Ann Zootech (1996) 45, Suppl, 337

Effect of yeast culture, *Saccharomyces cerevisiae*, on ruminal fermentation during adaptation to high-concentrate feeding

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Changes occurring in the rumen after excessive intake of starch have been studied extensively, but little is known about the critical changes during stepwise adaptation from low to high concentrate diets. Under these unsteady ruminal conditions, the ruminal pH drops, lactic acid becomes an important intermediate metabolite in the fermentation pathway, and can accumulate rapidly (Mackie and Gilchrist, 1979, Appl Environ Microbiol, 38, 422-436). Moreover, Williams et al (1991, J Anim Sci, 69, 3016-3026) show the role of yeast, *Saccharomyces cerevisiae* (SC), on the stabilization of ruminal fermentation. The objective of this study was to provide additional informations on this effect of yeast during stepwise adaptation.

The effect of the addition of SC (10^7 CFU/ml of rumen contents) was studied with 4 ruminally fistulated wethers in a 2 x 2 Latin square design. All diets were fed twice daily at the level of 850 g dry matter. The initial diet contained 90% hay and 10% soya meal. At weekly intervals and during 5 weeks, increasing proportions of hay were replaced by ground barley until the final diet contained 70% barley, 20% hay and 10% soyameal. During the 5 adaptation weeks, ruminal liquid was collected using a suction pump 1 h before feeding, 1, 2, 3, 4, 6 and 8 h after feeding on 2 consecutive days of each week. Ruminal liquid pH was measured immediately after sampling, D- and L-lactic acids were determined enzymatically and volatile fatty acids (VFA) by gas liquid chromatography (Jouany, 1992, Sci Alim, 2, 131-144).

The pH decreased when the grain content in the diet increased, and reached the lowest values 3 h after feeding irrespective of the diet. The presence of SC increased significantly the mean ruminal pH (5.87 vs 5.53) on the 70% grain diet (70 diet). Lactic acid appeared in large proportions in the rumen only on 70 diet with a peak about 2 h after the meal of barley. Both D- and L-lactic acids were found, the D-isomer constituting from 50 to 90% of the total respectively on 0 and 70 diets. The presence of SC suppressed in an overall lower (0.397 vs 0.211 g/l) level of D-lactic acid with the 70 diet. Yeast prevented the peak in lactic acid, and reduced the variations between animals, high with this diet. The concentration of total VFA increased regularly with barley content in the diet, from 82.5 to 105.9 mM/l, and the molar proportion of acetic acid in the total VFA decreased (69.8 to 60.0%). The molar concentration of VFA in the rumen of animals given the forage diet tended to be higher in animals given SC (86.2 vs 82.5 mM/l) probably due to a beneficial effect of SC on cellulolysis. In contrast SC tended to cause a reduction in molar concentration of VFA in concentrate diets. This was attributed to decrease in VFA production or increase in absorption in relation to the pH decrease. On the other hand, the molar proportions of acetic, propionic and butyric acids in the total VFA were not modified in animals given SC compared with control animals.

During stepwise adaptation to a high concentrate diet, addition of yeast culture may stabilize the ruminal fermentations, and reduce the large variability between animals observed with these diets which induce unsteady conditions in the rumen.