



Making Effective Use of Simple Genomic Tools in the Beef Herd

K-STATE
Research and Extension

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Overview

- Basics of DNA Parentage Tools
 - Panel types
 - Principle of exclusion
 - Pedigree validation vs. construction
- Once I have parentage then what?
 - Seedstock
 - Commercial



DNA Parentage Tools

- Based on Mendelian inheritance
- Exclusion based
 - Exploits violations in Mendelian inheritance pattern
 - Dependent on variation in population
 - Allows development of probabilistic statements of parentage
- Useful for pedigree validation or construction



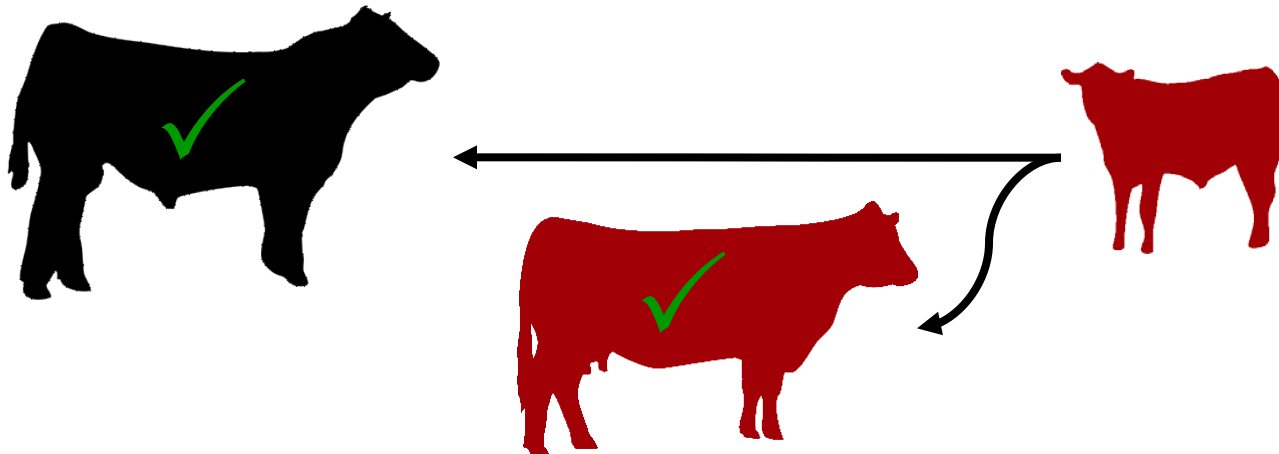
DNA Parentage Tools

- SNP or Microsatellite Panels
 - SNP- ~100 biallelic markers-Standardized Panel
 - Microsatellite - ~12 Polymorphic dinucleotide tandem repeats (Older and phasing out)
- Need all animals you plan to use for inference tested on same panel
- If using stored genotypes at Breed Association make sure you use the same vendor



