

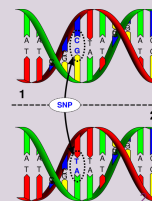
Practical application of genomic tests in beef production

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What is genomic testing?

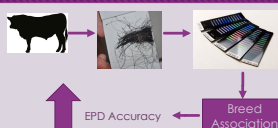
- Many tests for genetic markers (usually SNPs)
 - Single nucleotide polymorphisms
 - Seedstock and commercial herd applications
 - Used as a genetic marker to predict performance for ERT
 - Can also be used for parentage testing
- Some tests for causal mutations
 - Mostly genetic abnormalities



Watch video on beefreproduction.com for more info

Genotyping in Seedstock

- Quantitative trait testing
 - Generally mid- to high-density SNP genotyping
 - Use in the context of genetic evaluation
- Marketing tool
 - Tool for enhancement of genetic improvement
 - Use to make selection decisions
 - How much?
 - Dairy had substantial genetic gain (net merit)
 - PIC Index gain ~35% (Lourenco 2017)



If a seedstock breeder, work with association on submission of samples

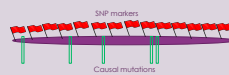
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How does it work?

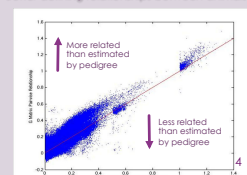
Either estimating the effect of QTN

or

Better defining relationships between animals



This doesn't work perfectly:
 -Differences in allele frequency
 -Thousands of effects to predict with small individual effects
 -Sometimes more effects to predict than animals genotyped



How I think of genomic tests

What we usually have (absent AI):
Low accuracy EPD



Best estimate for genetic merit we have w/ all info -Ped, own perf

We can also have: Genomic test



Useful, but has some holes -Doesn't explain all variation

If we add them together....



Higher accuracy EPD -More predictive the test, larger stack

If we continue to collect and report performance data....



Even higher accuracy EPD

Gold standard: High accuracy EPD



Proven-lots of performance data

Performance Trait Testing-Commercial

- Commercial cattlemen can benefit from testing done by bull suppliers
- Bull selection
 - What is the increased accuracy worth to you?
 - May want to consider critical traits (potentially CED, etc.) separately
 - Consider other production traits (WW, carcass, etc.)

Young Angus Herd Sire

WW EPD =65
Accuracy =0.3

Possible change value =11
68% confident true EPD Between 54 and 76

Young Herd Sire + Genomic

WW EPD =45
Accuracy =0.45

Possible change value =8.6
68% confident true EPD Between 56.4 and 73.6


Young Herd Sire Prospect

CED EPD =12
Accuracy =0.2
Possible change value =8.2
68% confident true EPD Between 3.8 and 20.2

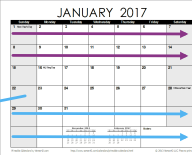
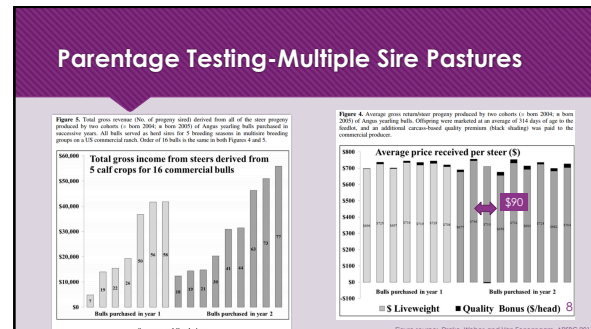
Proven sire
CED EPD =12
Accuracy =0.8
Possible change value =2.1
68% confident true EPD Between 9.9 and 14.1

Parentage Testing

- Parentage testing
 - Resolve ambiguous birth dates
 - Maintain integrity of pedigree
 - Management Information-Keep only AI sired heifers
 - We know a lot about a commercial heifer just by knowing the sire



DOB Jan 22
???

Parentage Testing

- Parentage testing
 - Exclusion of animals that can't be the parent
 - Use genetic markers to exclude animals as a possible parent, leaving those remaining (hopefully only one) as the most likely parent

	Locus A	Locus B	Locus C	Locus D	Locus E
Calf	aa	BB	Cc	DD	ee
Dam	Aa	Bb	cc	Dd	ee
Sire 1	AA	BB	Cc	Dd	ee
Sire 2	Aa	bb	CC	dd	Ee
Sire 3	aa	Bb	Cc	DD	Ee

Parentage Testing Tips

- Make sure marker panels are consistent
- Genotype all possible parents
 - Don't include animals that couldn't possibly be the sire or dam due to location or other factors
- Dam genotypes are helpful, but not essential
- Parentage is harder to resolve when using related sires/animals

	Locus A	Locus B	Locus C	Locus D	Locus E
Calf	aa	BB	Cc	DD	ee
Dam	Aa	Bb	cc	Dd	ee
Sire 1	AA	BB	Cc	Dd	ee
Sire 2	Aa	bb	CC	dd	Ee
Sire 3	aa	Bb	Cc	DD	Ee

Single-Gene Tests

- Polled
- Black coat color
- Genetic abnormalities
 - Management of these conditions
 - Do not cull good genetic lines completely due to recessive genetic conditions!!!
 - Use in crossbreeding
 - Terminal breeding programs
 - Manage incidence of affected calves in any program

2 alleles at each locus N=normal n=affected	N	N
N	NN	NN
n	Nn	Nn

2 alleles at each locus N=normal n=affected	N	n
N	NN	Nn
n	Nn	nn

For more Information

- eBEEF.org
 - Videos and fact sheets
- Beefreproduction.org
 - Videos




Identification and Management of Alleles Impairing Heifer Fertility While Optimizing Genetic Gain in Cattle

