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How To Use Commercially Available Genomic Predictions

Michael Gonda, Ph.D., Associate Professor
Department of Animal Science, South Dakota State University

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Genomic predictions for simply-inherited traits

	E^D	e
E^D	$E^D E^D$	$E^D e$
e	$E^D e$	ee

$E^D E^D$ $E^D e$ ee

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Genomic predictions for complex traits

- Feeds & feeding management
- Pasture quality & stocking density
- Calving season
- Climate & weather
- Exposure to pathogens
- Preventative medicines
- Exposure to stress
- Animal handling
- Maternal effects (effect of dam)

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Benefits of DNA Testing for Complex Traits

GPA Before Entering Class

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Limitations of DNA Testing for Complex Traits

Environment

Genetics NOT included in DNA test

Genetics included in DNA test

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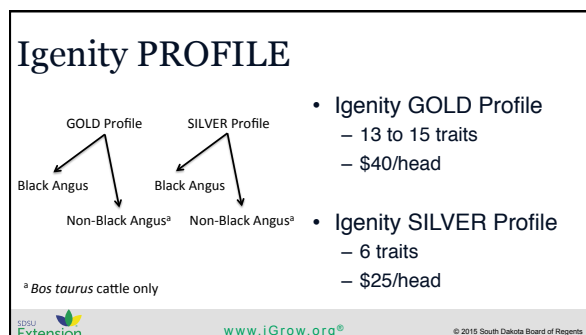
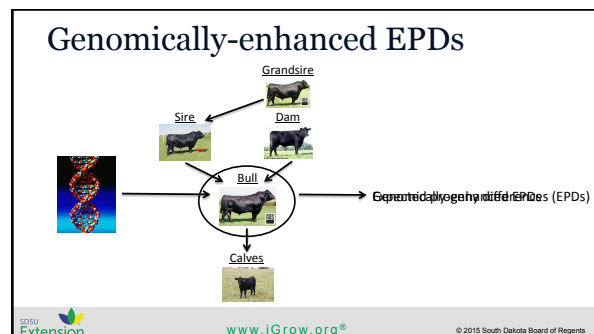
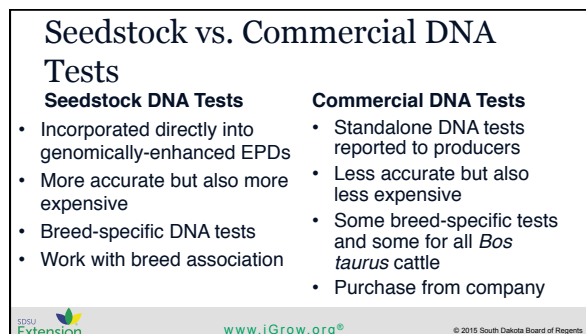
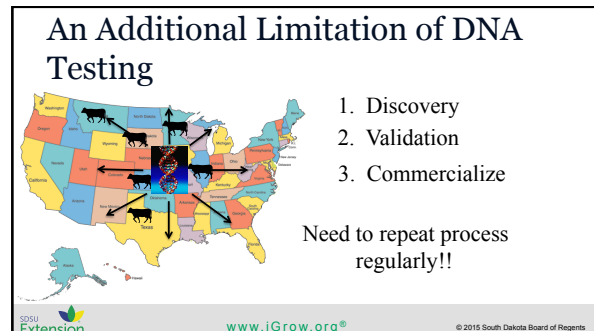
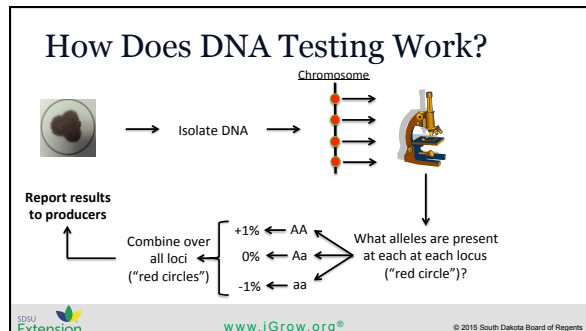
Limitations of DNA Testing for Complex Traits

Environment

Genetics NOT included in DNA test

Genetics included in DNA test

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	Igenity GOLD		Igenity SILVER	
	Angus	Non-Angus ^a	Angus	Non-Angus ^a
Growth & Feed Efficiency				
Average daily gain	X	X	X	X
Mature weight	X			
Milk	X	X	X	
Residual feed intake/ RADG	X	X		X
Weaning weight	X			
Reproduction & Calving Ease				
Birth weight	X		X	
Calving ease direct	X		X	
Calving ease maternal	X	X	X	X
Heifer pregnancy rate	X	X	X	
Stayability		X		X

^a *Bos taurus* cattle only

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	Igenity GOLD		Igenity SILVER	
	Angus	Non-Angus ^a	Angus	Non-Angus ^a
Carcass				
Carcass weight	X			
Fat thickness	X	X		
Marbling	X	X	X	X
Ribeye area	X	X		
Tenderness	X	X		X
Behavior				
Docility	X	X	X	

Parentage test offered for no additional charge, but need to provide DNA from all parents or parents' DNA already genotyped by GeneSeek (Igenity).

^a Bos taurus cattle only

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Interpreting Igenity PROFILE Results

Animal ID	Marbling	Stayability	Fat Thickness	Docility	Igenity Score	Stayability
701	8	8	8	7	8	12.9%
702	6	5	6	5	7	11.2%
					6	9.5%
					5	7.6%
					4	5.8%
					3	3.9%
					2	2.5%
					1	0%

Animal 701's daughters are 5.3% (12.9% - 7.6%) more likely to remain productive until six years of age than Animal 702's daughters.