Validation vs. Testing

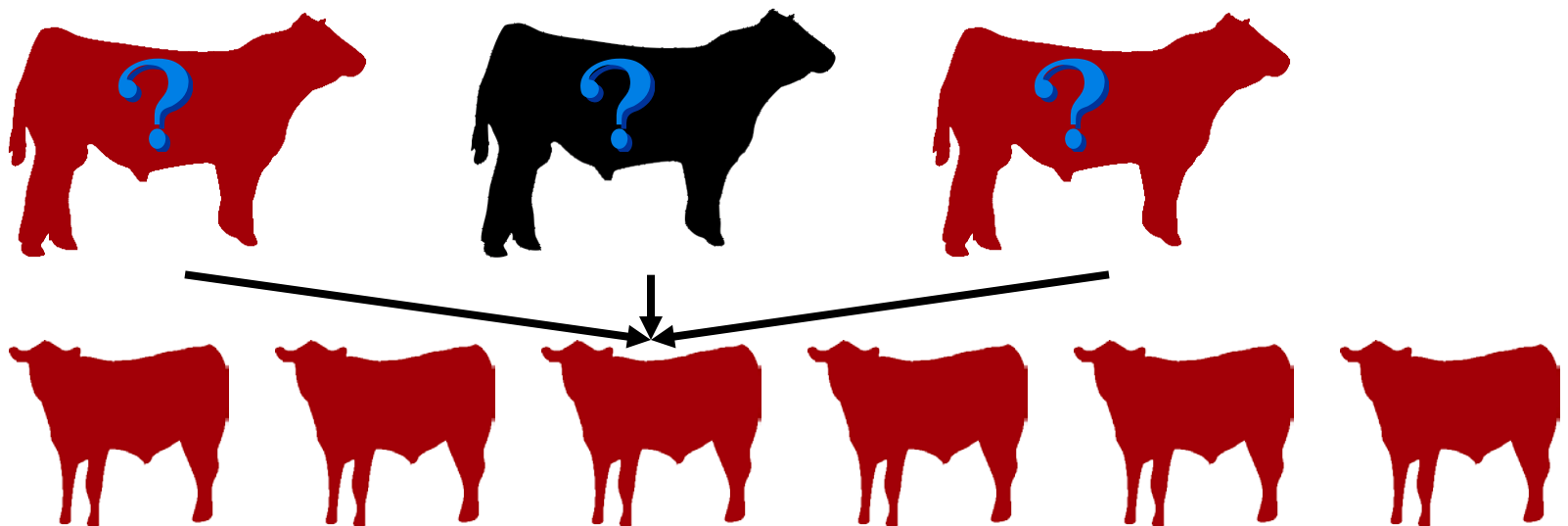
- Validation
 - Given progeny, do sire and dam qualify as parents (non-exclusion)
 - Pedigree integrity checks by breed associations of significant animals





Validation vs. Testing

- Testing
 - Assignment of paternity (or maternity)
 - One or both alleged parents unknown





Principle of Exclusion

Possible Sires:

Bull A: AA BB

Bull B: Aa bb

Bull C: aa bb

??
??

??
??

??
??

