

Effect of fat supplement in Holstein dairy cow transition diets on plasma leptin concentration and performances

A Afzalzadeh¹, MH Palizdar¹, M Danesh Mesgaran², A Niasari³

¹Department of Animal Science, University of Tehran, Abureihan Pardis, Tehran, Islamic Republic of Iran, ²Department of Animal Science, University of Ferdowsi, Mashhad, Islamic Republic of Iran, ³Department of Veterinary and Medicine, University of Tehran, Tehran, Islamic Republic of Iran

Email: aafzal@ut.ac.ir

Introduction The effect of increasing energy supply through fat supplementation (Douglas *et al.*, 2004) in transition period on plasma leptin concentrations was not elaborated. The main objective of this study was to determine the effects of supplemental fat in transition cow diets, with differing caloric densities, on plasma leptin, glucose and NEFA concentrations.

Materials and methods Fifteen Holstein multiparous dairy cows were used. The close up diets consisted of 1) a low energy diet with no fat supplement (LD), 2) a moderate energy diet with 2% supplemental fat (MD), and 3) a high energy diet with 4% supplemental fat (HD). The diets were based on alfalfa and corn silage. The fat source was a hydrogenated rumen inert fat. The cows received a single lactation diet after parturition (30 days in milk) with 2% supplemental fat and 1.74 Mcal/kg NEL (net energy for lactation). The body weight (BW) and body condition score (BCS) were measured weekly during pre and postpartum. Prepartum dry matter intake and net energy intake, was recorded daily. Weekly estimated energy balance (EB), glucose, non-esterified fatty acids (NEFA) and plasma leptin concentrations, were determined pre and postpartum. Data were subjected to ANOVA for a randomized design with repeated measures using the MIXED procedure of SAS (Littell *et al* 1996; Release 9.0, SAS Institute Inc Cary NC).

Results The prepartum DMI (dry matter intake) was not affected by prepartum diets and also there were no significant differences in NEI (net energy intake) prepartum. Cows received MD and HD diets, had better energy status, and were in a more positive EB prepartum compared to those received LD diets ($P < 0.001$). After parturition, BW of cows fed HD diet was greater than LD and MD diets ($P < 0.05$). Postpartum BW and BCS tended to be greater for HD cows compare to LD diet ($P = 0.05$). No significant differences were found between treatments in plasma NEFA concentration, pre and postpartum ($P > 0.05$). Prepartum diets had significant effect on postpartum plasma glucose concentration ($P < 0.05$). After parturition, cows fed HD and MD diets prepartum, had significantly greater plasma glucose concentrations ($P < 0.05$). Prepartum plasma leptin concentration was significantly different across treatments ($P < 0.05$). In agreement with other studies (Kokkonen *et al* 2005), leptin concentration decreased as parturition approached ($P < 0.05$; Figure 1). There were no significant differences between plasma leptin concentrations postpartum.

Conclusions The results showed increasing energy density through fat supplementation near the time of calving could result in better energy balance pre and postpartum and it could affect prepartum leptin concentration and postpartum BCS and BW maintenance and lead to more milk production and lower metabolic disorders.

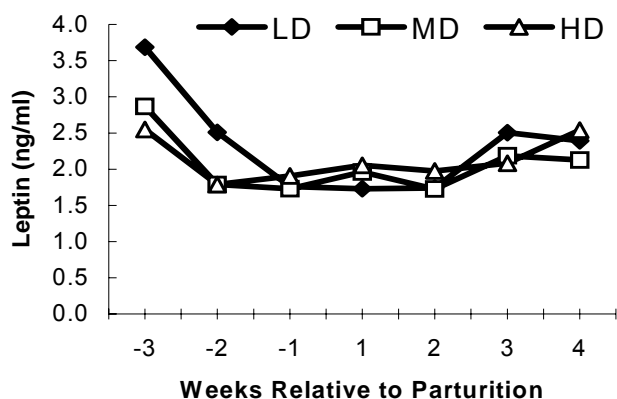


Figure 1 Plasma leptin concentration in cows receiving a low energy diet (LD, ♦); moderate energy diet (MD, □) and high-energy diet (HD, △) prior to calving.

References

- Douglas, G. N., T. R. Overton, H. G. Bateman and J. K. Drackley. 2004. Peripartal Metabolism and Production of Holstein Cows Fed Diets Supplemented with Fat During the Dry Period. *Journal of Dairy Science*. 87:4210–4220.
- Kokkonen, T., Taponen, T., Anttila, L., Syrjala-Qvist, C., Delavaud, Y., Chilliard, M., Tuori, M. and A. T. Tesfa. 2005. Effect of body fatness and Glucogenic supplement on lipid and protein mobilization and plasma Leptin in dairy cows. *Journal of Dairy Science*. 88, 1127-1141.
- Littell, R. C., G. A. Milliken, W. W. Stroup, and R. D. Wolfinger. 1996. SAS System for Mixed Models. SAS Inst. Inc., Cary, NC.