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# PHENOTYPIC AND GENETIC RELATIONSHIPS BETWEEN SUBCLINICAL KETOSIS, BODY CONDITION SCORE, FAT-PROTEIN-RATIO AND OTHER DISEASES IN AUSTRIAN FLECKVIEH COWS

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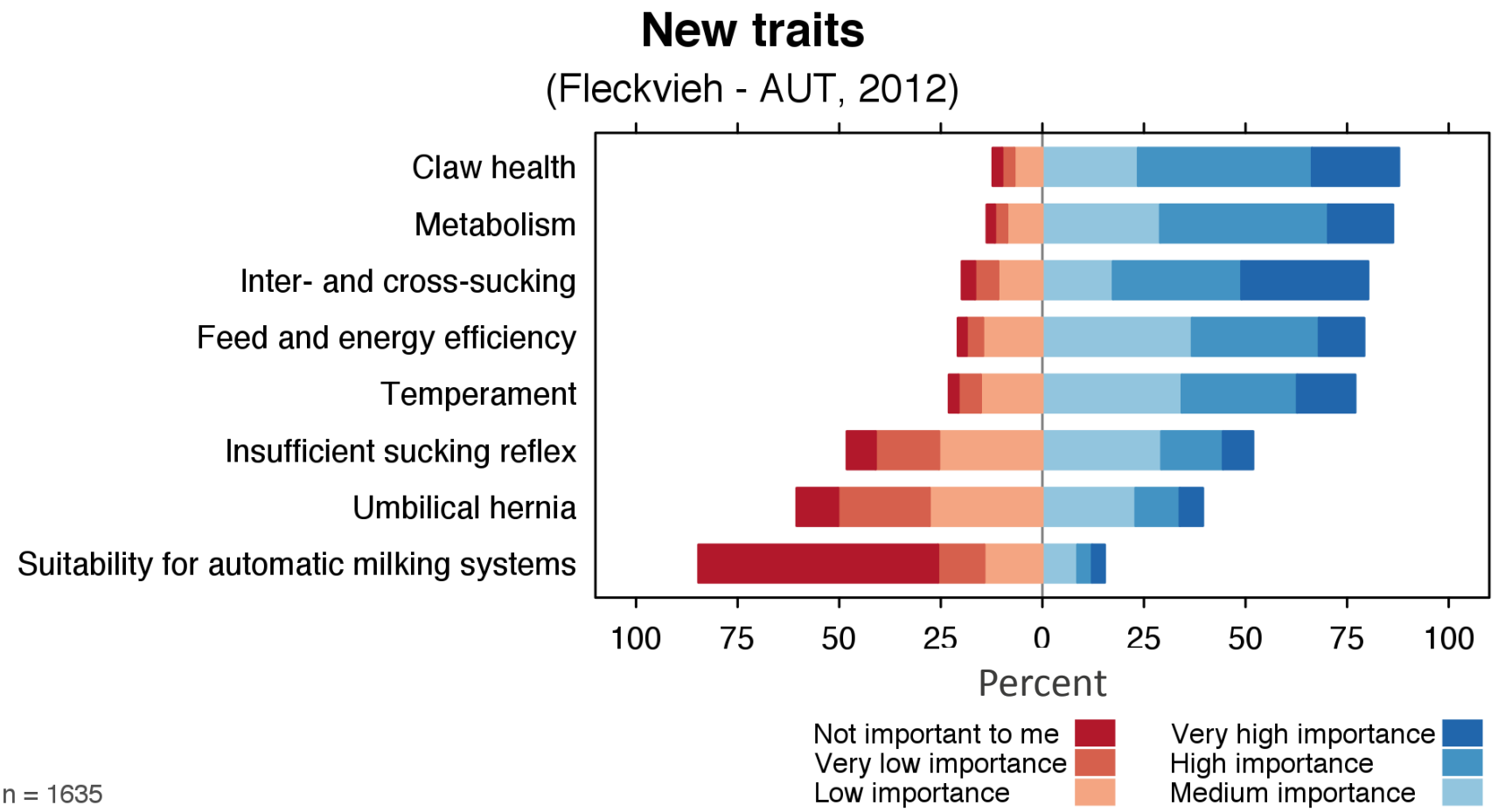
# Background

- In 2006 Austrian health monitoring project was launched (Egger-Danner et al., 2012)
- Since 2010 breeding values for mastitis, early fertility disorders, cystic ovaries and milk fever have been published (Fuerst et al., 2011)
- Metabolism is currently covered only by the trait milk fever

