Effects of omega-3 fatty acids supplementation on reproduction of dairy cows

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Our objective was to evaluate the effects of omega-3 (**n3**) fatty acids (**FA**) supplementation on ovarian and uterine functions. Cows (n=104) were assigned into 1 of 4 dietary treatments from 2 to 90 DIM: 1) Unsupplemented Control; 2) CaPO: Calcium salts of palm oil; 3) CaFO35: Calcium salts of fish oil through 35 DIM; 4) CaFO90: Calcium salts of fish oil through 90 DIM. Fat was supplemented at 1% of DM. Blood and milk samples were collected at 14, 35, and 71 DIM for analysis of FA. Estrous synchronization was performed for timed AI at 70 DIM. Ultrasonography examination of ovaries and quantification of plasma progesterone were performed on d 0, 7, and 15 after AI. On d 15 after AI, uterine flushing (**UF**) and biopsy (**UB**) were performed for analysis of FA (UF and UB) and concentration of interferon-tau (**IFN-τ**; UF only). The dominant follicle was aspirated 3 d after $PGF_{2\alpha}$ injection for analysis of FA in the follicular fluid (**FF**). Supplementing CaFO increased concentrations of EPA+DHA in plasma (38.5 vs 14.4 µg/mL) and milk (122.9 vs 46.9 µg/mL) at 14 and 35 DIM, which remained higher in the CaFO90 group at 71 DIM. CaFO reduced the n6:n3 ratio in plasma (4.0 vs 5.2) at 14 and 35 DIM, which remained lower in the CaFO90 group at 71 DIM. There were no differences in size of the dominant follicle and luteal volume. However, CaPO and CaFO35 had higher plasma progesterone than CaFO90. Cows in the CaFO90 group had greater concentrations of EPA+DHA in FF (29.8 vs 10.9 µg/mL) and UB (98.8 vs 56.7 µg/g), and had greater concentrations of EPA in the UF (0.2 vs 0.08 µg/mL). Based on IFN-τ concentrations in the UF, CaFO35 group had higher pregnancy per AI (68.8%) than the other groups (~33.0%). In pregnant cows, CaFO35 had higher IFN-τ concentrations than CaFO90 and Control.
Take home message: Supplementation of n3 FA in the early postpartum period benefited subsequent ovarian and uterine functions but these benefits were lost when supplementation was extended until the breeding period.

Effects of protected and unprotected butyrate supplementation on growth performance and fermentation profile in dairy calves

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Butyrate is known to promote growth performance in calves. Uncertainty persists on whether butyrate is more effective when unprotected, targeting the rumen, or protected, targeting the small intestine. The objective of this study was to evaluate rumen protected and unprotected butyrate supplementation on calf performance, as well as rumen and small intestine pH and short-chain fatty acid concentrations. Calves (n=21) were fed MR at 900 g/d and fed calf starter and water *ad libitum*. Animals were blocked by body weight, breed, and sex, and then assigned to one of three starter treatments: 1) No butyrate, 1% w/w palm fat as a placebo carrier (**CON**); 2) 1% w/w protected butyrate (2.5% of product; **PRO**); or 3) 1% w/w unprotected butyrate (1.5% of product) + 1% w/w palm fat (**UNP**). Calves were weaned with a two-stage stepdown from d 49 to 63 of age and were slaughtered at 70 d of age. Feed intake was measured daily. Blood and weight were sampled weekly. Feces and rumen fluid were sampled at 28, 42, 56 and 70 d of age. Digesta were collected at slaughter. At day 42, UNP calves had lower rumen pH than CON and PRO. Ruminal propionate and butyrate concentrations were higher in UNP than PRO, and higher in PRO than in CON. At d 56, ruminal propionate concentrations were higher in PRO and UNP than CON. At day 70, ruminal pH in PRO was higher than both CON and UNP, while duodenal pH tended to be higher in CON compared to PRO. UNP had a higher propionate concentration than CON. PRO tended to have a higher concentration of propionate than CON. At day 70, body weight was higher for CON and PRO compared to UNP. Both CON and PRO had greater starter intake than UNP. In duodenal digesta, propionate concentrations tended to be lower in UNP than CON.
Take home message: Fermentation profile is similarly altered by both supplements, but unprotected butyrate appears to compromise growth performance during weaning. Using a protected butyrate product may increase calf starter intake and growth which may decrease the time calves consume calf starter.