

Viscosity Measurements of Milk to Investigate Risk Factors for Milk Leakage in Dairy Cows Before and After Dry-Off

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Abstract

Milk leakage is a prevalent phenomenon in dairy cows and it is known to negatively affect udder health, as it increases the risk for clinical mastitis and new intramammary (IMM) infections. The determination of risk factors for milk leakage might be the first step towards the development of potential prevention measures. Therefore, the objective of this *in vitro* study was to evaluate the effect of the teat canal diameter, IMM pressure, milk temperature, milk composition, dry-off and antibiotic dry cow therapy on the occurrence of milk leakage in dairy cows. Two Ubbelohde viscometers (type no. 50100 and 50110 according to DIN 51 562 Part 1; SI Analytics GmbH, Mainz, Germany) were used to mimic the teat canal diameter, IMM pressure and milk temperature by suitable choice of the capillary diameter, hydrostatic pressure and milk sample temperature. Nineteen quarter foremilk samples each were collected on the day of dry-off and 2d after dry-off in cows dried off with and without antibiotic dry-cow therapy, respectively. All milk samples were analysed for milk composition (protein, fat, lactose, somatic cell count (SCC)) by the local Dairy Herd Improvement Association. The viscometers were used to measure the efflux time of all milk samples and afterwards the dynamic viscosity was calculated on basis of the Hagen–Poiseuille equation. Parameters that lead to shorter efflux times and smaller dynamic viscosities were considered as potential risk factors for milk leakage *in vivo*, because the milk could flow faster and more easily. In our study, the efflux time was shorter at wider capillary diameter, higher hydrostatic pressure, higher milk sample temperature and lower concentrations of fat and protein ($P < 0.001$). The dynamic viscosity was determined to be smaller at higher milk sample temperature and lower concentrations of fat and protein ($P < 0.001$). These results indicate that wider teat canal diameter, higher IMM pressure, higher milk temperature and lower concentrations of fat and protein might be risk factors for milk leakage in dairy cows.

Key words: milk leakage, dairy cow, dynamic viscosity, dry-off