



Genomics, EPDs and their application to beef herds in Florida

Raluca Mateescu | Associate Professor of Quantitative Genetics & Genomics

(raluca@ufl.edu)

UF UNIVERSITY of FLORIDA
Department of Animal Sciences

Outline



- Revisiting some basic genetic concepts
- Beef cattle – traditional selection
- Genomic selection - practical questions
 - Dairy Industry as a genomic selection success story
 - Beef Industry as an “opportunity for improvement”
- What genomic tests are available?
- What do the results mean?
- Current and future status of this technology

Basic Genetic Concepts

Types of traits



Simple (qualitative)

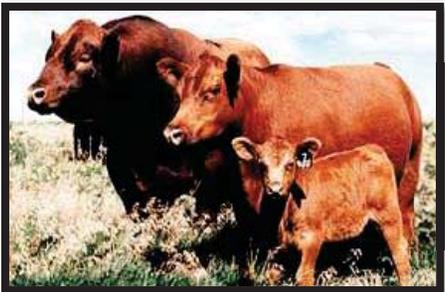
- Coat color (black vs red)

1. Number of Genes

- One gene



BB or
Bb



bb

Complex (quantitative)

- Growth rate (WW, YW)

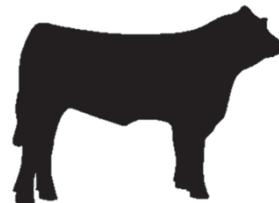
1. Number of Genes

- Many genes



450 lb

AABbccDDeeGg
FFIijjkkLIMmNN
OoppRRSStt.....



480 lb

AABbCcDDeeGg
FFIijjkkLIMmNN
OOppRRSStt.....

Types of traits



Simple (qualitative)

- Coat color (black vs red)

1. Number of Genes

- One gene

2. Environment

- No effect

Complex (quantitative)

- Growth rate (WW, YW)

1. Number of Genes

- Many genes

2. Environment

- Has an effect (small – large)

Nutrition: (pasture vs pasture+suppl.)



450 lb vs 480 lb

Types of traits



Simple (qualitative)

- Coat color (black vs red)

1. Number of Genes

- One gene

2. Environment

- No effect

Complex (quantitative)

- Growth rate (WW, YW)

1. Number of Genes

- Many genes

2. Environment

- Has an effect (small – large)

Climate: (drought vs rain)



450 lb vs 480 lb

Types of traits



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- Coat color (black vs red)

1. Number of Genes

- One gene

2. Environment

- No effect

Complex (quantitative)

- Growth rate (WW, YW)

1. Number of Genes

- Many genes

2. Environment

- Has an effect (small – large)

Disease: (sick vs healthy)



450 lb vs 480 lb

Types of traits



Simple (qualitative)

- Coat color (black vs red)

1. Number of Genes

- One gene

2. Environment

- No effect

Complex (quantitative)

- Growth rate (WW, YW)

1. Number of Genes

- Many genes

2. Environment

- Has an effect (small – large)

How much of an effect?

Heritability - proportion of phenotypic variation caused by genetics

<u>traits</u>	<u>h²</u>	<u>magnitude</u>
Reprod.	<.2	low
Growth	.2-.4	moderate
Carcass	.4-.6	high

Impact on genomics



- Most – if not all – economically important traits are complex (quantitative) traits

1. Controlled by **many genes**

- Genomic tests - subset of these genes (and most times, not the genes themselves)
- Accuracy - associated with how much of the underlying genetics is accounted for by the test

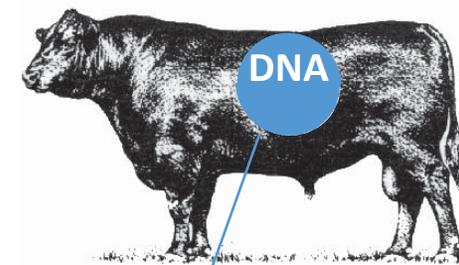
2. Under **environmental** influence

- Same genetics will perform differently in different environments
- Accuracy associated with the environmental variation

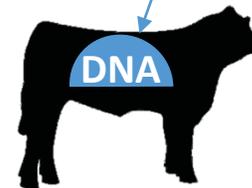
Inheritance



- Parent – offspring
 - Share **50%** of their DNA



50%



Inheritance



- Parent – offspring
 - Share **50%** of their DNA
- Two half-sibs:
 - On average, share **25%** of their DNA
 - In reality, that ranges from **0** to **50%**

Implication for selection: even when the genotype of the sire is completely known – offspring could be quite different genetically:

1. Due to half of the DNA coming from the **dam**
2. Due to random segregation of genes from the sire (**Mendelian sampling**)

