Identification of latent udder health types by using systematic clinical examinations in Danish dairy herds

*[1]I.C. Klaas, [2]C. Enevoldsen, [1]M. Vaarst, [3]H. Houe

*[1]Danish Institute of Agricultural Science, Department of Animal Health and Welfare, P.O.Box 50, DK-8830 Tjele, Danmark

[2]The Royal Veterinary and Agricultural University, Department of Clinical Studies, Large Animal Medicine, 1870 Frederiksberg C, Denmark

[3]The Royal Veterinary and Agricultural University, Department of Animal Science and Animal Health, 1870 Frederiksberg C, Denmark

Summary

A cross-sectional study was carried out to explore the applicability of systematic clinical examinations of udders as tool to evaluate udder health status on dairy farms, additional to somatic cell count (SCC) and central cattle base data. Sixteen dairy farms were visited five times and the udders of 20 randomly chosen cows were clinically examined after milking. Principal component analysis revealed four different udder types: 1) the small udder 2) the distressed udder 3) the mastitis udder and 4) the soiled udder. SCC contributed to the small udder and to the mastitis udder. Milk yield was related to the mastitis udder.

Introduction

Udder health status in dairy farms is often described by the incidence of treated cases of mastitis, presence of bacteria, and somatic cell count in bulk milk or at test day. However, the farmers' decision-making influences the incidence of reported cases of mastitis and the somatic cell count, and may result in biased reporting of mastitis. Therefore, a cross-sectional study was conducted to explore the applicability of systematic clinical examinations of udders as an additional tool for evaluation of udder health status on dairy farms.

Materials and Methods

During 1999, 16 dairy farms were visited 5 times and 20 cows per farm were randomly chosen for clinical udder examination immediately after milking. Clinical examination was conducted based on Rosenberger (1979) and Houe et al. (2002). Besides udder and teat characteristics, soiling of udder and teats was recorded. One observation per cow was analysed (n = 692 cows) using principal component analysis. The four components with the highest eigenvalues before a visible 'break' in scree test were retained. Every component had at least three variables with high loadings. Udder shape, teat shape, parity and stage of lactation were treated as dummy variables with normal udder and teat shape, second parity and middle part of lactation as reference level. A lactation curve was modelled for each parity group using energy corrected test-day milk yield. For each clinically examined cow the mean deviation from the standard lactation curve was calculated to classify the cows as low, average or high yielding in comparison to all other cows in that parity. The

Proceedings of the 10th International Symposium on Veterinary Epidemiology and Economics, 2003
Available at www.sciquest.org.nz

previous somatic cell count was included as the mean logtransformed somatic cell count from calving until clinical udder examination. PCA was conducted in three steps to identify different udder types and their relation to udder health. First, 19 variables characterising udder and teats were analysed (PCA 1). Second, the variables parity and stage of lactation were added (PCA 2). Finally, somatic cell count (SCC) and milk yield (PCA 3) were added to analyse their relation to udder and teat characteristics. To enhance the interpretability of the components and to test the inter-correlation between the components the non-orthogonal promax rotation with a power of 3 was used.

Results and Discussion

The three PCAs extracted four components explaining an increasing amount of variation of the data from 61.1 % in PCA 1 to 74.6 % in PCA 3. The inter-component-correlation after rotation was low. The clinical variables with the highest loadings on a component kept their high loadings and their position within a component throughout the model building process indicating a meaningful pattern. These components were named according to an interpretation of their biological function and were: 1) the small udder, 2) the distressed udder, 3) the mastitis udder and 4) the soiled udder. SCC contributed to the small udder and the mastitis udder. Milk yield was related to the mastitis udder.

A cow with a high positive score on the first component ‘small udder’ was typically in the first parity, with small udder, short teats and a low SCC whereas a cow with high negative scoring on ‘small udder’ was in higher parity and had a deep udder. Deep udders are likely to develop if the strength of the udder attachment decreases with increasing age (Harris et al., 1992). Decreased teat-end to floor distance is related to higher SCC (Faye et al. 1998). Cows with a high loading on the component ‘small udder’ may be less susceptible to mastitis than cows with normal or deep udder shape.

