Selection for Traits Not Included in National Cattle Evaluation

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Why Wouldn't a Relevant Trait Be in NCE?

- Subjectively measured
- Data not collected by association
- Niche trait
- Questionable indicator
- Not related to profit

Natural Service Sires

- Functional structural soundness and breeding soundness are obvious necessities
- The remainder of this talk will focus on sire selection to improve the phenotypes of progeny

Selection without EPDs

- Anytime you make a selection decision, you are basing that on your estimation of the individual's progeny difference
- Consider what selection with EPDs includes
  - Those need to be considered when selecting without EPDs

Selection without EPDs

- EPD selection starts with accurate, objective measurement of the phenotype
- Measurement error lowers the accuracy of selection
- EPD selection compares animals' phenotypes to those of other animals in the same contemporary group
  - Accounts for environmental effects

Selection without EPDs

- EPDs account for the heritability of the trait
  - Heritability reflects the degree to which variation in the trait is the result of individual gene effects
  - Higher heritability means greater resemblance among relatives
  - Higher heritability means greater rate of genetic change as a result of phenotypic selection

Heritability

- Highly heritable traits ($h^2 > 0.40$) respond well to phenotypic selection
  - Carcass traits, mature size
- Traits that are low in heritability ($h^2 < 0.15$) are difficult to change without progeny testing
  - Female reproductive rate, survival
- Rate of growth is typically moderately heritable

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Heritability of Conformation

Trait	h^2	Trait	h^2
Stature (height)	0.60	Rear legs (hock set)	0.12
Body length	0.39	Foot/pastern angle	0.13
Muscling	0.42	Udder attachment	0.23
Body capacity	0.44	Udder depth	0.35
Femininity	0.32	Teat size	0.39

Simmental data from ABS Global, Kirschten et al, 2002

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Selection without EPDs

- EPDs combine data from the animal, its ancestors, and its progeny
- EPDs account for level of genetic competition (genetic level of herd of origin)
- EPDs account for non-random mating

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Selection without EPDs

- Some EPDs incorporate genomic information
  - Better account for Mendelian sampling
  - Add accuracy to young animals

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Profit

- Selection indices (B, BMI, API) describe the relationship between level of a trait, and profit
- What is the relationship between your trait of interest, and profit?

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Cow Disposal

Reason	Freq.	Reason	Freq.
Open	52.2%	Udder	1.8%
Production	16.5%	Old age	1.2%
Illness	8.9%	Structure	0.8%
Other death	6.4%	Prolapse	0.8%
Injury	4.2%	Feet	0.5%
Temperament	2.9%	Eyes	0.5%
Calving difficulty	2.9%	Genetic defect carrier	0.3%

American Hereford Association Whole Herd TPR data

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Visual Muscling vs. Ribeye EPD

- Koch et al., (2004) showed visual muscle score was as heritable as ribeye area, and the two traits were reasonably correlated
- Ribeye area was a much better indicator of carcass cutability
- For a ranch that sells calves at weaning, visual muscling may be the economically relevant trait

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Summary

- When EPDs for a trait are available, they are the most powerful tool available for selection
- "Mental Adjustment" of EPDs for visual characteristics, actual data, etc. introduces bias and lowers rate of genetic progress
- Traits without EPDs can be selected for, but selection is more difficult and genetic change is slower

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Good News / Bad News

- Traits without EPDs are more difficult to improve through selection
- Traits without EPDs change at a slower rate, so significant unfavorable change is less likely

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