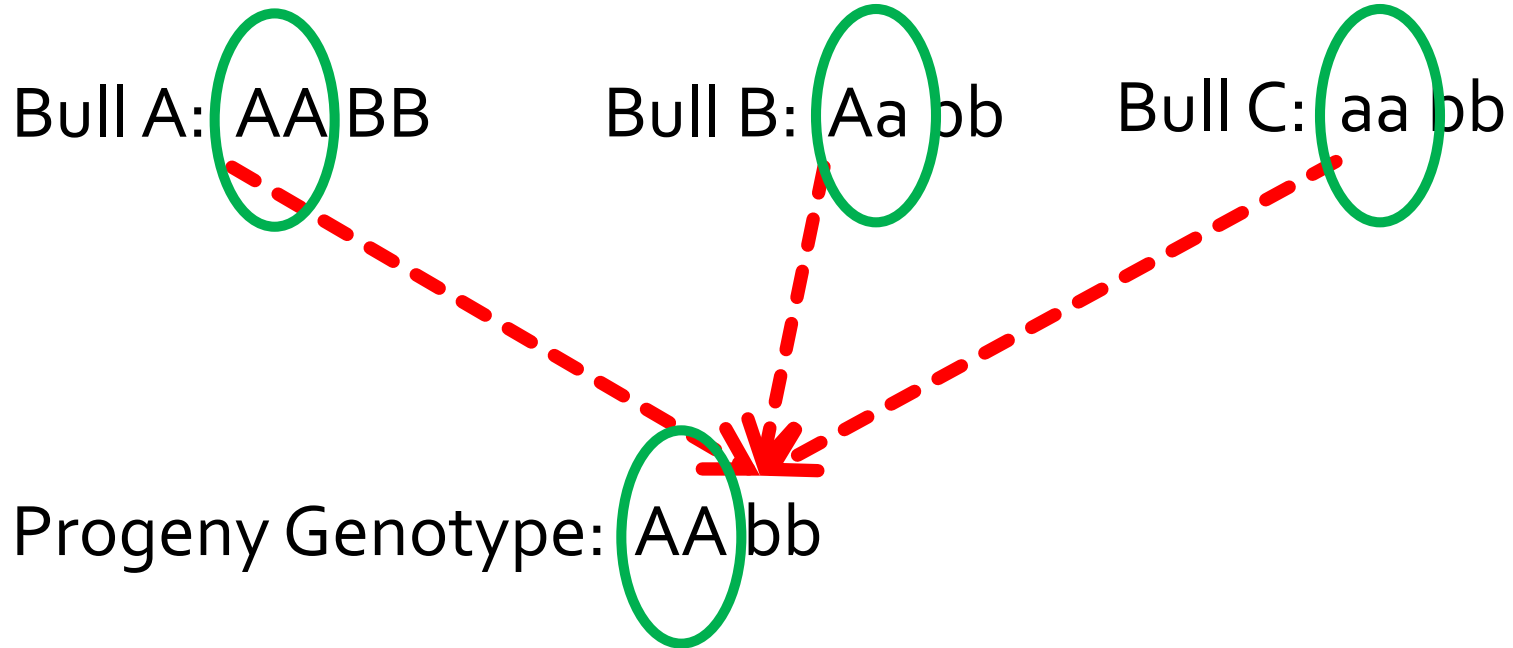
Progeny Genotype: AA bb





Principle of Exclusion

Possible Sires:





Principle of Exclusion

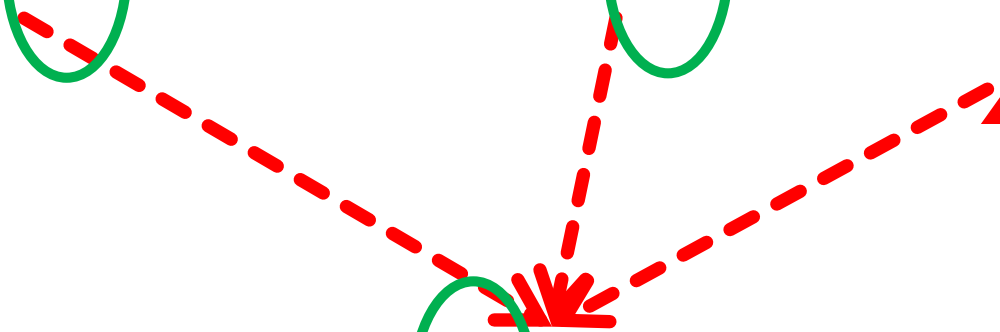
Possible Sires:

Bull A: AA BB

Bull B: Aa bb

~~Bull C: aa bb~~

Progeny Genotype: AA bb





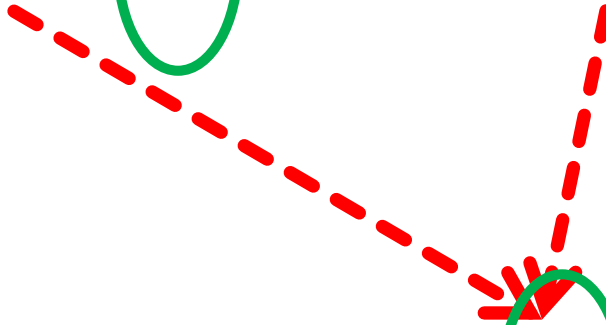
Principle of Exclusion

Possible Sires:

