

Changes in skeletal muscle thickness and echogenicity and plasma creatinine concentration as indicators of protein and intramuscular fat mobilization in periparturient dairy cows

ABSTRACT

High-producing dairy cows experience a state of negative energy balance in the periparturient period that is partially addressed by increasing the rate of fat and protein mobilization. Previous studies have focused on the rate of fat mobilization, and consequently the rate of protein mobilization has not been well characterized. The objective of this study was therefore to determine the change in indicators of muscle mass during early lactation using ultrasonographic measurement of muscle thickness and changes in plasma creatinine concentration. The maximum thickness of the gluteus medius and longissimus dorsi muscles of 106 Holstein cows (34 primiparous, 72 multiparous) was determined ultrasonographically on d -3, 0, 3, 7, 14, 21, and 28 relative to the day of parturition. Plasma creatinine concentration was measured periodically during the same period. Mixed models analysis and Passing-Bablok regression were used to analyze the data. Gluteus medius thickness, longissimus dorsi loin thickness (LDLT), and longissimus dorsi thoracic thickness (LDTT) were decreased at 28 d postpartum compared with d 3 antepartum. Plasma creatinine concentration was weakly associated with gluteus medius thickness, LDLT, and LDTT (Spearman's rho = 0.31, 0.39, and 0.32, respectively). Plasma creatinine concentration in primiparous and multiparous cows at 28 d postpartum decreased by 0.24 and 0.30 mg/dL, respectively, compared with values 3 d antepartum. We concluded that ultrasonographic measurement of LDLT and LDTT and change in plasma creatinine concentration may provide practical methods for monitoring the rate of protein mobilization in periparturient dairy cows. Ultrasonographic examination of LDLT and LDTT therefore complements ultrasonographic measurement of backfat thickness and may be useful in the evaluation of energy reserve mobilization in periparturient dairy cows.

Keyword: Muscle mobilization; Negative energy balance; Intramuscular fat