

WATER QUALITY AND LIVESTOCK HEALTH

Is the water safe for my animals to drink?

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Every kind of livestock (e.g., cattle, sheep, horses, goats, llamas, alpacas, etc.) needs to drink clean, fresh water to remain healthy. In fact, water is the most essential nutrient for livestock health. Animals need water to help them regulate their body temperature, digest their food, lubricate their joints, grow muscle, and to carry out almost every other biological process.

Water quality may be impaired by contaminants, such as salts, excessive nutrients, or bacteria. Most contaminants will cause animals to drink less water, which, in turn, causes them to eat less and to be less healthy and productive. However, if livestock water (or food) contains a high amount of salt, animals may drink more water to try and flush out the excess sodium from their bodies. Testing labs can determine how much salt is in water by drying samples and weighing the salt left behind, which is called Total dissolved solids (TDS). TDS can easily be estimated in the field using a simple meter that measures specific conductance (SC). The

sidebar on page 16 has more information on using SC meters to estimate TDS and Table 1 lists the effects of increasing TDS concentrations in livestock drinking water.

Concentrations of TDS may change throughout the year. For example, data in Figure 1 were collected throughout the summer and fall of 2014 from three sources of water in southeastern Montana. Water samples were tested with an SC meter to estimate TDS about every two weeks by Elin Westover, Montana State University Extension agent in Fallon and Carter Counties. Based on these results, water source Number One would not provide suitable livestock drinking water during most of the summer and fall. The variability of the results throughout the summer and fall also illustrates the importance of testing water sources immediately before and during the time that livestock are using the water sources. An SC meter is a quick, easy tool that can be used to estimate TDS of the water source with immediate results.

TABLE 1. Recommended use of livestock drinking water that contains total dissolved solids (TDS).

TDS Content (ppm)	Recommendations
<1,000	Low levels, excellent source of water for livestock.
1,000 to 2,999	Satisfactory for all livestock; may cause mild diarrhea in livestock; no effect on health or performance.
3,000 to 4,999	Satisfactory for livestock; may cause temporary diarrhea; may be refused by livestock not accustomed to it.
5,000 to 6,999	Reasonably safe for livestock; avoid using with pregnant or lactating animals.
7,000 to 10,000	Not safe for pregnant or lactating cows, horses, and sheep; not safe for young animals or animals with increased heat stress or water loss; use should be avoided; older livestock may consume if under low stress.
>10,000	HIGH RISK; DO NOT USE UNDER ANY CONDITIONS

Water with high concentrations of TDS may also have high concentrations of sulfates or nitrates. High sulfate water tastes bitter and livestock may drink less water than they need to remain healthy. High sulfate concentrations in water can also lead to polioencephalomalacia (polio) in cattle, sheep, goats, llamas, and alpacas. Livestock owners should be especially aware of water sulfate concentrations when feeding high-sulfur feedstuffs, such as distillers grains or corn gluten feed. The combination of sulfates in the water and sulfates in the feed can be toxic to livestock.

High-sulfate water is also a concern when livestock, especially cattle, are consuming feeds that contain high concentrations of the trace mineral molybdenum. Molybdenum toxicity can occur when high sulfate levels

impair the animals' ability to use copper, which is needed to help cattle excrete excessive molybdenum. It may be necessary to supplement cattle with copper when they are drinking water high in sulfates and consuming feed high in molybdenum. Table 2 provides recommendations for safe sulfate levels in livestock drinking water.

Water with high nitrate concentrations can also be toxic to livestock. Nitrate from the water (and from the animal's food) is converted to nitrite within the animal's digestive system, which can be toxic by decreasing the oxygen-carrying capacity of hemoglobin in the animal's blood. Table 3 (following page) provides recommendations for livestock drinking water that contains nitrates. Livestock owners should especially be aware of water nitrate concentrations when feeding forages

