

Effects of Physically Effective Fibre on Chewing and Ruminal pH

Wen Z. Yang and Karen A. Beauchemin

Research Center, Agriculture and Agri-Food Canada, P. O. Box 3000, Lethbridge, AB T1J 4B1, Canada E-mail: yangw@em.agr.ca

Recently, the concept of physically effective (pe) NDF was introduced to relate the physical characteristics of feeds to chewing activity and ruminal pH. Mertens (Feedstuffs, 2000; April 10:11-14) suggested that peNDF could be determined by measuring the proportion of feed (by weight) retained on sieves 1.18 mm. An alternative approach is to sieve the feed into three fractions using the Penn State Particle Separator (Lammers et al., J. Dairy Sci. 1996), with the sum of the fractions retained on the two sieves assumed to be equal to peNDF. The Penn State Particle Separator is a practical method that can be used on the farm, but information is needed concerning effects of peNDF on chewing activity and rumen pH for barley-based diets fed to dairy cows.

We recently conducted a study using dairy cows fed a variety of barley-based diets that ranged in forage:concentrate ratio (F:C, 35:65, 55:45), particle length, and extent of grain processing. The peNDF contents of the total mixed rations were not affected by extent of barley rolling, but were greatly affected by the F:C and forage particle length. Higher intakes of peNDF due to higher F:C or longer forage particle length increased eating and total chewing time. The intake of peNDF measured using the Penn State Particle Separator was moderately correlated to chewing time ($r = 0.46$, $P < 0.01$). However, the intake of peNDF measured using the method of Mertens was only numerically correlated to chewing time ($r = 0.29$, $P < 0.13$). In addition, no correlation was observed between the intake of peNDF and mean pH in the rumen regardless of the method used. Interestingly, proportion of particles retained on the first sieve (19 mm) of the Penn State Particle Separator was numerically ($P < 0.15$) correlated to ruminal pH.

These results indicate that the Penn State Particle Separator is a reliable and practical method to estimate the peNDF of feeds for predicting chewing activity of dairy cows fed barley-based diets. The content of peNDF of diets is mainly affected by F:C and forage particle length, but not extent of barley rolling. However, total chewing time by itself is not a good indication of ruminal pH, or the risk of acidosis.