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Manipulation of rumen fluid pH and its influence on *in sacco* dry matter degradation of forage

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The effect of starch to decrease forage digestion can be explained by a preference (or competition) by rumen microbes for starch rather than fibre components, or a decrease in ruminal pH caused by a rapid starch fermentation. The objective of this study was to separate these 2 effects on the kinetics of hay digestion. Four rumen cannulated Jersey cows were fed daily 7 kg dry matter (DM). Animals received 3 diets: 100% hay (CP = 16.5%, dOM = 54.8%) in a first period (diet H); 70% hay and 30% pelleted ground barley in a second period (diet HB); and diet HB with a continuous intraruminal infusion of bicarbonate salts solution ($640 \text{ g d}^{-1} \text{ NaHCO}_3/\text{KHCO}_3$) in a third period (diet HBB). Water was infused at the same rate (8 l d^{-1}) during the first 2 periods. Rumen fluid was withdrawn during each dietary treatment on 2 consecutive days at 2, 5, 8, 11 and 23 h after feeding. The kinetics of DM disappearance were adjusted to the exponential model (Ørskov and McDonald, 1979). DM degradability (DMD) of hay was calculated using the ruminal particle outflow of Eu-labeled hay (0.03 h^{-1}) measured previously. The effect of diet on pH, DMD and degra-

dation parameters was tested by an analysis of variance with 2 main effects, diet and animal. Diet effect means were separated by Duncan's test.

Supplementation of forage (diet H) with a readily fermentable energy source (diet HB) reduced significantly the rumen pH to 6.23 (pH < 6.00 for 5 h), but also hay DMD by 7.6 points (table 1). This difference in degradability can be explained by a significant decrease in the degradation rate (c) of the slowly degradable fraction (b). Compared with diet HB, the infusion of bicarbonate (HBB) increased the ruminal pH to 6.79 and the DMD of hay (5.6 points); the degradation rate was unaffected but a significant increase in the slowly degradable fraction was observed. From these results can be concluded that part of the reduction in DM degradability of hay is mainly due to the ruminal pH drop and not directly to starch addition (Mould and Ørskov, 1983).

Mould FL, Ørskov ER (1983) *Anim Feed Sci Technol* 10, 1-14

Ørskov ER, McDonald I (1979) *J Agric Sci Camb* 92, 499-503

Table 1. *In sacco* dry matter degradation of hay and rumen fluid pH.

| | H | HB | HBB |
|------------------------|--------------------|--------------------|--------------------|
| DMD | 67.3 ^c | 59.7 ^d | 65.5 ^c |
| a | 18.8 | 22.6 | 18.6 |
| b | 63.1 ^c | 53.2 ^d | 68.9 ^c |
| c | 0.100 ^c | 0.067 ^d | 0.065 ^d |
| pH mean * | 6.70 ^c | 6.23 ^d | 6.79 ^e |
| Time (h) during pH < 6 | 0 ^c | 5 ^d | 0 ^c |

DMD, dry matter degradability (%); a, rapidly degradable fraction (%); b, slowly degradable fraction (%); c, constant rate of degradation of fraction b (h^{-1}). ^{c,d,e} different letters in a row indicate a significant difference $P < 0.05$. * Mean of 10 pH values (5 sampling times on 2 consecutive days).