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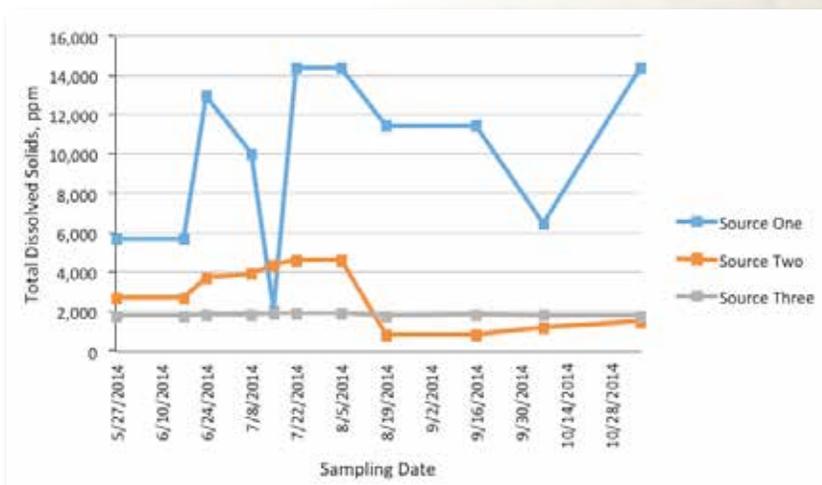


TABLE 2. Recommended use of livestock drinking water that contains sulfates.

Sulfate Content (ppm)	Recommendations
< 1500	No harmful effects. May be temporary refusal of water close to upper limits
1500 to 2500	No harmful effects. May have temporary diarrhea. May contribute significantly to total sulfur intake and cause a reduction in copper availability.
2500 to 3500	Laxative effects, diarrhea will usual disappear after a few weeks. May have sporadic cases of sulfur-associated polio. Can cause a significant reduction in copper availability.
3500 to 4500	Laxative effects. Do not use for pregnant or lactating ruminants or horses, or ruminants fed in confinement. Sporadic cases of sulfur-associated polio are likely. Significant reduction in copper availability.
> 4500	Do not use for livestock under any conditions.

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that contain high nitrate concentrations because total nitrite levels in an animal’s blood come from the forage and water combined.

Finally, bacteria are another common water contaminant that can depress livestock health. High bacteria concentrations in livestock drinking water can cause infertility, foot rot, and low milk production, while stagnant water that is contaminated with manure and other contaminants also can develop blue-green algae, which can be toxic to livestock. Safe levels of bacteria in livestock drinking water are provided in Table 4.

In summary, livestock owners must provide clean, fresh drinking water to their livestock in order to maintain livestock health and performance. Information gained from periodic water tests for TDS, sulfates, nitrates, and bacteria can help livestock owners to be good livestock stewards. Contact your local MSU county or reservation Extension office for names and addresses of water quality testing laboratories that may be available in your area. ■

TABLE 3. Recommended use of livestock drinking water that contains nitrates.

Nitrate Content (ppm)	Recommendations
< 100	Safe for livestock.
100 to 300	Water is safe for livestock. However, if hays, forages, or silages have high nitrate concentrations, water may contribute significantly to nitrate problem.
> 300	Water could cause nitrate toxicity in cattle, sheep, or horses. Do NOT use for livestock.

TABLE 4. Recommended use of livestock drinking water that contains bacteria

Bacteria	Bacteria Content (colonies/100 ml of water)	Recommendations
Total Bacteria	< 200	Excellent source of water for livestock.
	200 to 1,000	Satisfactory for livestock.
	> 1,000	Unsafe for livestock.
Fecal Coliform	< 1	Safe for young animals.
	1 to 10	Safe for older animals.
	> 10	Unsafe for livestock.
Fecal Streptococci	< 3	Safe for young animals.
	3 to 30	Safe for older animals.
	> 30	Unsafe for livestock.

SPECIFIC CONDUCTANCE METERS TO ESTIMATE SALT IN WATER

Pure water (H₂O) does not conduct electricity. It is the salt in the water that conducts electricity. This is very convenient because it means a person can use a very simple hand-held meter that costs approximately \$100 to instantly estimate the amount of salt in a water sample. Electrical conductivity is the measure of how readily a water sample will conduct electricity. It is also important to note that the temperature of water affects how much electricity it can conduct, with warmer water conducting more electricity. For this reason, in order to estimate the amount of salt in water, temperature has to be measured and a correction factor applied. Most all commercially available meters do this automatically and produce a Specific Conductance (SC) number. SC is a temperature corrected electrical conductivity number, which means it is directly related to the amount of salt in the water. SC meters are readily available from a number of online distributors. If purchasing an SC meter, it is a good idea to buy calibration solution to check the meter every month or so to make sure it is staying accurate.

- Adam Sigler