Cows with high scores on the second component ‘distressed udder’ had an impaired teat surface with wounds on warts, poor skin quality and teat wounds. Further, these cows had a long or backwards bulging udder, fleshy teats and hard udder texture. Impaired teat skin weakens the local immune mechanisms and is reported as risk factor for mastitis (Agger and Willeberg, 1986). Hardness of udder tissue characterises two different morphological features: the secretory tissue and the connective tissue with the udder attachment. The percentage of secretory tissue increases with parity and is highest during peak lactation (Michel, 1994). But stage of lactation and parity did not contribute to the component; probably because udder texture was palpated from behind the udder close to the ventral abdomen where ligaments and connective tissue were strongest and percentage of secretory tissue lowest. However, cows scoring high on the ‘distressed udder’ may be at higher risk for subsequent clinical mastitis due to an impaired teat surface.

The third component ‘mastitis udder’ consisted of variables describing acute signs (clinical mastitis) and chronic signs (asymmetry, knotty tissue) of mastitis. Chronic mastitis can lead to atrophy of the affected quarter resulting in asymmetry. Further, drying off a mastitic quarter is a common treatmant practice among Danish farmers and leads to involution of the gland. Screening for cows with high scoring on

‘mastitis udder’ can improve data quality in field studies, especially when under-reporting of mastitis cases is suspected. As expected from literature (Bartlett et. al., 1991), cows scoring high on the ‘mastitis udder’ had as well a higher somatic cell count and a lower milk yield than the average in the same parity.
Cows scoring high on the fourth component ‘soiled udder’ had soiled udder and teats and were in early lactation. In contrast to our results, Bruun et al. (2003) found no relation between soiling and stage of lactation. Contamination with manure reflects hygiene in the barn (Cook, 2002) and since degree of soiling was measured immediately after milking, hygiene practices before the milking process had an influence on the degree of soiling.

Conclusion

Systematic clinical examinations provide information additionally to treatment records, milk yield and SCC. Including udder types in the assessment of udder health may be of substantial value for data analysis, especially in farms with suspected under-reporting of clinical mastitis.

References

Agger, J. F., and P.Willeberg. 1986. Epidemiology of teat lesions in a dairy herd. II. Associations with subclinical mastitis. Nord. Vet.-Med. 38:220-232.

Bartlett, P. C. J. van Wijk, D. J. Wilson, C. D. Green, G. Y. Miller, G. A. Majewski, and L. E. Heider. 1991. Temporal patterns of lost milk production following clinical mastitis in a larger Michigan Holstein herd. J. Dairy Sci. 74,1561-1572.

Bruun, J. 2003. Risk factors for different health measures in Danish dairy cows – with metritis, antibacterial drug use and udder health as examples. Ph.d. Thesis, The Royal Veterinary and Agricultural University, Frederiksberg C, Denmark.

Cook, N. 2002. The influence of barn design on dairy cows hygiene, lameness and udder health. Pages 97-103 *in* Proc. of the 35th Annual Conference.American Association of Bovine Practitioners. Madison, Wisconsin, USA.

Faye, B., L. Perochon, N. Dorr, and P. Gasqui. 1998. Relationship between individual-cow udder health status in early lactation and dairy cow characteristics in Brittany, France. Vet. Res. 29,31-46.

Harris, B.L., Freeman, A.E., Metzger, E. 1992. Genetic and phenotypic parameters for type and production in Guernsey dairy cows. J. Dairy Sci. 75:1147-1153.

Houe, H., M. Vaarst, and C. Enevoldsen. 2002. Clinical parameters for assessment of udder health in Danish dairy herds. Acta vet. Scand. 43,173-184.

Michel, G. 1994. Anatomie der Milchdrüse. Pages 44-50 *in* Euter- und Gesäugekrankheiten. Wendt, K., H. Bostedt, H. Mielke, and H.-W Fuchs, ed. Gustav Fischer Verlag Jena and Stuttgart, Germany.

Rosenberger, G. 1979. Clinical examintation of cattle. Paul Parey, Berlin and Hamburg. Germany.