Physically Effective Fibre Content of Dairy Diets and the Risk of Ruminal Acidosis

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Subacute ruminal acidosis is a common and economically important metabolic disorder in dairy cattle. It is caused by low pH (< 5.8) in the rumen due to an accumulation of fermentation acids. Salivary buffers help neutralize these acids. Salivation increases during chewing, thus, increasing the time that cows spend chewing is thought to decrease acidosis. We conducted this study to determine whether increasing the physically effective fibre (peNDF) content of dairy cow diets increases chewing activity, thereby reducing the risk of acidosis.

Corn silage and barley silage, chopped fine, medium and coarse were each used in a separate study designed as a double 3 × 3 Latin square. The fine, medium and coarse silages were combined with a barley-based concentrate to provide three levels of peNDF in each study. The peNDF contents were measured using the Penn State Particle Separator with a top sieve (19-mm), middle sieve (8-mm) and pan. The sum of particles retained on the top and middle sieves was calculated as the physically effectiveness factor, which was multiplied by NDF content to obtain peNDF. The peNDF contents were 8.9, 10.3 and 11.5% of dry matter (DM) for the corn silage-based diets and 10.5, 11.8 and 13.8% for the barley silage-based diets.

For cows fed corn silage diets, number of chews per day and total chewing time, including eating and ruminating time, increased linearly with increasing dietary peNDF. However, mean ruminal pH and the amount of time that the pH was low (below 5.8 or 5.5) were not affected by peNDF content of the diet. Dietary peNDF content was moderately correlated to number of chews during eating (r = 0.41) and to total chewing time (r = 0.37). Similarly, for cows fed barley silage diets, total chewing time and chewing time per unit of DM or fibre were linearly increased with increasing dietary peNDF due to increased ruminating time. Again, ruminal pH was not affected by dietary peNDF.

Take Home Message: Increasing the peNDF content of diets increased chewing time. Thus dietary particle size, expressed as peNDF, was a reliable indicator of chewing activity. However, increased chewing time did not reduce ruminal acidosis. Increased chewing may have increased salivation, but the incremental buffering was insufficient to cause a change in rumen pH. To reduce the risk of ruminal acidosis, the fermentability of the diet must also be reduced.