



Genotyping solutions for commercial Beef producers

NEOGEN Genomics
Sharon Watkinson 26th May 2021

| Who am I?

Sharon Watkinson
Business Development Beef and Sheep

- 1½ years with Neogen
- BSc Hons in Biomedical Science
- 19 Years working with Molecular Biology / Genomics organisations, such as Applied Biosystems and Eurofins
- Hillside Sheep and Beef farmer



Ayr, Scotland

NEOGEN Europe Headquarters



Growing Global Demand

Pressures placed on food production



In **50 years**, the world's population will require...



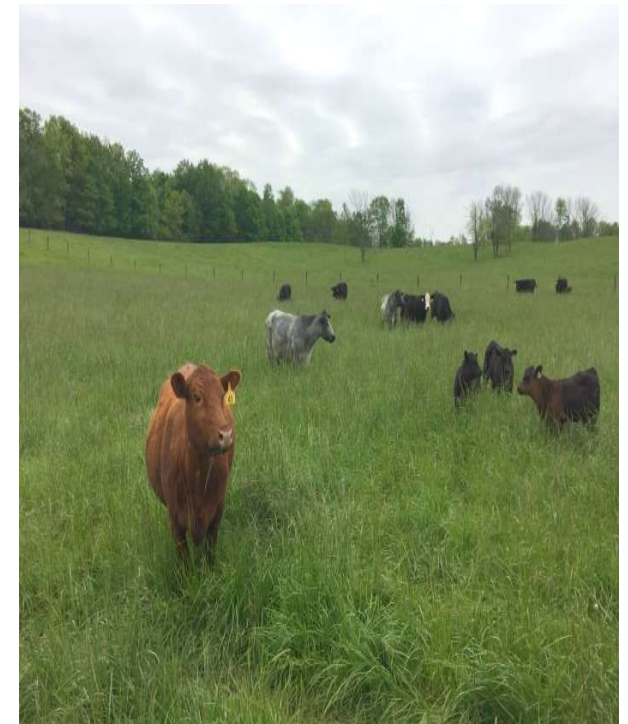
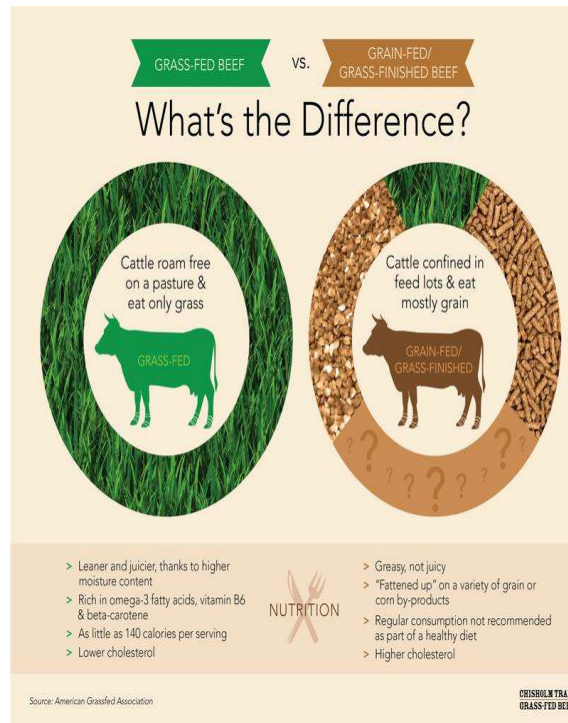
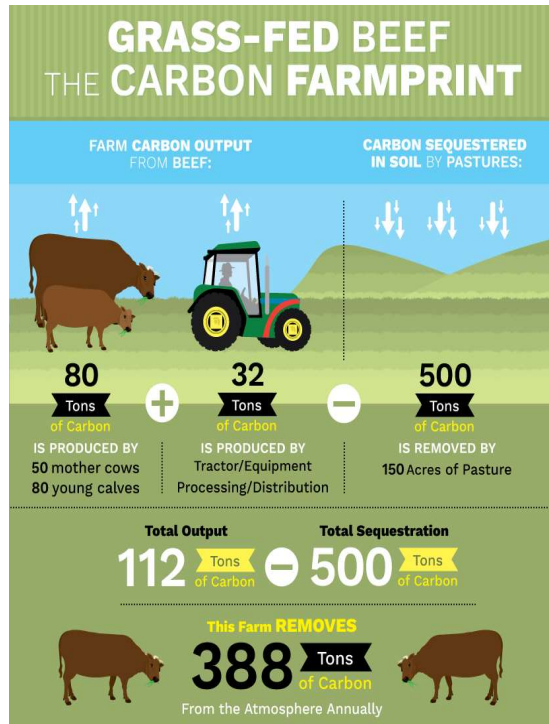
...**100%** more food...



...and **70%** of this food must come from efficiency-improving technology.

Environment / Sustainability

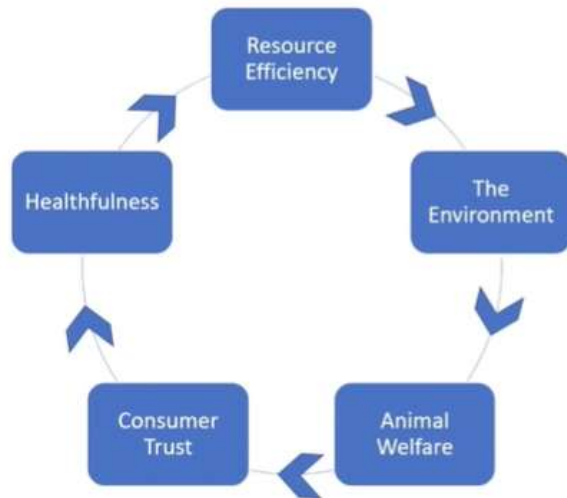
Select to meet goals



How Farmers use Genomics?

