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Dale Bumpers College of Agricultural, Food, and Life Sciences (University of Arkansas, Fayetteville). Center of Excellence for Poultry Science

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Clean Water Lines for Flock Health

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Clean, safe and sanitized water is crucial in assuring flocks perform their best. Before implementing a daily water sanitation program, it is important to thoroughly clean the water distribution system.

Line cleaning is necessary because low levels of sanitizer placed in dirty water lines can result in biofilm sloughing causing clogging of the drinkers.

Another impact of adding sanitizers is a reaction with the biofilm resulting in an off taste to the water thus causing birds to "back off" of the water.

Effectively cleaning the water system (including the drinker lines) helps remove biofilm and scale build-up that can act as a food source and hiding place for harmful pathogens such as *E. coli*, *Pseudomonas* or even *Salmonella*.

In fact, some bacterial pathogens, such as, *Salmonella* can live for weeks in water line biofilm resulting in a continuous source of contamination.

In addition, proper line cleaning can help with prevention of calcium scale deposits which can reduce pipe volume as much as 70-80%.

The use of cleaning products present some dangers since, many of the popular water additive products such as acids and performance enhancers can create conditions favorable for the growth of yeasts and molds, if they are present. Yeasts and molds can actually thrive in low pH water resulting in a gooey slime that will clog drinkers and generally create disaster in water systems. The bottom line is water systems must be properly cleaned between flocks.

Getting Started:

The first step to assure proper cleanliness of water lines is to answer the following questions:

1. What is the water source?

Untreated well water is the most vulnerable for formation of slime or biofilm in the drinker lines. Most municipal or rural water supplies contain a minimum of 0.2 ppm free chlorine which greatly reduces bacteria growth.

2. What is the mineral content of the water supply?

The minerals calcium and magnesium are the sources of a hard white build-up called scale. Water in a system that contains more than 60 ppm of either or both these minerals and a pH above 7 has an increased possibility



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for scale buildup in the system. This scale needs to be removed with an acid cleaner designed for nipple drinker systems. Other common mineral contaminants are iron, manganese and sulfur. Iron results in a rusty brown to red colored residue, while manganese and sulfur can form black colored residues. If the water smells like rotten eggs, then the culprit is not sulfur but hydrogen sulfide (a by-product of sulfur loving bacteria and the lines will need to be cleaned with a strong sanitizer). If the filters at the beginning of the water lines are rusty or black colored, then a strong acid cleaner should be used after the sanitizer flush.

3. What products have been used in the water system?

If additives such as vitamins, electrolytes, sugar based products, mineral based performance enhancers or weak concentrations of water acidifiers have been used frequently, quite possibly a biofilm is present. Once a biofilm is established in a water system, it is 10-1000 times harder to clean. It is important to play it safe and use strong sanitizer cleaners.

4. Have there been health issues flock after flock such as *E. coli*, necrotic enteritis or respiratory challenges that do not respond to good management, clean-out or down-time?

The culprit for these problems may be hiding and thriving in the water supply, especially water regulators and drinker lines. Cleaning with a strong sanitizer is definitely an option that might help.

Choosing a Product

After identifying the type of cleaning that will be most beneficial, the next step is to choose a product that will not damage the equipment. Currently there are several acid products that can be used for scale removal. Check with your local animal health product supplier for options. Just remember that in order for the product to be effective in removing scale, it needs to drop the water pH below 5 but should not drop the pH below 4 to prevent equipment damage.

While a strong bleach solution might be effective in removing biofilm, the potential damage it can do to the regulators and nipple drinkers makes this a poor option; the same is true for many cleaners that might otherwise be good poultry barn disinfectants. Iodine is not very effective against biofilms so it is a poor choice. Currently there are several sanitizer products

available for cleaning drinker systems, but some of the most effective products which are not damaging to the drinker systems are the concentrated, stabilized hydrogen peroxides. The active ingredients in these products are different from over-the-counter hydrogen peroxide because the stabilizer keeps the sanitizer from converting to water and oxygen before it finishes the cleaning job. There are also several chlorine dioxide products available, but they are most effective if an acidifier is present which may require dual injectors or a way to safely mix the products prior to injection. A third product used by the industry is household ammonia. A quick test on algae showed that one ounce of ammonia per gallon of water was as effective as a 3% ammonia solution. However it is strongly recommended that the equipment manufacturer be consulted before use.

The most important fact to remember is biofilms or established growth of bacteria, molds and fungus in water systems can only be removed with cleaners that contain sanitizers. It also should be a product and concentration that will not damage the equipment. Pay close attention to any product safety recommendations and follow them accordingly.

