

Poultry Water Line Sanitation

Many factors affect the health and performance of every poultry flock, but few, if any, are more important than water. A clean, safe water supply is a necessity if each flock is to perform at its best. Oftentimes, however, the water supply is the last thing we think about if we are having problems with growth rate, feed conversion, bird health, or egg production. This is somewhat understandable because much of the commercial poultry industry in the U.S. today uses totally enclosed drinker systems to reduce the risk of in-house contamination from bedding material, dust, dander, feathers, feed, feces, and litter. However, closed systems tend to **put the water supply out of sight and out of mind.**

In days past, regular cleaning of 8-foot troughs or other open-type water sources was a constant reminder of how dirty and contaminated the water supply could become in a short period of time inside the chicken house. Closed drinker systems have greatly improved the cleanliness of the water supply, and it's very likely that **no one misses washing open-type drinkers.** However, even though the water supply may be better protected in the chicken house today, it can still be contaminated with bacteria, fungi, minerals, and biofilms that thrive in a slow moving, nutrient-rich water supply.

Water sources are unique and dynamic

The **substances dissolved in water** are what make each water source unique. These substances can include phosphorus, sulfates, nitrates, sodium, chloride, iron, magnesium, manganese, calcium, and many others. They determine water's properties, such as taste, hardness, sedi-

ment content, and pH. Whether the water is safe or unsafe for poultry is determined by the types and amounts of the substances in the water. For example, 50 parts per million (ppm) is considered the average level for sodium in poultry drinking water, while 150 ppm is considered the maximum acceptable level. However, for iron, 0.2 ppm is considered average while only 0.3 ppm is considered the maximum acceptable level. Iron present at as little as 1 ppm can promote growth of harmful bacteria, such as *E. coli*, *Salmonella*, and *Pseudomonas*.

If you are having performance issues with your flocks and nothing seems to be working, consider having a mineral analysis, a bacterial analysis, or both conducted on your water source and find out what's in it. You can't fix a problem if you are unaware a problem exists. There are only so many factors that affect flock performance. If we manage those factors properly, the birds generally perform well. These are the factors that affect flock performance:

- Housing and equipment
- Feed and water (availability, quality, and quantity)
- Temperature
- Litter
- Ventilation (air quality)
- Lighting
- Biosecurity (disease control practices, rodent control program, visitors, etc.)

For the most part, we can see, smell, feel, or sense in some form whether these things are right or not...except for water. Closed nipple drinker systems mean **we no longer see the water**, but there are still ways to sense at least some of what is going on. For example, anyone that has grown birds for very long on a nipple



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drinker system can tell by the sound the nipple makes when a bird triggers it whether there is water coming out or whether that bird is pecking a dry pin. However, even though water may be available for the birds to drink, how many growers actually know what's in that water and what effect the water may be having on the birds? Minerals, bacteria, algae, yeasts, and fungi may all be present in the water supply without the grower's knowledge.

Minerals present at high levels in the water can be detrimental to flock performance. **Birds receive all the nutrients they need by eating a balanced diet.** Being overdosed with additional substances in the water supply can cause serious problems. For example, the feed has enough salt for the birds. If the water supply has high levels of sodium and chloride, the birds could easily consume too much total salt, which could lead to flushing, wet litter, increased ammonia levels, poor paw quality, and other problems. In addition, certain bacteria, algae, and fungi thrive off of particular minerals dissolved in water. Dissolved minerals in the water supply are often overlooked or unknown but can affect water quality and bird health and performance.

Water supplies are **dynamic and always changing.** They can be influenced by droughts, floods, septic systems, agriculture and industry within an area, well depth and site selection, and other factors. Season and usage level may also affect the water supply, along with the type of rock and soil the water passes through. There is probably no such thing as "pure" drinking water for poultry according to Environmental Protection Agency (EPA) standards. The EPA considers anything dissolved in water a contaminant, but not all contaminants are bad. Low levels of some contaminants may be fine in poultry drinking water and may have no impact on performance. However, higher contaminant levels could be a problem.

Also, combinations of certain contaminants, such as sodium and chloride (salt) or calcium and magnesium, can create problems. The combination of calcium and magnesium will work together to form scale, a hard, white, mineral build-up, on the insides of water lines. Over time, scale buildup can reduce the pipe volume and cause regulators and nipples to malfunction. If the pH of your water is above 7 and the water supply contains more than about 60 ppm of either or both these minerals, then scale buildup is likely.

