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IS WATER QUALITY IMPORTANT FOR POULTRY USE?

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Water is of unequaled importance as a primary element in the metabolism of all animals. Water acts as a transport medium for all nutrients, helps in controlling digestive heat production, and aids in heat loss by evaporation. Water consumption is greatly influenced by age and size of bird, environmental temperature, type and amount of feed consumed, as well as several other factors.

The normal avian adult will consume 5.5 percent of its body weight in 24 hours while a growing bird will consume 18 to 20 percent of its body weight daily.

Drinking water for poultry can be obtained from wells, the city supply (human potable water), streams, rivers, lakes, ponds, rainfall catchments, and springs.

Water quality is characterized by its taste, acidity, alkalinity, odor, color, turbidity, salinity, electrical conductivity, pH, biochemical oxygen demand, hardness, presence of nitrites, nitrates, silicates, phosphates, carbonates, bicarbonates, cations, and microbial and industrial contaminants and toxicants.

Standards for human health frequently are applied to poultry because data are limited on the effects on poultry of various inorganic materials in the drinking water. We are more interested today in standards of toxicity that may decrease poultry production rather than from a mortality standpoint.

Some research from Tastybird Foods, Russellville, Ark. (now part of Tyson Foods), reported results of a long-term study that positively correlated certain water characteristics with broiler cost of production. Specifically, they correlated bacterial contamination, low pH, and high nitrate levels with poor performance on particular farms.

Dr. Dennis Murphy, a former researcher at the University of Maryland, has reported that 466 ppm in nitrate contamination of wells caused significant growth retardation in broilers. He also found changes in water consumption and hematocrit levels occurred when nitrate levels were between 29 and 117 ppm levels.

Shallow wells were found to be characteristically acidic and more apt to have nitrate contamination. He contended that the testing of wells for pH, nitrate, and bacterial contamination would be useful in improving water quality and performance.

Salinity

Water high in saline is less palatable than water with lower levels of these salts. Saline salts are composed of sodium, calcium, magnesium, and potassium. These salts are found in bicarbonate, chloride, or sulfate forms.

Salinity problems can vary with the season of the year. Elevated ammonium chloride and sodium bicarbonate levels are desirable and can be used to help offset the effects of high summertime ambient temperatures and maintain egg production in broiler and turkey breeders and egg layers.

At other times of the year, these salt levels are not seen as desirable. Since water consumption is increased during summer, a salt level that is non-toxic during other times of the year can easily become toxic because of the total quantity consumed.

Salt in excess produces loose droppings, whether the source is from feed or from water. The minimum daily dietary requirement of sodium is 0.115 percent for all ages of chickens (normal table salt contains 37 percent sodium).

Many feed ingredients contain some salt so that the amount added as strictly salt in a poultry ration is seldom more than 0.25 percent. If water contains 1,000 ppm salt, it is equivalent to 0.20 to 0.25 percent salt in the ration.

As the percentage of salt in the diet increases over the optimum, chickens will increase water consumption in order to dilute and excrete the excess salt. However, if the water supply is high in salt, an increase in water intake only aggravates the problem.

Poultry droppings become almost watery when the salt content in the water is more than 4,000 ppm. Chickens can tolerate about 1 percent salt in water and about 3.5 percent in feed, but when the weather is hot, birds will drink up to three times as much water, therefore 1 percent salt becomes excessive.

Young birds are more susceptible than older birds. One case study found that turkey poults suffered up to 50 percent mortality when the water contains 5,000 ppm salt (0.5 percent) and the diet also contained 0.5 percent salt.

Nitrates and Nitrites

Nitrates and nitrites are found in most waters. When found, they usually indicate contamination from animal and poultry wastes or certain fertilizers.

In some instances, nitrates can originate from some geological sources. The symptoms of nitrate-nitrite toxicity vary with age and kind of bird, level of nitrate or nitrite consumed, and ration composition.