- Make decisions on what calves are to be retained in the herd
 - Retain animals to improve genetic gain in the herd
- Market and sell prime animals
- Cull animals, thereby improving the herd and reducing overheads
- Improve the performance of existing mating strategies

Breeding the Beef of the Future.....



Why profile your cattle?

- Seedstock offerings improve every year
- Biology = Variability
 - Good bulls don't mean good progeny
- For example:
 - Cattle have 30 pairs of chromosomes
 - 1 from sire
 - 1 from dam
 - $2^{30} = 1,073,741,824$ combinations per sperm cell
 - Same thing happens in the cow
- 1 Billion x 1 Billion = **1 Quintillion**
 - Possible combinations of DNA from a pair of parents
 - How do you choose?

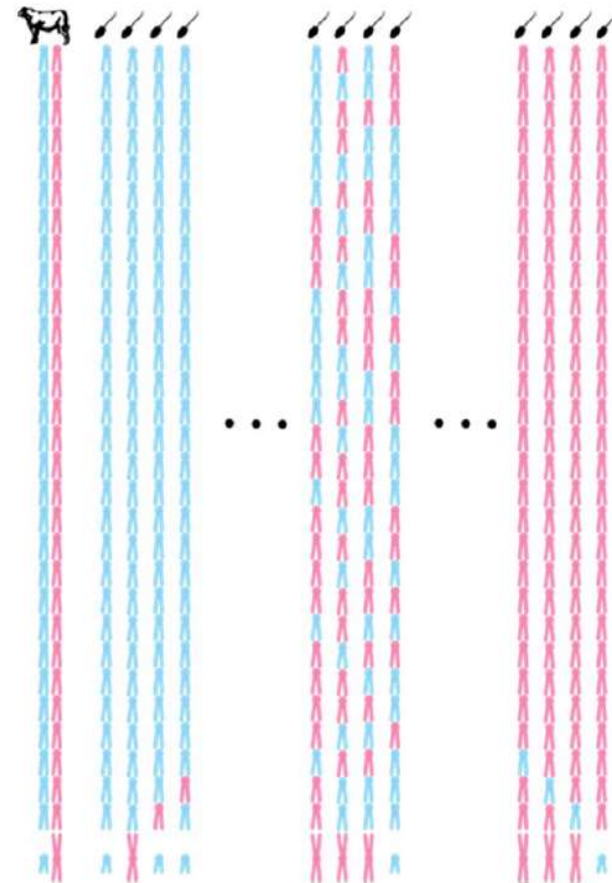
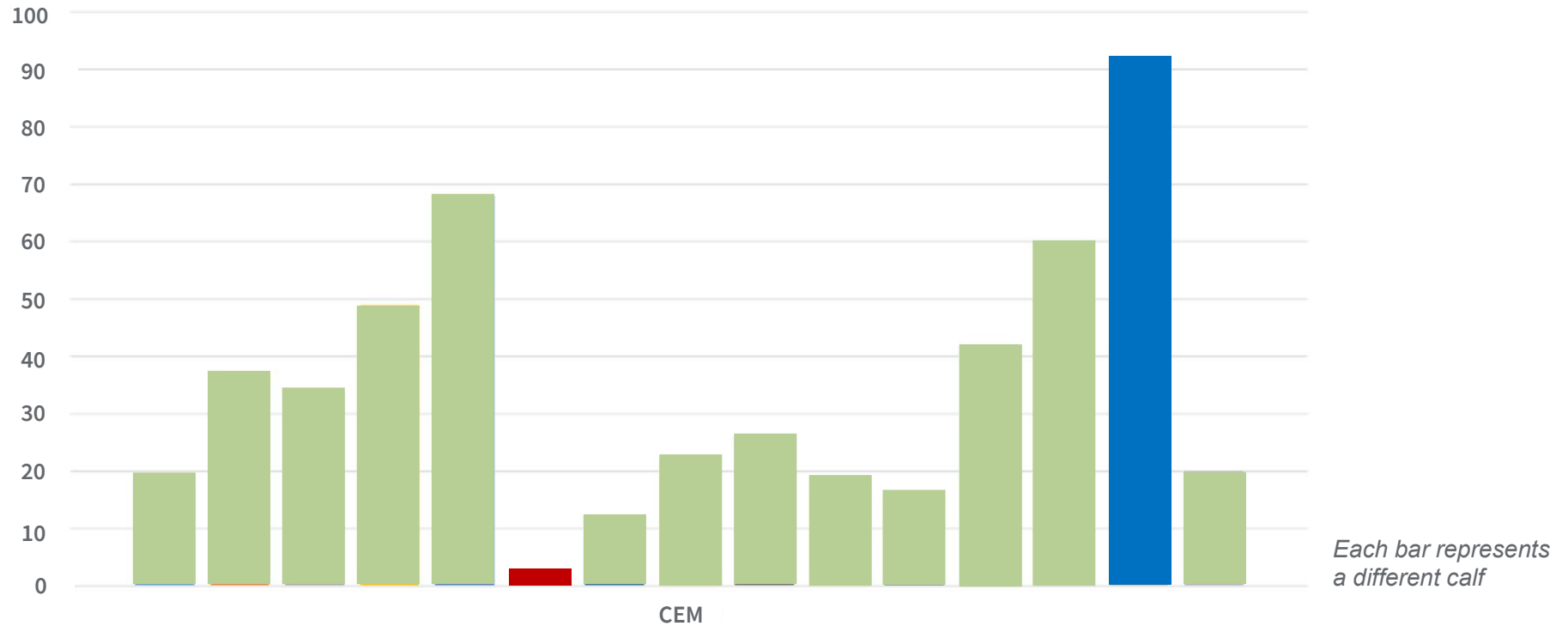


