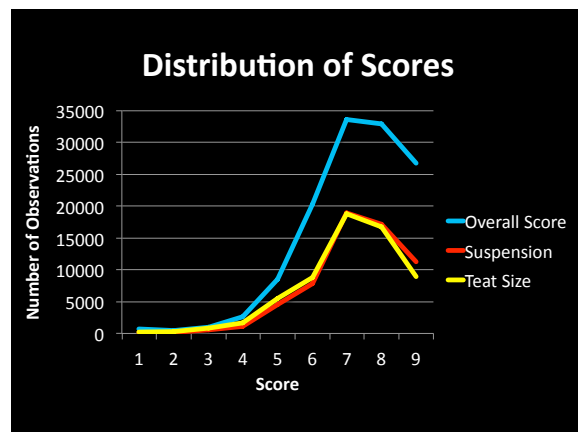 – Contemporary group (herd-year-season)
  – Age

Model

- Residual covariances
  – Overall score and teat size
  – Overall score and suspension
- Fixed at 0

RESULTS AND DISCUSSION

Descriptive Statistics

Trait	Mean	SD	n	Animals
Overall score	7.25	1.44	126,753	58,805
Suspension	7.25	1.36	61,758	33,299
Teat size	7.06	1.43	61,765	33,293

Distribution of Scores

Heritability

Trait	h^2
Overall score	0.32 (0.01)
Suspension	0.31 (0.01)
Teat size	0.28 (0.01)

- Overall score $h^2 = 0.23$
- Suspension $h^2 = 0.22$ to 0.33
- Teat size $h^2 = 0.21$ to 0.38

Repeatability

Trait	Repeatability
Overall score	0.49 (0.004)
Suspension	0.49 (0.010)
Teat size	0.47 (0.005)

- Overall score   repeatability = 0.34

Phenotypic Correlations

Traits	r
Suspension and teat size	0.64 (0.003)

- Attachment and depth $r = 0.49$
- Attachment and teat size $r = 0.31$
- Depth and teat size $r = 0.40$

Genetic Correlations

	Overall score	Suspension
Suspension	0.70 (0.02)	
Teat size	0.72 (0.02)	0.83 (0.01)

- Attachment and depth $r = 0.60$
- Attachment and teat size $r = 0.52$
- Depth and teat size $r = 0.58$
- Suspension and teat size $r = 0.95$

EPD

Item	Number
Total records	375,945
Total animals	146,855
Pedigree animals	334,289
Contemporary groups	15,774

EPD

Trait	Mean	SD	Min	Max
Suspension	0.05	0.16	-1.40	1.51
Teat size	0.05	0.16	-1.32	1.04

EPD

Bull	Suspension EPD	Teat size EPD
A	+ 1.00	- 0.25
B	0.00	+ 0.25

- Expect Bull A's daughters to be 1 score better for suspension (tighter suspension)
- Expect Bull B's daughters to be 0.5 score better for teat size (smaller teats)

Genetic Trend
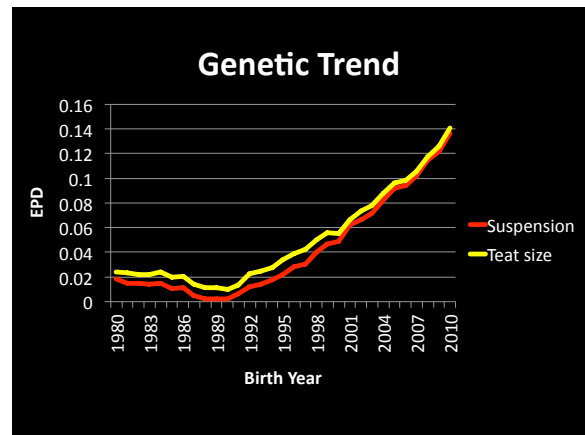
Conclusions

- Indicator trait
- Moderately heritable
- Highly repeatable
- Strong genetic correlations
- AHA
  - EPD
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Acknowledgements

- American Hereford Association

Questions