Possibilities and challenges establishing efficient selection tools and breeding programs for beef breeds used in dairy herds

Line Hjortø, VikingGenetics

and

Gert Pedersen Aamand, NAV

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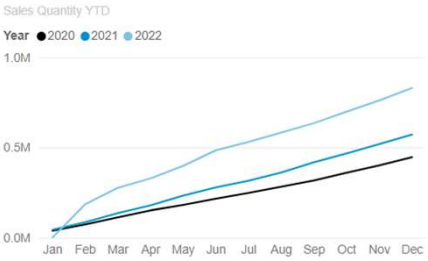
1

State-of-the-art

- A growing interest in inseminating low ranking dairy cows with semen from beef bulls
- This calls for a larger breeding scheme for beef cattle that improves B×D calves



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Today genetic gain is limited in the beef breeds

- Beef breeds for B×B:
  - Decentralized decisions
  - Less systematic collection of phenotypes and pedigree
  - Multiple breeding goals
- Beef breeds for B×D:
  - Limited pure breeding of beef breeds for crossbred performance

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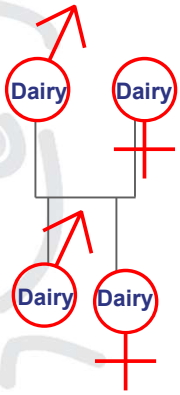
Dairy breeding program - today



- Selection is based on NTM
- Breeding values contain only additive genetic values
- Phenotypes are collected in the right production environment

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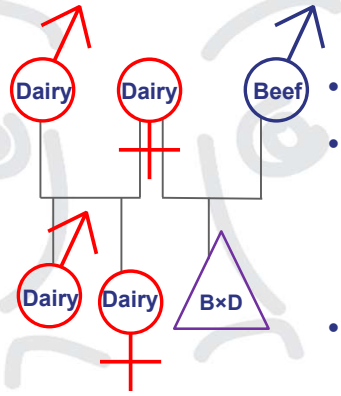
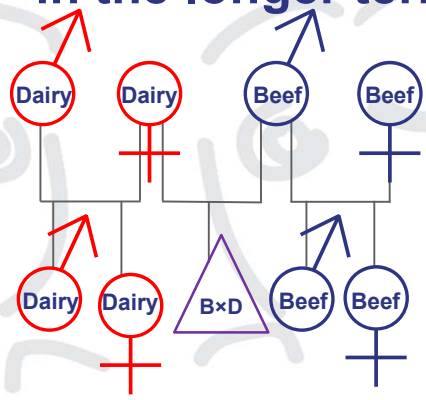
Beef on dairy - today



- Ranking is based on NBDI
- Index contain both additive genetic values and heterosis
  - OK because of terminal crossbreds
- Phenotypes are collected in the right production environment

Beef on dairy breeding program in the longer term



- Selection on NBDI traits + fitness traits
- Breeding values should preferably contain only additive genetic values
- Phenotypes are collected in the right production environment

Wishes for a breeding scheme for beef on dairy

- High genetic gain
  - Reliable breeding values
  - High selection intensity
  - Short generation interval
- Low and constant rate of inbreeding

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Genetic evaluation of NBDI traits in a transitional phase

B×D data	Pros	Cons*
Phenotypes	Lots of data Right production system	
Genotypes	Potential lots of genotypes	Few bulls per breed
EBV		Heterosis - all calves are crossbred

Beef data	Pros	Cons*
Phenotypes	Some data for most breeds (except Danish Blue)	Different production system
Genotype	Potential lots of genotypes	
EBV	Only additive genetic values	

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Genetic evaluation of fitness traits in purebred beef cattle

- Potential breeding goal traits:
  - Calving, fertility and feet & legs
- Breeding values are based on phenotypes from all purebred beef cattle
- Phenotypes are collected in the right production environment
- These breeding values are available today

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Genetic evaluation

- EBVs
  - Late in life
  - High reliabilities of breeding values (bulls with many progeny)
  - One sex - few beef bulls get B×D progeny
- GEBVs
  - Early in life
  - Reliabilities of breeding values?
  - Both sexes

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Genomic prediction of beef cattle in general

- Largest value for traits expressed late in life
  - Dam traits
  - Traits measured at the slaughtered animal
- Smaller effect for traits measured early in life
  - Note a part of the effect by genomic prediction can also be achieved by improved phenotyping of the animals itself

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Genomic prediction of beef cattle based on purebred performance

X

Growth, carcass conformation, birth and calving

NAV genomic prediction of purebred beef expected in 2023/24 based on Swedish and Finnish projects

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Genomic prediction of beef cattle based on crossbred performance

X

Growth, carcass conformation, birth and young stock survival

A Danish project develops GEBVs for beef bulls based on crossbred performance in 2023/24

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Photos: VikingDanmark and VikingGenetics

13

High selection intensity and short generation interval

- Prerequisites for high genetic gain
- MOET is an abbreviation for Multiple Ovulation and Embryo Transfer
- More progeny from all selected heifers → Higher selection intensity in the female path
- Progeny of the same heifer and more bulls are born in a short period of time → Shorter generation interval

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Low and constant rate of inbreeding

- In the purebred beef populations, we want to:
  - Maintain genetic diversity
  - Avoid inbreeding depression
- EVA is a program that monitors and controls the risk of inbreeding
- EVA maximizes genetic gain in the next generation at a given rate of inbreeding

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Take home messages

- We have to study how we achieve the most reliable (G)EBVs
- We can benefit from the tools that are used in breeding schemes for dairy cattle and pigs
- A Danish research project on breeding schemes for B×D will be applied for this spring

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16