Image: eBEEF.org (2014) The Random Shuffle of Genes: Putting the E in EPD

Genomics Identifies the Variability

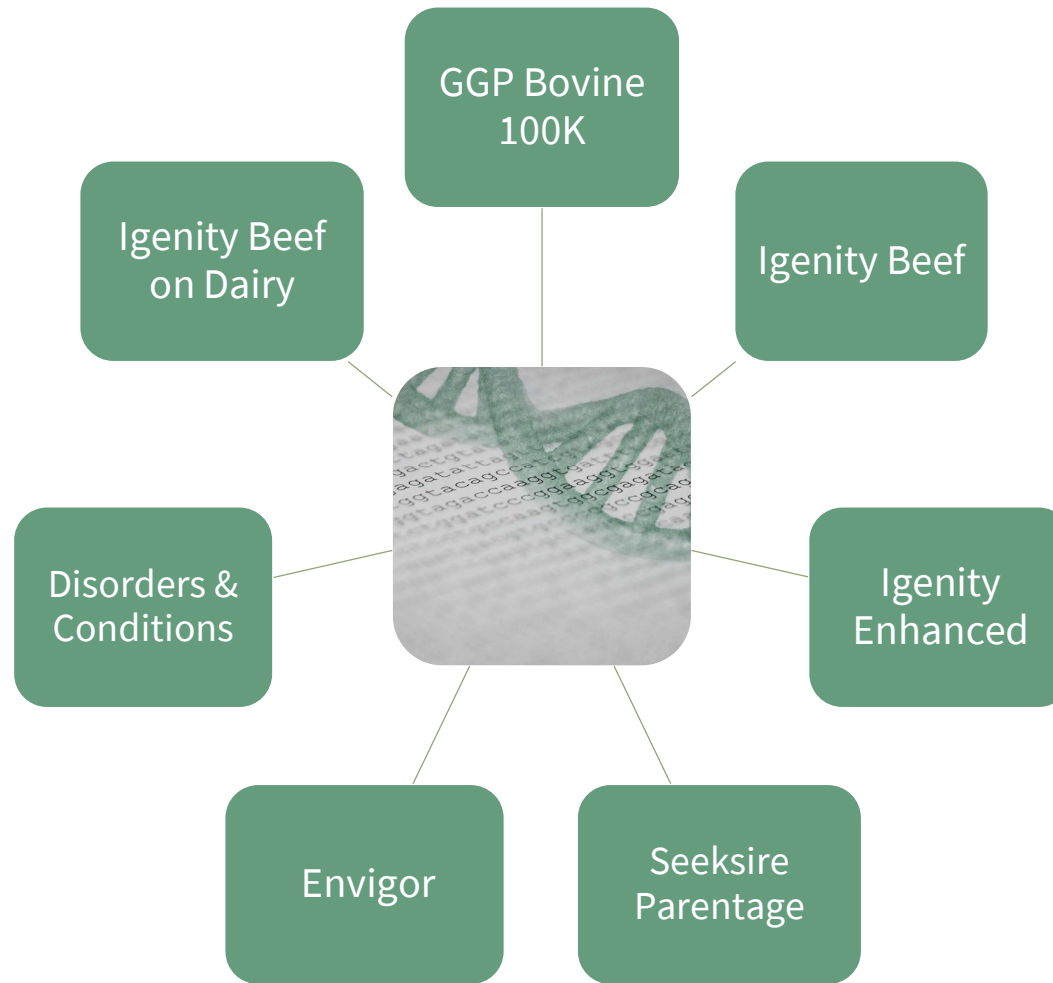
Tremendous variation even between cattle that are closely related



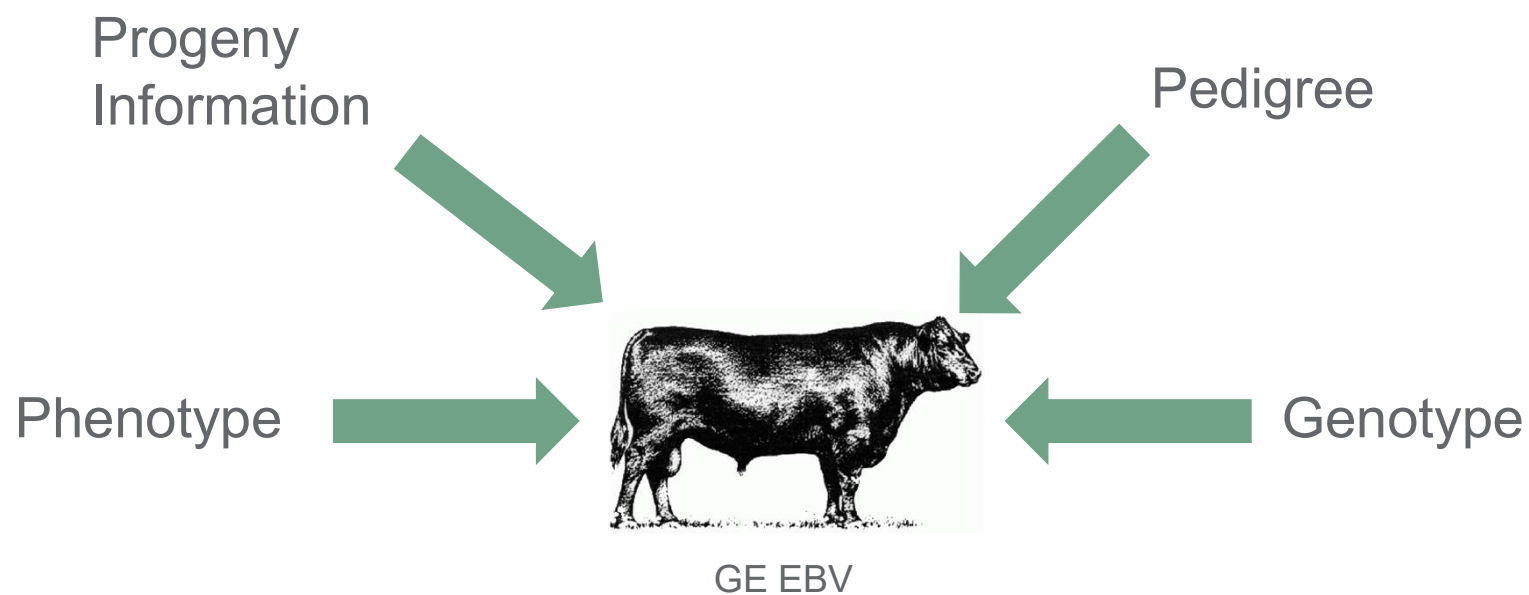
Genomic variation in Calving Ease Maternal among half-sibling embryos (percentile ranking) all sired by a single bull

