

UNDERSTANDING YOUR WATER TEST REPORT

Water used by livestock will occasionally contain elements or substances at levels that may reduce performance or cause toxicity. The source of the contaminants may be natural or man-made. In either case, if you suspect your water supply is harming your livestock, the first step in diagnosing the problem is to collect a representative water sample and submit it to your County Extension office for a livestock water test.

What Do the TEST RESULTS MEAN?

The OSU Soil, Water and Forage Analytical Laboratory tests livestock water samples for pH, total soluble solids, electrical conductivity, nitrate-nitrogen, sulfate, and concentrations of major elements. A summary of major tests follow.

The **pH** reflects the acidity or alkalinity of the water. A pH of 7 is neutral. A pH value below 7 is acid, and a pH value above 7 is alkaline. It is preferred that the water has a pH between 6.0 and 8.5, but most animals can tolerate water slightly outside of this range (5.5-9).

Total dissolved solids (TDS) refer to salt particles that are dissolved in a water sample. Salt particles include the substances that form common table salt (sodium and chloride) as well as calcium, magnesium, potassium, sulfate, nitrate, and carbonate. When salts mix with water, they dissolve into ions that have positive and negative electrical charges. As the amount of dissolved salt increases, the number of charged ions increases, and the ability of the water to conduct electricity becomes greater. As a result, the amount of TDS in a water sample can be estimated by measuring **the electrical conductivity (EC)** of the sample. Table 1 presents guidelines for interpreting TDS test results and determining the associated livestock risks.

TABLE 1. GUIDELINES FOR INTERPRETING LIVESTOCK AND POULTRY WATER TEST RESULTS FOR TOTAL DISSOLVED SOLIDS.

| Total Dissolved Solids Content (ppm) | Interpretation |
|--------------------------------------|--|
| <1,000 | Considered low. Excellent for all classes of livestock and poultry. |
| 1,000-2,999 | Very satisfactory but may cause a mild temporary diarrhea in animals not accustomed to the water. |
| 3,000-4,999 | Satisfactory for livestock; poor water for poultry, especially turkeys. Water may be refused when first offered to animals or cause temporary diarrhea. |
| 5,000-6,999 | Marginal quality for livestock. Avoid these waters for pregnant or lactating animals. Not suitable for poultry. |
| 7,000-10,000 | Avoid use for all animals if possible. Considerable risk for pregnant or lactating animals. Older animals may be tolerant under less stressful conditions. |
| >10,000 | Unsafe. Avoid under all conditions. |

ppm=parts per million

National Research Council. 1974. Nutrients and Toxic Substances in Water for Livestock and Poultry. Washington D.C., National Academy of Sciences.

For more information on understanding your livestock and poultry water test, please consult your local OSU County Extension Office.

Nitrates are a salt that can be particularly harmful to livestock, and are therefore included in the livestock water test. Table 2 presents guidelines for interpreting nitrate-nitrogen test results and determining the associated livestock risks. In some cases, the nitrate content of feed and forage should also be considered when assessing the risk of nitrates in water.

Mineral concentrations are also important water quality parameters for poultry and livestock. The upper limits of tested and selected untested minerals are listed in Table 3. For more details of interpretations for livestock water quality, please use the online interactive program at <http://soiltesting.okstate.edu/water-test-interpretation-program>.

TABLE 2. GUIDELINES FOR INTERPRETING LIVESTOCK AND POULTRY WATER TEST RESULTS FOR NITRATE-NITROGEN.

| NO ₃ (ppm) | NO ₃ - N (ppm) | Comment |
|-----------------------|---------------------------|--|
| 0-44 | 0-10 | Safe for consumption by livestock and poultry. |
| 45-132 | 10-20 | Generally safe in balanced diets with low nitrate feeds. |
| 133-220 | 20-40 | Could be harmful if consumed over long periods. |
| 221-660 | 40-100 | Animals at risk. Potential death losses. |
| 661-800 | 100-200 | Unsafe. High potential for death losses. |

National Research Council. 2001. Nutrient Requirements of Dairy Cattle, 7th revised edition. Washington D.C., National Academy of Sciences.



COLLECTING A PROPER WATER SAMPLE

Use a clean 4 oz. plastic container to collect your water sample. Plastic bottles can be obtained from your County Extension office. Prior to filling the bottle, rinse it three times with the water to be tested. Try and leave as little air as possible in the bottle after collecting the sample. Make sure the sample is representative of the water being consumed by the livestock. If contamination of an isolated water supply is suspected, it is best to also collect and submit a water sample from a nearby supply that is known to be uncontaminated.

Just because a water sample passes the livestock water test does not mean it is safe for all livestock. Other elements or substances not tested for may be present at harmful levels. Recommended concentration limits for some potentially toxic substances not tested by the OSU laboratory are presented in Table 3. Pesticide contamination may also make water harmful to livestock. If you suspect a water supply is contaminated with potentially toxic substances or pesticides, another reputable laboratory should be consulted for testing your sample.

TABLE 3. Recommended Limits of Concentration of Some Potentially Toxic Substances in Drinking Water for Livestock and Poultry*

| Substance | Safe Upper Limit of Concentration (ppm) |
|------------|---|
| Arsenic | 0.2 |
| Barium | Not established [§] |
| Boron | 5 |
| Cadmium | 0.05 |
| Chloride | 600 |
| Chromium | 1.0 |
| Cobalt | 1.0 |
| Copper | 0.5 |
| Cyanide | Not established [§] |
| Fluoride | 2.0 |
| Iron | Not established [§] |
| Lead | 0.1 |
| Manganese | Not established [§] |
| Mercury | 0.010 |
| Molybdenum | Not established [§] |
| Nickel | 1.0 |
| Nitrate-N | 100 |
| Nitrite-N | 10.0 |
| Sodium | 1000 |
| Sulfate | 1000 |
| Vanadium | 0.1 |

*The concentration values in this table are generally far below the LD₅₀ intakes of the various elements. §No limit is given for a number of elements since experimental data available are not sufficient to make definite recommendations.

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