You should also be aware of nitrates in the water. Nitrates can result in poor growth rate and poor feed conversion. They are generally an indication of fecal contamination.

Sulfur is also a common contaminant in water supplies. The rotten-egg smell often associated with sulfur is actually hydrogen sulfide, a byproduct of sulfur-loving bacteria present in water with high sulfur content. Presence of sulfur in the water will sometimes

turn the water filter black or cause a black residue on the filter canister or housing. Remember that manganese can also form a black residue; a water mineral analysis can tell you which mineral is present.

Acids, biofilms, and sanitizers

To remove scale buildup from the water lines, you'll need to use a strong, acidic cleaner that is safe for nipple drinkers and can drop the pH of the water to below 6. Be aware that some acids break scale buildup into chunks, which can clog the system and prevent nipple drinkers from working properly. Check with your drinker manufacturer and local poultry supply store for the best options, as there are several acid products that will work.

Also remember that acids are not sanitizers. Acids are only part of a larger, overall sanitation program; they are not the entire program. For example, if you suspect a **biofilm problem**, you'll need to run a good sanitizing cleaner that can dissolve the biofilm before you use the acid. The acid will not be able to cut through the biofilm and, therefore, will be unable to remove any scale buildup that may exist.

Biofilm is a difficult problem to address. A biofilm is a complex community of bacteria, fungi, and algae encased in an extracellular polysaccharide and other organic contaminants attached to a surface. In other words, biofilm is slime. Biofilm is a breeding ground where microorganisms can easily multiply. The biofilm then protects the microorganisms from antibacterial agents. Biofilm development is rapid in slow-flowing water systems where adequate nutrients are present, such as nipple drinker systems in poultry houses. Scale, sediment, and algae attached to the inside of drinker lines can make the problem worse. In addition, poultry growers often run additives in poultry drinking water that **help promote the growth of a biofilm** in the water lines. These additives include flavored gelatin mixes, powdered drink mixes, vitamins, electrolytes, sugar water, stabilizers, antibiotics, and others.

These additives are a food source for the biofilm. This food supply promotes microbial growth that can decrease effectiveness of medications and vaccines dispensed through the drinker lines and result in poor feed conversion and increased mortality, carcass downgrades, and condemnations. Once established, a biofilm makes the water system much more difficult to clean and keep clean. Even when the biofilm is removed, it can return in as little as two to three days. Follow these rules to help keep the biofilm away:

- Clean the drinker system thoroughly.
- Implement an adequate clean water program.
- Keep the water supply sanitized.
- If you run any additives that could feed biofilm through the medicator, flush the water system immediately afterward.

Water line sanitation

Household bleach is likely the most commonly used water sanitizer on poultry farms. However, bleach must be used properly in order to sanitize the water supply. You must have the proper level of chlorine at the end of the water line farthest from the water source to ensure that bleach is doing its job. Many growers use some type of chlorine test kit to measure parts per million (ppm) of chlorine at the end of the line. You should have **3 to 5 ppm of free chlorine** at the end of the line for your sanitation program to be effective. More than 5 ppm may be too strong and could back the birds off water and possibly damage the drinker system. Less than 3 ppm chlorine is likely too weak and will prove ineffective against organisms in the water supply.

To be most effective, chlorine must have time to dissolve and produce hypochlorous acid. Hypochlorous acid sanitizes 80 times better than the hypochlorite ion does. Free chlorine is not considered effective unless it is 85 percent hypochlorous acid. Contact time is important; chlorine needs time to work. During periods of high water demand, contact time may be minimal, which could reduce chlorine's effectiveness.

Growers have several **alternatives to bleach** that are also very good sanitizing agents. Some of the best appear to be the concentrated, stabilized hydrogen peroxide products. The stabilizer prevents the hydrogen peroxide from converting to water and oxygen before its work is finished; thus, it lasts longer and stays stronger in stock solutions. Stabilized hydrogen peroxide works well on biofilms because it is a very good oxidizer and can hydrolyze (or break down) the biofilm. In addition, it is non-corrosive to the drinker system and quite effective on bacteria, fungi, and viruses. It can break down algae thoroughly enough to allow it to pass through nipple drinkers without causing the nipple to clog or stick.