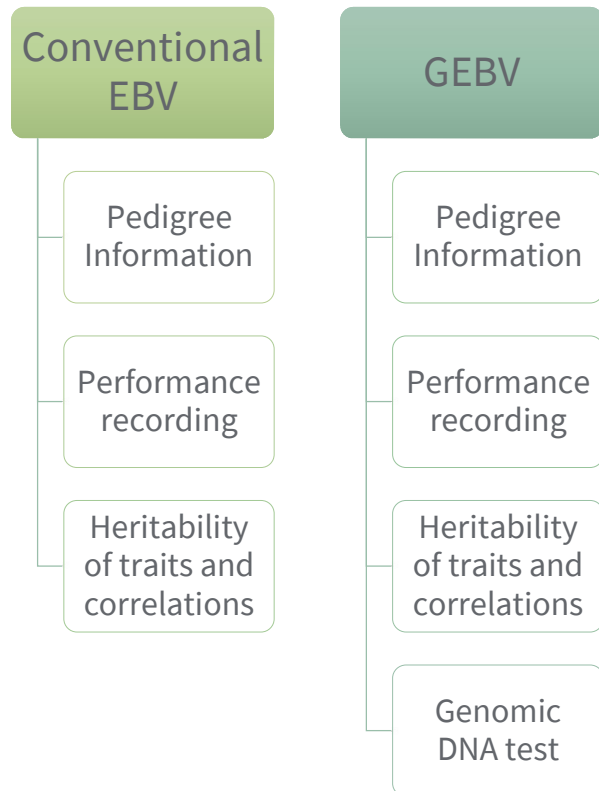
Neogen Beef

Solution for all aspects of the industry



Genomic Evaluations – Genomic Enhanced EBVs





Why Producers Genomically Test Bulls?

- Increase accuracy of EBVs
 - More accurate estimate of relationship (shared DNA)
 - More confident selection decisions
- Decrease generation interval
 - Faster genetic turnover
- Allows for more accurate evaluation of traits that are difficult to measure or are measured late in life
 - Carcass traits, Stayability, Heifer Pregnancy, etc.

Decrease the Generation Interval

Progeny Equivalents

Obtaining progeny records takes time

- Growth records (WW, YW, etc) – 3 years
- Carcass records (REA, MARB, etc) – 4 years
- Maternal records (CED, HP, etc) – 5 years

Trait	PE	Trait	PE
Calving Ease Direct	25+	Stayability	15
Calving Ease Maternal	4	Docility	25+
Birth Weight	22	Carcass Weight	5
Weaning Weight	25+	Marbling	8
Yearling Weight	25+	Rib Eye Area	6
Milk	19	Back Fat	8

Know as much, if not more, about a male shortly after birth, as would take 5+ years to obtain!

Faster Generation Interval

	Birth	Year 1	Year 2	Year 3	Year 4	Year 5
Growth and Carcass EBVs	Bull calf weight	Yearling weight Mate bull for progeny testing	Birth weight of progeny Wean and place progeny on feed	Obtain Growth EBVs	Slaughter progeny. Get Carcass EBVs	
Maternal EBVs		Mate bull for maternal EBVs	Birth of progeny Wean and sort heifers	Breed heifers for first calf	Rebreed heifers for second calves	Obtain Maternal EBVs
GE-EBVs	Collect DNA Samples on bull calves and heifers Obtain GE-EBVs	Market yearling bulls with accurate GE-EBVs				



Neogen Genotyping

To be used in partnership with a genomic evaluation provider

Ideal tool to test bulls and cows, producing high-accuracy GE EBVs (Genomically Enhanced EBVs)

