SELECTION FOR FEED EFFICIENCY IN HOLSTEIN COWS BASED ON DATA FROM THE EFFICIENT COW PROJECT

Astrid Köck¹, Maria Ledinek², Leonhard Gruber³, Franz Steininger¹, Birgit Fuerst-Waltl², Christa Egger-Danner¹

¹ ZuchtData EDV-Dienstleistungen GmbH, Dresdner Str. 89/19, 1200 Vienna, Austria
² University of Natural Resources and Life Sciences, Department of Sustainable Agricultural Systems, Division of Livestock Sciences, Gregor-Mendel-Str. 33, 1180 Vienna, Austria
³ Agricultural Research and Education Centre, Raumberg 38, 8952 Irdning-Donnersbachtal, Austria
Approach – field data for novel traits

• Study based on data of Austrian project „Efficient Cow“

• Extended data recording on-farm on 161 farms in Austria with app. 6,500 cows for one year (1.1.2014 – 31.12.2014)

• Data recorded: general information about the farm, various data related to health (veterinarian diagnoses, claw trimming, farmer observations, milk ketotest,...), feeding information, body weight and body measures, linear scoring, body condition score, lameness, infrared-spectra,...

• Dry matter intake: Individual feed intake was impossible to measure on-farm. To get information on feed intake on a relatively large number of cows, dry matter intake was estimated according to the model of Gruber et al. (2004).
Aim of the presentation

• Genetic parameters for efficiency traits

• Efficient cows
  • Milk yield
  • Body weight
  • Dry matter intake
  • BCS
  • Fat-protein ratio
  • Fertility
  • Health
Genetic parameters for efficiency

Data: 7,037 records from 1,152 Holstein cows

Efficiency traits

- ECM/BW^{0.75} = Body weight efficiency
- ECM/DMI = Feed efficiency
- ECM/INEL = Energy efficiency

Model

- Fixed effects: Herd, Year*season of calving, Parity-age at calving, Parity-lactation stage, Parity-pregnancy stage
- Random effects: Animal (genetic effect), Permanent environmental effect, Herd-test-day
Genetic parameters for efficiency

<table>
<thead>
<tr>
<th>Trait</th>
<th>Heritability</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECM/BW^{0.75}</td>
<td>0.14</td>
</tr>
<tr>
<td>ECM/DMI</td>
<td>0.12</td>
</tr>
<tr>
<td>ECM/INEL</td>
<td>0.11</td>
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</tbody>
</table>

Efficiency traits were highly correlated (0.93-0.99)
Efficient cows

Estimated breeding values for ECM/INEL

Division into 3 groups

• Low EBV for efficiency (10% of cows)
• Medium EBV for efficiency
• High EBV for efficiency (10% of cows)
Efficiency and milk yield

- Low efficiency
- Medium efficiency
- High efficiency

Milk yield, kg /d

Month after calving
Efficiency and body weight

Month after calving

Body weight, kg

- Low efficiency
- Medium efficiency
- High efficiency
Efficiency and dry matter intake

- Low efficiency
- Medium efficiency
- High efficiency

Dry matter intake, kg/d

Month after calving
Efficiency and BCS

Month after calving

Low efficiency

Medium efficiency

High efficiency

BCS

1 2 3 4 5 6 7 8 9 10 11 12

Month after calving
Efficiency and fat-protein ratio

- Low efficiency
- Medium efficiency
- High efficiency

Month after calving:
- Low efficiency
- Medium efficiency
- High efficiency

Fat-protein ratio:
- Low efficiency
- Medium efficiency
- High efficiency
Efficiency and calving interval

- Low efficiency: 393 days
- Medium efficiency: 403 days
- High efficiency: 412 days
Efficiency and disease resistance

- Low efficiency
- Medium efficiency
- High efficiency

Frequency, %

- Milk fever
- Ketosis
- Mastitis
- Retained placenta
- Metritis
- Cystic ovaries
- Silent heat
Efficiency and SCS

- Low efficiency
- Medium efficiency
- High efficiency

Month after calving
Efficiency and lameness

Moderately to severely lame (%) vs. Month after calving:

- Low efficiency
- Medium efficiency
- High efficiency
Efficiency and culling rate

- Low efficiency
- Medium efficiency
- High efficiency

- Other reasons
- Infertility
- Metabolic health problems
- Poor milking speed
- Slaughter
- Feet and leg problems
- Infectious diseases
- Animals sold
- Udder health problems
- Death
- Old age
- Low performance
Conclusions

Efficient cows

- Milk yield ↑
- Body weight ↓
- Dry matter intake ↑
- BCS ↓
- Fat-protein ratio ↑
- Fertility ↓ (calving interval ↑, cystic ovaries ↑, silent heat ↑)
- Somatic cell score ↓
- Lameness ↓
- Culling rate ↓

Cows with a medium efficiency combine both, a high milk yield with good fertility and health!
Acknowledgement

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Thank you!
Dry matter intake and SCS

Month after calving

Low DMI  Medium DMI  High DMI
Dry matter intake and lameness

Month after calving

Moderately to severely lame (%)

- Low DMI
- Medium DMI
- High DMI