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Igenity Production Index

Yearling weight
Carcass weight
Fat thickness
Marbling
Ribeye area

→ **\$Beef**

Calving ease maternal
Residual feed intake
Marbling
Average daily gain
Stayability
Tenderness

→ **Production Index^a**


- DNA-based selection index
- Default or custom weights
- Recommend custom weights

^a Non-Black Angus

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GeneMax (Zoetis/CAB)

- GMX Focus
 - GMX Score (ADG & Marbling)
 - \$17/head
- GMX Advantage
 - Cow Advantage Index
 - Feeder Advantage Index
 - Total Advantage Index
 - \$44/head



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GeneMax Advantage

	Cow	Feeder	Total
Growth & Feed Efficiency			
Mature height	X		
Mature weight	X		
Milk	X		X
Dry matter intake		X	X
Weaning weight	X		X
Yearling weight		X	X
Reproduction & Calving Ease			
Calving ease maternal	X		X
Heifer pregnancy rate	X		X

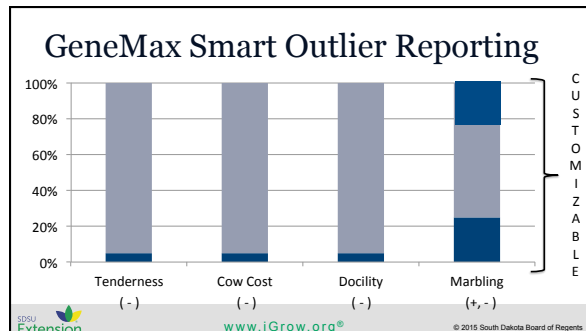
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GeneMax Advantage

	Cow	Feeder	Total
Carcass			
Carcass weight		X	X
Fat thickness		X	X
Ribeye area		X	X
Marbling		X	X

Parentage test offered for no additional charge, but need to provide DNA from all parents or parents' DNA already genotyped by Zoetis Animal Genetics.

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Interpreting GeneMax Results

GeneMax Focus				GeneMax Advantage						
	Gain	Marbling	Focus	Smart Outliers				GMX Advantage		
				Doc	Tend	Cost	Marb	Cow	Feeder	Total
701	4	5	87							
702	5	5	96							
703	3	2	52							
	Range 1-5		Range 1-100							
				801	[-]		[+]	80	92	96
				802			[-]	69	93	92
				803	[+]		[+]	49	74	68
					[-]		[-] or [+]	Range 1-100		

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PredicGEN (Zoetis)

- Carcass genetic merit
 - Marbling, Tenderness, and Yield Grade
- Grid merit index
 - Marbling and Yield Grade
- Results reported on 0-100 scale
- Cost = \$19.50/head
- <75% Black Angus cattle

	Marb	Tend	YG	GRID
901	89	64	57	75
902	62	91	93	72
903	41	39	74	50

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Selecting the Right DNA Test

- What breed(s) do you own?
 - ≥ 75% Black Angus
 - Igenity GOLD & SILVER
 - GMX Focus & Advantage
- What traits are economically relevant?
 - < 75% Black Angus^a
 - Igenity GOLD & SILVER
 - PredicGEN

^a Bos taurus cattle only

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Selecting the Right DNA Test

- What breed(s) do you own?
 - All-Purpose
 - Igenity GOLD & SILVER
 - GMX Total Advantage
 - Pre-weaning
 - GMX Cow Advantage
 - Post-weaning
 - GMX Focus
 - GMX Feeder Advantage
 - Carcass
 - PredicGEN
- What traits are economically relevant?

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Selecting the Right DNA Test

What should you do if multiple DNA tests are appropriate for your operation?

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Using DNA Test Results

GMX Focus Score Category	Number of Animals	Marbling Score	Average Daily Gain (lbs/d)
High (80-99)	83	538 ^a	4.33
Mid-High (60-79)	32	518 ^{ab}	4.36
Mid-Low (40-59)	30	479 ^b	4.27
Low (0-39)	28	466 ^b	4.22

Data taken from "GeneMax™ Field Study Summary." Certified Angus Beef.
<https://www.zoetis.com/animal-genetics/media/documents/prattstudytechnicalreview.pdf>

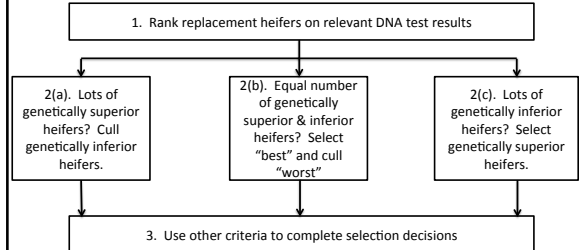
Means with different superscript letters are significantly different ($P < 0.05$)



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Using DNA Test Results - Selection



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Using DNA Test Results - Mating

Milk Igidity Scores	
101	10
108	9
117	9
178	8
109	7
119	6
102	6
103	5
111	4
115	2

← Mate to bull with low Milk EPD

← Mate to bull with high Milk EPD



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Using DNA Test Results - Marketing

	SIREs			Feeder Calf Tested
		Top 15% \$B	Top 25% \$B	GMX > 80
COWHERD	Top 50% \$B	X		X
	Top 25% \$B	X	X	X
	GMX > 75	X	X	X
	GMX 60-74	X		X
	Angus-base	(X)		X



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How To Collect DNA?



Blood spot on FTA card

Hair follicle collector



- Semen
- Whole blood (w/ anticoagulant)
- Tissue sample (e.g., ear notch)



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Take Home Messages

- DNA testing can be useful for selecting replacement heifers, mating decisions, and marketing programs
- DNA testing does have limitations, like all predictions of genetic merit
- DNA testing should be used jointly with other selection criteria for replacement heifers



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