Serum Fatty Acid and 3-hydroxybutyrate Concentrations Depend on the Sample Time Related to the First Feed Intake in Dairy Cows

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Introduction

Serum concentrations of fatty acids (FA) and 3-hydroxybutyrate (BHB) are predictors of negative energy balance (NEB) in dairy cows in the prepartum and postpartum periods, respectively. There are studies that describe daily variation of both analytes and suggest these changes are influenced by feed intake, digestion and metabolism. However, to the best of our knowledge, there are no reports about the most appropriate time of the day relative to feeding to collect blood from cows for proper interpretation of these analytes.

Materials and Methods

In order to determine the effect of time of blood sampling to monitor adaptation to NEB in dairy cows, blood from the coccygeal vein was collected once in plain tubes from 37 cows in the last week prior to calving and 47 different cows in the first week after calving. Cows were from three neighboring farms and were fed a total mixed ration once or twice a day. Each cow was sampled one hour before first feeding in the morning and then four and 10 hours after feed was delivered (groups –1h, 4h and 10h respectively). Serum FA and BHB concentrations were determined with commercial procedures in the pre-calving and post-calving cows, respectively. Mean values at each time point were logarithmized, then compared using ANOVA. If animals had any sample $\geq$0.4mmol/L of FA or $\geq$1400 umol/L of BHB in the prepartum or postpartum respectively, they were classified as test-positive for NEB. Each time cutpoint was then assessed for proportion of correct classifications of positive test results.

Results

For FA, a significant difference was observed between groups -1h and 4 h (p=0.006), but not between groups –1h and 10h, and groups 4h and 10h (p=0.058 and p=0.371 respectively). Back-transformed least squares mean values of FA were 0.20, 0.14 and 0.17 mmol/L for groups –1h, 4h and 10h respectively. When using 0.4 mmol/L as cutpoint for FA, the group sampled 1h before feed intake showed the highest prevalence (12/37) of high NEFA cows compared to that of the other groups (6/37 for each). Proportion of positive cows was not significantly different across the three times (P=0.15); however, when –1h was contrasted with each of 4h and 10h postfeeding, there was a tendency for a higher prevalence (p=0.10). The back-transformed least squares means for BHB were 646, 596, and 711 for –1h, 4h and 10h respectively. Time 4h was significantly different from time 10h (P=0.01). Proportion of high BHB (defined by BHB >= 1400 umol/L) in each group was 8.5% and 10.6% and 12.8% respectively. These were not significantly different.

Significance

When sampling cows to monitoring NEB in the peripartum, there is twice the probability of detecting animals with values $\geq$0.4 mmol/L if they are sampled one hour before the first feed offer. This has practical implications in routine monitoring, since the prefeeding sample could misclassify a herd as having problems when there may not be an issue. There is no difference in probability of detecting subclinical ketosis at the cutpoint of 1400 umol/L of BHB in relation to the first feeding for postparturient cows.