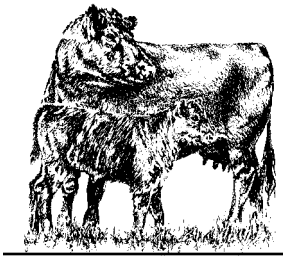

Western Beef Resource Committee *Fourth Edition*

Cattle Producer's Handbook

Animal Health Section 609

Analysis of Water Quality for Livestock

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Animals are able to ingest a wide variety of different types of water and survive. However, some salts and elements at high levels may reduce animal growth and production, or may cause illness and death.

The measures used to evaluate water quality include salinity, hardness, pH, sulfate, nitrate, and analysis for other specific elements known to be toxic. Waters can be evaluated for these characteristics at university or commercial laboratories. Microbiological agents (bacterial, viral, and protozoan) can be spread through water and cause disease. These are not usually evaluated in livestock waters, but samples could be submitted to an animal disease diagnostic laboratory for culture. Only certain laboratories are prepared to test for pesticides and organic toxins.

Salinity

Salinity refers to salts dissolved in water. The anions (negatively charged ions) commonly present include: carbonate, bicarbonate, sulfate, nitrate, chloride, phosphate, and fluoride. The cations (positively charged ions) include calcium, magnesium, sodium, and potassium.

Salinity may be measured as Total Dissolved Solids (TDS) or Total Soluble Salts (TSS), and is expressed as parts per million (ppm), which is equivalent to mg/l or ug/ml. Salinity may also be measured by electrical conductivity (EC), and is then expressed as reciprocal micro ohms per centimeter (umhos/cm) or decisiemens per meter (dS/m). There is a close correlation of EC and ppm with the values of ppm being about three-fifths of those for EC (@ 300 ppm, EC=500 umhos/cm and @ 3,000 ppm, EC=5,000 umhos/cm). The effects seem to be the same whether one or several salts are involved. The conversion factors are listed in Table 6.

An abrupt change from water of low salinity to water of high salinity may cause animals harm, while a gradual change would not. Animals can consume water of high salinity for a few days without harm, if they are then given water of low salinity. Animal tolerance also varies with species, age, water requirement, season of the year, and physiological condition.

As the TDS of water increases, intake also increases, except at very high content where the animals refuse to drink. Depressed water intake is accompanied by depressed feed intake.

The ions of magnesium (Mg), calcium (Ca), sodium (Na), and chloride (Cl) all contribute to the salinity of water, and they may cause toxic effects because of this salinity effect or by interference with other elements, but these are not usually considered toxic otherwise.

Salinity by itself tells nothing about which elements are present, but this may be of critical importance. So when the salinity is elevated, the water should be analyzed for the specific anions and cations.

Tables 1 and 2 give guidelines on potential uses of water of various salinity.

Hardness

Water containing appreciable amounts of calcium and magnesium are called "hard" because it is hard to make such water lather with soap. The free calcium and magnesium react with soap to form an insoluble curd-like material. If they are removed, the water will lather easily.

Water "hardness" is not necessarily correlated with salinity. Saline waters can be very soft if they contain low levels of calcium and magnesium (the cations that cause hardness). Calcium and magnesium are usually present at less than 1,000 ppm in water. The calcium carbonate content of waters of various hardness is classed as:

Water hardness	**mg/l**
Soft	0 to 60
Moderate	61 to 120
Hard	121 to 180
Very hard	more than 180

Hardness does not cause urinary calculi.