# „Wish list“ for new traits from farmers – Fleckvieh (Steininger, 2013)




n = 1635

# 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)

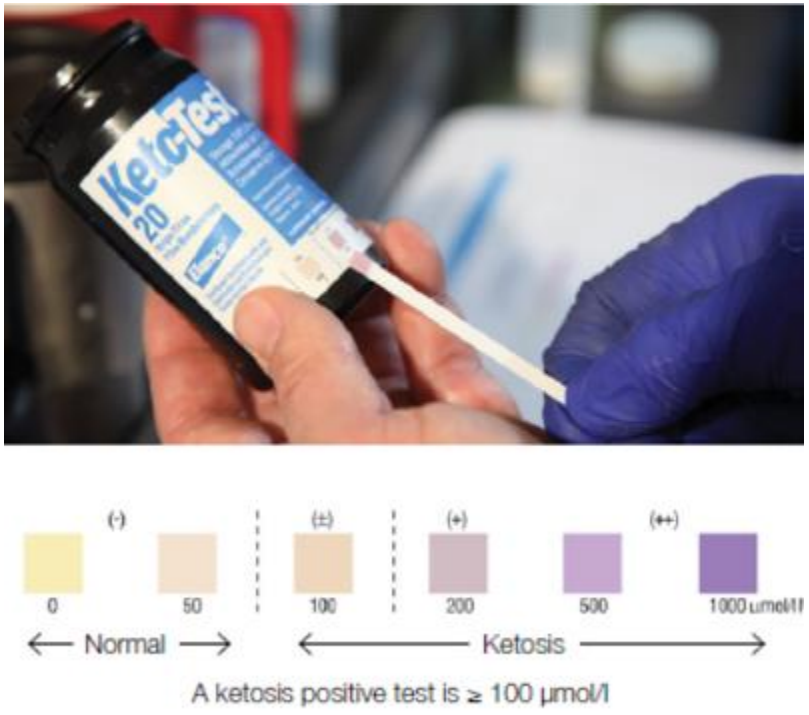
- **Data recorded**: general information about the farm, various data related to health (veterinarian diagnoses, claw trimming, farmer observations, **subclinical ketosis**,...), feeding information, body weight and body measures, linear scoring, **body condition score**, lameness, infrared-spectra,...

# Aim of the presentation

- Phenotypic and genetic analysis of subclinical ketosis
- Associations with BCS, fat-protein-ratio and other diseases

# Subclinical ketosis

- Detected by using the milk Keto-Test from ELANCO (measures milk ß-hydroxybutyrate) at the 7 and 14 day after calving



