

## Effect of Various Sulphate Salts on Water Consumption by Beef Cattle

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Water consumption in ruminants is closely linked to dry matter intake; therefore, reduced water intake can result in poor growth rates. In certain situations inadequate water intake can lead to dehydration, illness and death. In the southern interior region of British Columbia, sulphates are present in many of the water sources found on rangeland and negatively affect water intake by cattle. It has been shown that cattle consuming water containing high levels of sulphates may also suffer from associated metabolic disorders such as polioencephalomalacia. The objective of this work was to determine the water consumption by beef cattle when they were given access to water containing a range of concentrations of various sulphate salts.

Three experiments were conducted during June to August 2001 at the Agriculture and Agri-Food Canada Range Research Unit in Kamloops, BC. Yearling Angus heifers (300-400 kg), housed and fed in groups but watered individually, were used in all experiments. Water intake was recorded after each drinking event. In Exp. 1, animals were offered either tapwater (8 ppm SO<sub>4</sub>) or water containing 3000 ppm sulphate (SO<sub>4</sub>) as sodium sulphate (Na<sub>2</sub>SO<sub>4</sub>). The water treatments were available *ad libitum* during the first two weeks and restricted to twice daily access during the second two-week period. In Exp. 2, animals were watered twice daily with water containing sulphate salts as Na<sub>2</sub>SO<sub>4</sub>, MgSO<sub>4</sub>, or K<sub>2</sub>SO<sub>4</sub> at 3000 ppm SO<sub>4</sub>, plus a tapwater control (9 ppm SO<sub>4</sub>). Each treatment period lasted one week, for a total of four periods. Exp. 3 was conducted as a “taste test” in which animals were provided with water twice daily containing tapwater (11 ppm SO<sub>4</sub>), Na<sub>2</sub>SO<sub>4</sub> or MgSO<sub>4</sub> at 1500, 3200, or 4700 ppm SO<sub>4</sub>. Each test period lasted two days and was separated by two days of access to tapwater.

During Exp. 1 animals drank less ( $P < 0.005$ ) water ( $4.37 \pm 0.90$  kg/drink) when it contained Na<sub>2</sub>SO<sub>4</sub> compared to tapwater ( $9.00 \pm 0.83$  kg/drink) when given *ad libitum* access. When access to water was restricted to twice daily, average drink intake was  $21.88 \pm 2.15$  kg for tapwater and  $11.19 \pm 2.89$  kg for water containing Na<sub>2</sub>SO<sub>4</sub> ( $P < 0.01$ ). Average daily intake of tapwater was less ( $P < 0.05$ ) when water access was restricted to twice daily ( $44.26 \pm 4.13$  kg) compared to *ad libitum* access ( $55.42 \pm 5.62$  kg); however, average daily intake of the saline water was not different ( $P > 0.05$ ) for *ad libitum* ( $25.52 \pm 5.16$  kg) and restricted access ( $21.53 \pm 5.74$  kg). In Exp. 2, there were no differences ( $P > 0.05$ ) in water consumption, with intakes being 95.6 (Na<sub>2</sub>SO<sub>4</sub>), 93.3 (MgSO<sub>4</sub>), and 97.0% (K<sub>2</sub>SO<sub>4</sub>) of that for tapwater. In Exp. 3 there was a negative response to increasing SO<sub>4</sub> levels with MgSO<sub>4</sub> having a greater impact than Na<sub>2</sub>SO<sub>4</sub>, given equal SO<sub>4</sub> concentration. This was particularly evident at the highest SO<sub>4</sub> concentration (4700 ppm SO<sub>4</sub>), where the average intake of MgSO<sub>4</sub> treated water was 6.70 kg/drink compared to 15.38 kg/drink for Na<sub>2</sub>SO<sub>4</sub> ( $P < 0.05$ ). There was considerable variation in intake between animals, particularly at higher SO<sub>4</sub> concentrations.

Differences in consumption between Na<sub>2</sub>SO<sub>4</sub> and MgSO<sub>4</sub> are of particular interest to cattle producers because magnesium is the predominant cation in many ponds and dugouts. The presence of these different cations may affect water consumption and drinking behaviour of cattle kept on rangeland, impacting beef production. The wide range of tolerances for saline water suggests that some animals are much more sensitive to SO<sub>4</sub> contamination of water than others, and guidelines regarding maximum allowable limits of SO<sub>4</sub> in drinking water should be on the cautious side to account for these animals.