Ann Zootech (1995) 44, Suppl, 215

The effects of the balance between rumen degradability of crude protein and organic matter and meal frequency on rumen fermentation

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As a surplus of crude protein (CP) in dairy cow rations may have an adverse effect on dairy cow performance, a reduction in excessive N losses may be achieved by stabilizing fermentation in the rumen. Such improvements may be obtained by a balanced meal frequency schedule and by synchronization of degradable CP and organic matter (OM) in the rumen.

Four Holstein cows in midlactation with ruminal and abomasal cannulae were studied in a split 4 X 4 Latin square trial. Diets of 50 % concentrates contained (on a DM basis) 17 % CP, 1.7 Mcal NE, 29 % NDF and were offered in two or four meals, lasting 2 to 3 h. Diet degradability, varied in rumen degradability of OM (HDOM 58 vs LDOM 54 %), the difference stemming from the use of corn or steam-treated corn grains, and in rumen degradability of CP (HDCP 67 vs LDCP 60 %), the difference lying in the use of soybean meal or Soypass. The other ingredients, corn silage and vetch hay, were fed in equal amounts. Ruminal samples were taken every 1.5 h to assess the diurnal pattern of fermentation. Blood urea was sampled at 0, 2 and 4 h post-feeding. Abomasal OM and CP flow was assessed using Cr-mordant as a marker. Difference of effects were based on $P<0.05$ F ratio.

The ruminal acetate/propionate ratio was 3.5 in HDCP and 3.7 in LDCP. Rumen ammonia (means and coefficients of variation, CV) were 15.5 and 16.7 mg/dl in HDOM and LDOM ; and 17.4 and 14.9 mg/dl at HDCP and LDCP, respectively. Ammonia levels were 17.0 and 15.3 mg/dl at four and two meals per day, respectively. Ammonia CV was 60.8 and 52.7 % with LDCP and HDCP, respectively. With two or four meals per day, CVs of ammonia were 63.8 and 49.7 %, respectively. Blood N-urea was 18.4 and 21.5 mg/dl in HDOM and LDOM. Blood N-urea was 16.4 and 20.7 mg/dl before the meal at 2 and 4 meals per day. Under these treatments, blood N-urea was 22.2 and 18.3 mg/dl 2 h after meal, and 22.8 and 19 mg/dl 4 h after meals. Abomasal CP flows were 2.6 and 2.8 kg/d in HDCP and LDCP, and 2.9 and 2.5 kg/d in HDOM and LDOM, respectively.

It is concluded that rumen fermentation may be controlled by means of a balanced supply of OM and CP, or by meal frequency.