**Application** Feeding an elevated level of milk will result in a sustained growth advantage in the pre-wean period. Calcium peroxide supplementation at 2.25% of DM lowered concentrate intake and live weight in pre- and post-weaning periods. Elevated milk replacer allowance increased calves' average daily gain in the pre-weaning period.

**Introduction** Feeding calves higher milk replacer (MR) levels in the pre-weaning period could improve growth in early life. Elevated MR can boost long-term production performance regarding average daily gains and greater milk yield in the first lactation. Reduction in methane production of cattle can increase performance such as average daily gain (ADG) which could result in a lowered age at first calving. Higher milk replacer intake and reduced methane emissions can increase calves' growth. A feed additive, calcium peroxide, has been proven to reduce methane emissions in adult cattle by 16-28% (Roskam et al., 2024). However, no research has been reported using calcium peroxide as a methane-suppressing additive for calves and its effects on performance. This study aims to assess the effects of milk replacer level and calcium peroxide supplementation during the first 12 weeks of life on methane production and calf development. Our hypotheses are i) calves fed higher milk replacer levels will have higher body weights and lower concentrate dry matter intake from birth to week 12, and ii) calcium peroxide supplementation at 2.25% will reduce methane production (g CH4/day).

**Materials and Methods** Holstein heifer calves (n = 53)were allocated to treatment in a 2 MR feeding level (Conventional vs. Elevated) x 2 Concentrate type (Additive vs. Control) design and balanced for birth weight, dam parity and colostrum quality. Calves were individually housed from birth, and experimental diets were offered on day 4. MR was offered at conventional (4 L/day) or elevated (8 L/day) feeding levels until weaning at day 63. Ad libitum additive (2.25% calcium peroxide) and Control (2.25% limestone) were offered from day 4 to week 12. Concentrate and MR intake were measured daily, and calves had free access to drinking water and chopped straw. Live weight was recorded weekly from birth to week 18. Methane emissions were recorded using metabolic chambers at week 2 and 9. From week 12, all treatments ceased, and calves were moved from individual pens to group housing. Once in group housing, calves were fed ad libitum grass silage alongside a standard heifer developer concentrate (2kg/day) using a GreenFeed unit (C-Lock Inc., Rapid City, SD.), with this being used to record their methane emissions. Daily concentrate intake and weekly live weight were fitted to a repeated measures REML model (GenStat 21st ed., VSNI Ltd) where milk replacer level, concentrate treatment, day and their interactions were fitted as fixed effects and birth weight was included as a covariate. Daily live weight gain was fitted to a linear mixed model with fixed effects of milk level and concentrate treatment and birth weight as a covariate. Pen was a random effect in all models.

**Results** As expected from day 4 – 83 calves fed the conventional MR level consumed more concentrate (Table 1; P = 0.021). Average daily concentrate intake in Control calves was higher than that of calves offered Additive concentrate – during the first 12 weeks of life (Table 1; P <0.001). In the pre-wean period (d4-63), calves offered conventional levels of MR consumed ~ 134 g DM/day more concentrate than those offered elevated levels of MR (P = 0.002). In the same period, calves fed control concentrate consumed ~109 g DM/day more than those offered the Additive concentrate (P = 0.008). The difference in intake between concentrate treatments continued in the post-wean period (d64-84), whereby Control calves consumed ~ 403 g DM/day more than Additive calves (P <0.001).

**Table 1.** Daily concentrate intake (g DM/day) in the first 12 weeks of life

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | MR Treatment | |  | | Concentrate Treatment | | |  | | P-Value | | |  | |
|  | Conventional | Elevated | | SED | | Additive | Control | | SED | | MR | Conc | | MR xConc | |
| Day 4 – 83 (gDM/day) | 888.2 | 766.4 | | 49.20 | | 736.2 | 918.3 | | 48.54 | | 0.021 | <0.001 | | 0.928 | |
| Day 4– 63  (gDM/day) | 430.8 | 296.7 | | 40.41 | | 309.5 | 418.1 | | 39.86 | | 0.002 | 0.008 | | 0.578 | |
| Day 64-84  (gDM/day) | 2260 | 2175 | | 59.45 | | 2016 | 2419 | | 58.69 | | 0.233 | <0.001 | | 0.420 | |

In line with expectations, elevated levels of MR resulted in improved growth from week 1 to week 18 (P = 0.016). Within the first 18 weeks of life, calves fed the control concentrate had increased live weights (P = 0.036; Figure 1). Between birth and weaning (day 63), calves fed control concentrate had a 70 g/day increased gain (additive ADG = 0.54kg/day vs. Control ADG = 0.61kg/day; P = 0.026). Within the post-weaning period (days 63 – 84), calves fed the control concentrate had a 140 g/day increased ADG over calves fed the additive concentrate (additive ADG = 0.91kg/day vs Control ADG = 1.05kg/day; P = 0.031). Analysis of the methane emissions of these calves is currently underway.

**Figure 1.** Live weight (kg) of calves fed each treatment (Tx) from day 7 to day 126. The treatments are as follows Tx 1 = Conventional MR, Control concentrate; Tx 2 = Elevated MR, Control concentrate; Tx3 = Conventional MR, Additive concentrate; Tx4 = Elevated MR, Additive concentrate.

**Conclusions** The study shows that feeding calves elevated levels of MR during the pre-weaning period enhances growth as evidenced by increased average daily gains. The supplementation of calcium peroxide at 2.25% DM reduced concentrate intake in the first 12 weeks of life and live weight from day 7 to day 84. Liveweight was not significantly different between additive and control treatments from week 12 to week 18. More examinations are needed on completion of methane emissions analysis to investigate the effectiveness of calcium peroxide at suppressing methane, specifically in the post treatment period.

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**References** Roskam, E., Kenny, D.A., Kelly, A.K., O’Flaherty, V. & Waters, S.M. (2024). animal*,*18(11)**,** 101340.