Effect of Monensin on Milk Production Parameters, Feed Intake, Body Weight, Body Condition, and Efficiency of Milk Production When Fed to Holsteins

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Materials and Methods

Holstein cows (primiparous n=305 and multiparous n=553) from nine locations** were used in a study to measure the effect of monensin sodium on milk yield, milk composition, feed intake, body weight, body condition, and efficiency of milk production. Cows were assigned to study using a randomized complete block design. Cows were blocked on parity, days in gestation, and body weight (BW). Previous-lactation milk yield and genetic potential of multiparous and primiparous cows, respectively, were also considered for blocking.

The cows were fed diets containing 0, 8, 16, or 24 ppm monensin on a dry matter basis in total mixed rations (TMR). Monensin was added via a dry corn supplement which represented 5% of the dry matter of the TMR. The rations were formulated to meet National Research Council requirements and were fed ad libitum beginning 21 ± 3 days prior to anticipated calving and continued through the subsequent lactation and dry period (if applicable). Trial site personnel were blinded to assignment of animals to treatment groups.

Milk production was measured daily and milk composition was determined from samples collected weekly. Feed intake was measured daily. Body weights and body condition scores (BCS, 1 to 5 scale)[1] were determined periodically throughout the study. Data were analysed with mixed models which included location, treatment by location, and block as random factors, and parity, treatment, and parity by treatment as fixed factors. Previous lactation, genetic potential, BW, and BCS were considered for pre-treatment covariates. Data collected longitudinally were analyzed with repeated measures techniques.

Results and Conclusions

Milk yield increased by an average of 2.2 lb/day in the monensin-treated groups relative to control and the increases were significant ($P < 0.05$) at 8 and 24 ppm. Percent fat was reduced in milk from cows fed 16 and 24 ppm, while a slight but significant reduction in percent milk protein occurred in the 24 ppm group. The milk protein-to-fat ratio increased in a dose-responsive manner. Monensin did not affect solids-corrected milk (SCM) yield. However, efficiency of milk production increased with increasing dietary monensin (Table 1). Production efficiency is defined as SCM yield divided by net energy for lactation intake adjusted for body weight change.

Dry matter intake (DMI) prior to first calving was reduced ($P < 0.05$) in cows fed 24 ppm monensin compared to controls. Dry matter intake was not affected by monensin treatment during the period of negative energy balance (calving to approximately 9 weeks postpartum). During the remainder of lactation DMI was reduced in the 16 and 24 ppm groups and the reduction continued at 24 ppm through the dry period.

Loss of body condition in early lactation was reduced ($P < 0.05$) in the 16 and 24 ppm groups compared to controls, and cows in these groups maintained a higher BCS for the remainder of lactation (Figure 1). Higher BCS was reflected in greater body weight gains during lactation. By 21 days before the second calving, BCS and BW were similar in all groups. Recovery of BCS by control cows as compared to monensin supplemented cows likely resulted from greater DMI during the dry period when tissue deposition is least efficient. (Table 2).

Overall, cows receiving monensin produced more milk while maintaining a higher BCS from the same or less feed compared to controls, leading to a dose-responsive increase in production efficiency. This increased efficiency was likely due to improved nutrient utilization through modified rumen fermentation in the monensin-fed animal.[2]

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Table 1. Effect of monensin on DMI, milk yield, milk composition, and efficiency of milk production

Parameter	Monensin (ppm) in ration 0	8	16	24
Number of cows[b]	215	210	216	217
DMI, lb/d	43.7	44.1	42.8[a]	42.5[a]
Milk yield, lb/d	64.7	66.8[a]	66.6	67.1[a]
Milk fat, %	3.66	3.61	3.52[a]	3.42[a]
Milk protein, %	3.15	3.16	3.14	3.12[a]
Milk solids non-fat, %	8.72	8.69	8.68	8.66[a]
Milk protein-to-fat ratio	0.891	0.908	0.926[a]	0.956[a]
SCM yield, lb/d	60.4	62.1	60.9	60.5
Milk production efficiency, lb/Mcal	1.90	1.93[a]	1.96[a]	1.97[a]

[a] Significantly different from control (P<0.05)
[b]Number of cows at beginning of lactation period

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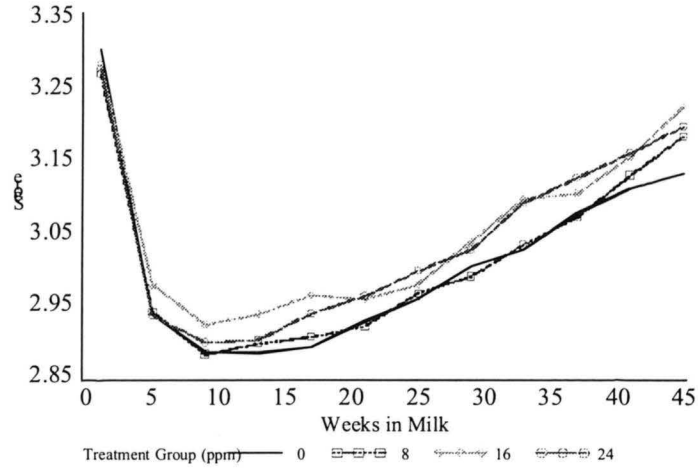

Figure 1. Body condition score during lactation

Table 2. Effect of monensin on DMI, BCS, and BW during pre calving, 305-day lactation period and dry period

Parameter	Period	Monensin (ppm) in ration 0	8	16	24
DMI, lb/d	Pre calving	24.5	24.3	24.0	23.2[a]
	Lactation	43.7	44.1	42.8[a]	42.5[a]
	Dry	28.2	27.4	27.5	26.4[a]
BCS loss	Calving to nadir	0.58	0.54	0.52[a]	0.52[a]
	Lactation	0.15	0.07[a]	0.05[a]	0.07[a]
Average BCS	Lactation	3.01	3.01	3.06[a]	3.04
	21d before Calving 2	3.39	3.36	3.43	3.39
BW gain, lb	Lactation	127	155[a]	140	152
Average BW, lb	Lactation	1319	1323	1327	1332
	21d before Calving 2	1599	1600	1610	1647

[a] Significantly different from control (P<0.05)