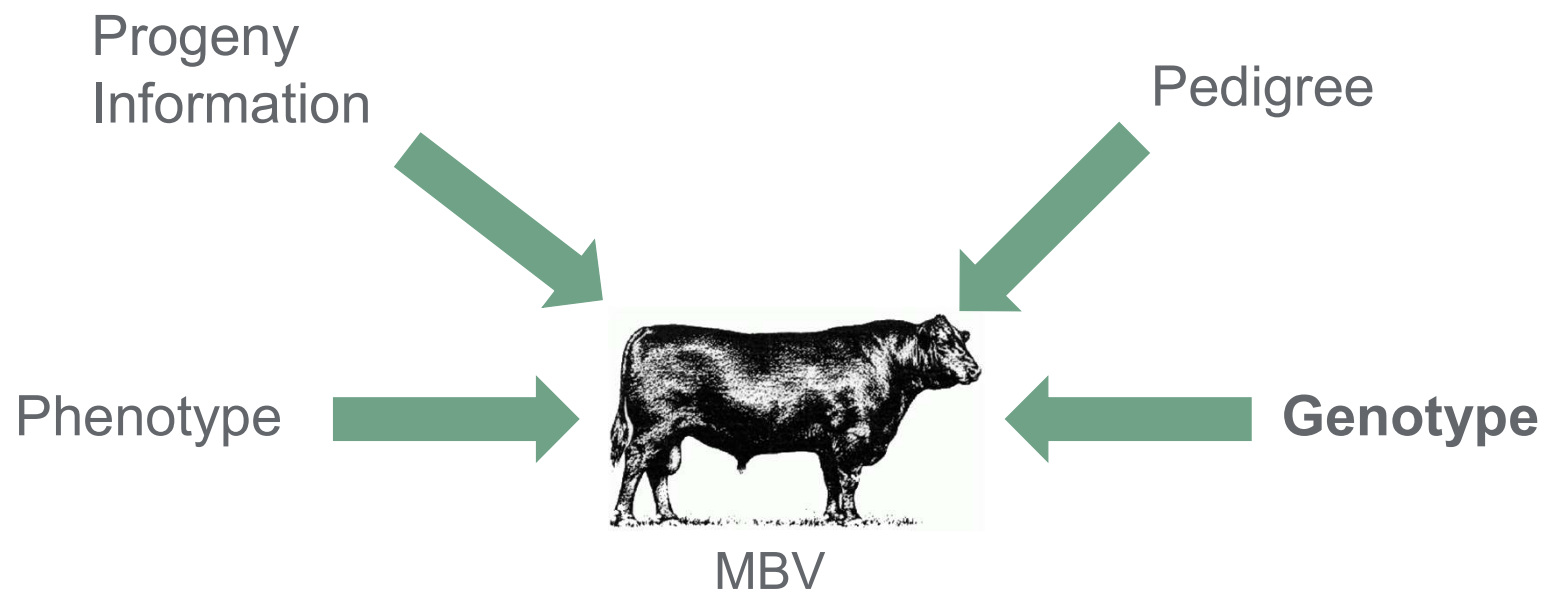
Impact on key traits that cattle inherit from their parents

Detect gene markers that have the greatest influence on economically important traits and conditions

- **GGP Bovine 100K chip**
- **Angus GS specifically for Angus animals**



Commercial Beef Tools



New Igenity Beef Profile

First and only complete heifer profile designed for crossbred and straight bred cattle.

Igenity Beef reports an estimate of genetic merit for 16 maternal, performance, and carcass traits.

Produced in partnership with International Genetic Solutions (IGS), Igenity Beef is now powered by one of the largest multibreed genetic evaluations in the world!

Based on 350,000 genotypes and 8 million phenotypes

Proud Partner
 **IGS** International
Genetic Solutions
www.internationalgeneticsolutions.com
We Collaborate. You Profit.





Igenity Beef

- 16 traits
- 1-10 score
- Includes Seeksire Parentage

- Training population consisted of 15,000 + animals
 - Angus, Red Angus, Hereford, Simmental, Limousin, Gelbvieh
- Validated prediction equations on 8,500 animals
- Crossbred evaluations are believed to be 80% as accurate as a breed specific evaluation

- MBV - Genomic Molecular Breeding Value
 - ✓ Increase accuracy of selection
 - ✓ Reduce generation interval
 - ✓ Increase selection intensity
 - ✓ Increase rate of genetic gain
 - ✓ Determine value of animal at birth

16 traits reported:

MATERNAL

Birth Weight
Calving Ease Direct
Calving Ease Maternal
Heifer Pregnancy
Milk
Stayability
Docility

GROWTH

Weaning Weight
Average Daily Gain
Yearling Weight
Residual Feed Intake

CARCASS

Marbling
Rib Eye Area
Fat Thickness
Tenderness
Hot Carcass Weight

Use Igenity indexes for multi-trait selection



Production, maternal and terminal selection index options help with multi-trait selection



Selection indexes can be designed to fit specific production or market opportunities



Powerful dashboard assists in visualizing data and sorting cattle

What to expect – Detailed report

Igenity



Valued Igenity Customer
 123 Main Street, Lincoln, NE 68504
 test.igenity@neogen.com
 USA10000

Genomics Customer ID: 6330
 Date: 11-14-2019
 Genomics Order: 117090
[Click here](#) to go to dashboard.

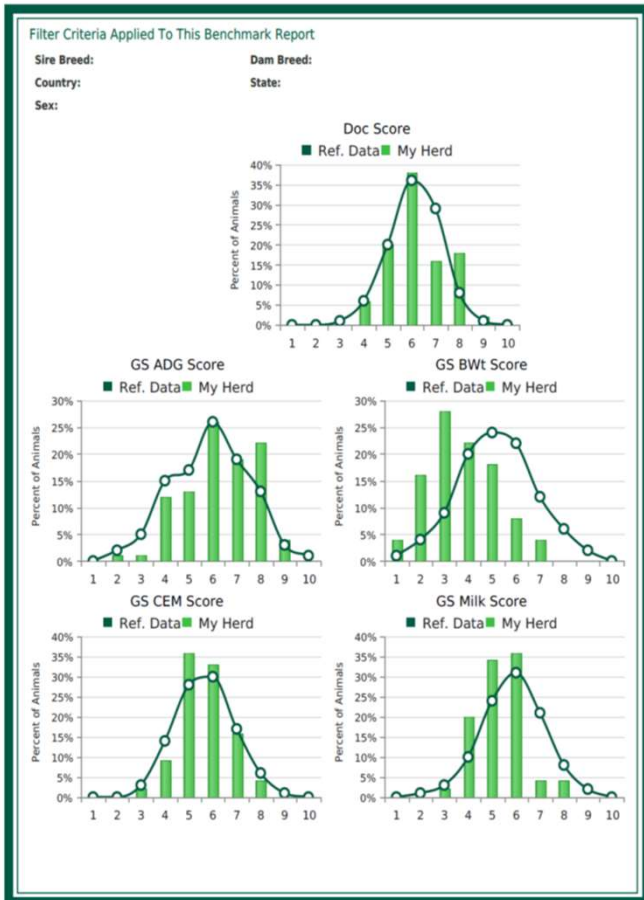
Igenity® – Confident Selection

Neogen GeneSeek Operations
 4131 No. 48th Street, Lincoln, NE, 68504
 igenity.support@neogen.com - (402) 435-0665

