

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.

SOIL, WATER & FORAGE ANALYTICAL LABORATORY

Email: soiltesting@okstate.edu

Website: www.soiltesting.okstate.edu

Hailin Zhang, Ph.D.
Laboratory Director

Josh Payne, Ph.D.
State Poultry Specialist

"Oklahoma State University, in compliance with Title VI and VII of the Civil Rights Act of 1964, Executive Order 11246 as amended, and Title IX of the Education Amendments of 1972 (Higher Education Act), the Americans with Disabilities Act of 1990, and other federal and state laws and regulations, does not discriminate on the basis of race, color, national origin, genetic information, sex, age, sexual orientation, gender identity, religion, disability, or status as a veteran, in any of its policies, practices or procedures. This provision includes, but is not limited to admissions, employment, financial aid, and educational services. The Director of Equal Opportunity, 408 Whitehurst, OSU, Stillwater, OK 74078-1035; Phone 405-744-5371; email: eeo@okstate.edu has been designated to handle inquiries regarding non-discrimination policies; Director of Equal Opportunity. Any person (student, faculty, or staff) who believes that discriminatory practices have been engaged in based on gender may discuss his or her concerns. Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Director of Oklahoma Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President, Dean, and Director of the Division of Agricultural Sciences and Natural Resources and has been prepared and distributed at a cost of \$1.15. 516

Livestock and Poultry Drinking Water Quality: Understanding Your Water Test Report

L-256



Oklahoma Cooperative Extension Service

Division of Agricultural Sciences and Natural Resources