3131 BELL, SUITE 101 AMARILLO, TX 79106 OFFICE: 806.331.3510 FAX: 806.331.3667 ORDERS: 1.888.848.8178 WWW.MIN-AD.COM

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MIN-AD

The Effect of MIN-AD® on Performance and Health in Early Lactation Dairy Cows

Introduction

Proper nutrition during the transition period and early lactation is crucial for maximizing milk production and health of dairy cows. In late 2003 and early 2004, MIN-AD, Inc. conducted a transition cow study at the W. H. Miner Agricultural Research Institute (MIN-AD Technical Bulletin D-3). Over the course of the 56-d trial, cows received buffer packs containing either sodium bicarbonate or a 50:50 mixture of sodium bicarbonate and MIN-AD. Results from this trial were encouraging. While no statistical differences were noted, cows receiving the MIN-AD:Bicarb treatment produced 3.4% more milk and 2.9% more fat than cows receiving bicarb alone, thereby indicating that MIN-AD was a suitable replacement for bicarb.

This success prompted further interest in the role of MIN-AD in transition cow diets. Therefore, a subsequent study was conducted in 2006 with the objective to determine the effect of partial replacement of MgO and sodium bicarbonate with MIN-AD in the ration of early lactation cows in a well managed, high producing commercial dairy herd on milk yield, composition and health. A brief summary of results follows in the table below (Table 1). Replacing a portion of the MgO and bicarb with MIN-AD resulted in a 3.9% increase in milk production and a 3.2% increase in the percentage of protein. The remainder of this bulletin details the procedures and full results of this trial.

Table 1. Lactation performance of transition cows supplemented with 1% sodium bicarbonate or 0.5% MIN-AD and 0.5% sodium bicarbonate (current trial).

	Treatments			
Item	Control	MIN-AD	SE	*P* =
Milk, lb/d	93.5	97.1	0.37	0.001
3.5% FCM, lb	110.3	112.6	1.2	0.18
Fat, %	4.49	4.43	0.06	0.50
Protein, %	2.82	2.91	0.03	0.03

Procedures

The study was conducted at Spruce Haven Farm and Research Center in Auburn, NY under the supervision of Dr. James Nocek. One hundred and four multiparous cows were utilized for this 91-day study which lasted from January through July 2006. Cows were housed in group pre- and postpartum pens containing approximately 70 cows/group. They were assigned to treatment based on parity and previous lactation 305ME (multiparous).

Cows started the experimental period approximately 21 days prior to calving. They remained on treatment for 10 weeks during the subsequent lactation. Animals were assigned to treatment as they entered the close-up dry (21 day) period. Non-study cows that previously resided in the treatment freestall areas remained until study animals were moved to that group, at which time, non-study animals were removed to maintain constant numbers of cows per group.

The treatments were as follows.

1) Control: Cows received sodium bicarbonate at 1.0% of DM upon calving.

2) MIN-AD: Cows received MIN-AD at 0.5% DM for the entire study. At calving, these cows received sodium bicarbonate at 0.5% of ration DM.

MIN-AD replaced a portion of the MgO and limestone to maintain equal proportions of Ca and Mg in the two diets.

Feeding Management

Groups in both the pre- and postpartum period had a 0.5 lb premix pack incorporated into the TMR (Tables 2 and 3), fed once daily, such that the only difference between the control and MIN-AD diets was contained in the premix. All diets were formulated to contain equal concentrations of Ca and Mg.

The close-up dry diet premixes contained the following (lb as fed/cow/day).

Control:	.07 lb Calcium carbonate	MIN-AD:	.12 lb MIN-AD
	.03 lb Mg Oxide		.38 lb Corn meal
	.40 lb Corn meal		

The post-fresh diet premix contained the following (lb as fed/cow/day)

Control:	.15 lb Calcium carbonate	MIN-AD:	.24 lb MIN-AD
	.03 lb Mg Oxide		.26 lb Corn meal
	.03 lb Mg Sulfate Anhy		
	.24 lb Sodium bicarbonate		
	.05 lb Corn meal		

All diets were fed as a TMR once daily, ad libitum. The treatment premix was mixed into the basal TMR.

Feed Sample Collection

Haylage, corn silage and western hay were collected on a weekly basis and composited monthly for chemical analysis. Feedstuff analyses were conducted at the Dairy One Laboratory in Ithaca, New York. Dry matter determinations via Koster tester were measured on wet feeds weekly to adjust as fed "ration composition".

Data Collection

Daily group feed offerings and refusals were collected to evaluate dry matter intake**.** Milk yields were recorded daily. Cows were milked at 12-hour intervals. Milk samples were collected at the monthly DHI interval and analyzed for fat, crude protein, lactose, MUN and SCC.

Metabolic and infectious diseases were also monitored with measurements including twinning, retained placentas, metritis, ketosis, displaced abomasums, and milk fever.

Body condition scores were taken at -21 days prior to expected calving date, 7$\pm$ 3 days post calving and trial termination. Blood samples were taken 1-2 days pre- and post calving on 10 cows/trt for NEFA determination.