Growing birds generally show unthriftiness, loss of appetite, depressed growth, incoordination, muscle tremors, labored breathing, and high mortality. Poultry seem to be more tolerant of high nitrate-nitrite levels than humans, with tolerance levels of 300 ppm for nitrates and 50 ppm for nitrites (45 ppm nitrate causes blue babies' syndrome, nitrate cyanosis, in infants).

One effect of high nitrate-nitrite level is decreased levels of Vitamin A and Beta-carotene in the livers that can affect health and growth.

Acidity

The taste preference of birds is different from that of humans. In a trial, chickens did not decrease their water intake so long as pH was between 2 and 10, but the water was rejected at pH 1 and pH 13. However, a pH of 6.3 or less may interfere with antibiotic uptake and therefore may be detrimental to performance.

Chlorinating water is commonly used for sanitation. The components that form the chlorine gas are more reactive in waters of low pH (acidic) than those of high pH (basic).

Iron

Many water supplies have a reddish-brown color due to the presence of iron which, when exposed to air, oxidizes and forms iron oxide.

It stains almost everything and may produce a slimy covering, clogging water valves and fountains.

Iron oxide is harmless to poultry, but the slime produced may harbor pathogenic microorganisms. Efforts to soften water or filter water can help eliminate the slime and iron, but care must be taken to prevent adding detrimental levels of salts by softening, or creating a site for bacterial concentration and growth by not changing filters on a regular basis.

Sulfur

When hydrogen sulfide gas is dissolved in water, the resulting product is often termed a "rotten egg" odor or taste to water. The common origin is the result of anaerobic bacterial action in the water table, producing hydrogen sulfide from organic matter containing sulfur.

Hydrogen sulfide itself has no detrimental effect on poultry. However, the fact that in most instances bacterial action is necessary for formation of this sulfur product means that an undesirable environment exists in your water system.

Chlorinating has been found to obliterate the sulfur taste and odor if added in the correct amount.

Microbial Contamination

We consider water "contaminated" if it contains any E. coli, Pseudomonas sp. or Staphylococcus sp. Pathogenic bacteria as well as viruses can gain entrance to the water supply as the water travels across or down through soil and rock.

Sudden periods of heavy rains or flooding may cause ordinarily weather-exposed waste material to be washed down into the water table. Many times disease-producing microorganisms, particularly coliform organisms, are an indication of fecal contamination.

Although all coliform organisms are not pathogenic, many possess this potential and their presence indicates that infectious bacteria and viruses might be present.

Poultry diseases possibly transmitted by the water supply include salmonellosis, coryza, infectious bronchitis, Newcastle disease, blackhead and erysipelas, to name a few. If the water is suspect, bacterial counts of fecal coliform and fecal streptococcal bacteria should be taken.

Bacteria and viruses may be destroyed by adding disinfectants and sanitizers to the water (chlorine). Sanitizers used routinely can also help control algae. The presence of these organisms can be greatly diminished if the water lines and fountains are flushed, drained, and disinfected with a water line cleanser between flocks.

Conclusion

The following levels are listed as guides for evaluating water quality.

Factor	Detrimental	Questionable	No Effect
Bacteria (coliform/liter)	>20	1-20	< 1
Sodium (ppm)	>100	<5, >10	6.0-8.5
Nitrates (ppm)	>300	50 - 300	< 25
Nitrites (ppm)	> 50	10 - 50	< 10
Iron (ppm)	> 6	3-6	< 2
Sulfates (ppm)	>1000	250 - 1000	< 250

<= less than; > = greater than.

In conclusion, water quality is important for poultry, however, much is not known about how different salts, high levels of nitrates, and nitrites, and high or low pH levels are detrimental and should be avoided.

Other water quality factors such as turbidity, hardness, electrical conductivity, oxygen demand, silicates, phosphates, and carbonates have not been correlated with poultry performance.