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**Additional value of cell differentiation in the course of DHI testing**

Folkert Onken<sup>1</sup>, Eva Gass<sup>1</sup>, Alexander Bartel<sup>2</sup>, Christian Baumgartner<sup>3</sup>, Friederike Querengässer<sup>2</sup>, Marcus Doherr<sup>2</sup>

<sup>1</sup>German Association for Performance and Quality Testing, DLQ, Bonn, Germany

<sup>2</sup>Institute for Veterinary Epidemiology and Biostatistics, Free University Berlin, Berlin, Germany

<sup>3</sup>Bavarian Association for raw milk testing, mpr, Wolnzach, Germany

As a well-established parameter in monthly DHI testing, SCC is being used in order to monitor udder health and to support management decisions on dairy farms.

Aim of this study was to evaluate, whether the additional analysis of cell differentiation in the course of DHI testing could further enhance the informative value of DHI results, e.g. in the form of prognostic key figures for udder health. Using a new generation of high throughput devices, SCC and cell differentiation index (CDI) were analyzed simultaneously. The CDI essentially reflects the proportion of macrophages of the total SCC. Cell differentiation was routinely performed from DHI samples taken over a period of 1.5 years from approximately 920,000 animals, partly from robot farms in two different German federal states. Additionally, an experiment including 2,800 animals was conducted over a period of 5 months: DHI samples were analyzed with regard to SCC and CDI. Simultaneously, SCC, CDI, and the bacteriological status were assessed from udder quarter level samples of the same animals. The data set was supplemented by additional information in regard to diagnosis and treatment of animals.

Statistical analysis of the collected data reveals a complex interaction of cell count and CDI, making it difficult to directly generate additional value from cell differentiation separately from somatic cell count results. Furthermore, it is impractical to model acute inflammatory processes of the udder due to the common interval of four weeks in between DHI testing dates. Nevertheless, two statistical models including CDI and additional DHI parameters could be established in order to predict cell counts in the future. In the case of currently > 100,000 cells/ml, the probability for elevated cell counts in the next two months can be predicted. Whereas in the case of currently < 100,000 cells/ml, the probability for stable udder health with low cell counts in the next two months is predicted. By providing the probability for different outcome scenarios, farmers would be able to rank their animals according to high or low risk and prioritize their effort. The data from quarter milk samples including the bacteriological status are currently being evaluated and preliminary results will be available soon. They will serve as reference to DHI samples and give more detailed insight into actual processes in the udder and the potential further value of CDI.

**Keywords:** udder health, DHI data, cell differentiation, somatic cell count, statistical models, prognostic key figures, bacteriological status