Detailed Report

Animal Information				Decision Indexes				Maternal							Growth				Carcass				
Animal ID Number	Sample Barcode Number	Gender (M/F)	Breed	Igenity Total Cow Index	Igenity Maternal Index	Igenity Production Index	Envigor Score	BW	CED	CEM	HPR	MILK	STAY	DOC	WW	ADG	YW	RFI	MARB	REA	FAT	TEND	HCW
ENV24	Holo_24	M		6.47	6.55	7.05	6	4	7	8	8	8	8	5	8	9	8	7	6	7	6	7	7
ENV35	Holo_35	M		6.26	6.30	5.90	6	1	9	7	7	9	7	5	4	4	3	5	5	5	7	6	4
ENV27	Holo_27	M		6.21	6.25	7.10	6	5	6	7	7	4	7	7	9	8	9	7	8	5	9	9	7
ENV22	Holo_22	M		6.13	6.15	6.85	6	6	5	5	8	6	7	6	10	10	10	8	8	5	3	7	9
ENV25	Holo_25	M		6.13	6.15	5.95	6	6	6	6	6	7	7	5	9	9	9	7	5	5	5	3	7
ENV23	Holo_23	M		5.98	6.15	5.85	5	6	5	4	7	8	7	6	9	8	8	8	5	6	3	7	8
ENV33	Holo_33	M		5.88	5.50	5.40	8	4	6	5	4	3	7	6	4	4	4	7	3	5	3	10	3
ENV26	Holo_26	M		5.83	6.15	5.30	4	3	9	7	7	7	6	5	5	4	4	5	6	4	6	1	3
ENV28	Holo_28	M		5.75	5.70	6.15	6	4	5	4	6	7	7	7	5	6	5	6	5	4	6	10	4
ENV40	Holo_40	M		5.60	5.70	4.75	5	3	8	4	6	7	6	8	5	5	5	5	1	5	4	7	3
ENV38	Holo_38	M		5.56	5.30	5.30	7	3	6	5	6	5	5	6	5	5	5	6	4	5	5	10	4
ENV32	Holo_32	M		5.43	5.15	5.15	7	6	3	6	7	5	5	7	5	5	6	5	5	6	6	4	5
ENV21	Holo_21	M		5.34	5.75	6.40	3	4	5	6	7	7	7	6	6	7	7	6	6	4	6	7	7
ENV30	Holo_30	M		5.15	5.35	4.70	4	4	6	7	5	7	5	5	4	4	4	5	3	5	5	4	4
ENV31	Holo_31	M		5.15	5.00	4.70	6	4	5	4	6	4	5	5	5	5	6	6	4	4	4	5	5
ENV34	Holo_34	M		5.09	5.10	5.15	5	6	5	4	4	7	5	7	6	7	7	5	3	5	5	7	6
ENV36	Holo_36	M		5.08	5.80	5.80	1	4	5	8	7	7	6	7	5	4	5	5	5	4	5	7	5
ENV37	Holo_37	M		4.98	5.50	5.60	2	3	6	4	5	5	7	6	4	4	4	7	5	4	6	9	4
ENV29	Holo_29	M		4.72	5.20	4.65	2	2	7	4	7	5	6	6	2	3	3	5	3	3	6	5	1
ENV39	Holo_39	M		4.70	5.35	4.55	1	2	8	5	7	5	5	6	3	3	3	5	4	5	6	4	2

Igenity Dashboard — Easy tools and reports



NEOGEN Confidence Cattle Company ⚙

Test Records: 2870

Tools - Igenity Beef

Animal ID	Sample Barcode	Order ID	Batch ID	Ranch ID	Profile	Sex	Breed	BVD-PI	Active Inactive	ENV Score	GS BWT Score	GS CED Score	GS CEM Score	Doc Score	GS HPRG Score	GS Milk Score	GS Stay Score	WWT Score	GS ADI Score										
3600	8400032043165...	117803	8208	Lane County	Multiple	M			✓		4	7	7	5	6	6	6	7											
3784	8400032043165...	117803	8208	Lane County	Multiple	M			✓		2	9	8	5	8	7	8	3											
3781	8400032043165...	117803	8208	Lane County	Multiple	M			✓		4	8	7	6	8	6	7	3											
3659	8400032043165...	117803	8208	Lane County	Multiple	M			✓		8	2	5	7	5	6	6	7											
3645	8400032043165...	117803	8208	Lane County	Multiple	M			✓		4	6	5	6	6	4	6	5											
3642	8400032043165...	117803	8208	Lane County	Multiple	M			✓		5	6	6	7	6	3	5	4											
3634	8400032043165...	117803	8208	Lane County	Multiple	M			✓		7	5	6	6	6	4	5	7											
3558	8400032043166...	117803	8208	Lane County	Multiple	M			✓		5	6	6	6	6	5	8	5											
3645	8400032043165...	117803	8208	Lane County	Multiple	M			✓		4	6	5	6	6	4	6	5											
3642	8400032043165...	117803	8208	Lane County	Multiple	M			✓		5	6	6	7	6	3	5	4											
3634	8400032043165...	117803	8208	Lane County	Multiple	M			✓		7	5	6	6	6	4	5	7											
3558	8400032043166...	117803	8208	Lane County	Multiple	M			✓		5	6	6	6	6	5	8	5											
3713	8400032043166...	117803	8208	Lane County	Multiple	M			✓		4	7	6	7	7	6	7	7											
3705	8400032043166...	117803	8208	Lane County	Multiple	M			✓		4	7	7	7	7	6	6	8											
3702	8400032043166...	117803	8208	Lane County	Multiple	M			✓		6	5	5	6	8	6	7	5											
Order Average:																													