Bull A: AA **BB**

Bull B: Aa **bb**

Progeny Genotype: AA **bb**





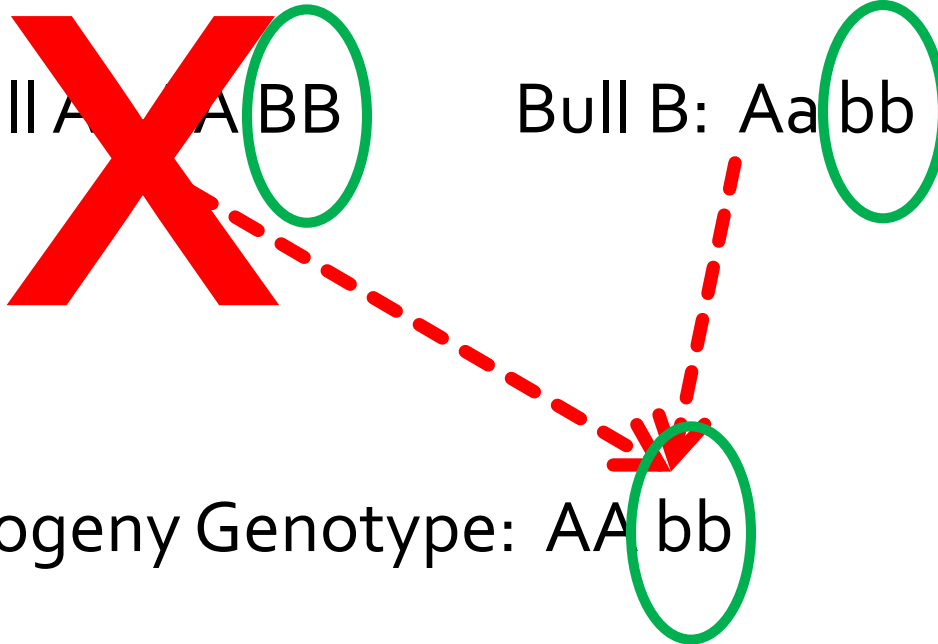
Principle of Exclusion

Possible Sires:

~~Bull A: AA BB~~

Bull B: Aa bb

Progeny Genotype: AA bb





Principle of Exclusion

Possible Sires:

