Relationships between the Concentration Of IGF-1 in Serum of Dairy Cows in the Puerperal Period and Back Fat Thickness and Metabolic Parameters

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Introduction

Major endocrine and metabolic changes occur around parturition and the onset of lactation in dairy cows. These changes influence milk production and reproductive performance in the next lactation. Results of this study describe interrelationships between concentration of IGF-1 in serum in the post partum period and milk yield, metabolic parameters (i.e. BHBA, NEFA, urea, bilirubin) and body condition as measured by back fat thickness (BFT).

Materials and Methods

A total of 417 multiparous Holstein-Frisian cows without clinical signs of systemic illnesses in the first 12 hours after calving were enrolled. Serum samples for the determination of _-hydroxybuturate (BHBA), non-esterified fatty acids (NEFA), urea, and bilirubin were collected within 12 hours after calving and in the morning on days 4, 10(±2), 20(±4) and 40(±4) post partum (pp). For the measurement of the concentration of IGF-1 in serum an immunometric chemiluminescence immunoassay was used (IMMULITE 2000 IGF-I-Assay®, Bad Nauheim, Germany). BFT was determined with ultrasound at the same times and on days 70(±14), 100(±14) and 130(±14) pp. The correlation between the concentrations of IGF-1 in serum and the metabolic parameters and the BFT was described with Pearson coefficients. The effect of the five successive samples for each animal was analyzed with the UNIANOVA procedure with repeated measurements of SPSS® (Version 12.0, SPSS® Inc. Munich, Germany). The level of significance was set at $p < 0.05$.

Results

The results of our study indicates a negative correlation between the concentration of IGF-1 in serum of dairy cows with BHBA (-0.188, $p<0.01$), NEFA(-0.259, $p<0.01$), bilirubin (-0.256, $p<0.01$) and a positive correlation with BFT (0.59, $p=0.018$). The correlation between the concentration of IGF-1 and urea in serum changes from significantly negative within 12 hours pp and day 4 pp ($p<0.01$) into positive on day 20 pp ($p<0.05$). Cows with a high concentration of IGF-1 in the first 40 days post partum had a significantly lower milk yield in the lactation period between the 40th and 260th day of lactation but a lesser loss of back fat thickness.

Significance

The objective of our study was to describe the relationship between the concentrations of IGF-1 in serum in the puerperal period of dairy cows and the detectible risk of high loss of BFT in the first 130 days and the influence on milk yield. In conclusion, our results demonstrate that IGF-1 in serum plays an important role in the relationship between milk yield and the metabolism of the cow during early lactation.