Genetic parameters for calving and conformation traits in Charolais x Montbéliard and Charolais x Holstein crossbred calves

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Introduction

- Dairy cows not used for replacement are mated to beef sires to produce crossbred calves for beef production
- Economic value linked to calving difficulties and the conformation
- Montbéliard and Holstein
- Charolais beef sires are selected to produce the best crossbreds

Are bulls producing the best Charolais x Montbéliard calves also the best for Charolais x Holstein calves?

Introduction

- In pigs and poultry, genetic correlations lower than 1 between purebred and crossbred lines (Zumbach et al., 2007)

  ➡ Different environments

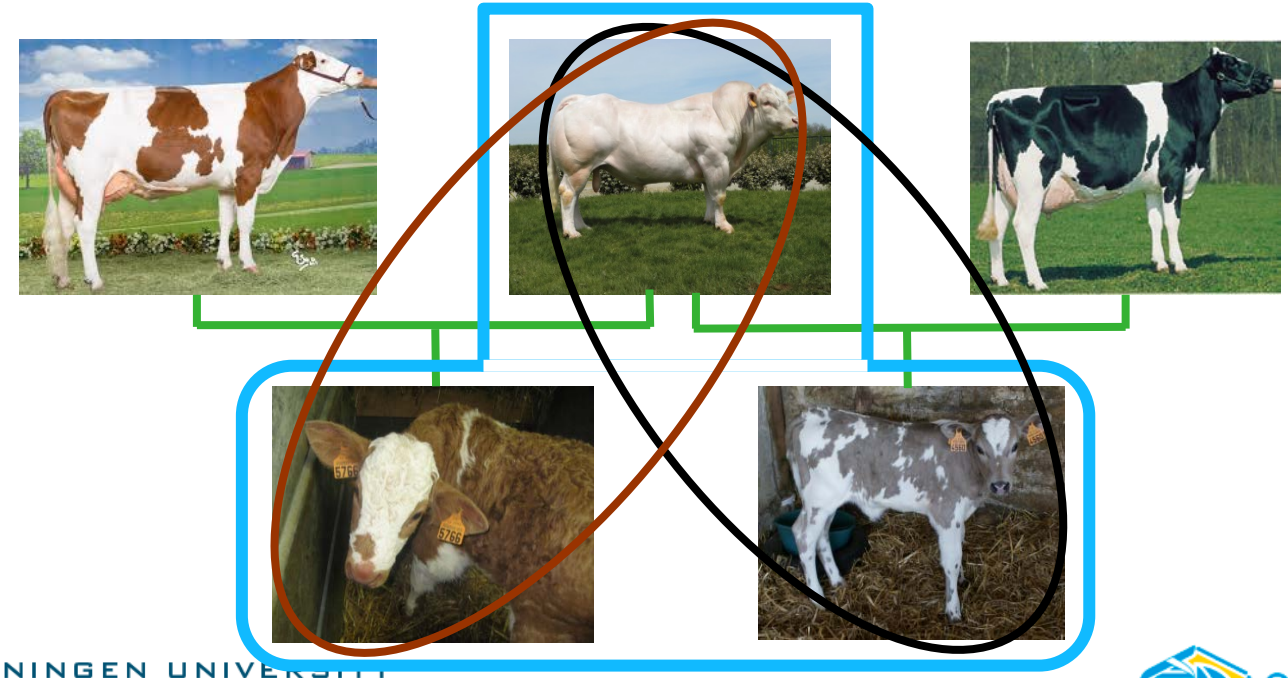
- In cattle, low correlations between breeding values of beef sires estimated on purebred and on crossbred progeny (Tilsch et al., 1989)

Objectives

Estimate heritabilities and genetic correlations for calving and conformation traits in crossbred calves

1. Separately for Charolais x Montbéliard and for Charolais x Holstein crossbreds

2. Between same traits measured in Charolais x Montbéliard and in Charolais x Holstein crossbreds



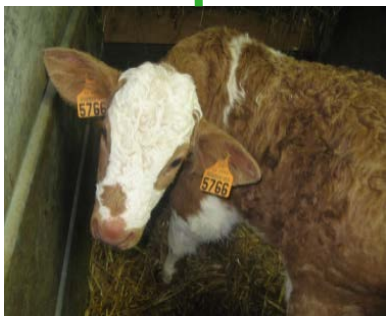
Population

- 38,864 crossbred calves born between 1986 and 2012

391 sires
of which 367 with offspring
in both populations



59 %




41 %

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Traits

- At calving

  Calving difficulty — from 1 (easy) to 5 (difficult)