Bull B: Aa bb



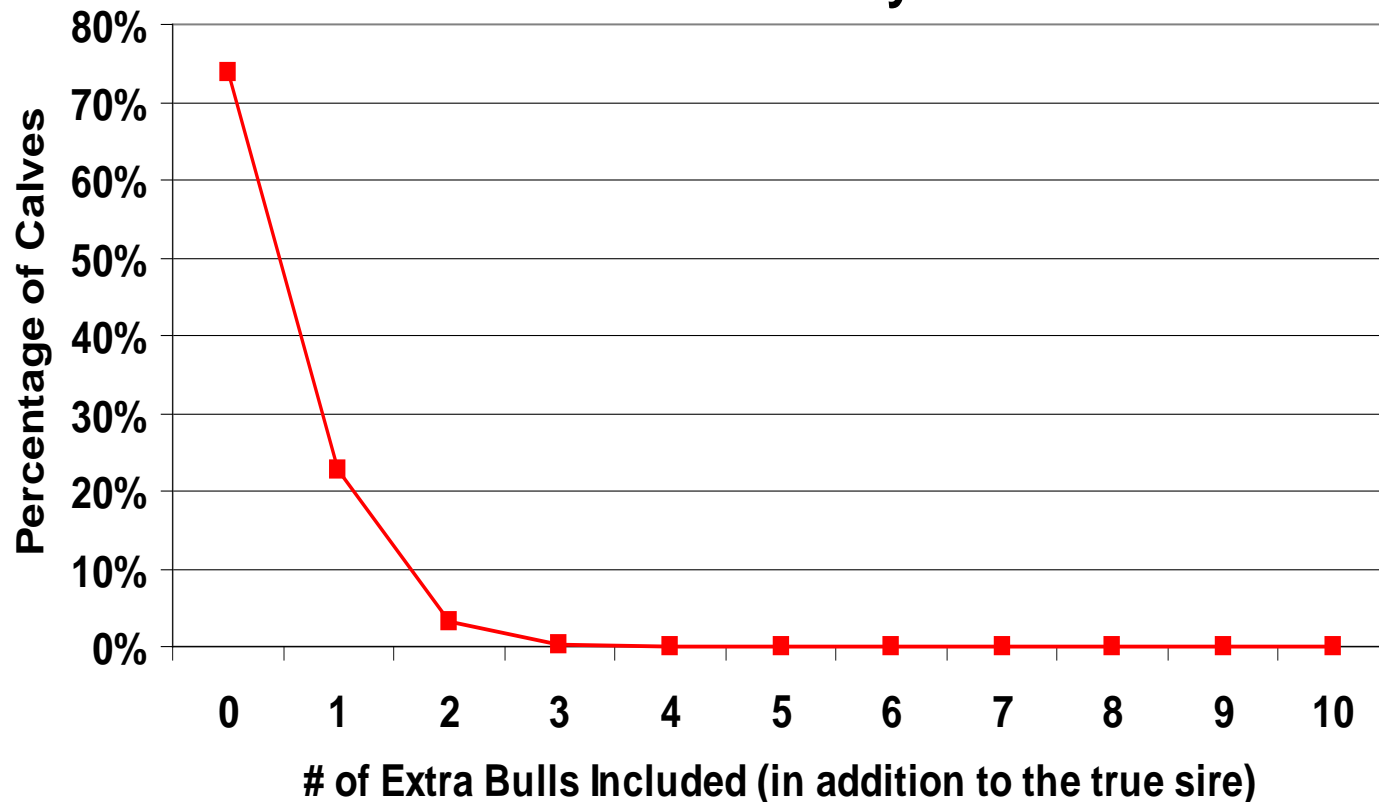
Progeny Genotype: AA bb





Paternity Assignment via DNA Markers

Breeding Pasture with 10 Bulls Exclusion Probability = 0.97





AMERICAN ANGUS ASSOCIATION *The Business Breed*
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N Bar Emulation EXT Reg: AAA #10776479 Bull
 [AMF-CAF-D2F-DDF-M1F-NHF] [Click here for info](#)

Birth Date: 02/07/1986 Tattoo: 023
 Parentage: Blood type, Microsatellite, SNP
 Genomic: IG1, IG384, PF50
 Breeder: 406621 - N Bar Land & Cattle Co, Bend OR

Owner(s): 212830 - Green Garden Angus Farm, Ellsworth KS
 406621 - N Bar Land & Cattle Co, Bend OR
 516398 - Sinclair Cattle Co, Frederick MD

Emulation 31 F C R Elation Lad 652 **AAA 4830664**
AAA #6064368 [DWF-RDF]
 Miss Emulous 243 **AAA 5037042**

Emulation N Bar 5522 **AAA #10095639**
 Ankonian Dynamo 27542 **AAA 7408217**
 Ankony 8F78 Lass 8F275 **AAA 8535406**
 Ankony B999 Lass 26832 **AAA 7434804**

Emulation 31 F C R Elation Lad 652 **AAA 4830664**
AAA #6064368 [DWF-RDF]
 Miss Emulous 243 **AAA 5037042**

N Bar Primrose 2424 **AAA 10474919**
 Lad 118K of J R S **AAA 9243827**
 Primrose N Bar 9962 **AAA 10095807**
 N Bar Primrose 5329 **AAA #9440553**
Pathfinder

EPD Percentiles As of 09/29/2014

Production								Maternal						
CED Acc	BW Acc	WW Acc	YW Acc	RADG Acc	YH Acc	SC Acc	Doc Acc	HP Acc	CEM Acc	Milk Acc	MkH MKD	MW Acc	MH Acc	\$EN
+3	+1.8	+41	+73	+08	+4	-10	-10	+8.4	+14	+18	4744	+32	+2	+10.69
.97	.99	.98	.98	.82	.98	.97	.91	.80	.96	.98	18525	.95	.95	

Carcass					
CW Acc	Marb Acc	RE Acc	Fat Acc	Carc Grp Carc Pg	Usnd Grp Usnd Pg
+34	+21	+06	+035	268	4616
.92	.93	.93	.93	1123	9592

\$Values



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ASA #: 1937373
Registered
CANSM - 624630

NICHOLS LEGACY G151
Black (Documented-Homozygous Black)
Polled (Documented-Homozygous Polled)