Igenity Beef helps you select with confidence



Rank and select replacement heifers to meet future goals



Produce cattle to fit your market



Score commercial bulls



Verify sire parentage





 **NEOGEN**[®]

Envigor



FERTILITY. POUNDS. PROFIT.

Neogen is proud to offer **Envigor**, the first and only genomic tool to measure heterosis.

Envigor reports an estimate of heterosis in crossbred cattle. Reported on a scale of 1 to 10, the results can be used as an indication of hybrid vigor.

A higher score indicates increased heterosis.

A one score increase in Envigor leads to...

**MORE
FERTILITY**

A 4% increase in the probability of a heifer breeding as a yearling

**MORE
LONGEVITY**

A 4% increase in the probability of the cow staying in the herd for 6 years

**HEALTHIER
PROGENY**

A 2% decrease in the probability of an animal having a health event

ENVIGOR

With Envigor, producers can select the replacements benefitting the most from heterosis

HYBRID VIGOR

Increased fertility



Lower cull rates



Increased weaning weights



Greater feed efficiency





Other Genomic Tools

Igenity Enhanced

Neogen is proud to offer **Igenity Enhanced**, the first and only heifer profile customized for your crossbred and straightbred cattle.

Igenity Enhanced reports Igenity Beef customised figures, based on your genotypes and phenotypes of progeny and pedigree information (sire EBVs), and phenotypes of close relatives if available (TBA).

The deliverable is **blended IgB scores** with your phenotypes/genotypes for the IgB traits. If you only supply phenotypes for 3 traits, then they will get “enhanced” results for those 3 traits.





SeekSire Parentage

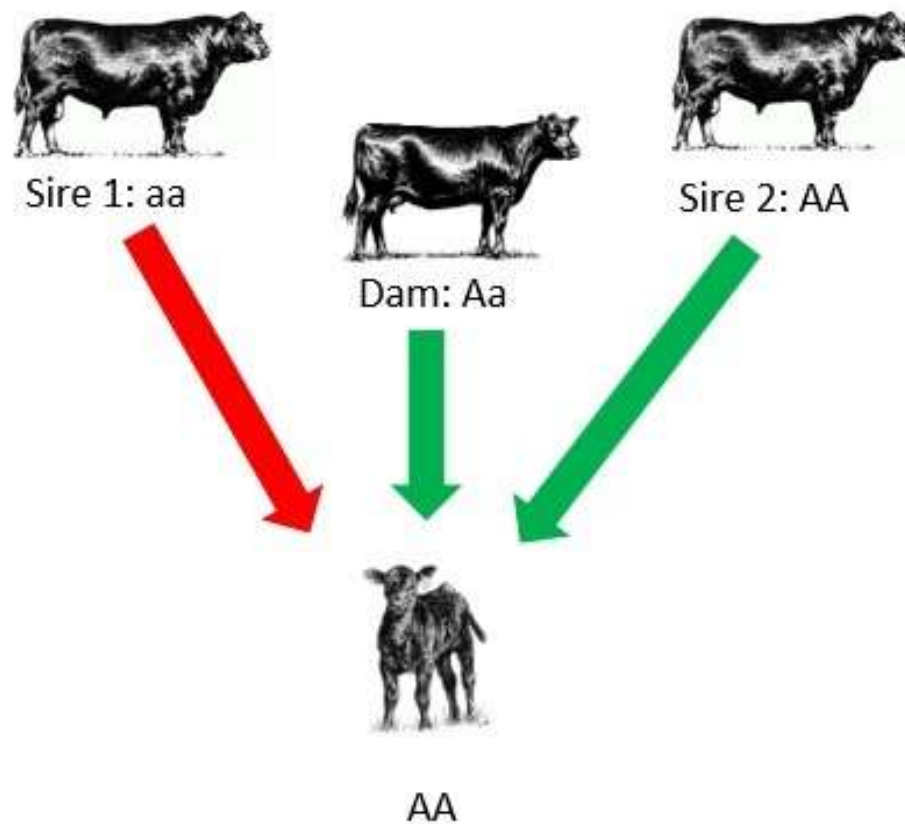
SNP Parentage

- **SeekSire parentage** is based off more than 200 SNP's
- Internationally recognized parentage SNPs (USDA, ISAG)
- Profile and verification

- Reasons to parentage test:
 - Breed association requirements (records)
 - AI
 - ET
 - Genetic evaluations
 - Registration of calves produced in large, extensive operations
 - Identify sires in multi sire paddocks
 - Breeding decisions
 - Traceability
 - Blockchain