# Phenotypic analysis

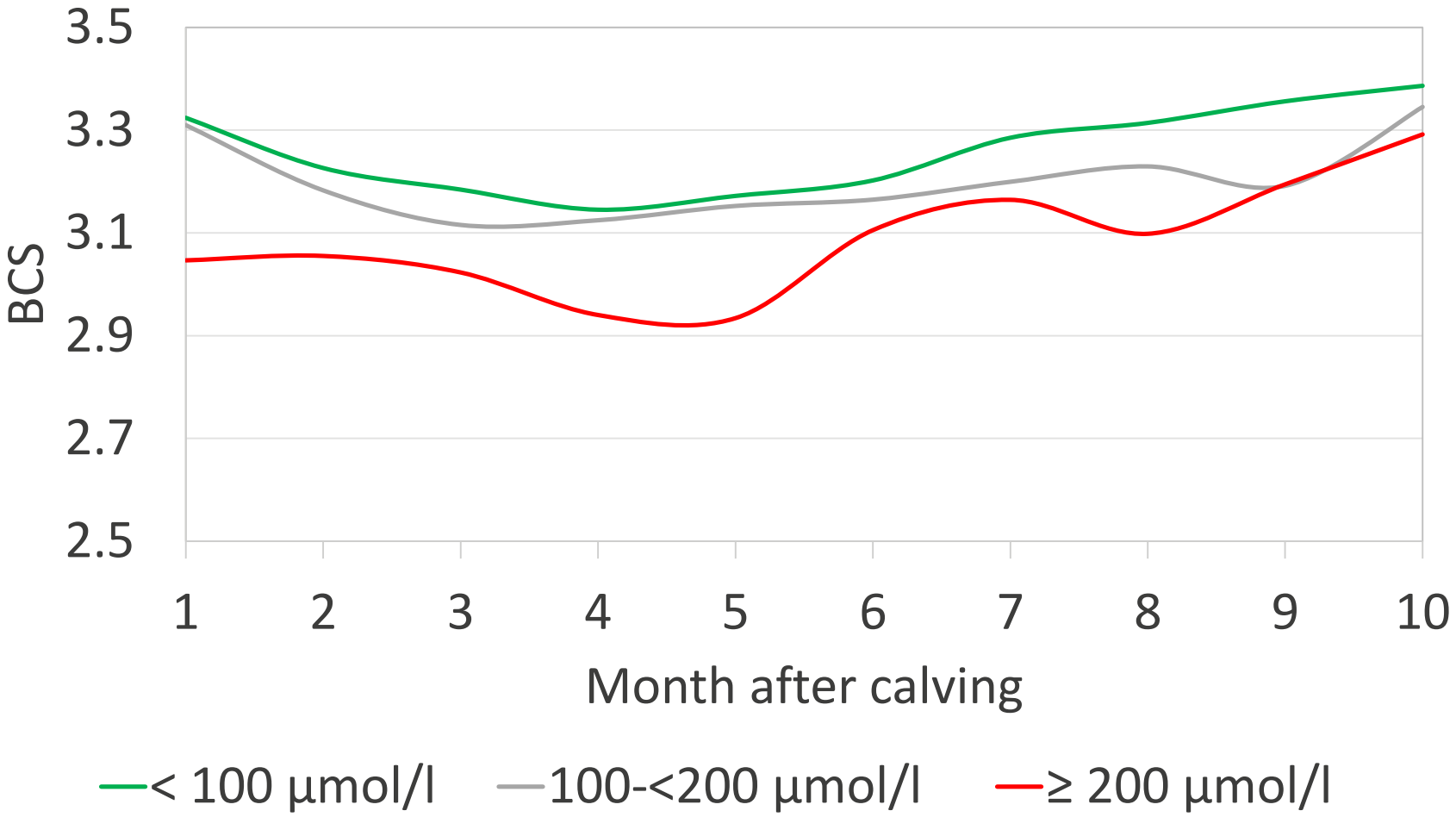
- Keto-Test result 7 days after calving was considered (N=1,920)

- Keto-Test results were grouped into 3 groups according to their milk ß-hydroxybutyrate:
  - healthy = <100 µmol/l
  - suspicious = 100-<200 µmol/l
  - subclinical ketosis = ≥ 200 µmol/l

