Genetic growth profiles for carcass traits in steers

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Growth Profiles

• Modelling trait development over time
• Carcass growth (\(\Delta\) carcass weight)
• Muscular development (\(\Delta\) conformation)
• Body fat accumulation (\(\Delta\) fat)
• Information on variation in rate of development
• Informed management decisions

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Growth rate

Weight (kg)

Age (days)

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Within breed differences

<table>
<thead>
<tr>
<th>Age (days)</th>
<th>Weight (kg)</th>
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<tbody>
<tr>
<td>Bull A</td>
<td></td>
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<tr>
<td>Bull B</td>
<td></td>
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<tr>
<td>Bull C</td>
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Aim

• Examine variability in rate of trait development
  • Estimate optimum slaughter age of progeny
Materials and methods

• Carcass records 2010-2013

• Multiple beef and dairy breeds

• Steers: 360-1200 days

• Known sire and dam

• Sire ≥ 5 progeny
Age distribution

Number of records

Age (days)

n = 124,641

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Materials and methods

Pedigree

124,641 Progeny

Random regression

Sire growth profiles
Random regression models

• Model trait changes over time

• Using repeated measurements

• Not traditionally used in study of carcass traits

• Model traits at a sire level
Random regression model

\[ Y = \mu + \text{HYS} + \text{AbattoirDate} + \sum_{i=1}^{n=3} \text{Age} \Phi + \sum_{i=1}^{n=3} \text{Het} + \text{Rec} + \text{Parity} + \sum_{i=1}^{n=3} \text{Age} \Phi + \text{Sire} \Phi + e \]
Results
Genetic correlations within trait

- Carcass weight
- Conformation
- Fat

Correlation vs. Age (days)
Eigenfunctions & eigenvalues

VCM

[σ²₁]
- Intercept

[σ²₂]
- Linear

[σ²₃]
- Quadratic

Eigenfunctions

Eigenfunctions & eigenvalues
Eigenfunctions

Conformation

First (77%)  
Second (16%)  
Third (7%)  

Age (days)
Eigenfunctions

Carcass weight

Age (days)

First (71%)
Second (21%)
Third (8%)
Bivariate correlations

Genetic Correlation

Age (days)

Carcass weight and Conformation
Conformation and fat
Carcass weight and fat
Within Breed

EBV

Age (days)

Conformation

Fat

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Within Breed

Conformation

Fat

EBV

Age (days)

650  690  730  770  810  850  890  930  970

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Conclusions

• Carcass weight at younger ages is under different genetic control than at older ages

• Genetic variability exists among animals in the shape of their growth profiles

• May be exploited in breeding programs.
**Implications**

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<th>Very Early Maturing</th>
<th>Early Maturing</th>
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<th>Late Maturing</th>
<th>Very Late Maturing</th>
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Thanks For Listening