Tattoo: G151_
Left Ear

Single Birth Bull PB SM PCB KN GE **TraitTrac**
(Check available results)

Owner: [216326 - HOOK, NICHOLS FARMS & TOM](#) **Birth Date:** 1997-04-12
Breeder: [174198 - MOSTAERT, KRISTA](#) **Original Issue:** 1997-12-01

Fall 2014 EPDs

	CE	Brth	Wean	Year	MCE	Milk	MWW	Stay	Doc	CW	YG	Marb	BF	REA	Shr	API	TI
EPD	10.5	-0.3	57.5	77.9	11.5	24.2	52.9	22.9	12.3	15.5	-0.44	0.31	-0.075	0.84	-0.22	139.0	71.1
ACC	0.97	0.97	0.97	0.97	0.96	0.96	0.96	0.91	0.80	0.61	0.60	0.87	0.85	0.86	0.90		
%	35	15	75	85	35	45	65	20	15	90	5	15	15	35	80	15	25

[- Pedigree](#) [+](#)

	Color	HPS
CIRCLE S LEACHMAN 600U	1140615	BB PP
NICHOLS BLK DESTINY D12	1757710	P
NICHOLS KELLY 75U	1134674	P
NICHOLS LEGACY G151	1937373	BB PP
BURNS BULL X339U	1259344	PP
NICHOLS DEBRA D81	1760795	P
NICHOLS KELLY B81	1595693	P

No Pictures available [Toggle QR code](#)

Owner

[216326 - HOOK, NICHOLS FARMS & TOM](#)
[000508 - NICHOLS FARMS](#)

[Useful Links](#)

- [New Animal Search](#)
- [Epd Animal Search](#)
- [Herd Groups/Reports](#)
- [Planned Mating](#)

Transfer Details

Date of Sale/Owner Date **Date of Record**

1998-09-23 1997-04-12

[Reports](#)

- [Basic Report](#)
- [Progeny Report](#)
- [Genetic Detail](#)

© American Simmental Association - 1 Simmental Way, Bozeman, MT 59715 - 406.587.4531



Guest - AHA Hereford Animal Details

TH 122 711 VICTOR 719T {CHB,DLF,HYF,IEF} (P42800895)

[Home](#)
[Animal Inquiry](#)
[EPD Inquiry](#)
[Member Inquiry](#)
[Sale Catalogs](#)
[Semen Catalogs](#)

Registration No.: 42800895
Reg. Status: Registered
Sex: Bull
Tattoo: 719
Birth Date: 01/24/2007
Calving Year: 2007
Status: Active
AI/ET: AI PERMITTED
Sire: [DRF JWR PRINCE VICTOR 711 {CHB,SOD} \(P41141619\)](#)
Dam: [KBCR 19D DOMINETTE 122 {DLF,IEF} \(P42220359\)](#)
Breeder: [FRANK KUCERA](#)
Current Owner: [Multiply Owned](#)
Horn Status: Polled
Herd ID: 719
Pedigree: [View](#)
Performance Pedigree: [View](#)
EPD Graph: [View](#)
DNA Parentage Profile: SNP and Microsatellite Profile

FALL 2014 EPDS																
	Calv. Ease Direct (%)	Birth Wt	Weaning Wt	Yearling Wt	Milk Milk Growth	Milk & Growth	Calv. Ease Mat. (%)	Mature Cow Weight	Scrotal Circ.	Fat	Rib Eye Area	Marbling	BMI Index (\$)	CEZ Index (\$)	BII Index (\$)	CHB Index (\$)
EPD	+8.0	+0.4	+63	+88	+26	+58	-1.2	+76	+1.3	-0.011	+0.36	+0.09	+\$ 24	+\$ 21	+\$ 20	+\$ 32
Acc	.71	.93	.90	.89	.67	.00	.60	.72	.77	.66	.67	.65	-	-	-	-
Breed Avg. EPDs for 2012 Born Calves Click for Percentiles																
EPD	0.8	3.5	46	75	19	42	1.1	86	0.7	0.002	0.28	0.06	17	15	15	21

Traits Observed: BWT,WWT,YWT,FAT,REA,IMF,

Statistics:

Statistics: BW:471/2849, WW:347/2119, YW:172/879, SC:54/230, Dgt:180, SCAN:562, HARVEST:3, MCW:41

Once I have pedigree
then what?