Parentage Analysis

Referred to as Parent Verification



Sire 1 is “excluded” as the sire at that locus

Beef Traits and Conditions Testing

Available through Igenity and GGP

- Coat Color (CC)
- Coat Color Diluter (DL)
- Horned/Polled (HP)
- Arthrogryposis Multiplex (AM)
- Neuropathic Hydrocephalus (NH)
- Contractural Arachnodactyly (CA)
- Osteopetrosis (OS)
- Developmental Duplication (DD)
- Oculocutaneous Hypopigmentation (OH)
- Myostatin/Double Muscling (MYO, M1, DM)
- Pulmonary Hypoplasia with Anasarca (PHA)
- Tibial Hemimelia (TH)
- Alpha-Mannosidosis (MA)
- Maple Syrup Urine Disease (MSUD)
- Hypotrichosis (HY)
- Idiopathic Epilepsy (IE)
- Digital Subluxation (DS)





Igenity Beef on Dairy

What it is:

Product to help breeders certify beef influence in dairy calves

Assistance in marketing calves with increased

- Tenderness
- Palatability
- Juiciness

How it works:

Summarizes 13 breeds via Beef or Dairy category

Breed	Composition
Beef	58%
Dairy	42%



Genomic Benefits

- ✓ **Verify parentage**
 - **Traceability**
- ✓ **Rank and select heifers**
 - **Address the other 50% of the equation**
- ✓ **Profile the best sire prospects when young**
- ✓ **Focus feed and resources on specific groups**
- ✓ **Predict traits that are a costly challenge**
- ✓ **Produce cattle that fit market requirements**
- ✓ **Save time & money**
- ✓ **Efficiency**
- ✓ **Reputation for quality**
- ✓ **Added Value**

Genomic Tools for Producers

Pure bred Producers

Animal registration through a Society

Most beneficial for producers who invest in accurate and complete data recording with pure bred stock

- Pedigree, phenotypes, progeny information
- Addition of a genotype

Delivers

- Parentage
- Traits and conditions
- Enhanced EBV's from society if genotype utilised

Accuracy - ★★★★★

Labor - ★★★★★

Price - ★★★★★

Progeny Information

Phenotype

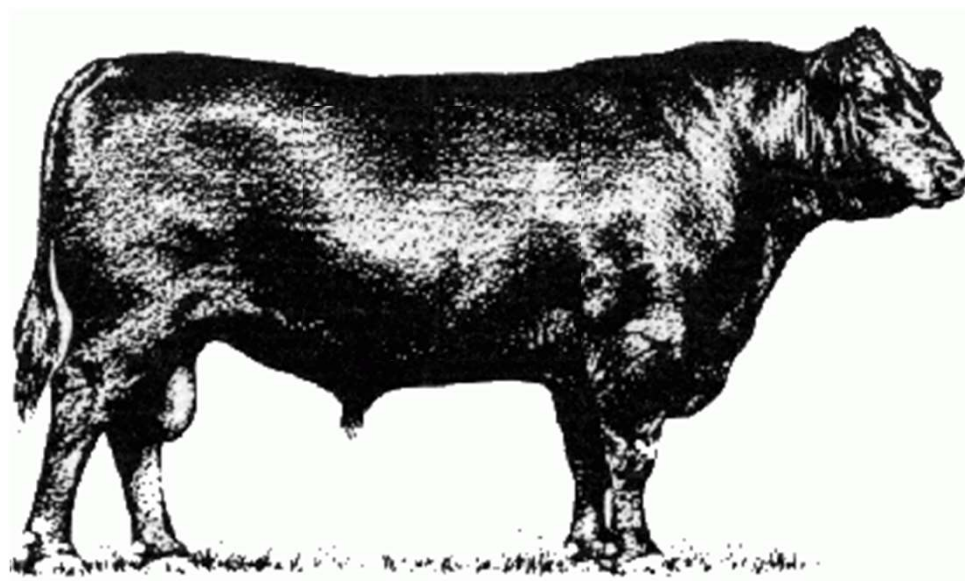


(GE)EBV

Pedigree

Genotype

Block Chain

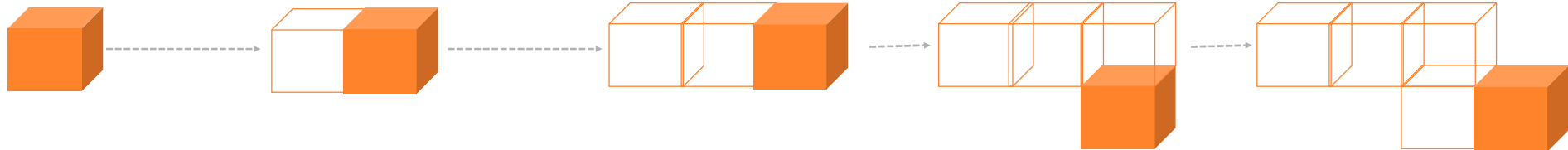


From Gate to Plate

How it all ties together



BLOCKCHAIN



Genomics
Parentage
Genetic Values
Source

Animal Safety
Treatments
Management
Products

Food Safety
Test Results
Quality
Claims

From Gate to Plate

Neogen influences genetics across the entire supply chain



Conception

Natural and AI



Seedstock

Breed associations



Commercial

Head of domestic
cow/calf,



Marketing Channel

Livestock Auctions



Feeders

Head of feeder cattle



Packers

Meat packers



Distributor/Retail

Seedstock, Veterinarian
and Food Safety
partners



Consumer

Domestic consumers

Genomics

Solutions for every segment of the beef industry



Seedstock

Genomically Enhanced EBVs
(GE-EBV)

Parentage Testing

Genetic Condition Testing

Trait Testing (HP, CC, etc.)

Commercial

Genomic Profiles

BVD – PI

Genetic Condition Testing

Trait Testing (HP, CC, etc.)

Parentage testing

Stockers/Feeders

Genomic Profiles

Optimum Days on Feed

Marketing Opportunities

Traceability

**Thank you
for listening**

Get in touch

www.NEOGEN.com

