Collection and Use of New Phenotypes in Germany

The future for phenotyping strategies – how will ICAR members exploit the opportunities?

Collection and Use of New Phenotypes in Germany

- Introduction
- Kick Off
- German Projects
  - FSMIrmi
  - KetoMIR
  - Q-Check
- Near Future

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- Performance testing
  46.735 herds with 3.670.021 cows
  ➔ Germany is the second largest DHI region world wide

- Quality monitoring for the milk payment scheme of all German dairy producers and dairy cows
  69.200 dairy farms with around 4,2 million cows
  ➔ Germany is the largest milk producer in the EU with more than 31 million tons in 2016

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Kick Off

The systematic collection of FT-IR spectra was kicked-off in May 2012, when the Bavarian DHI Association (LKV Bayern, 0.98 million dairy cows) began to store the spectra with each single DHI sample result for each cow.
→ 46.612.855 IR-Spectra collected between May 2012 and March 2017.

First analyses were focused on pregnancy prediction for the dairy cows since reference data were available without additional efforts. Later on different projects in Germany have been started aiming at identification of metabolic disorders, mainly targeting ketosis and acidosis especially in fresh cows.

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FSM-IRMI-Project in Bavaria

Idea:

IR-Spectra include information of all milk components, but significant variations are required

Aim:
- New additional tool for farmers without extra costs
- Indications/ Warnings relating to Ketosis-Status of dairy cows

Involved:
- LKV Bayern and MPR Bayern promoted by the bavarian ministry of agriculture
- Veterinarians on farm
- Farms with robots

Bayerisches Staatsministerium für
Ernährung, Landwirtschaft und Forsten

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FSM-IRMI-Project

Analysis of IR- Spectra out of DHI measurement concerning Blood-BHB results (Cows are 5 – 50 days under milk)

Evaluation of 1078 IR-Spectra from 26 farms together with Blood-BHB results from 359 German **Simmental** cows

Limit of Ketosis classification: BHB concentration ≥ 1.2 mmol/l
→103 samples with Ketosis
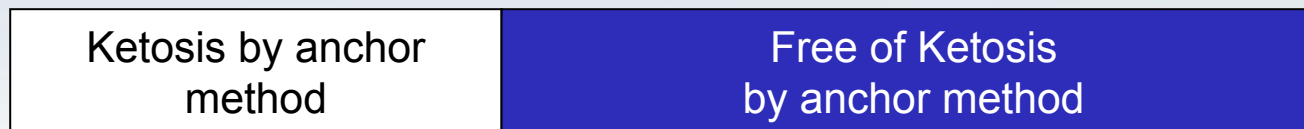→970 samples free of Ketosis

For each sample: Use of linear discriminant analysis and tenfold crossvalidation for calculation of Ketosis risk.
Limits are free of choice for optimization

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FSM-IRMI-Project

Ketosis by anchor method	Free of Ketosis by anchor method

Model-classification ➡
1. Calculation of Ketosis risk
2. Correlation with status of Ketosis

false	correct

Hit-rate: Sample part with correct Ketosis status

Sensitivity:
Sample ratio with Ketosis IR and anchor from all samples
Detection of Ketosis is correct

Specificity:
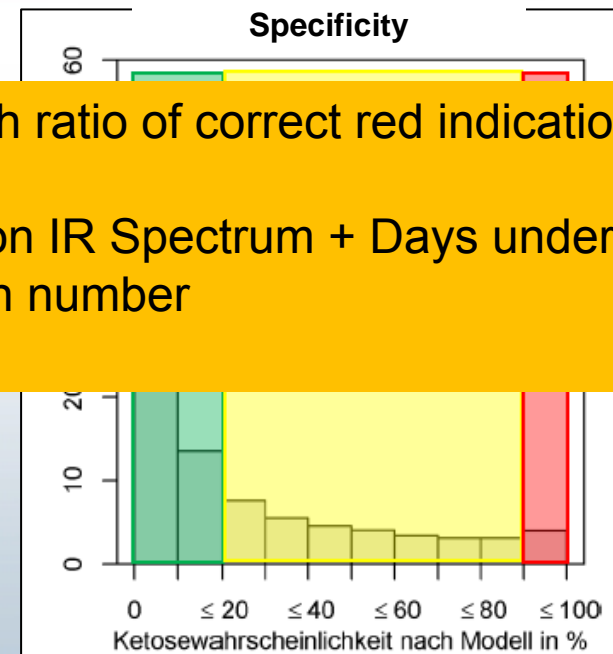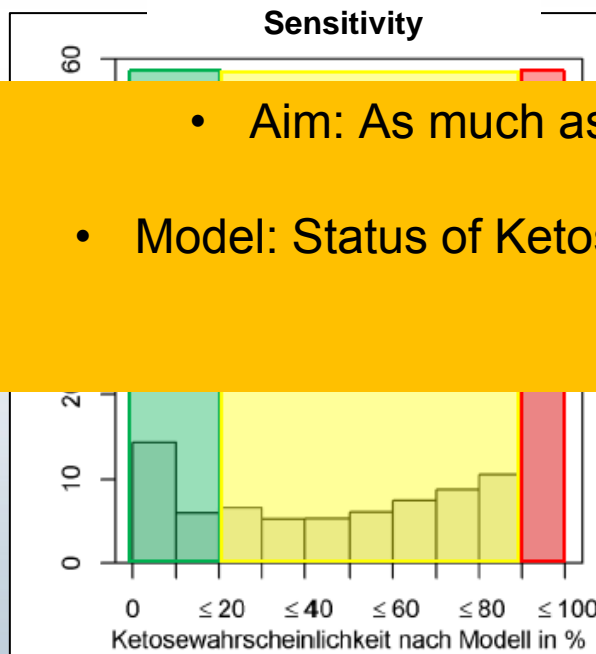Sample ratio with no Ketosis IR and anchor from all samples
Detection of no Ketosis is correct

