

Use Water Analysis Reports to Enhance Water Quality

Animals and their products are composed mostly of water. Inadequate water intake profoundly affects the animal and its performance. Water is used in the digestive process, nutrient transport, body temperature regulation and elimination of waste. Unsuitable water that doesn't meet minimum standards will reduce performance, retard growth, curtail egg production, reduce egg quality and cause illness and death in severe cases. Water quality may be the reason for some chronic production problems. Analyze your water supply semi-annually. Use the following information to help you evaluate and improve your farm's water quality.

Mineral Load – Conductance is the measure of total mineral load. It doesn't pose serious problems to animals but effects the water delivery system. Total Dissolved Solids (TDS) is another way of measuring mineral load or salinity where calcium (Ca), magnesium (Mg), sodium (Na) and chlorine (Cl) are the primary contributors. These natural chemicals, when out of balance and when in combination with other minerals, can amplify problems. A TDS of less than 1000 ppm is excellent and over 6000 ppm is unacceptable. As salinity increases, water consumption increases and moisture content of feces increases. Birds will adjust but production is effected like poor egg shells, wet litter, decreased growth and increased mortality.

pH (optimum 6.8 - 7.5) – pH is a measure of the acid or base condition of the water. When above or below the optimum pH of 6.8-7.5, things will start to happen. Acidic water gives poor solubility to vaccines leading to improper vaccine dosage. Acidic water (<6 pH) has a bitter taste which will lower the intake and, in turn, affects digestion and impairs broiler performance. Acidic water is corrosive to water system equipment and could increase mineral levels like copper. Basic water (>8 pH) has a bitter soda-like taste and allows for more bacterial growth. At a pH range of 6.8-8, bacteria responsible for nitrification work best at increasing ammonia nitrate and odor. pH is temperature dependent and cold well water may have a lower pH.

Bicarbonate, Carbonate & Alkalinity (max - 500 mg/l) – Alkalinity is a measure of the buffered condition of water. Bicarbonate and carbonate are the major contributors to water alkalinity along with phosphate ions. These negatively charged ions associated with Ca and Mg combine with other ions to form salts. Chickens have two taste sensors: salt and bitter. In nature, most poisons are associated with bitter or alkaloids. The natural response of the bird is to decrease water consumption with water that has a bitter taste associated with it. The bitter taste can be masked by using acidifiers like organic acids such as citric acid or acetic acid.

Phosphate (PO4) (max - .1ppm) – A high phosphate level means water is being contaminated from sewage, animal waste or excess inorganic fertilizers. Phosphoric acid can be added to a hard water supply to keep Ca and Mg deposits from clogging water supply pipes.

Sodium (Na) (max. - 50 ppm); Potassium (K) (max - 500 ppm) – Sodium has a diuretic affect above the normal level of 32 mg/liter and is detrimental to poultry when over 50 ppm. When water is high in Na, adjust diet Na to reflect this supply. When a water softener is used, adjust ration Na to reflect increased water content. K has the same effect as Na and the body uses both ions for acid-base balance in cells and nutrient transport across cell membranes.

Chlorine (Cl) (max - 250 mg/l) – Water at 14-50 ppm Cl will affect poultry metabolism and performance detrimentally when in combination with high sulfate. Cl by itself at >25 ppm will give water a salty taste and a brackish appearance.

Nitrate (NO3) (max - 10 ppm); Nitrites (NO2) (max - 1 mg/l) – Nitrate is a colorless, odorless compound produced in the final stages of organic matter decomposition and is found in runoff containing fertilizer, animal and industrial waste and crop residue. Nitrates leach into groundwater by percolating through the soil and move considerable distances in the ground. High nitrates in the presence of coliforms indicate a water contamination problem. Nitrates interfere with the oxygen carrying capacity of blood. Nitrates are harmful at >50 ppm and excess nitrate (>20 ppm) is known to affect weight gain, feed conversion and overall performance. Even nitrate levels of 3-20 ppm are suspected of interfering with the performance of young chicks. Nitrites form in the intermediate stages of organic material decomposition. A level of 1 mg/l is considered toxic. When nitrites are high and can't be eliminated, drill the well deeper or drill a new well. There should not be problems with properly constructed wells.

