

TECHNICAL BULLETIN

DAIRY



BENEFITS OF HEALTHY RUMEN PH

Liquid supplements provide soluble sugars to increase forage fiber digestion, which facilitates formulation of higher dietary forage levels. Research has demonstrated that reducing dietary starch and NFC, and increasing dietary forage levels maintains a healthy rumen pH. Healthy rumen pH is essential to maximizing fiber digestion and optimizing animal health and productivity.

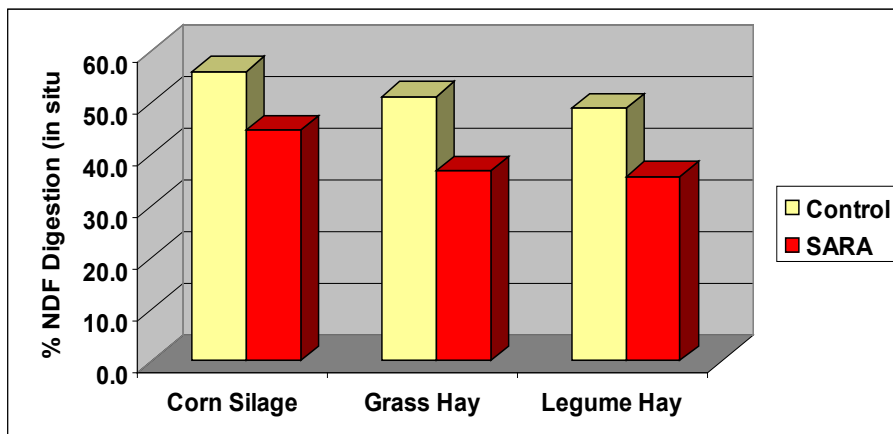
SARA Impacts Fiber Digestion

Maintenance of rumen pH > 6.0 maximizes fiber digestion. Sub-optimal rumen pH inhibits fiber-digesting bacteria metabolism and ability to uptake carbohydrate, causing fiber digestion to decrease (Russell & Wilson, 1996). In the study below, researchers experimentally induced sub-acute ruminal acidosis (SARA) in lactating dairy cattle through altering dietary forage:concentrate ratio and daily feeding patterns. SARA cows had ruminal pH <6.0 for 15.6 hours per day, compared to control cows at 2.6 hours per day, resulting in a significant decrease in 48 h in situ ruminal NDF digestion of corn silage, grass hay, and legume hay ($P<0.05$).

Lowering fiber digestion decreases forage nutritive value within the cow, which reduces milk production efficiency and return over feed cost. And remember fiber digestion produces acetate, which is an important precursor for milk fat production!

Effects of Repeated Bouts of SARA

Dairy cattle often experience repeated bouts of SARA, due to diet formulation (too much NFC), slug feeding, or insufficient forage consumption due to sorting. To study the effects of repeated bouts, researchers experimentally induced three bouts of SARA two weeks apart in lactating dairy cattle through altering dietary concentrate inclusion and daily feeding patterns. Prior to the SARA challenge periods, cattle were divided into two groups by stage of lactation and acidosis risk. High-acidosis risk early-lactation cows received a 45% forage diet, and low-risk, midlactation cows received a 60% forage diet. Repeated acidosis challenges magnified effects on rumen pH, as shown in the table below:



Challenge Period	High Risk (45:55 F:C)			Low Risk (60:40 F:C)			P-Value	
	1	2	3	1	2	3	Risk	Period
Mean Rumen pH	5.94 ^a	5.85 ^a	5.63 ^b	6.32 ^a	6.20 ^a	6.10 ^b	0.02	0.01
Minimum Rumen pH	5.34 ^a	5.17 ^b	4.88 ^b	5.69 ^a	5.51 ^b	5.40 ^b	0.04	0.01
Hr/day pH<5.8	7.9 ^a	10.1 ^{ab}	13.9 ^b	2.4 ^a	3.4 ^{ab}	4.7 ^b	0.03	0.02

^{a,b}Within row and risk category, challenge period means with different superscripts significantly differ ($P<0.05$)

Dohme et.al. (2008) J. Dairy Sci. 91:3554-3567.

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Increasing the severity of acidosis intensifies the negative effects on forage digestion and health of the animal, decreasing productivity, profitability, and longevity. Note that cows fed high forage diets (60% forage) experienced a less intense bout of SARA, as shown by higher mean and minimum rumen pH, and fewer hours/day pH<5.8. In this study, rumination of fiber particles from high forage diets fed prior to, and post-SARA challenge likely buffered VFA released during the challenge. Fiber particles require multiple bouts of rumination to reduce size sufficiently for passage out of the rumen. Rumination stimulates saliva production, which buffers VFA release. Consequently, the intensity of SARA is reduced for cattle fed high forage diets.

Digestive upset induced by rumen pH < 6.0 causes decreased appetite, intake, laminitis, diarrhea, and weight loss. In addition, SARA also begins an immune response. Researchers experimentally induced SARA in lactating dairy cattle by decreasing forage:concentrate ratio from 50:50 to 29:71. Cattle with SARA had significantly increased concentration of immune markers in ruminal fluid, blood plasma, and milk, indicating that ruminal SARA impacted animal health (Khafipoor et. al, 2007). And remember that the negative effects of immune response (depressed growth, reproductive efficiency, metabolic health, milk production, etc.) are separate from the effects of decreased feed intake which occur due to SARA!

SARA Reduces Profitability

Through the impacts on fiber digestion and cow health, SARA also negatively affects productivity and profitability, as demonstrated by the below research results:

Item	Control ^a	SARA ^b	Difference
Dry Matter Intake, lb/d	41.9	36.4	-5.5
Milk Yield, lb/d	68.8	61.7	-7.1
Milk Fat %	3.41	2.82	-0.59
Milk Fat Yield, lb/d	2.18	1.74	-0.44
Khalfipoor et.al. (2007) J. Dairy Sci. 90:Suppl. 1:W900.			
^a Control diet: 50:50 Forage:Concentrate diet			
^b SARA diet:29:71 Forage:Concentrate diet			

It is estimated that 20% of cows days 1-120 DIM experience SARA (Oetzel et al., 1999). Based on reduction in milk yield shown above, for every 100 cows that are 2-120 DIM, approximately \$680/month revenue is lost due to incidence of SARA (using \$16/cwt milk). That's \$8,175/year lost revenue due to reduced milk production! And remember, other costs of SARA including laminitis treatment costs, and wasted feed due to depressed intakes further reduce producer profits.

Maintaining a healthy rumen pH is critical to maximizing cow productivity and profitability. QLF Dairy TMR supplements provide soluble sugars and degradable protein to stimulate fiber digestion and utilization to maximize the nutrient value obtained dietary forages. In addition, QLF TMR supplements improve ration palatability and forage consumption. Please see TB-4316 for specific details on how soluble sugars improve utilization of high quality dairy forages. Also, please see TB-4317 for specific details on how reducing dietary NFC and increasing dietary forage levels maintain a healthy rumen pH and improve productivity.