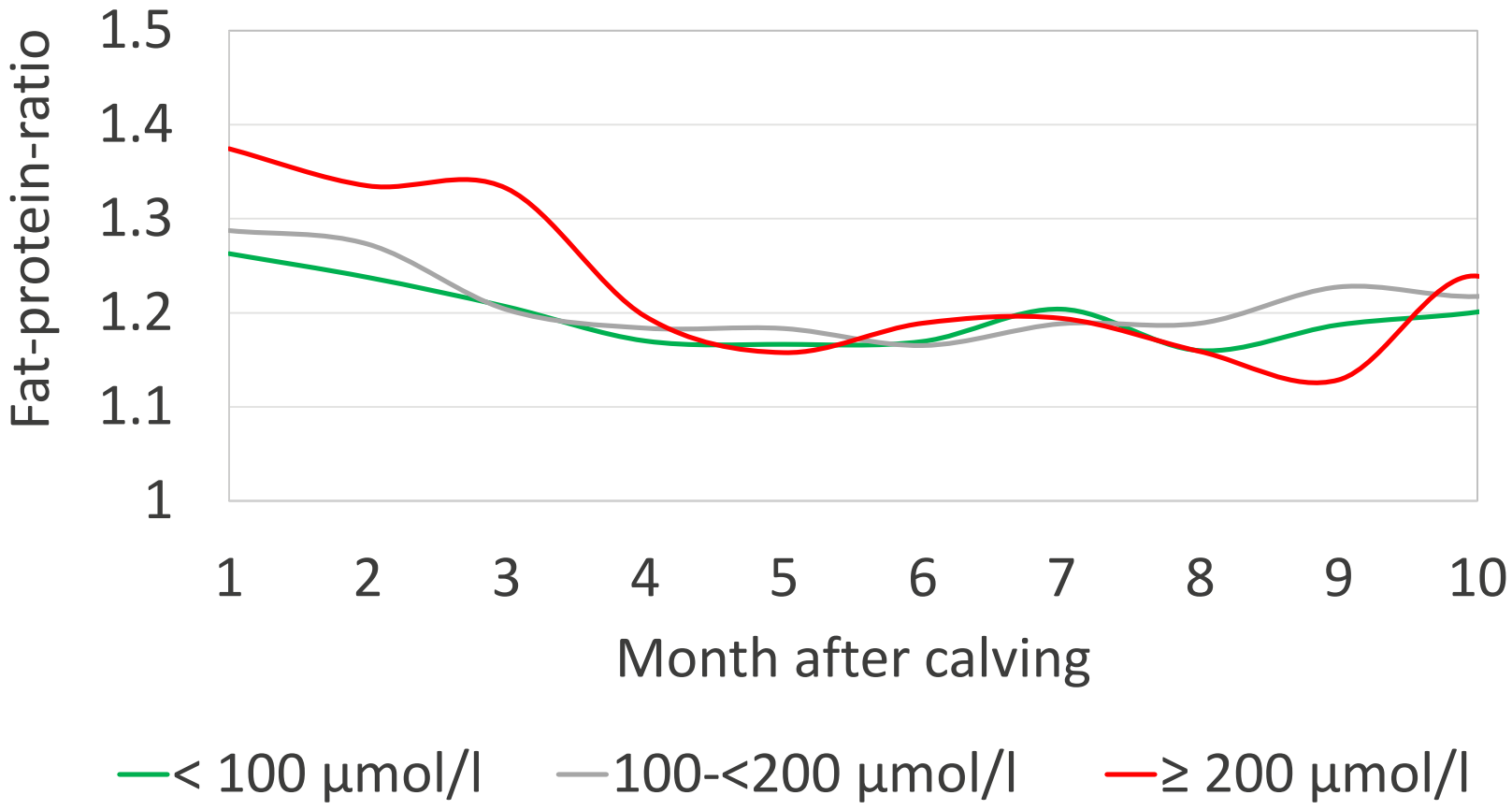
# Frequency of subclinical ketosis

| Keto-Test (N=1,920) | Parity | | | |
|---|---|---|---|---|
| | All | 1 | 2 | 3+ |
| < 100 µmol/l | 64.2 | 71.9 | 68.5 | 58.0 |
| 100-<200 µmol/l | 28.5 | 23.4 | 24.0 | 33.2 |
| ≥ 200 µmol/l | 7.3 | 4.7 | 7.5 | 8.8 |

