Variability of Water Composition and Potential Impact on Animal Performance

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Introduction

Water is often overlooked as an important nutrient in livestock diets. Animals need a plentiful supply of good, clean water for normal rumen fermentation and metabolism, proper flow of feed through the digestive tract, nutrient absorption, maintaining normal blood volume and tissue requirements. In addition to assessing adequacy and cleanliness of waterers, as well as water supply, nutrition advisors and clinicians need to assess chemical composition of water. Despite the importance of water to livestock, limited research has examined the water composition variability and the impact on animal performance. This paper summarizes survey results of 3651 water samples collected throughout the United States of America.

Materials and Methods

Water analysis results were collected from various testing laboratories, nutrition consultants and feed manufacturers. Water source was not noted and was assumed to originate from ponds, water troughs, milking complexes and directly from well heads. Chemical analyses of water were summarized, categorized by geographic region and compared to desirable levels for livestock.

Results and Conclusions

Averages and range of chemical concentration in the 3651 water samples collected were as follows: Ca, 65 ppm, 0 – 590 ppm; Cl, 59 ppm, 0 – 727; Cu, 0.07 ppm, 0 – 11; Fe, 0.79 ppm, 0 – 123 ppm; Mg, 24 ppm, 0 – 682 ppm; Mn, 0.17 ppm, 0 – 12.7 ppm; K, 4 ppm, 0 – 33 ppm; Na, 46 ppm, 0 – 1556 ppm; SO_4, 81 ppm, 0 – 3595; and Zn, 0.12 ppm, 0 – 10 ppm. Fifteen to 30% of the samples collected exceeded desired levels for livestock for Ca, Na and sulfates. The average Fe and Mn content of samples exceeded the desired livestock levels, with greater than 40% of samples containing Fe and Mn concentrations above desired levels.

When predicting water intake, using the Murphy equation, less than 10% of Ca, Cu, Mg, Na, S and Zn dairy cattle intake would have been supplied by the average U S water sampled. The average water sampled would have minimal impact on dietary cation/anion difference (DCAD). In contrast, water can be a significant mineral source when one considers the amount contributed when the maximum mineral content is observed. For instance, U S water samples with the maximum observed Cu, Fe, Na and S content would contribute 257%, 284%, 163% and 275%, respectively, of that contributed by the diet and would reduce the dietary DCAD by 192.9 meq/kg DM.

Although water is considered one of the most important nutrients, there is limited data on water quality variability and its effect on animal performance. Survey results indicate that water quality can vary substantially and impact mineral intake of livestock. This variation could potentially affect animal performance.