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FSM-IRMI-Project

- Model calculates ratio for notification „Ketosis" between 0 and 100 %

- Indicator: **Less risk of Ketosis**, **Warning**, **High risk of Ketosis**

- Aim: As much as possible high ratio of correct red indication

- Model: Status of Ketosis depends on IR Spectrum + Days under milk + Lactation number

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FSM-IRMI-Project

Conclusion:

- Good results
- Optimized models with high ratio of correct notifications of high Ketosis risk
- Clear report with color indicator
- Next step: Integration in DHI report and and online service
- supporting tool useful for farmers

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KetoMIR – Ketosis determination out of the milk sample

- Overall 11 European associations for animal recording from GB, IR, FR, BE, LU and GER are working together in one project in order to earn more information out of the DHI sample improving herd management. All used analyzer are based on same MIR technology.

- European Union funded this project. Aim was to earn more information out of IR spectra (Ketosis, Acidosis, pregnancy etc.) In applying determination of Ketosis was a breakthrough using OptiMIR system

⟹ KetoMIR

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KetoMIR

- The DHI assoziation of Baden Württemberg (LKV BW) has implemented a new Ketosis indicator at DHI testing and uses the existing cattle health monitoring system (GMON).

- Currently 1.050 Farms with 70.000 cows are involved

- Holstein Fresian, Brown Cattle, Simmental, Vorderwald Cattle are checked in order to validate the Ketosis indicator.

- Meanwhile 300.000 diagnoses are stored in LKV Database together with positive Ketosis results diagnosed by vet.

- Retrospective results of GMON from all herds between the years 2013 – 2015 have been used for subsequent calculation of Ketosis classes.

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KetoMIR

- Evaluation by KetoMIR together with GMON showed high impact of Ketosis on health of dairy cows.

- KetoMIR has been used officially after validation showed good correlation between vet diagnoses and classification by IR spectra.

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Q-Check – Project in Germany (Start: Oct. 2016)

Background:

German legal obligation for farmers: Self-monitoring of animal health and welfare. Suitable indicators for animal welfare shall be used.

Aim:

•Creation of self-monitoring report as support for farmers by upgrading existing DHI-service
•Creation of national monitoring: German federal DHI-associations are considered as neutral monitoring system with 3.7 million cows

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Q-Check - Project

Working steps for Q-Check Ketosis screening:

•Consideration of automatically determined indicator

•Sufficient data supply by already existing analysis and data systems (DHI, QM-Milk, HIT)

•Upgrade of DHI data system regarding Ketosis screening and other automatable parameter e.g. fertility management (IDEXX-Test)

→Run-time: 3 years
→The project is supported by funds of the Federal Ministry of Food and Agriculture via the Federal Office for Agriculture and Food

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Q-Check - Project

Field test:

• Sampling of 2000 Holstein-Friesen and 500 Simmental

• Time interval: 5 – 30 days under milk
  - weekly blood samples
  - weekly DHI samples

• Milk samples: Milk components + MIR Spectra (partly attending KetoMIR)

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<u>Near future</u>

- Further use of MIR

    - Fatty acids
    - Defined proteins
    - Mineral nutrients
    - Citrate

- Prediction models for further indicators

    - Animal disease
    - Milk technological characteristic
    - Feed utilization & methane emission
    - Somatic cell count differentiation

The End