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# Close up Dry Period Protein Supplementation Influences Performance of Mature Dairy Cows

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## Introduction

Considerable effort has recently been directed to better defining protein requirements of dry dairy cows. Early efforts (Moorby *et al*., 1996) suggested substantial increases in milk and milk protein yield of multiparous cows to a small amount of a high undegradable dietary protein (UDP) supplement in the late dry period. Recent studies have not consistently supported these findings.

The objective of this experiment was to define the impact of supplementation of a high UDP supplement in the late dry period of multiparous dairy cows 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: $D_0$, no supplement; $D_1$, with 1.1 kg/d of a UDP supplement; and $D_2$, 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 121 multiparous Holstein cows, each offered one of the dry period diets for up to 16 d (n = 47, 40 and 34 for $D_0$, $D_1$ and $D_2$), were measured monthly for the first 150 d of lactation. Following calving, all cows received the same complete diet formulated to contain 17.7 % CP and 32% g 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 and 13-16 d). Parity effects, beyond the primiparous/multiparous parity split, were not considered. 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: $y$ = constant + $P + P^2 + T + T^2 + T^3 + T^4 + P\times T + P\times T^2 + P\times T^3 + P\times T^4 + P^2\times T + P^2\times T^2 + P^2\times T^3 + P^2\times T^4$, with removal of terms until the best fit regression was achieved.

## Results

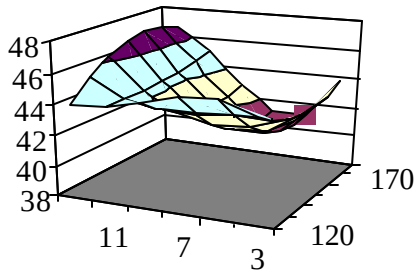
Milk, milk fat and milk protein yield were influenced, albeit in different ways, by increasing the level of diet UDP supplementation and increasing the time that cows received the supplement (Table 1). Shapes of the modelled responses are in Figures 1 to 3. Milk yield was greatest for cows offered diet $D_0$ for shorter periods of time or $D_1$ or $D_2$ for longer periods of time. Milk protein yield tended to be greatest for cows offered diet $D_1$ for longer periods of time. Both milk and milk protein yields appeared to be depressed when cows on any diet were fed the protein supplement for

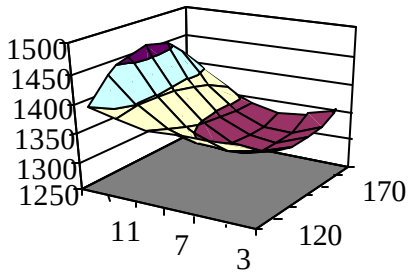
approximately 5 to 7 d, although the extent of the depression in milk was greater in cows offered more protein supplement. Similarly, milk fat yield tended to be lower for cows supplemented for intermediate periods of time.

**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 | $R^2$ | $P^{\dagger}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Milk | NS | * | - | * | * | - | - | * | * | * | - | + | - | * | - | 1.05 | 0.76 | + |
| Protein | *** | - | - | + | + | - | - | + | + | - | - | NS | + | - | - | 40.5 | 0.48 | NS |
| Fat | *** | - | - | - | NS | - | - | + | NS | - | - | - | NS | - | - | 82.4 | 0.22 | NS |

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



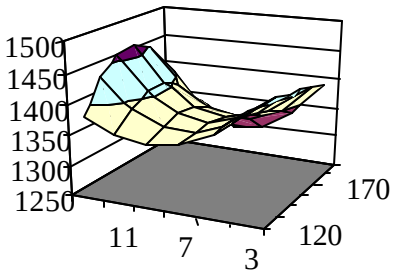




**Figure 1** Milk production (kg/d) **Figure 2** Milk protein yield (g/d) **Figure 3** Milk fat yield (g/d)
All figures: days close-up (3-16 d) by diet crude protein concentration (120-170 g/kg DM)

## Conclusions

The amount of protein supplement fed close to calving, and the length of time that animals received it, both influenced milk and milk component production. While these results are broadly consistent with an earlier study (Robinson *et al.*, 2000), it is evident that relationships between close-up period protein supplementation and production in the next lactation are complex. Experiments are required to define the characteristics of dry cows that influence their potential to respond, and actual response, to dietary protein if prediction of lactation responses are to be accurate.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## References


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