Calcium Salts of Polyunsaturated Fatty Acids Deliver More Essential Fatty Acids to the Lactating Dairy Cow

M.L. Theurer[*1], M.A. McGuire[1], E. Block[2], W.K Sanchez[2]*
[1]University of Idaho, Moscow
Arm & Hammer Animal Nutrition Group, Princeton, NJ

Recent research has focused on the importance of supplying essential fatty acids to the lactating dairy cow. Essential fatty acids are fatty acids that cannot be synthesized in the body so they must be supplied by the diet. They are important in many cellular functions such as specific roles in cellular membrane structure and are required to produce Prostaglandins. These essential fatty acids belong to a larger group of fatty acids called polyunsaturated fatty acids (PUFA). Recent research suggests that the addition of essential fatty acids specifically linoleic acid and linolenic acid can improve first service conception and overall conception rate. Many sources of PUFA are already available to dairy producers as feed ingredients. However, specific rumen microbial populations biohydrogenate unsaturated fatty acids to saturated fatty acids. This is an important issue as it can also lead to milk fat depression when high levels of unsaturated fatty acids are fed. Feeding rumen inert fat is important to avoid negative impacts on fiber degradation and rumen microbe populations. Megalac-R is a rumen inert fat that contains approximately 27% linoleic and 3.5% linolenic acid (DM basis). This is about 3.5 times greater than Megalac, a rumen inert fat previously shown to deliver these fatty acids to the small intestine. The objective of this experiment was to evaluate intake, milk production and milk composition effects of cows fed Megalac-R compared to those fed Megalac.

Nineteen lactating Holstein cows were used in a switchback experiment to determine any differences between Megalac and Megalac-R on milk production and composition. All cows were housed in the same pen and were individually fed in Calan gates. The cows were randomly assigned to 2 groups. Each group received the same basal diet (alfalfa hay, triticale silage, whole cottonseed and a corn-barley based grain concentrate) supplemented with either Megalac (control) or Megalac-R (treatment) at 462 g/d (DM basis). This experiment consisted of 3 consecutive periods of 14 days. All cows were fed once per day and milked twice daily. Milk weights and feed intakes were recorded daily for each cow. Milk samples were collected the last 2 days of each period and analyzed for components and fatty acids.

Dry matter intake (28.0 vs. 27.0 kg/d; SEM = 0.4) and milk production (44.4 vs. 44.0 kg/d; SEM = 0.7) were not different ($P > 0.05$) between treatments for Megalac and Megalac-R, respectively. Milk fat percent (3.34 vs. 3.22%; SEM = 0.07) and milk protein percent (2.78 vs. 2.80%; SEM = 0.01) were not different for Megalac and Megalac-R fed cows. Feeding Megalac-R ($P < 0.01$) reduced the concentration of palmitic acid in milk fat (28.3 vs. 26.8%; SEM = 0.3). Supplementation of Megalac-R increased ($P < 0.001$) the linoleic acid concentration (3.96 vs. 4.61%; SEM = 0.1) of milk fat indicating that linoleic acid was protected from rumen biohydrogenation. Concentrations of conjugated linoleic acid (CLA) were also increased (0.44 vs. 0.52%; SEM = 0.02) when cows consumed Megalac-R indicating

that some biohydrogenation did occur. Increasing the CLA concentration of milk fat may provide beneficial anticarcinogenic effects to dairy product consumers. Feeding Megalac-R did not alter milk production, milk fat percent, or dry matter intake when compared to Megalac. Megalac-R supplied more essential fatty acids to the small intestine that were available for milk fat synthesis.