Cleaning the system

After the birds are removed from the house, clean the system. First flush the lines with water. Use a high pressure flush if available. This will remove any loose sediment from the lines. Make sure the standpipes are working properly to assure any air build-up that may occur during the cleaning process will be released from the lines.

Next, determine how the cleaner will be injected. If a medicator is used, it may not provide the concentration of cleaner necessary, therefore use the strongest product available to overcome the dilute injection rate of the

medicator. A very effective alternative is mixing the cleaner in a 55 gallon barrel and then using a small submersible pump (1/12th horse power) to pump the product either into individual lines or through the water tap where the medicator attaches to the water line. A third option is pumping the cleaner from the well room through a variable injection pump which will pump solutions stronger than a 1:128 rate. This is a good idea because it cleans the water lines going to the poultry house, a possible source of contaminants. However, if the distribution lines are very dirty then the dirt in them will be sent into the poultry house water lines and therefore will require extra flushing of the lines. Use this option only if there is a faucet in the poultry barn that can be used to flush the water lines before water reaches the nipple drinker lines. In a 400 foot poultry house it takes approximately 7 gallons of water per line. So eight 180 foot lines will require approximately 56 gallons of prepared cleaning solution. Once the drinker lines are filled with the cleaning solution, let it stand as long as possible with 72 hours being ideal. Use a broom to sweep the nipple drinkers in order to get the cleaning product down into the drinkers. However check with the product manufacturer to assure this will not damage the equipment. After the lines are cleaned, if mineral build-up is an issue, then re-flush the lines with the acid cleaner.

Keeping the System Clean

Cleaning the water lines between flocks is only half the battle. Even with a thorough cleaning, if a significant number of bacteria, fungi or yeasts are still present, then the biofilm has the potential to return completely in 2-3 days. Therefore the last step is to establish a daily water sanitation program. This will benefit both the birds and the water system.

Quick Guide to Cleaning Water Lines and Starting Chicks

1. After birds are gone, flush all water lines with plain water to loosen biofilm and remove any sediment. Make sure standpipes and drain hoses are working. Use safety glasses and plastic/rubber gloves.
2. Utilize the Qwik Blend Pump (attaches where Medicator connects to water line) to inject a 3% solution of ProxyClean, HydroClean, Siloxicide, CID 2000 or Sanidate.
 - a. Determine amount of product to use:
 - b. The Qwik Blend adds 4 oz to each gallon of water so 1 gallon of product treats 32 gallons.
 - c. Every 100 feet of water line holds ~ 2.5 gallons of water
3. Flush product into each line
4. Activate nipple drinkers with a broom or by hand (wear gloves)
5. Leave in lines:
 - a. Proxyclean, HydroClean or Siloxicide- 24 hours minimum; 48 to 72 hours is even better.
 - b. CID 2000 or Sanidate- 4-8 hours
6. Flush cleaner from lines with water that contains a sanitizer level birds can drink
 - a. Proxyclean-2-4 ounces/gallon-this is stock solution then administer with medicator at a rate of 1 ounce per gallon of water (1:128); Use the higher rate for dirty water, lower rate for cleaner water
7. For farms with hard water (more than 110 ppm combined calcium and magnesium)
 - a. Skip step 6 and do the following:
 - Fill lines with a solution of citric acid or other low pH product approved for use with water lines and let stand in lines for 24 hours.
 - Acid stock solution: Mix 4-6 packs of citric acid per gallon of water to make a stock solution (The more scale in water the more acid should be added to the stock solution). The final pH of the water should be less than 6 with 5 pH ideal for scale removal. Mineral Clean or Proxor are excellent descaler products as well.
1. Final flush before new flock arrives. (Water birds will start on)
 - a. Prepare one of following stock solutions. Add with medicator or peristaltic pump at rate of 1:128
 - Bleach stock solution: 4-6 ounces bleach in a gallon of water
 - Goal: 2-4 ppm of free chlorine in the drinking water
 - Hydrogen peroxide stock solution: 2-3 ounces of product in a gallon of water
 - Goal: 25-75 ppm of H₂O₂ in the drinking water
2. Maintain water sanitation for at least first 7-14 days
 - a. If starting birds on chlorine, flush water lines once a day.
 - b. If starting birds on stabilized hydrogen peroxide solution (Proxyclean, CID, Sanidate), sanitizer should remain effective in water lines for up to 5 days but flushing in fresh product every 2-3 days could still be beneficial.

DO NOT ADD CHLORINE WHEN ADMINISTERING VACCINES, MEDICATIONS, VITAMINS OR COPPER SULFATE, DO NOT MIX CHLORINE AND OTHER PRODUCTS IN THE SAME STOCK SOLUTION