



Close up Dry Period Protein Supplementation Influences Performance of First Lactation Dairy Cows

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Introduction

Considerable effort has recently been directed towards better defining protein requirements of dairy cows approaching parturition. Little effort has been directed towards cows entering first lactation, although Van Saun *et al.*, (1993) suggested modest increases in milk protein production to a supplement of high undegradable dietary protein (UDP) in the late dry period.

The objective of this study was to define the impact of supplementation of a high UDP protein supplement in the late gestation of cows entering first lactation on production of milk and its components.

Methods

A close-up dry period ration, based on corn silage (17% of dry matter, DM), alfalfa hay cubes (24%), oat hay (25%), barley (16%) and corn grains (16%), was limit fed at 12.1 kg DM/d. Diets were: D₀, no supplement; D₁, with 1.1 kg/d of a UDP supplement; and D₂, with 2.3 kg/d of the supplement, comprising rumen-protected canola meal (0.6), dried distillers grains (0.2), blood meal (0.1), feather meal (0.05), and corn gluten meal (0.05). Final crude protein (CP) contents of the diets (P) were 11.8, 14.8 and 17.8 % of DM.

Milk, protein and fat yields of 192 primiparous Holstein cows, each offered one of the dry period diets for up to 16 d (n = 54, 73 and 65 for D₀, D₁ and D₂), were measured monthly for the first 150 d of lactation. Following calving, all cows received the same complete diet formulated to contain 17.7 % of and 32% neutral detergent fiber (DM). Cows were allocated to one of four groups based upon time close-up (T) for statistical analysis (1-4, 5-8, 9-12, 13-16 and 17-20 d). Yields of milk, protein and fat for each cow during the first 150 d of lactation were used to calculate a mean for each treatment group. Data were analysed by multiple regression with a maximum model of: $y = \text{constant} + P + P^2 + T + T^2 + T^3 + T^4 + P \times T + P \times T^2 + P \times T^3 + P \times T^4 + P^2 \times T + P^2 \times T^2 + P^2 \times T^3 + P^2 \times T^4$, removing terms until the best fit regression was achieved.

Results

Milk, milk fat and milk protein yield were influenced, albeit in different ways, by increasing the level of diet UDP supplementation and increasing the time that cows received the supplement (Table 1). Shapes of the modelled responses are in Figures 1 to 3. Milk yield was greatest for animals offered diet D₀ for longer periods of time and for animals offered diet D₃ for intermediate periods of time, with evidence that cows offered the highest level of protein supplement for the longest period of time had a reduced level of milk production. Milk protein yield showed a similar pattern, without the tendency to higher yields from cows offered D₀ for longer times. Both milk

and milk protein yields appeared to be depressed when cows on any treatment were exposed to the close-up diet for approximately 5 to 7 d.

Table 1 Significance and model parameters of multiple regressions (P = diet protein, T = time in close-up group)

	Constant	P	P ²	T	T ²	T ³	T ⁴	P×T	P×T ²	P×T ³	P×T ⁴	P ² ×T	P ² ×T ²	P ² ×T ³	P ² ×T ⁴	SE	R ²	P [†]
Milk	***	-	-	-	*	*	-	-	*	*	-	*	*	*	-	0.73	0.67	*
Protein	***	-	-	*	**	**	**	-	**	**	-	-	**	-	**	13.8	0.76	*
Fat	NS	+	*	*	*	**	**	*	-	**	**	*	**	-	-	24.0	0.84	+

[†]Regression significance; -, excluded; NS, not significant but in model; +, $P < 0.1$; *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$

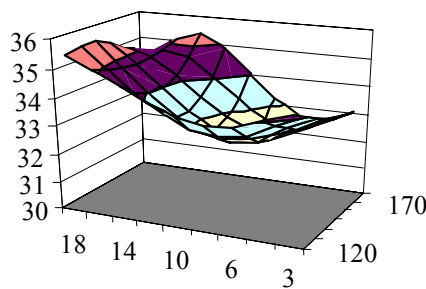


Figure 1 Milk production (kg/d)

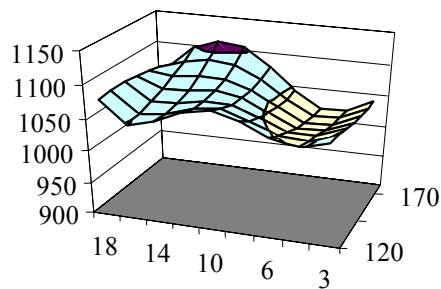


Figure 2 Milk protein yield (g/d)

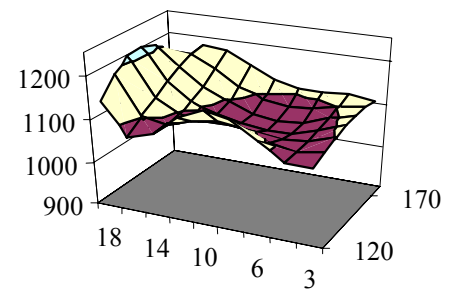


Figure 3 Milk fat yield (g/d)

All figures: days close-up (3-18 d) by diet crude protein concentration (120-170 g/kg DM)

Conclusion

Level of feeding of a protein supplement near calving, and the length of time that cows received it, both influenced milk and milk component yield. While these results are broadly consistent with an earlier study (Robinson *et al.*, 2000), it is evident that the optimal combination of level of protein supplement offered, and time of offer, is a complex response that requires further research. Nevertheless, results demonstrate for the first time that performance in the next lactation may be reduced if excess protein supplement is fed to close-up heifers entering first lactation.

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References

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