Effects of Sodium Bicarbonate on Feed Intake and Acidosis in Cattle Fed High-Grain Diets

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The objectives of this study were to determine whether sodium bicarbonate (SB) could reduce the risk of acidosis in cattle receiving high concentrate diets and whether free choice or dietary supplemented SB was more effective. Two groups of ruminally cannulated cattle, previously adapted to a high concentrate diet, were each used in a 3x3 Latin square to study the effects of SB on daily feed intake, ruminal pH, and ruminal and blood characteristics. One group consisted of mature Jersey steers (n=3) and the second group of mature non-lactating Holstein cows (n=3). Steers and cows were provided ad libitum access to the control diet containing steam-rolled barley, barley silage, and a protein-mineral supplement at 80, 12 and 8% (DM basis), respectively. Treatments were control with no SB, control plus free choice SB mixture (free choice SB) and control supplemented with 0.7% SB (DM basis) (mix SB). The free choice SB mixture was offered as 30% dried molasses and 70% SB, based on a previous palatability trial. Periods consisted of 10 d adaptation and 4 d of measurements. Ruminal pH was continuously measured on d 11 to 13 using indwelling electrodes. Dry matter intake was recorded daily for each period and was not affected by treatment for group 1 ($P = 0.45$) or group 2 ($P = 0.86$). Group 1 DM intakes (mean ± SD) were 9.61 ± 4.09, 9.12 ± 2.86 and 8.36 ± 2.28 kg/d and group 2 DM intakes (mean ± SD) were 7.65 ± 1.77, 7.94 ± 1.76 and 7.99 ± 1.97 kg/d for control, free choice SB and mix SB, respectively. Variation in DMI was affected by treatment for group 1 ($P < 0.05$), but not for group 2 ($P = 0.75$). No treatment differences were detected for mean ruminal pH for group 1 ($P = 0.19$) or group 2 ($P = 0.97$). Ruminal pH (mean ± SD) for group 1 were 5.65 ± 0.28, 5.75 ± 0.32 and 5.91 ± 0.46 and for group 2 were 5.97 ± 0.27, 6.01 ± 0.17 and 5.99 ± 0.49 for control, free choice SB and mix SB, respectively. Ruminal pH variances for group 1 did not differ between treatments ($P = 0.15$), however, for group 2, differences were detected ($P < 0.05$). SB intakes for group 1 were (mean ± SD) 17.40 ± 23.45 and 57.77 ± 16.19 and for group 2 were (mean ± SD) 129.08 ± 88.58 g/d and 56.12 ± 13.25 g/d for free choice SB and mix SB, respectively. Significant differences in SB intakes were detected between cows in group 1 for free choice SB ($P < 0.05$) and mix SB ($P < 0.05$). Group 2 steers also had significant differences in SB intakes for free choice SB ($P < 0.05$) and mix SB ($P < 0.05$). The variation in intakes between the two SB treatments was not significant for group 1 ($P = 0.12$), but was for group 2 ($P < 0.05$). No treatment differences were detected for total volatile fatty acid concentrations for group 1 ($P = 0.46$) and group 2 ($P = 0.56$). For both groups, lactate concentrations for all treatments were not detectable (< 2 m*M*). Treatment had no affect on rumen fluid osmolality for group 1 ($P = 0.61$) or group 2 ($P = 0.25$). Blood chemistry, pH and gases (HCO_3, CO_2 and O_2) were not affected by treatment in both groups, however, trends were detected for blood packed cell volume (PCV) for group 2 ($P = 0.06$) and blood osmolality for group 1 ($P = 0.09$). Results suggest that although SB had no affect on overall rumen pH or DMI for both groups, SB offered free choice or mixed into the diet may be useful in reducing the variation in feed intake. Ruminal pH variation was greatest with mix SB, therefore, free choice SB may be more useful in maintaining a more stable rumen pH.