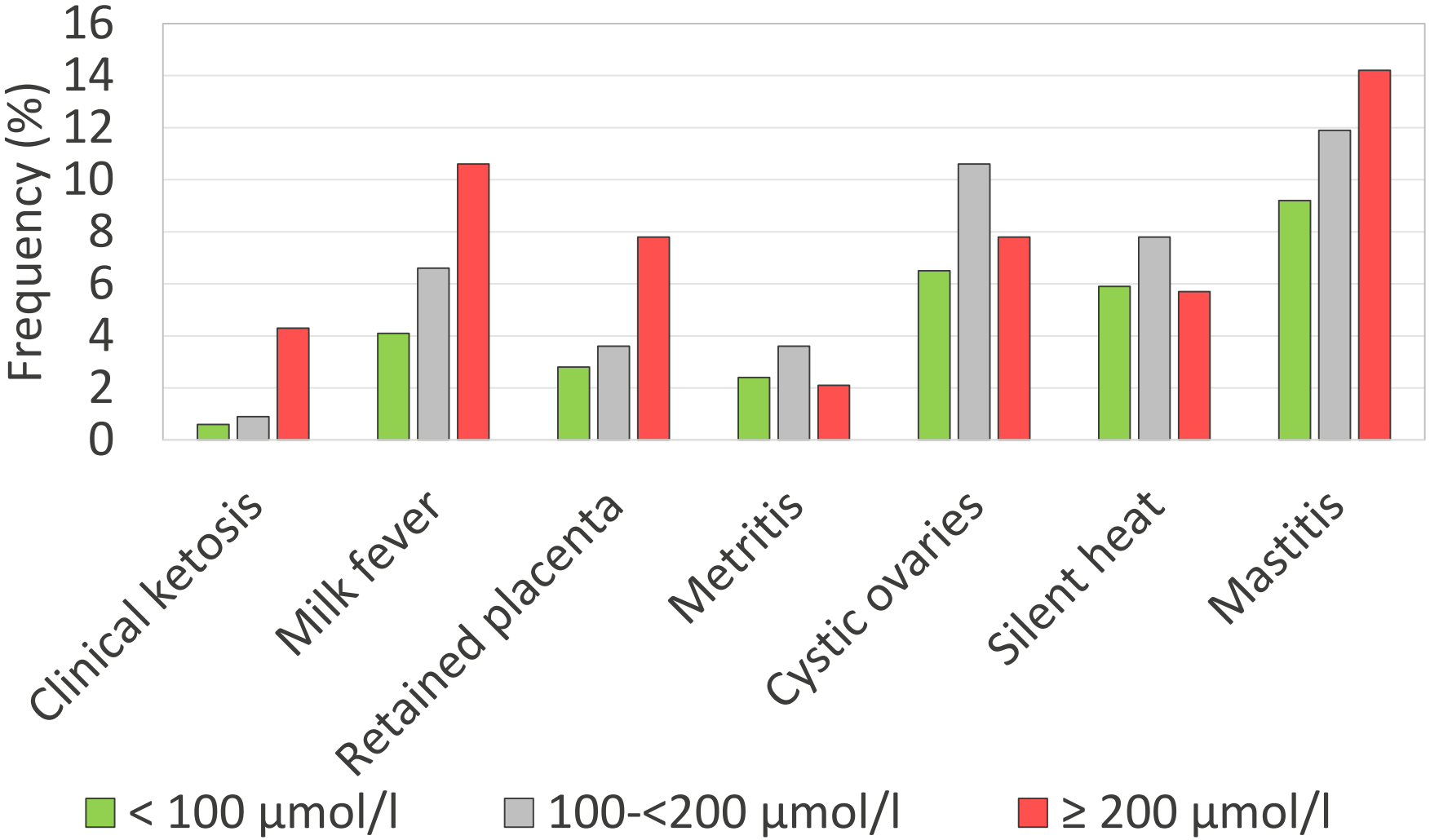
# Subclinical ketosis and BCS



# Subclinical ketosis and fat-protein-ratio



# Subclinical ketosis and other diseases



# Genetic analysis

- Keto-Test results 7 and 14 days after calving were combined (N=1,805)

- Keto-Test results were grouped into 3 groups according to their milk ß-hydroxybutyrate:
  - healthy = <100 µmol/l
  - suspicious = 100-<200 µmol/l
  - subclinical ketosis = at least 1 ketotest ≥ 200 µmol/l

# Summary statistics of data set

| | Number of records | Mean |
|---|---|---|
| Subclinical ketosis | 1,805 | 0.56 |
| KET, % | 5,670 | 0.70 |
| MF, % | 5,670 | 4.10 |
| BCS | 2,492 | 3.31 |
| BCS_DIFF | 2,169 | -0.15 |
| F:P | 7,187 | 1.28 |

# Model

- Fixed effects:
  - Year*season of calving
  - Parity-age at calving
  - Type of recording (for clinical ketosis and milk fever)
  - Days in milk (for BCS, F:P)
  - Day of first BCS scoring (for BCS_DIFF)
  - Days between first and second BCS scoring (for BCS_DIFF)
  - Day of first ketotest (for subclinical ketosis)
  - Number of ketotests (for subclinical ketosis)

- Random effects:
  - Herd*year
  - Animal (genetic effect)
  - Permanent environmental effect

# Genetic parameters

| | SK | KET | MF | BCS | BCS_DIFF | F:P |
|---|---|---|---|---|---|---|
| **SK** | **0.05 (0.029)** | 0.89 (0.62) | 0.51 (0.31) | -0.45 (0.22) | -0.24 (0.43) | 0.16 (0.26) |
| **KET** | | **0.01 (0.006)** | 0.79 (0.32) | -0.99 (0.17) | 1.00 (0.00) | -0.33 (0.41) |
| **MF** | | | **0.02 (0.027)** | -0.61 (0.36) | 0.66 (0.47) | 0.43 (0.26) |
| **BCS** | | | | **0.17 (0.039)** | -0.61 (0.33) | -0.26 (0.16) |
| **BCS_DIFF** | | | | | **0.04 (0.027)** | -0.19 (0.28) |
| **F:P** | | | | | | **0.14 (0.026)** |

# Conclusions

Sufficient genetic variation for novel traits based on field data

BCS is a valuable tool for the prevention and early detection of metabolic diseases

Metabolism with subclinical and clinical symptoms is complex

Different information sources and traits can be used to improve metabolic disease resistance

# Acknowledgement

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