

Lactational Changes in Casein Composition of Milk from Norwegian Dairy Cattle

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The composition of the milk protein fraction changes during the course of lactation to meet the changing dietary demands of the calf. An understanding of these variations is of major importance because of their influence on essential technological properties of the milk.

Variations in milk protein composition such as concentration and relative proportions between different protein species may significantly change the technological properties of the milk and reduce its quality as a raw material for production of other dairy products. Milk protein polymorphism and environmental factors such as stage of lactation, lactation number, season and nutrition and health status of the cow have been reported to have profound influence on the milk protein fraction.

This investigation was undertaken to study lactational changes in casein composition in milk from Norwegian Dairy Cattle. Milk samples were obtained from 58 cows throughout the lactation period, and measurements were made of calcium content, calcium ion activity and pH, content of crude protein (CP) and casein (CN), and amounts of individual caseins.

The effect of stage of lactation was estimated using a univariate animal model. Stage of lactation was grouped into four classes: week 1-2, week 3-22, week 23-37 and week 38 or more post partum.

Most of the compositional factors investigated in this study changed significantly during the course of lactation. Significant changes were observed for calcium content and calcium ion activity. These components decreased from the first to the third interval, and then an increase was observed in late lactation milk (interval 4).

The content of crude protein and casein reached their minima between week 3 and week 22 (interval 2) and showed an increase during the two remaining intervals. The CN:CP ratio decreased during lactation, indicating a decreasing proportion of casein nitrogen relative to other nitrogen containing compounds.

The amounts of all caseins were highest in the first interval reflecting the amount of casein being much higher in early lactation compared to the remaining intervals. The amounts of α_{s1} - and α_{s2} -caseins decreased significantly during the course of lactation. The content of κ -casein was significantly higher in the first interval compared with the remaining intervals. A similar but not significant trend was observed for the content of β -casein.

The content of γ -casein was high in the first interval; the content dropped significantly in the second interval and increased onwards.

The compositional changes observed in this study such as differences in the CN:CP and $(\alpha_s + \alpha_{s2}) : (\beta + \gamma)$ ratios and mineral content may influence the technological properties of the milk.