Effect of dietary concentration and source of trace minerals on serum mineral status, ruminal pH, and ruminal volatile fatty acids in lactating Holstein cows

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Inorganic sources of trace minerals are commonly supplemented in dairy cow diets, however there has been an increase in the supplementation of minerals complexed with organic compounds. These are thought to increase the bioavailability of trace minerals for use in rumen fermentation and for absorption in the small intestine but there is a paucity of information about this topic in the dairy cow. The objective of this study was to assess the effects of the dietary concentration and source of supplemental trace minerals on trace mineral status and rumen fermentation. Six lactating Holstein cows were utilized in a 6x6 Latin square design with a 28-day period (23-day adaptation and 5-day experimental). Cows were fed the same basal diet through the experiment, except for the source and level of supplemental trace minerals. Treatments included the supplementation of organic and inorganic trace minerals at 50%, 100% (Co 0.11, Cu 15.70, Mn 16.70, Se 0.30, Zn 63.00 ppm) and 200% based on the NRC recommendations. Basal diet and treatments were fed once daily. Feed intake was recorded daily and the basal diet was fed at 95% of the expected intake during the experimental period to reduce variation. Blood was collected daily two hours after feeding on days 1-5 and before feeding on days 4 and 5. Rumen fluid was collected on days 4 and 5 before feeding and 1, 2, 3, 4, 5, 6, 12 and 18 hours following feeding. Dry matter intake (kg; 18.1 ± 0.85), water intake (L; 76.8 ±7.09), milk production (kg; 24.3 ± 2.14) and blood serum concentrations of Cu, Se, and Zn (µg/ml; 1.0 ± 0.06, 0.11 ±0.003, 0.86 ±0.06) did not differ between treatments. Rumen pH (pH; 6.5 ± 0.64), and rumen fluid concentration of acetate (µmol/ml; 55.8±1.41) and butyrate (µmol/ml; 10.7 ±0.37) were not different between treatments. However, propionate was higher in the 50% and 100% organic treatments than the 100% inorganic and 200% organic treatments. These findings demonstrate that serum trace mineral status, ruminal pH and volatile fatty acids are not tightly controlled by the source of trace minerals when supplemented between 50-200% of the NRC recommendations. Absorption and retention of the source and level of these trace mineral levels needs to be investigated further.