  Birth weight — Kg

  Assessed by farmer

- Conformation

  Bone thinness — from 1 (thin) to 5 (thick)

  Height — from 1 (small) to 5 (tall)

  Muscular development, 3 visual notations — from 1 (poor) to 9 (high)

  Scored at 22 days of age on average

  19 classifiers

Model

Animal model

- Fixed effects
  - sex (2 classes)
  - classifier (19 classes)
  - combination between birth year (from 1986 to 2012) and the birth season (three-month periods)
    (104 classes)
- Random effects
  - animal

Relations on the (charolais) paternal side were used to construct A

Analysis

Within the same crossbred population

- univariate analyses to estimate heritabilities
- bivariate analyses to estimate genetic correlations between different traits

Between the two different crossbred populations

- bivariate analyses to estimate heritabilities and genetic correlations between the same trait

ASREML (Gilmour et al., 2009)

Results

Heritability within crossbred population

	 Charolais x Montbéliard h^2	 Charolais x Holstein h^2
Calving difficulty	0.16	0.12
Birth weight	0.26	0.20
Height	0.33	0.36
Bone thinness	0.32	0.30
Muscular dev.	0.35	0.30

SE between 0.02 and 0.04

Results

Genetic correlation within crossbred population

Charolais x Montbéliard	Calving difficulty	Birth weight	Height	Bones thinness	Muscular development
Calving difficulty	-				
Birth weight	0.86	-			
Height	0.54	0.71	-		
Bones thinness	0.27	0.20	0.44	-	
Muscular dev.	0.47	0.18	-0.10	0.01	-

Charolais x Holstein	Calving difficulty	Birth weight	Height	Bones thinness	Muscular development
Calving difficulty	-				
Birth weight	0.87	-			
Height	0.67	0.68	-		
Bones thinness	0.42	0.52	0.45	-	
Muscular dev.	0.49	0.41	0.01	-0.02	-

SE between 0.03 and 0.08

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Results

Genetic correlation between crossbred population

	rg	p- value *
Calving difficulty	0.91	0.01
Birth weight	0.96	0.05
Bones thinness	0.70	<0.01
Height	0.80	<0.01
Muscular dev.	0.99	0.75

SE between 0.02 and 0.05

* from Likelihood ratio test

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Conclusion and discussion

- Estimates of heritability and genetic correlation are similar to literature (Bouquet et al., 2010; Phocas and Laloe, 2003; Mujibi and Crews, 2009, Colleau et al. 1989)
- Calving difficulty and birth weight highly genetically correlated
  Conformation traits moderately genetically correlated
- Calving difficulty, bone thinness and height are genetically different traits between the 2 crossbred populations

Conclusion and discussion

Why are they genetically different traits?

- Genotype by environment interaction

  differences in maternal environment

  (Cowley et al., 1989; Rhees et al., 1999; Barker, 1998)

- Epistatic interactions

  effect of Charolais genes depends on the background genes of the dam (Montbéliard or Holstein)

- Indirect genetic effect

  maternal genotype and genotype of the offspring
  (Maestripieri and Mateo, 2009)