However, in general, the stabilized hydrogen peroxide products are not as user-friendly as some less effective products and are somewhat harder to find. They are not available in most grocery stores. Your local poultry or animal health supply store is likely the only place that carries these products. Common brand names include Proxy-Clean, Siloxycide, HydroLine, and others.

Other alternatives include 35 percent hydrogen peroxide and chlorine dioxide.

There are several factors to keep in mind when considering a water line sanitation program, including these:

What is the source of the water?

- Is it a well? If so, how deep is it? What rock formations does it pass through?

- Is it surface water from a pond, lake, or stream? What is its algae content? Is it clean?
- Is it a rural or community water supply? How is it treated? What is its chlorine level?

Are there issues with health or performance of past flocks?

- Excess mortality
- Condemnations
- Poor feed conversions or weight gain
- Poor egg numbers

Is the mineral content of the water known?

- What's in it?
- At what level?

Are additives run through the drinker system?

- If so, are water lines flushed afterwards?

Don't overlook the pH of your water supply. In general, birds do not like to drink high pH water. High pH water tends to have a bitter taste that birds are able to recognize, and this may reduce consumption. **A reduction in water intake will mean a reduction in feed intake!** A pH above 8 will prevent most sanitizers from performing their best. A pH below 5 may affect intestinal health, create a bloom of algae or mold that thrives at low pH levels, and damage metal drinker system components. **A pH in the range of 6.2 to 6.8** appears to work well. If the pH of your water is above 7.0, lowering the pH may benefit overall flock performance.

Routine flushing is one of the simplest ways to help keep the water system clean. In addition to routine flushing, the system should also be flushed after any use of the medicator. Flushing helps wash away potential food sources for bacteria or other organisms. Be sure to flush long enough to completely purge the lines. A general rule of thumb is to **flush one minute for every 100 feet of water line**. If you have a 400-foot house with approximately 200-foot water lines in each half, then each line should be flushed for about two minutes. A 500-foot house with 250-foot water lines in each half would require a two-and-a-half- to three-minute flush per line. In general, when the birds are gone, a higher level of cleaning and sanitizing products should be run into the water lines with a medicator or injector pump. Sweep the lines with a broom to trigger all the nipples, and allow the product to sit in the lines for 24 to 72 hours. Then flush all the lines with fresh water and trigger the nipples once again.

Check with your service technician, drinker manufacturer, or your local poultry supply store concerning which products to use, at what concentrations, and how long to leave the solution in the lines to avoid damaging the drinker system. When birds are in the

house, follow a regular maintenance program. Be sure solutions are less concentrated than the mixture used between flocks. To protect the birds and yourself, always **follow label instructions** on the products you use. Some cleaning and sanitizing products are quite strong and can be dangerous if mishandled. Use protective gear, such as gloves, footwear, goggles, and respirators, as instructed on the label. Keep a Material Safety Data Sheet (MSDS) handy for products that you use.

Summary

Clean, safe drinking water for your birds does not happen simply by chance. It takes work on your part. We understand less about water than any other factor associated with raising poultry flocks. However, water has one of the most significant impacts on flock health

and performance. If your flocks are experiencing health or performance issues and nothing you try seems to help, the problem may be in your water. Collect a water sample and have it analyzed. If necessary, the Extension Service can assist you with water sample collection and interpretation of the analysis. Learn what minerals and microorganisms are in your water supply and what course of action to follow as a response. Consider maintaining a continual cleaning and sanitation program to control biofilm buildup when birds are in the house. Use a stronger, more aggressive cleaning and sanitation program between flocks for optimum results. Strive for a pH in the range of 6.2 to 6.8. Never underestimate the importance of a clean, safe water supply to the health and performance of your flocks.

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By **Dr. Tom Tabler**, Extension Professor, Department of Poultry Science; **Dr. Morgan Farnell**, Associate Professor, Department of Poultry Science; and **Jessica Wells**, Extension Instructor, Department of Poultry Science.

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Publication 2839

Extension Service of Mississippi State University, cooperating with U.S. Department of Agriculture. Published in furtherance of Acts of Congress, May 8 and June 30, 1914. DR. GARY JACKSON, Director
(POD 06/14)



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