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Experiences in Magnesium Supplementation of Dairy Cattle Rations on the Oregon Coast

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SUMMARY

Symptoms of magnesium deficiency were observed in 10 percent of the cows calving over a two-year period beginning 22 months after supplemental magnesium in the grain portion of their ration was removed. Prior to removal, supplemental magnesium amounted to 0.06 percent of the grain mixture. Symptoms were observed for nine months, although at a lesser frequency, after the supplemental magnesium in the ration was replaced at a level of 0.04 percent. Blood plasma magnesium levels of the cows averaged 1.42 milligrams per 100 milliliters (mg %), 34 months after the supplemental magnesium was removed. Plasma magnesium levels averaged 1.98 mg % and 2.07 mg %, nine and 13 months respectively after supplemental magnesium was replaced at the level of 0.04 percent in the grain ration.

INTRODUCTION

It is a common practice to include supplemental magnesium in the grain mixtures fed to dairy cattle in the coastal area of Oregon. The need for supplemental magnesium is inferred from the fact that beef cattle losses from grass tetany in the area have been reduced by feeding mineral supplements containing magnesium through the winter and spring months. The object of this experiment was to test the validity of feeding supplemental magnesium to dairy cattle.

METHODS AND RESULTS

The level of supplemental magnesium in the grain portion of the ration fed the herd of Guernsey cows at this experiment station was removed. Previous to the removal of supplemental magnesium, the level fed provided an intake of 3.23 grams per cow per day. The supplemental mag-

nesium at this level was 0.06 percent of the grain mixture. The magnesium status of the cows was assumed to be adequate since no grass tetany or hypomagnesemia had been observed in recent years.

Twenty-two months after the supplemental magnesium was removed a cow was treated for milk fever which showed symptoms unlike those normally observed. Although she was unable to stand, the cow showed unusual excitability. Her skin flinched strongly when she was touched. Her eyes appeared dilated and bulging, and her legs were stiff. In addition, she was slow to respond to the milk fever treatment. During the following nine months four other cows were observed with similar symptoms soon after calving. The analyses of blood plasma from 23 of the 30 milking cows in the herd showed an average magnesium level of 1.42 mg % (Table 1). The blood from these cows was taken 34 months after the supplemental magnesium in the grain was removed.

The magnesium level of the grain ration was increased by adding 52 lbs. of magnesium oxide to a trace mineral mixture which totaled 1050 lbs. per batch. The trace mineral mixture was included in the grain formulation at the rate of 30 lbs. per ton of grain mixture, which increased the level of supplemental magnesium in the grain mixture to 0.04 percent.

During the following nine months, two cows died showing severe hypomagnesemia. Blood plasma analyses of 14 of the 23 cows previously analyzed showed an average magnesium level of 1.98 mg % (Table 1) nine months after supplemental magnesium had been added to the grain mixture. The blood plasma of the remaining nine cows was analyzed five months later and showed an average magnesium level of 2.07 mg %. No symptoms of magnesium deficiency were observed during the period between these two analyses.

Table 1. Magnesium levels of blood plasma taken from milking cows before and nine and 13 months after the grain ration was supplemented with 0.04 percent magnesium

Cow Number	Before Sept. 1971 mg %	After Sept. 1972 mg %	Feb. 1973 mg %
41	1.9		1.9
85	1.5	2.4	
99	1.2	1.2	
101	1.1	2.1	
110	1.0		1.9
117	1.0	2.1	
126	1.8	2.3	
132	1.0	2.0	
133	1.7	2.1	
141	1.7		2.1
144	1.7	1.8	
145	1.9		2.3
146	1.3		1.5
147	1.1		2.1
148	1.7	2.4	
150	1.4	2.0	
151	1.0	1.9	
154	1.6		2.2
156	1.4	1.9	
157	0.9		2.4
158	1.7	2.0	
160	1.4		2.2
161	1.7	2.5	
Average	1.42	1.98	2.07
Change within group		+0.56	+0.65
Statistical significance (t-test)		P < 0.025	P < 0.05
Pooled		P < 0.001	

DISCUSSION

The blood plasma magnesium levels of cattle receiving an adequate intake of magnesium range from 1.8 to 3.2 mg %. In Table 1, it can be seen that all but three blood samples taken while supplemental magnesium was withheld from the grain mixture are below this range, and that all but two of the blood samples taken afterwards are within the range. The difference between average plasma magnesium levels of individuals before and after this dietary change was statistically significant. The long time (23 months) between the removal of supplemental magnesium from the grain mixture, and the occurrence of two of the most severe cases of magnesium deficiency during a nine months period following addition of magnesium to the grain mixture is evidence that the supplemental magnesium, though necessary for adequate intake, was not the major source of mag-

nesium for the cows. By using published biological availability value for magnesium of forages and grains (Peeler, H. T., 1972) the estimated amount of available magnesium provided by the supplement was calculated to be between 14 and 20 percent of the total available magnesium.

The appearance of hypomagnesemia in conjunction with the milk fever, as observed in this herd, was reported as atypical milk fever by practicing veterinarians as early as thirty years ago. They described hypomagnesemia cows with milk fever as highly nervous in contrast to cows with normal plasma magnesium and with milk fever which were described as comatose. Hemingway, Ritchie and Brown (1965) and Ritchie and Hemingway (1965) have shown that both sheep and cattle may have plasma magnesium value of less than 1.0 mg % without showing clinical signs of hypomagnesemia until a drop in level of blood calcium is experienced.

During the period covered in this work the average milk production of the Station herd was 14,100 pounds of milk and 740 pounds of fat as converted to standard mature equivalent, 305 day lactation, for twice-a-day milking. The annual average feed consumption of each cow was: 2¼ ton of grain, 1 ton of hay (part imported alfalfa and part local grass), grass silage free choice 210 days, and pasture 155 days. Under this feeding program, the addition of 0.04 percent supplemental magnesium to the grain mix in the form of magnesium oxide was sufficient to increase blood plasma magnesium levels to within a normal range and to prevent the occurrence of hypomagnesemia. It is the opinion of the author that this level of supplementation should be considered a minimum level.

REFERENCES

- Hemingway, R. G., N. S. Ritchie, and N. O. Brown. 1965. The effect of grazing management on plasma calcium and magnesium concentrations of ewes in early lactation. *J. Agric. Sci.* 64:109.
- Peeler, H. T., 1972. Biological availability of nutrients in feeds: availability of major mineral ions. *J. Ani. Sci.* 35:695.
- Ritchie, N. S., and R. G. Hemingway. 1965. The importance of hypocalcemia in the development of hypomagnesemia. *Proc. Nutr. Sci.* 24:54.