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Internet of Cows – Opportunities and challenges for improving health, welfare and efficiency in dairying

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With the growing world population, climate changes and the simultaneous increase in the demand for animal products issues such as efficiency, health, resilience and environmental impact are becoming increasingly important. Social sensitivity for animal welfare, appropriate feeding and housing and food safety is of increasing concern as well. Those changes in the production circumstances as well as the need for economical sustainability are reflected in broadening breeding goals. At the same time, new technologies are revolutionising the dairy industry. In addition to achievements in omics technologies (e.g. genomics, metabolomics), information and communication technologies (e.g. Internet of Things, sensor technology) are also finding their way into modern dairy herds. Instead of punctual measurements, sensors record animal behavioural patterns that allow to draw conclusions on animal health, animal wellbeing and welfare. The large amounts of data generated by monitoring and the integration of various already existing data sources thus promise completely new insights into animal health and welfare. Optimised processes e.g. feeding improve efficient use of resources and reduce the daily workload of farmers. Better trait defintions are expected to result in higher heritabilities and higher genetic gain. Traditional data pipelines with information from performance recording in combination with indicators for metabolic disturbances, such as veterinary diagnoses, feeding information, test of ketone bodies, body condition score, and mid-infra- red spectra have existed for some time. With regard to metabolic disorders, they already provide more precise possibilities to predict health status than some traditional traits such as the fat-protein-ratio. For claw health, information from claw trimming, veterinary diagnoses and lameness scoring has only been partly made available. Sensor technology provides alarms based on irregularities of normal behaviour for early detection of disordes. Advanced methodology offers the possibility to combine various environmental informations and genomic background to gain new insights into the occurance of or susceptibility to disorders. To explore these opportunities, the big challenge is the integration of different data sources. In practice, data are often generated by different hardware and software products, which makes data integration more difficult due to different data exchange formats of the communication partners involved. Traits are defined differently by different products. Volume, velocity, variety and veracity of data are topics to consider. It is therefore necessary to create structures to bring these

data sources together in order to provide farmers with maximum support for herd management. Another challenge of data integration from different sources is compliance with legal data protection regulations, since this is often associated with lack of clarity in practice. Cooperation between different partners and integrating different data is the precondition for successfully applying advanced data technologies based on complex trait definitions. Based on the COMET-project D4Dairy steps to overcome these challenges are presented.