How Water Quality and Source Affect Animal Performance

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Providing a continuous and adequate water supply is necessary for livestock survival, growth and reproductive performance. For beef cattle, water requirements have been established based on production phase and air temperature (Table 1).

Compared to other nutrients, little data is available on the effect of water quality and source on animal performance. Regardless of source, producers should make sure water is protected from contamination by chemicals, excess nutrients (from soil erosion or manure), and microorganisms (manure). Water quality guidelines for livestock are summarized in Table 2. This information was gathered from government agencies, research councils and extension publications.

Water Source

Producers often modify traditional watering sites such as stock ponds, dugouts and streams to provide cleaner water to grazing livestock. It is becoming more common to fence ponds to keep out livestock and install a drain pipe to carry water to a tank downstream. Restricting animal access prevents feces from being deposited directly into the water and prolongs the life of the pond by decreasing sediment agitation.

Such practices may provide cleaner drinking water, but research on the effects on animal performance is limited and inconclusive.

Researchers from Alberta, Canada (Willms et al., 1994, 1996) studied the performance of yearling cattle for 70 days in the summer. Performance was evaluated when animals were given fresh water, when drinking from a dugout, or drinking water from the same dugout that had been pumped to a trough.

In year one, animals that drank water from old dugouts gained 20 percent less than those that consumed fresh water. When the experiment was repeated the following year, researchers found no difference in animal performance.

A University of Missouri study (Crawford et al., 1997) evaluated yearling cattle that were given fresh water or pond water (from a pasture with cattle present) supplied in similar tanks. The study revealed no differences in water intake, growth performance or hair coat scores. Cattle did not show a preference for either water source.

Additional research from the University of Missouri (Crawford et al., 1997) evaluated cow-calf performance in a two-year study when animals were given fresh water or pond water (from a pasture with cattle present) supplied in similar tanks. Researchers reported no differences in water intake, cow and calf growth performance and hair coat scores, or on cow body condition score. During the first year, cattle that drank pond water consumed more than those that drank fresh

Table 1. Water requirements (gallons per day) for cattle based on production phase and temperature[a].

Air temperature	40°F	60°F	80°F
Growing cattle @ 800 lb	6.3	7.9	10.6
Finishing cattle @ 800 lb	7.3	9.1	12.3
Wintering pregnant cows	6.0	7.4	—
Lactating cows	11.4	14.5	17.9
Mature bulls @ 1600 lb	8.7	10.8	14.5

[a]National Research Council, 1996.

water, with no differences in year two.

Research from South Dakota State University (Patterson et al., 2003) indicated that growing steers given rural water (1,019 ppm total dissolved solids (TDS); 404 ppm sulfates) increased water consumption, dry matter feed intake, daily gain and feed efficiency. They also showed a decrease in morbidity, mortality, and polioencephalomalacia compared to steers that were given well water (4,835 ppm TDS; 3,087 ppm sulfates) or dam water (6,191 ppm TDS; 3,947 ppm sulfates). Researchers observed no differences between steers drinking well or dam water.

Patterson et al. (2004a) reported that water with 4,720 ppm TDS and 2,919 ppm sulfates reduced performance in growing steers. Water with 7,268 ppm TDS and 4,654 ppm sulfates reduced growth performance *and health* compared to steers that drank water with 1,226 ppm TDS and 441 ppm sulfates. Water intake decreased linearly with increased TDS and sulfates.

Patterson et al. (2004b) observed that sulfate levels in drinking water of 2,608 ppm for cow-calf pairs increased cow weight loss and body condition, but did not influence water intake, calf performance or reproduction compared to sulfate levels averaging 388 ppm.

Table 2. Acceptable water quality guidelines for livestock.

Item, ppm	Source 1[a]	Source 2[b]	Source 3[c]
Nitrate–Nitrogen, ppm	—	100	< 440
Nitrite–Nitrogen, ppm	20	10	< 33
Sulfate, ppm	300	500	< 300
Total Dissolved Solids, ppm	5,000	3,000	< 3,000
Fecal coliform, CFU/ml	—	100	—
Total bacteria, CFU/ml	—	1,000	—

[a]Mineral Tolerance Domestic Animals, NAS, 1980; Nutrients and toxic substances in water for livestock and poultry, NAS, 1974.
[b]Bergsrud and Linn, 1990.
[c]National Research Council, 1996.

Summary

Providing clean, fresh water to livestock is a best management practice that can improve stockmanship, performance and health.

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