Sulfate (SO4) (max - 250 ppm) – A level of 125 mg/l is considered normal but birds can acclimatize to high levels. Excess sulfates have a laxative affect, a bitter taste leading to decreased water intake and emit an objectionable rotten egg type odor. Affects are accentuated when sulfates at 50 ppm are in combination with higher levels of Na, Mg and/or Cl.

Copper (Cu) (max - .06 mg/l) – Copper present at >1ppm will give water a bitter metallic taste. High levels damage livers in poultry and will interfere with Ca and P absorption resulting in poor growth and poor shell quality in layers. Cu causes green staining and corrosion of galvanized products. Acidic water's corrosive actions on Cu piping may account for some of the Cu in the water.

Iron (Fe) (max - .3 mg/l) – Iron poses no health risk to the bird, but can emit a bad odor and a bitter metallic taste. Fe is found in the ferric ion which is soluble in very acidic water; in ferric hydroxide which is insoluble in neutral or alkaline water; in ferric oxide as particles of rust in pipes; and in combination with organic compounds (iron bacteria). A sludge forms as iron in water, in the ferrous state, is drawn from the well. When it is exposed to air, oxygen enters the water as carbon dioxide escapes. The oxygen then oxidizes iron to ferric ions (insoluble). Ferric ions then combine with free hydroxyl ions (OH) to form insoluble gelatinous compounds (ferric hydroxide). This reddish-brown slime favors bacterial growth like pseudomonas and E. coli. The iron sludge that forms

will stain the water system and can be deposited in pumps and pressure tanks. When built up, it will clog filters, drinkers and fogger nozzles and restrict flow rates. With >.3 ppm, Fe sludge will form. Flush the water system weekly to get rid of build up. A chlorinator can be used for an oxidizing process where Fe and Mn combine with oxygen to form a solid precipitant. The water is then sent through a sand filter to remove these solids.

Manganese (Mn) (max - .05 ppm) – Mn is found in Fe bearing water and is closely related to Fe. Even at low levels (.2 mg/l) Mn gives water an objectionable bitter taste. Mn at >.05 ppm is responsible for the unsightly black deposits and stains on equipment which promotes leaking in components like valves.

Hardness (max - 110 mohm); Calcium (Ca) (max 500 ppm); Magnesium (Mg) (max - 125 mg/l) – This most prevalent water quality problem can cause stains, leave residues and cause physical problems with water holding equipment. Hardness affects water taste and thereby intake. Treating for hardness will increase chemical levels like Na. Hard water deposits plug pump impellers or jets, decrease water flow, plug drinkers (which require costly cleaning or replacement) and when valves are stuck open, wet manure and flooding will occur causing health and production problems. High levels of Ca are not detrimental and 35 mg/l is considered normal. Ca and Mg are responsible for water hardness. Heating hard water results in deposition of scale in pipes, water heaters and the water delivery system. High Mg (> 50 ppm) can have a laxative affect when in combination with high SO4 and/or Cl. The normal level is considered 14 mg/l.

Lead (Pb) (max - .02 mg/l), Zinc (Zn) (max - 1.5 mg/l) & Aluminum (Al) (max - .05 mg/l) – Heavy metals are toxic, causing liver and kidney damage. High zinc may cause a greasy film to form when boiling water. Like Cu, some of the Zn in the water system may originate from the plumbing system.

Bacterial Contamination (coliforms & Ecoli) (max - 0) – Tolerance for bacteria is zero (0) so if present, check the well, water equipment and distribution system for the source. High coliform counts means contamination from sewage treatment, poorly designed septic fields, animal waste, crop residue or industrial waste. Bacteria in water increases leg problems in young chicks, wet droppings, poor feed conversion and decreased body resistance to stress. Under stress, the gastric secretions may not inhibit pathogens and they colonize in the intestine. Coliforms in well water result from an opening in the well seal, improperly installed well casing, a well casing of insufficient depth, a well casing that is not sealed or a remote source unrelated to the well. Poor construction or maintenance leave a well unprotected from surface drainage, where pollutants flow down the inside or around the outside of the well casing. Protect the well with a sanitary seal or cover. Grout the space between the casings and bore hole with an impermeable material to a depth of 10+ feet or preferably to the water bearing formation. A tight 2 ft diameter concrete pad or curb sloping away from the casing helps prevent pollutants from entering the well.

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