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Commercial Herd

- Establish genetic value of calves
 - Computed weighted average pedigree estimate of group(s)—sort off high merit calves?
- Replacement females
 - Selection of AI sired females
 - Selection of half sib groups
 - Simplify future mating decisions
 - Defect management-calves of only non-carrier bulls



Commercial Herd

- Progeny test of young sires
 - Large integrated ranch that produces own bulls
 - Strategically mate yearlings to known age group of cows
 - Establish paternity
 - Genetic evaluation for ERT based on inferred pedigree and phenotypes collected



Commercial Herd

- Outlier management
 - Strategic culling of sires the produce problem calves
 - Dystocia
 - Docility
 - Feet/leg issues
 - Defects?



Seedstock

- Enable use of multi-sire breeding pastures
 - Bad bull risk management
 - Better pasture utilization
 - Assured pedigree



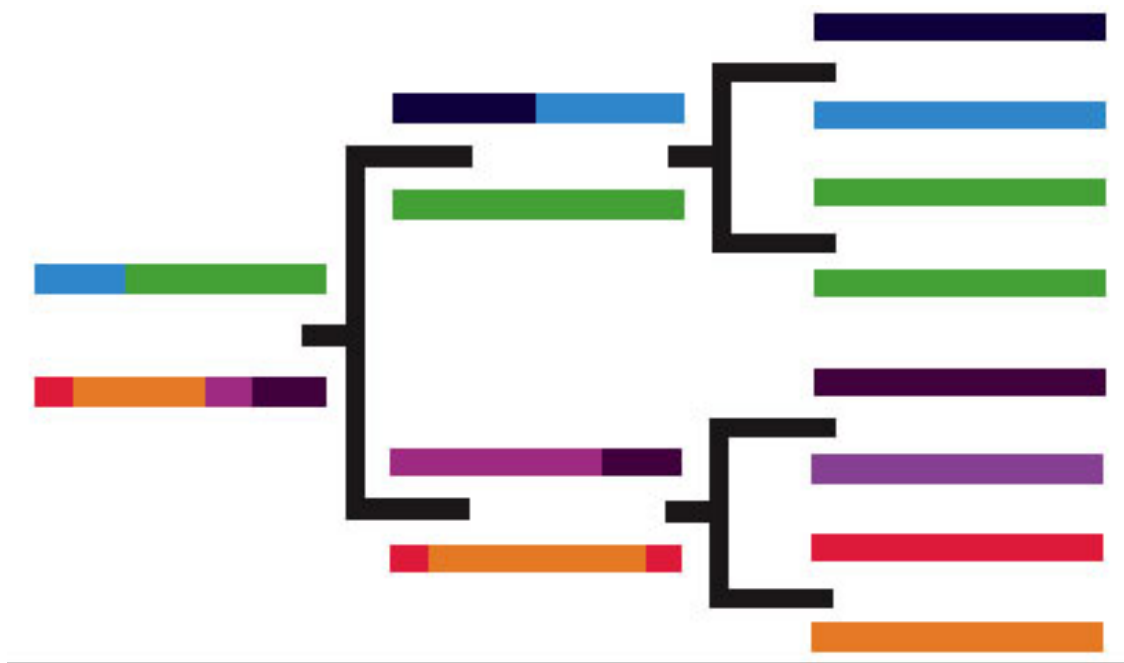
Enabling Strategies

- Make DNA sample collection part of SOP
 - Collect tissue samples from:
 - Natural service sires
 - Custom collected AI sires
 - Donor dams



A genomic pedigree

SNP markers allow identification of regions of chromosome and tracking of inheritance of specific region



Thank you!
Questions?



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