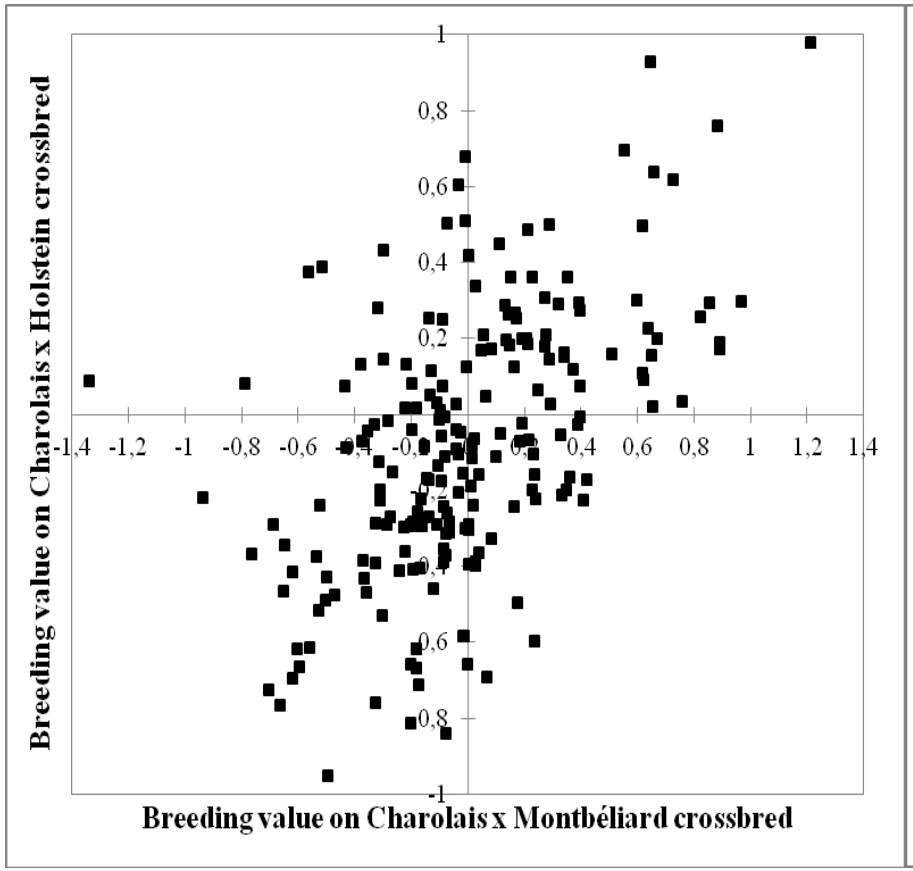
Implication

- Evidence of different ranking of sires depending on the dam breed they are mated to
- Commercial interest to produce separated genetic evaluation
- Opportunity for labeling

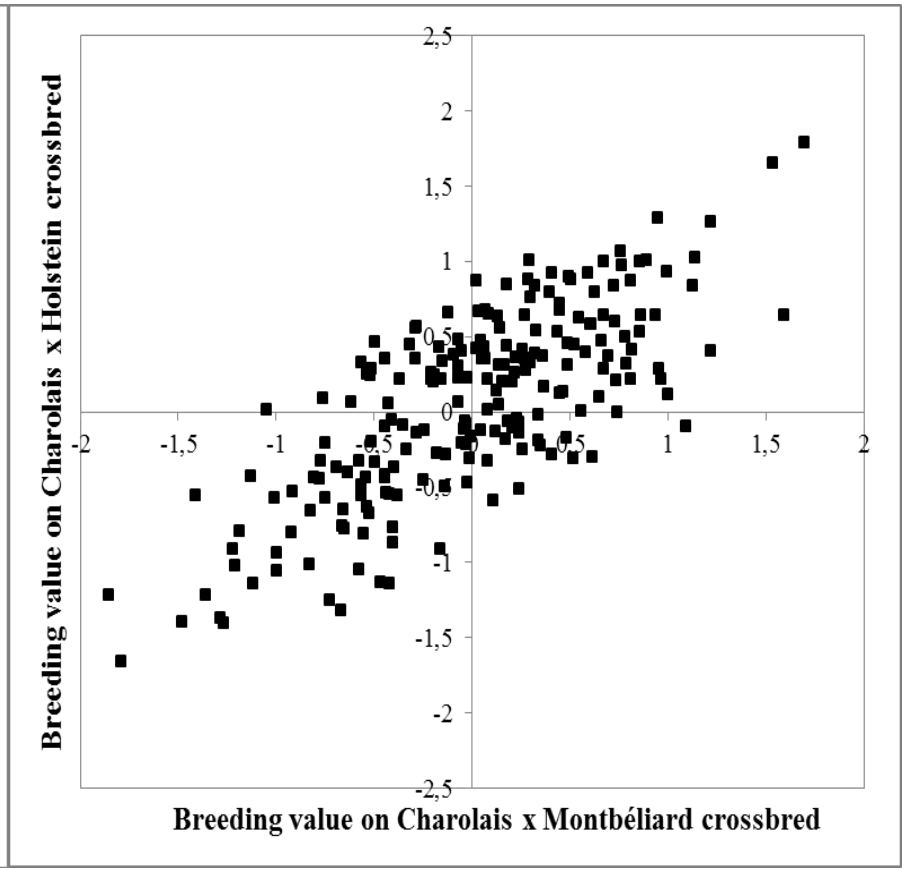
Thank you for your attention

Comparison of sires EBV

Bone thinness



Muscular development



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