Statistical Analysis

Production parameters were analyzed by analysis of variance (ANOVA) procedures of SAS, JMP, utilizing a split plot-in-time for repeated measures analysis with the model as follows: u = mean + trt + week + cow(trt) + trt x week + error.

Results

Group dry matter intakes were similar between treatments during the prepartum period (Table 4), however, tend to be numerically higher for cows supplemented with MIN-AD during the post-partum period (47.4 vs. 49.5 lb, respectively). No statistical analyses were conducted on intake data.

Milk yield was higher (P = 0.001) for cows supplemented with MIN-AD as compared to control cows (Table 4): control cows produced 93.5 lb/cow/day and MIN-AD supplemented cows produced 97.1 lb/cow/day. Figure 1 shows higher peak milk and persistency for MIN-AD supplemented cows compared to control. There were no significant differences in milk fat percentage, yield or protein percentage. Protein yield and MUN were higher (P =0.03 and 0.02, respectively) for cows supplemented with MIN-AD, and lactose was higher (P =0.01) for control cows. Fat corrected milk was numerically higher for MIN-AD supplemented cows (112.6 lb vs. 110.3lb). There was also no difference in SCC between the two groups. Body condition scores were not affected by MIN-AD supplementation (Table 5).

Percentage of twins was 3.8% for both treatments (Table 6). The incidence of retained placenta was numerically, but not statistically higher for cows supplemented with MIN-AD. The incidence of metritis and ketosis was similar between treatments. Incidence of displaced abomasums was reduced (P = 0.16) by MIN-AD supplementation from 7.7 to 1.9%.

Clinical milk fever was reduced (P = 0.15) from 3.8% (2 cows) to 0% (0 cows) for cows supplemented with MIN-AD.

Summary

Partial replacement of MgO and sodium bicarbonate with MIN-AD in early lactation rations increased milk production by 3.6 lb (3.9%) and protein yield by .09 lb/cow (3.2%). In our previous transition study, replacing 50% of the sodium bicarbonate with MIN-AD did not result in any statistically significant increases in production; inclusion of MIN-AD did numerically increase milk production by 2.4 lb/d. The lack of a significant response in the first trial could in part be due to the high incidence of metabolic and infectious disease encountered. The results of the first trial, however, certainly indicated that MIN-AD could replace a portion of the bicarb while still maintaining production performance.

In the current trial, not only was the total level of production maintained, but it was in fact increased for a number of parameters. Taken together, these trials show that MIN-AD is a beneficial addition to transition cow diets which should lead to increased cow performance, even when the diets are formulated to contain equal Ca and Mg.

If you would like more information about this trial or any others, please visit our website at www.min-ad.com; or contact our sales office at 806-331-3510.

Table 2. Ingredient composition of experimental TMR[a,b].

	Close-up Dry			Lactation Diet		
Ingredient	TMR	CON	MA	TMR	CON	MA
	----------------------------% dry matter basis---------------------------					
Corn silage	28.9			40.7		
Hay crop silage	32.7			3.0		
Western alfalfa hay	19.3			10.55		
Corn meal	7.7			13.84		
Soybean meal, 49%	4.23			7.39		
Roasted soybeans	---			4.22		
Citrus pulp	---			10.55		
Corn gluten meal	1.40			0.34		
Blood meal	---			1.57		
Soy-plus	---			1.02		
Fish meal	---			0.30		
Corn distillers	---			1.72		
Tallow	0.15			0.09		
Megalac	---			1.31		
Alimet	---			0.07		
Cellmanax	0.29			0.15		
Calcium carbonate	2.43			0.53		
Calcium sulfate	0.19			---		
Dynamate	---			0.04		
Mag oxide	0.27			0.17		
Mag sulfate	0.04			0.19		
Sodium bicarbonate	---			0.50		
Selenium 270	0.14			0.07		
Vitamin E 2000	0.25			0.04		
Daily premix PM	0.12			0.04		
Urea	---			0.30		
Salt	0.10			0.23		
Availa-4	0.05			0.04		
Daily inclusion treatment premix						
Calcium carbonate		0.27	---		0.31	---
Manganese oxide		0.11	---		0.06	---
Mag sulfate		---	---		0.06	---
Sodium bicarbonate		---	---		0.50	---
MIN-AD		---	0.50		---	0.50
Corn meal		1.36	1.24		0.10	0.53

[a]CON = control diet; MA = MIN-AD diet.

[b]Sodium bicarb was included in the pack for control cows to equal 1.0%.

Table 3. Nutrient composition of experimental diets.

