Variability Factors of Milk Fat-Protein Concentration Ratio

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Introduction

The milk fat-protein concentration ratio (FPR) may be an important index of cow health and rumen fermentation in diary herds. This is supported by research that indicates FPR may be useful in the diagnosis of negative energy balance and in predicting abomasal displacement. Additionally, FPR will vary by rumen fermentation-acid profile because diets rich in starches and sugars commonly depress milk fat concentration and increase milk protein concentration. This is possibly mediated by rumen hydrogenation of fats to the trans-configuration and the insulin response to propionic acid production. Interpretation of FPR is currently difficult because variability factors are not completely known. The objectives of this report are to describe non-nutritional factors affecting the variability of FPR and improve diagnostic interpretation of FPR in dairy herds.

Materials and Methods

Milk fat and protein concentrations from the first nine (DHIA) tests of 4,916 Holstein lactations were measured. The lactations commenced between January 1, 1997 and August 31, 1999, and were from 86 herds. The FPR was calculated by dividing the milk fat concentration by the milk protein concentration of an individual cow milk sample. A repeated measures analysis of variance was performed using the (GLM) procedure3 with FPR as the dependent variable; herd, lactation number, season of calving, peak milk production and 305-day projected mature equivalent (305dME) milk production as the main between-subject effects; and DHIA test number as a within-subject effect. Significance was attributed at $p<0.05$.

Results and Conclusions

The effect of herd ($p=0.07$) and DHIA test number alone ($p=0.09$) approached significance. The variation in FPR by DHIA test number is illustrated in Figure 1. The herd x DHIA test number interaction term was significant ($p=0.04$), indicating that the shape of the FPR vs. time curve varies significantly among herds. We conclude that diagnostic interpretation of raw FPR data from DHIA requires consideration of factors such as distribution of cows by lactation stage and pattern of FPR change over the lactation.

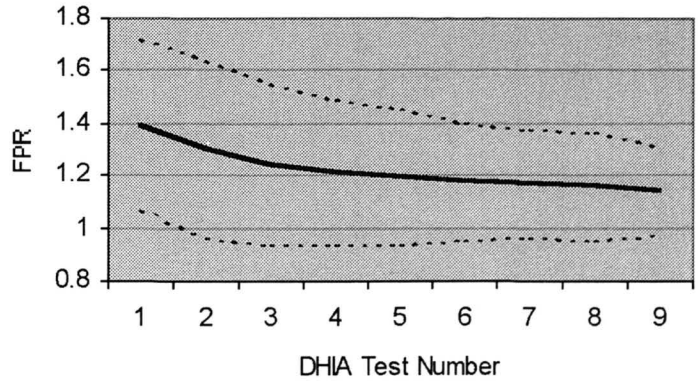

Figure 1. Mean and 95% Confidence Interval of Herd FPR Means vs DHIA Test Number.