



## Sodium Bicarbonate and Magnesium Oxide in Dairy Cattle Rations

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During digestion and fermentation in the rumen, acids are produced. These acids must be neutralized or "buffered" to maintain normal fermentation and prevent problems of off-feed and low fat tests. Sodium bicarbonate is normally produced and secreted in the saliva of the cow and is, therefore, a natural buffer. Sometimes when inadequate salivation occurs (such as during feeding of high-grain rations, or when forage is very succulent or finely chopped) supplemental sodium bicarbonate can be of benefit. In addition, magnesium oxide appears to work in conjunction with sodium bicarbonate.

High-grain, low-forage rations tend to decrease the amount of ruminal acetic relative to propionic acid. The ratio of acetic to propionic acid is important in maintaining fat test. Therefore, conditions that maintain the acetic:propionic ratio also maintain an adequate or normal fat test. Level of "effective" fiber in the ration, method and level of concentrate feeding, and timing of concentrate feeding in relation to forage are all important in determining the amount and type of acid produced in the rumen. These factors should be considered before adding supplemental buffers to the feed of lactating dairy cattle.

### Method and Level of Buffer Feeding

Sodium bicarbonate and magnesium oxide should be fed mixed with concentrate or included in a total mixed ration. This method assures that the cow will obtain adequate amounts. Table 1 contains recommended amounts. Sodium bicarbonate should be included at 1 to 1.5% of the concentrate mix (20 to 30 lbs/ton) with magnesium oxide at 0.4 to 0.8% (8 to 16 lbs/ton). When feeding buffers in a total mixed ration, 0.3 to 0.45 lbs/cow/day sodium bicarbonate and 0.1 to 0.2 lbs of magnesium oxide is recommended. Too much sodium bicarbonate will reduce feed consumption. Generally, do not feed more than 0.6 lbs/cow/day or include in the concentrate at greater than 30 lbs/ton. When feeding

Table 1. Most effective sodium bicarbonate and magnesium oxide concentrations in rations for lactating cows

	Site of action	% of concentrate	Lbs per ton of concentrate	Lbs per cow per day
Sodium bicarbonate**	rumen	1.0-1.5	20-30	0.3-0.45
Magnesium oxide**	unknown	0.4-0.8	8-16	0.1-0.2

\*\*When using sodium bicarb and magnesium oxide together, a 2 to 3:1 ratio is usually best.

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a concentrate separately from the forage or a bunk ration, it is best to include the buffers in the concentrate because the majority of the acids are produced after concentrate consumption. Therefore, the buffers would be available for neutralizing acids produced in the rumen.

When using sodium bicarbonate and magnesium oxide together, a 2 to 3:1 ratio is usually best (2 to 3 parts sodium bicarbonate and 1 part magnesium oxide). Research has indicated sodium bicarbonate's effect is in the rumen, but it is unclear where magnesium oxide works. Some speculation has indicated magnesium may enhance fatty acid uptake into the mammary gland. Other research indicates magnesium oxide may not be needed and sodium bicarbonate is effective by itself. Currently, I recommend both sodium bicarbonate and magnesium oxide for early lactation cows consuming a high grain, corn silage based ration.

Free-choice feeding of sodium bicarbonate is not recommended. A study at University of Minnesota's Rosemont Experiment Station indicated cows consumed free-choice an average of 0.05 lbs/cow/day during a 14-month period. This is much less than needed to be effective.

#### Conditions for Best Results with Buffers

Best results with sodium bicarbonate and magnesium oxide may be expected under the following conditions.

1. Early-lactation cows while switching from a high forage ration (dry period) to a high grain ration.
2. When corn silage is the primary forage and grain makes up 50% or more of the ration dry matter.
3. Limited long hay in ration (less than 5 lbs/cow/day).
4. Animals consuming lush, green forages. Wet feeds do not stimulate saliva production as well as dry feeds.
5. When feeding highly fermented rations such as fermented forages with fermented grains.
6. When feeding finely chopped and/or pelleted forages.
7. In rations containing large quantities of finely ground by-product feeds.

Remember, early-lactation cows consuming a large quantity of grain will benefit most from buffers. Later-lactation cows should have adequate "effective" fiber in their rations and the supplemental buffers will probably be of no benefit. Buffers are not a cure-all for poor feed-bunk management. Nutritional problems should be corrected before using buffers.