Nutrient	Close-up Dry	Lactation Diet
	------------------------------% DM basis	-------------------------------
Dry matter, %	44.7	49.1
Crude protein, %	15.9	17.9
DIP (%CP)	67.5	55.1
UIP (%CP)	32.5	44.9
Sol protein (%CP)	44.9	35.6
NE_L, Mcal/lb	0.67	0.80
NDF, %	44.9	30.1
NSC, %	36.1	41.2
Fat, %	3.44	5.5
Calcium, %	1.91	0.96
Phosphorus, %	0.30	0.31
Magnesium, %	0.44	0.37
Potassium, %	1.73	1.2
Sulfur, %	0.25	0.24
Sodium, %	0.12	0.27
Chloride, %	0.60	0.36
Iron, ppm	197	184
Selenium, ppm	1.4	0.51
Cobalt, ppm	2.18	1.30
Iodine, ppm	1.49	0.54
Zinc, ppm	151	85
Copper, ppm	44	25
Manganese, ppm	142	72

Table 4. The effect of MIN-AD supplementation on production responses through week 11 postpartum.

	Treatments			
Variable	Control	MIN-AD	SEM	*P* =
n	52	52		
Group DMI, lb				
Prepartum	26.4	26.5		
Postpartum	47.4	49.5		
Milk, lb/day	93.5	97.1	0.37	**0.001**
Composition				
Fat, %	4.49	4.43	0.06	0.50
Fat, lb	4.27	4.33	0.06	0.44
3.5% FCM, lb	110.3	112.6	1.2	0.18
Protein, %	2.98	2.99	0.02	0.68
Protein, lb	2.82	2.91	0.03	**0.03**
Lactose, %	4.75	4.68	0.01	**0.01**
MUN	11.06	11.6	0.12	**0.02**
SCC, x1000	243	275	25	0.38

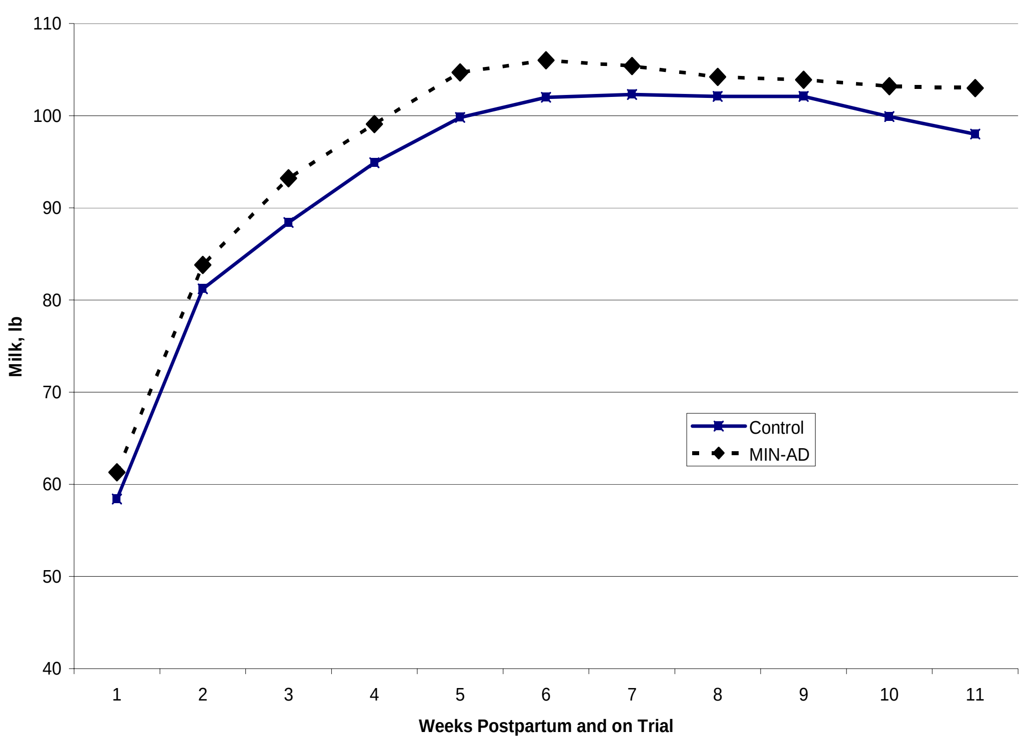

Figure 1. Effect of MIN-AD on weekly milk production.

Table 5. The effect of MIN-AD on body condition score at week -3, day 1 and week 11 postpartum.

Item	Treatments		SEM	*P* =
	Control	MIN-AD		
n	52	52		
Body Condition Score				
21d prepartum	3.81	3.79	0.03	0.76
Day 1 postpartum	3.67	3.61	0.04	0.24
Week 11 postpartum	3.41	3.44	0.05	0.47

Table 6. The effect of MIN-AD supplementation on postpartum health disorders.

Variable	Treatments		SEM	*P*=
	Control	MIN-AD		
n	52	52		
	------- % incidence (#) -------			
Twins	3.8 (2)	3.8 (2)	0.03	0.98
Retained placenta	11.5 (6)	15.4 (8)	0.13	0.43
Metritis	15.4 (8)	15.4 (8)	0.05	0.96
Ketosis	9.6 (5)	11.5 (6)	0.04	0.97
Displaced abomasum	7.7 (4)	1.9 (1)	0.09	0.16
Milk fever	3.8 (2)	0.0 (0)	0.03	0.15