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Large scale screening of the Danish dairy cattle population for their milk fatty acid profile

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Introduction: In the Danish dairy industry milk fatty acid (FA) composition has an increasing interest to develop products following new consumers' trends. Furthermore FA profiles of the milk have the potential to be used as a management tool to predict eg the energy balance in the cow. The golden standard to measure milk fat composition is based on gas chromatography, however this method is time consuming and costly. Therefore, to be able to provide the Danish dairy industry with routine milk FA composition data, mid-infrared spectroscopy prediction models have been applied since May 2015. Aim:The aim was to quantify the factors influencing the detailed milk FA profile.

Methods: Milk samples were collected from May 2015 to December 2017 from all cows participating in the Danish herd testing scheme. Samples were analyzed at Eurofins, Denmark with MilkoScanTM FT+/FT6000 (FOSS, Hillerød, Denmark) equipped with Foss Application Note 64 predicting 7 FA fractions, namely SFA, MUFA, PUFA, short-chain FA (SCFA), medium- chain FA (MCFA), long-chain FA (LCFA), and trans-FA (TFA), and 4 individual FAs: C14:0, C16:0, C18:0, and C18:1.

Results: There was a profound difference between breeds with the jersey having a higher content of SFA, SCFA, MCFA and C16:0, whereas the Holstein has the highest content MUFA, PUFA, LCFA, and C18:0. Additionally, a difference between conventional and organic production systems was observed during grazing for MUFA, PUFA and C16:0. Parity and lactation stage has an influence on the milk fat composition. Milk FA profiles of cows from different bulls showed a large difference between them. Heritabilities for the FA's were at the same level as for overall fat content in the milk, and for most of the FA's there were small correlations between their breeding values and other traits within the Nordic breeding goal. This makes genetic changes of FA's possible without influencing other traits. An exception are the correlations between FA's and ketosis. These are quite large and therefore FA's will be very well suited as an indicator trait for ketosis.

Conclusion: The results of large scale screening of the Danish dairy cattle population for a detailed milk fat composition revealed profound effects of breed, production system, parity, lactation stage and genetics. This opens up the possibility differentiate the milk at

farm level, by management and breeding strategies.

Keywords: Fatty acid profiles, Danish milk, genetics, ketosis