Alberta Dairy Management
PREPARED FOR AND DISTRIBUTED BY THE DAIRY EXTENSION ADVISORY GROUP

Feeding Rumensin® to Lactating Cows

Rumensin® has been widely used in Western Canadian feedlot rations for over 20 years. Based on its effectiveness in the feedlot and our knowledge about is mode of action, interest has developed in its use for lactating dairy cows.

The active ingredient, *monensin*, is approved by Agriculture Canada for the improvement of feed efficiency in beef cattle intended for slaughter, for increased weight gain in growing cattle on pasture and as an aid in the prevention of coccidiosis. Until very recently, monensin was not approved for use in lactating dairy cattle, although its use could be prescribed by a veterinarian. As a result of trials indicating that there are no unsafe drug residues in the milk of treated cows, approval for coccidiosis control has been extended to include lactating dairy cattle. However, coccidiosis is not considered to be a significant concern in lactating cows and, therefore, the use of monensin for its prevention has been questioned.

Will monensin improve production efficiency in lactating cows? If so, can it be used for this purpose when the only official non-veterinary clearance is for coccidiosis control?

Mode of action

Monensin is an antibiotic which inhibits the growth of specific rumen microbes resulting in changes in rumen fermentation and metabolism:

- production of propionic acid increases, resulting in a decrease in the acetate:propionate ratio and a reduction in the amount of energy wasted as carbon dioxide and methane;
- lactic acid production decreases, blunting the sharp declines in rumen pH that often occur after large meals of rapidly fermentable starch;
- reduced feed protein breakdown results in a decrease in microbial protein and an increase in feed protein passing from the rumen;
- ammonia-producing bacteria which use amino acids and peptides as their sole energy sources are suppressed;
- reduction in the incidence of bloat due to the inhibition of bacteria which produce large amounts of gas-trapping mucous.

Based on our understanding of the nutrition of the lactating cow, improved energy efficiency, enhanced propionate production, a lower acetate:propionate ratio and reduced amino acid breakdown in the rumen should promote higher production accompanied by increased protein and decreased fat tests. The risk of acidosis should be reduced as a result of lower lactic acid production and reproductive performance might improve due to a more positive energy balance and lower ammonia production. Reduction in the incidence of ketosis has also been attributed to the effects of monensin on rumen metabolism.

Effects on feed intake

In feedlot rations, monensin stabilizes intake. When feed is offered *ad libitum*, cattle eat less during each meal, eat more times per day and consume more consistent amounts from day to day. Total intake is usually lower but the combination of reduced intake and improved feed conversion efficiency generally results in a slight to significant improvement in daily gain.

In lactating cows, potential increases in milk production from the use of monensin will also depend on the balance between feed intake and feed conversion efficiency. If improved energy efficiency outweighs the negative effect of reduced dry matter intake (see article **1I1**), then increased output should be expected.

Monensin toxicity

At the levels used in cattle feeds, monensin can be very toxic to non-ruminants. Consumption of these feeds by dogs and horses has, in many cases, been fatal. If monensin premixes are used on-farm, it is very important to observe label warnings which suggest "The use of protective clothing, impervious gloves and a dust mask…" and "…wash with soap and water after using."

Several cases of monensin toxicity in ruminants have been reported. In one dairy herd, several cows died when a 1.65% monensin premix was fed rather than a much-diluted mineral mix. In another, 7-8 kg of a concentrate containing 366 mg/kg monensin was fed. Digestive disorders resulted in a dramatic drop in production.

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Research results

Research has clearly demonstrated the value of monensin in improving feed efficiency and rate of gain in growing cattle and in reducing the incidence of coccidiosis. These results are the basis of the regulatory approval of monensin for these purposes.

There are few published studies examining the effects of monensin in lactating cows, although the results of several trials currently underway are expected soon. Experiments conducted in New Zealand and Australia have focussed on the bloat-reducing effects of a Rumensin® controlled release capsule in grazing dairy cows. These capsules are designed to deliver approximately 270 mg/day of monensin for an average of 120 days. Although bloat reduction has been consistent and significant, production responses in these cows have been quite variable; changes in milk yield have ranged from none to an increase of 1.5 kg/day.

Results of a trial conducted at Agriculture Canada's Animal Research Centre in Ottawa are summarized in table 1. Fed to fresh cows at a dietary level of 33 mg/kg, monensin reduced the incidence of subclinical ketosis from 6 cases in 12 control cows to 1 case in 12 treated cows. Although monensin provoked significant changes in dry matter intake (DMI) and milk fat %, increases in milk yield at both levels of inclusion were not statistically significant.

Several preliminary reports on feeding monensin to lactating cows have been presented at recent scientific meetings:

	MONENSIN LEVEL, mg/kg		
	0	16.5	33
first 3 weeks postpartum:			
DMI, kg/day	14.5[a]	13.9[ab]	13.3[b]
Wt Change, kg/day	-1.5	-0.9	-1.1
first 4 weeks postpartum:			
Milk Fat, %	4.12[a]	3.58[b]	3.71[ab]
Milk Protein, %	3.49	3.25	3.34
weeks 12-16 postpartum:			
Milk Fat, %	3.40	3.29	3.83
Milk Protein, %	3.25	3.18	3.55
weeks 1-16 postpartum:			
Milk Yield, kg/day	29.9	32.8	31.4

Table 1 : Production responses to monensin at 2 levels of inclusion in diets fed to lactating cows. Values with different superscripts in the same row are significantly different from one another.

	MONENSIN INTAKE, mg/day			
	0	150	300	450
Milk Yield, kg/day	25.0[a]	27.8[b]	27.5[b]	26.6
Milk Fat, %	3.91[a]	3.58[b]	3.44[b]	3.44[b]
Milk Protein, %	3.39[a]	3.24[b]	3.25[b]	3.23[b]

Table 2 : Milk yield and component level responses to 4 levels of monensin intake. Values with different superscripts in the same row are significantly different from one another.

- In a trial conducted in Indiana, cows were fed 0, 150, 300 or 400 mg/day monensin from 2-4 weeks prepartum until 12 weeks postpartum. Monensin produced no detectable effect on milk yield or milk composition, at any level of inclusion. DMI was depressed in multiparous cows receiving 150 mg/day but, otherwise, intakes of treated cows did not differ from those of controls.
- Cows in a Kentucky trial were fed diets containing 15.1 or 19.2% ADF, with or without 300 mg/day of monensin. When monensin was added to the 15.1% ADF diet, milk production increased and milk fat % decreased significantly while DMI and milk protein content did not change. However, when added to the 19.2% ADF diet, monensin significantly decreased DMI, milk yield, fat % and protein %.
- Results of a British study are summarized in table 2. Mature cows received 0, 150, 300 or 450 mg/day of monensin for 20 weeks postpartum. At all levels of intake, monensin significantly increased milk yield and decreased milk fat and protein content.
- A South African study demonstrated significant increases in milk yield with no significant changes in milk fat or protein levels when cows were fed diets containing 10 or 20 mg/kg monensin from weeks 4 to 12 postpartum.

Based on published research results, it is not possible to predict whether monensin will improve production efficiency under any specific set of feeding and management conditions. Therefore, until more complete information on production responses becomes available, the use of monensin in lactation rations should be confined to applications where a solid body of research supports its efficacy, namely: the control of bloat, ketosis and coccidiosis.

prepared by :
Steve Mason, Ph.D.
ProLivestock : Nutrition/Management Specialists
Calgary : 284-5484