**Assessing the carry-over effect of enhanced amino acid nutrition of dairy cows in very early lactation**

**Application:** Providing a higher proportion of protein to dairy cows in the fresh period does not benefit milk protein production or nitrogen use efficiency over the first 49 days of lactation.

**Introduction:** During the first two to three weeks of lactation (fresh period), dairy cows experience concurrent negative energy and negative protein balance, where dietary intakes do not meet maintenance and production requirements. Consequently, amino acids are mobilised from body tissue reserves and utilised as a substrate for milk protein synthesis. Providing supplemental amino acids during the fresh period, via abomasal infusions of casein, can elicit a sustained, positive effect on milk yield, with this effect potentially persisting into later lactation (Larsen et al., 2014).  Therefore, the primary aim of this experiment was to translate these previously reported effects into practical feeding strategies that could be implemented on commercial dairy farms, using UK-representative diets. It was hypothesised that targeted protein supplementation in the first 14 days of lactation would be more beneficial for milk protein yield and nitrogen use efficiency (NUE) compared with supplementing the same amount of protein evenly over the first 49 days of lactation.

**Material and methods:** Thirty-six multiparous Holstein-Friesian cows (blocked into two cohorts of eighteen) were paired according to calving date, and within pair, allocated at random to one of two dietary treatments at calving. Dietary treatments were provided for the first 49 days of lactation as total mixed rations (TMRs) and were formulated to provide the same total quantity of CP based on predictions of dry matter intake. Treatment A (control) was formulated to contain 172 g CP/kg DM. Treatment B consisted of two separate TMRs, formulated to contain 222 g CP/kg DM, provided for days 1 to 14 of lactation, and 156 g CP/kg DM, for days 15 to 49 of lactation.

Individual dry matter intake, milk yield and composition were recorded, and blood metabolic profiling was performed (albumin, globulins, total protein, urea, NEFA, BOHB and glucose). Body composition was assessed by measurement of liveweight and body condition score (BCS) and ultrasound scanning was used to estimate the mobilisation of muscle and fat depth from prepartum through to days 14 and 49 of lactation. Data were analysed using linear mixed models, with treatment as a fixed effect, and individual cow and days in milk as random effects.

**Results:** Treatment had no effect on average NUE between Treatment A (0.40) and Treatment B (0.39; *P* = 0.45) or milk protein yield (1.26 versus 1.20; kg/day; *P =* 0.19) over the first 49 days of lactation. Treatment had no effect on dry matter intake (kg/d; *P =* 0.43), milk fat yield (kg/day; *P =* 0.28) and percentage (*P =* 0.85), milk protein percentage (*P =* 0.09) or blood composition (*P*> 0.05 for all parameters assessed). Liveweight and BCS were unaffected by treatment (*P* = 0.20 and *P* = 0.35, respectively). There was no effect of treatment on the change in eye muscle depth from the prepartum measurement to day 49 (*P* = 0.09).

**Conclusions:** Offering a greater quantity of CP to early lactation cows during the first 14 days of lactation did not elicit beneficial effects on milk production or composition, or NUE, compared with distributing the same total quantity of CP evenly over the first 49 days of lactation.

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**References:** Larsen et al. (2014). J. Dairy Sci. 97, 5608–5622.