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Poultry Housing Tips

Do You Know Your Water Quality?

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In the above picture, which water sample is the worst? The question you have to ask is are you sure? The clear water sample could have compounds in the solution that we cannot see. When people think about nutrition, things like amino acids, carbohydrates, fat, and energy content come to mind. Nutritionists pay a great deal of attention to feed composition and quality. However, water is also a nutrient that deserves attention as well but for many years has been ignored. When so much attention is paid to ensuring that feed quality is optimized then it should also make sense to know what kind of water is being consumed. Not only does water serve an important nutritional and physiological role, but it is also important in maintaining an optimal house environment. In poultry production water is needed for bird consumption and evaporative cooling. As house construction and design has improved to give considerable control over the bird's environment, things that may not have been a significant problem before now have bigger impact on house environment and bird performance. People in food animal production would like to provide the best water possible to ensure that the birds perform well. However, not all water is of the same quality and may need to be treated to make it more suitable for bird performance and protect house equipment. The question is whether or not a return on investment in a water treatment system can be achieved and how quickly can the system pay for itself. In order to answer such questions, producers need to know what kind of water they have and what components make water acceptable or unacceptable.

Water Quality

Water quality is a difficult term to define. Water is a universal solvent and as such tends to have a lot of contaminants. Defining poultry drinking water quality attempts has been made several times but the main issue is that in many cases one contaminant such as iron (Fe), manganese (Mn) or nitrate (NO_3) by themselves may not be a problem in terms of bird digestion and nutrient utilization. On the other hand, several studies have indicated that elevated levels of two or more elements are what people should really worry about when bird performance is concerned. Table 1 lists recommended and maximum acceptable levels of contaminants commonly found in drinking water that may impact bird performance.

Factor	Maximum Level	Comments
pH	<6.5 or >8.0	Possible performance issues
Hardness	100 ppm	Reduces ability of soaps, disinfectants, and some water administered medications
Iron	0.3 ppm	Bacteria growth increases as iron level increases
Manganese	0.3 ppm	Deposits in drinking systems and may cause leaky valves
Dissolved Oxygen		A measure of possible water contaminants
Bicarbonate	500 ppm	No known effect
Calcium	500 ppm	Decreased livability
Magnesium	125 ppm	Laxative effect
Sodium	20 ppm	Loose droppings-consider level when formulating feeds
Potassium	20 ppm	None known
Salt	2,000 ppm	Water palatability problems, and/or defective egg shells
Sulfate	250 ppm	Laxative effect
Chloride	250 ppm	None known
Copper	0.5 ppm	Liver damage
Nitrate	20 ppm	Possible performance issues
Total aerobic bacteria (cfu/ml)	100	Low levels may be present without problems
Coliform Bacteria	50	Possible fecal contamination and/or disease exposure

Table 1. Suggested maximum levels of water components for the poultry flock and drinkers.

When looking at a water test report it is important to realize that these are guidelines and the concentrations on your water test may not immediately impact bird health and performance. For example, studies have shown that Fe alone in concentrations as high as 600 ppm did not have negative effects on broiler performance. Concentrations of Fe as high as 100 ppm have not shown negative effects on layer performance. Another issue with high mineral concentrations such as Fe is that some bacteria actually will thrive in these conditions. While some of the microorganisms found in drinking water can be harmful to bird performance (i.e., E. coli), others like Fe bacteria do not pose a health threat to the birds. While Fe bacteria do not cause disease, they can form a reddish-brown biofilm that can coat the inside of pipes, clog filters and contaminate pumps. Another issue with high minerals is that they can be oxidized to form small particulates that could cause the drinkers to leak and even clog filters. While these particulates would not have negative effects on bird performance, the wet floors due to leaky drinkers would result in increased ammonia and disease challenges.

Figure 1. Evaporative cooling pad with mineral build up (partially cleaned)

While minerals can be oxidized and the particulates that form can cause problems some contaminates affect other qualities of water. For example, calcium (Ca) is directly related to water hardness. The more Ca present, the harder the water. Hard water can have detrimental impacts on some cleaners and disinfectants. In addition, the Ca in the water can combine with other compounds such as sulfate (SO_4). If this particular combination occurs calcium sulfate is formed and can build up on surfaces such as filters and evaporative cool pads (Figure 1.). In a case such as this not only could the water hardness affect water additives, but it could also reduce the amount of cooling capable of being produced.

Another important water characteristic is pH. Water pH indicates the potential activity of hydrogen ions and is an indicator of acidity. A pH of 7.0 is neutral, lower pH values are acidic and higher ones are basic. It is generally accepted that slightly acidic water is desirable for poultry drinking water. Acidic water slows microbial growth, enhances the effectiveness of some cleaners, disinfectants and pesticides. A study conducted at the University of Arkansas found no differences in water pH levels as low as 3.0. People should be cautious of how low they make their water pH because it could have negative effects on the drinker system. Some drinker manufacturers may even consider the warranty voided if the water pH was reduced too much.

Future newsletters will discuss advantages and disadvantage of various water treatment options. In the meantime, water tests are a good investment. It is important to know what kind of water we are dealing with so that money is not wasted using a cleaner, sanitizer or even a medication whose efficiency may be neutralized if exposed to poor water quality. Discuss having the water tested with your broiler flock supervisor. Cooperative extension offices are also a good source of locating information on water testing. When considering having water tests conducted be sure to consider:

What results are wanted:
In most cases mineral analysis and bacterial analysis are separate tests and may require individual water samples. Know what results each test will provide to make sure you are testing for the things you want tested.

How and where the water sample is taken:
Decide whether you want to test the well water or the water in the poultry house. In many cases this will provide different results depending on how well the drinker system is maintained or if there is a water treatment system installed at the poultry houses.

Sample collection method:
When taking a sample make sure the container is clean. It is recommended that you rinse the container a couple of times with the water that is going to be tested. If collecting water for a bacterial test make sure the inside of the container does not touch any surfaces of the water faucet, water hose or drinker system. Make sure that no debris falls into the sample when collecting water. It is advised to let the water run for 3-5 minutes before taking the water sample.

Consider a second opinion:
There are many different ways to measure water quality. Some are simple and quick and some require more expensive equipment and take longer. When considering whether or not to install a water treatment system that may cost thousands of dollars, it is recommended that water be tested by methods that are accurate and repeatable.

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