

Opportunities and challenges of new technologies for performance recording with focus on claw health and metabolism

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Background – new technologies

Evolution of technologies in dairy production and breeding

On-farm:

- Automatisation (milking systems, feeding systems, etc.)
- Environmental information (climate, remote sensing, etc.)
- Livestock sensors (activity, feeding behaviour, etc.)





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Evolution of technologies in dairy production and breeding

On-farm:

- Automatisation (milking systems, feeding systems, etc.)
- Environmental information (climate, remote sensing, etc.)
- Livestock sensors (activity, feeding behaviour, etc.)

In the labs:

- New laboratory diagnostic methods and analyses
- Omics technologies
- High-troughput technologies











Background – new technologies



Advances of digitalisation to be exploited

- Networking and data integration
- Real time analyses
- Big data analyses
- Image / pattern recognition



Data interpretation

Level II

Technique

Level

Integration of information

Level III

Decision making

Level IV

Figures: Klimek 2019, Rutten et al. 2013



BUT:

- Privacy concerns
 - Farm data \Rightarrow regarded as farmers' trade secret
 - Sensor-derived information through proprietary algorithms ⇒ regarded as companies' intellectual property

• Drawbacks

- Disconnected data silos
- Heterogeneous APIs
- Lack of common standards

Background – services of performance recording organisations





Breeding value estimation

Dairy – ICAR Conference 2019 - Prague - 20 June 2019 - Florian Grandl

Breeding goals include various traits – including "difficult to measure traits"





Performance recording of metabolic status BAYERN Deliver

- Traditional approach: milk constituents (fat, protein, urea), reason for culling
- Various sources of data for enhanced information on metabolic status
 - Veterinary diagnoses
 - Additional information from milk sample (mid-infrared spectra from milk, enhanced laboratory diagnostic methods and analyses)
 - Test of ketone bodies in blood or milk
 - Body condition scoring
 - Body weight change
 - Eating and rumination behaviour
 - Feeding information

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Performance recording of metabolic status



Data source	Heritability	Comment
Veterinary diagnoses	*1-2%	Clinical cases, important for BVE
Test of ketone bodies in blood or milk	*5-10%	Subclinical cases (higher incidences), important for herd management and BVE
Additional information from milk sample	*ca. 15%	Auxiliary traits for metabolic status
Body Condition Score	*2-4% for BCS change, BCS > 15%	Ideal range by breed (Häusler, 2015), change in BCS > 0.5 at beginning of lactation – higher disease risk
Sensor information (rumination data, etc.)	?????	Herd management information and potential contribution to (big data) early detection algorithms – auxiliary trait for BVE
Feeding information	?????	Herd management information and potential contribution to (big data) early detection algorithms – auxiliary trait for BVE

*Fürst-Waltl et al. 2017

Performance recording of metabolic status BAYERN DDairy



So far, only few information available about correlation to other predictors for metabolic problems – base for inclusion in herd management und breeding

Stangaferro et al., 2016

Performance recording of claw health status BAYERN Displaced Bayern Displaced Bayern Displaced Bayern Displaced Bayern Displaced Bayern Bayern

- Traditional approach: n/a (auxiliary: conformation traits and reasons for culling)
- Various sources of data for enhanced information on claw health status
 - Veterinary diagnoses
 - Claw health status from claw trimmers
 - Lameness scoring
 - Activity information
 - MIR predictors ?
 - ...



Data source	Heritability	Comment
Veterinary diagnoses	*1-2%	Low incidences (severe cases), important for breeding value estimation (BVE)
Diagnose from claw trimmers	*2-25%	Higher incidences, better quality information. Documentation helpful for herd management and BVE
Lameness scorings	*2-9%	Important herd management information. If standardised use for BVE – auxiliary trait for BVE
Sensor information (activity data, etc.)		Herd management information and potential contribution to (big data) early detection algorithms – auxiliary trait for BVE

*Heringstad and Egger-Danner et al. 2018



- Crucial in recording of health status: register application of preventative measures (e.g. propylene glycol)
- Alarms from single information sources are often not specific
- Does combining of information increases predictive ability or correlation to target traits ("Gold Standards")?
- Some of the data sources require sampling
 - Costs
 - Aligned to farms visit for routine milk recording
- Comprehensive research data sets are needed for algorithm development
- Optimise data availability





Networking is the challenge





D4Dairy – Digitalisation, Data integration, Detection and Decision support in Dairying



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Expected benefits for all project partners

- **LKV** BAYERN **D**Dairy
- Improved interoperability and data exchange between systems
- Better tools for early detection of diseases and optimisation of herd management
- New and better parameters for breeding higher heritability
- Improving animal health and welfare
- Monitoring and improvement of product quality
- Improving the environmental impact through resource savings
- Efficiency gains and improved sustainability
- Advantage for partners sharing data and knowledge and participating in possibilities of digitalization

Access and creating added value out of data will be key for success in the future!

What does that mean for performance recording in 2030?



What / how to record?

What to deliver?

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Performance recording in 2030 – what / how to record



- Record a wide variety of (auxiliary) traits using new recording technologies
- Integrate existing data and technology into performance recording
- Offer performance recording schemes that are aligned with the needs and the abilities of farms and farmers
- High-quality data provision as business model for farms ⇒ Integration with breeding programs

Performance recording in 2030 – what to deliver



- Offer decision (support) systems for farm management based on different sources of data (from performance recording and other sources)
- Make performance recording results available for further automatization of farm processes
- Adapt performance recording schemes to daily/hourly/every second data flow
- Make data streams in dairy production visible