Patterns of Ruminal H_2S Generation in Feedlot Cattle

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Polioencephalomalacia (PEM) in ruminants has traditionally been attributed to a thiamin deficiency. Recent studies have demonstrated that PEM lesions may result from excess total sulfur intake and the resulting ruminal H_2S generation. The objectives of this trial were to examine the effect of varying water sulfate (SO_4) concentrations on the patterns and magnitudes of hydrogen sulfide (H_2S) generation and health of feedlot cattle. Three treatment levels of 125, 500 and 2000 mg/L SO_4 were used. Nine steers (324kg) were in each treatment group. All steers were sampled for rumen gas cap H_2S concentrations (RGC[H_2S]) 3 times a week for 70 days, then once a week for another 7 samplings. On day 29, whole blood samples were taken to evaluate thiamin status. During the final month of the trial, pulmonary arterial pressures were measured. Disease occurrence was monitored daily. The magnitude of ruminal H_2S generation increased with increasing water sulfate content (average RGC[H_2S]ppm; 125=136, 500=714, 2000=2113; p=0.0001). All intensively sampled treatment groups demonstrated episodic fluctuations in ruminal H_2S production. The largest peak of ruminal H_2S generation was from day 17 to 35. One animal in group 2000 developed clinical signs of PEM on day 17. There was no significant difference in total blood thiamin concentrations between groups 125 and 2000(p=0.98). Mean pulmonary arterial pressures (mPAPs) increased with increasing water sulfate levels (average mPAPs mmHg; 125=29.1, 500=33.7, 2000=38.1; p=0.001). Pathological ruminal H_2S levels are primarily a result of excess sulfur intake. Pathological ruminal H_2S levels are associated with PEM. The total blood thiamin concentration of group 2000 was not different from the other groups when measured during the period of highest H_2S production. This suggests that ruminal H_2S does not significantly affect the active form of thiamin. The increases in mean PAPs may be reflective of pulmonary damage due to increased inhaled H_2S.
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