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Identify Poultry Water System Contamination Challenges

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Introduction

Optimizing growth rate and feed utilization go hand in hand with reducing stressors in the grow-out environment of poultry production facilities. Water systems are often overlooked as a stressor, but even enclosed systems can be heavily contaminated with microbial challenges that create health issues which impact growth and feed conversion.

Water systems are the perfect host for many types of bacteria, protozoa, viruses and fungi since water serves as an ideal home for many microorganisms. Poultry-barn drinker systems have slow-flowing water that is warmed during brooding, making water supplies more conducive for bacterial and fungal growth. The use of water additives such as electrolytes, vitamins and organic acids provides nutrients that feed the growth. Once microbes attach to pipe walls, they create biofilms which trap and store nutrients as well as create a protective environment. Since birds drink twice as much water as they consume feed, it is almost a given that birds will be negatively impacted should the water system contain unhealthy contamination, and it is not easy to predict when contamination will release from a biofilm and impact the birds.

Providing young chicks with the best possible source of water is essential to help assure that they have an excellent start in life.

Even turkeys near market age require a clean, safe water supply. While most finisher-barn turkey drinkers are not a completely closed water supply, it is still possible to minimize contamination with a good water sanitation program.

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Traditionally, water evaluations included recommendations to collect a water sample in a sterile container at the end of the water line to establish a baseline evaluation of how much, if any, bacteria were present. Yet now we know bacteria and other organisms build a biofilm in water systems which can protect the bacteria and give pathogens a hiding place, even when sanitizers such as chlorine are present in the water at levels okay for the birds to drink.

A water sample taken from the end of a water line or from a well may not accurately reflect the contamination load. A much better way to determine if microbes exist in drinking water lines in a poultry barn is to swab the inside of the line and compare to a water sample (drip sample) from the end of the line. Comparing the two samples gives producers and production personnel a better understanding of how much biofilm may be present, which helps in the development of a plan for effectively cleaning and eliminating contamination from the system. Results from several years of comparing water lines before and after they were properly cleaned on production-challenged farms clearly indicate that, when water lines are properly cleaned to remove any microbial contamination and then kept clean with a daily water sanitation program, the performance of flocks grown on the farm is almost always improved. Taking swab samples from water lines before and after cleaning the lines is also an excellent tool for determining effectiveness of line-cleaning products.

Making Swabs

Swabs can be easily made, or pre-made kits are available. Make the swabs by putting a one-inch dry cellulose sponge into a 50 ml vial that contains 25 ml of Butterfield's Phosphate Diluent (BPD). This acts as a neutralizer for any water sanitizers present, and it also preserves the microorganisms until the samples can be submitted to a microbiology lab. The sponges/swabs and solution should be sterilized, preferably with an autoclave to assure no contamination. Each swab is to be used for one individual sample. Swab kits can also be obtained from the Watkins lab at the Poultry Science Center of Excellence. Contact the lab at 479-575-8428.

Sampling Procedure

As a starting point, test a minimum of one line per barn and two barns per farm. Do not resample the same line if evaluating pre- and post-water sanitation procedures, because once a line has been swiped with a sponge, whatever is present has been physically removed and will most likely be lower with or without cleaning.

1. Shut the water off to the water line being tested.

2. Remove the cap from the end of the water line or detach the drain hose from the end of the line and allow excess water to drain out so the sponge will be absorbing biofilm and not just water. If a valve cap is present, remove it. Do not sample through the valve cap as it will not be a representative sample. Sample as close as possible to the standpipe.

3. Wipe off the outside threads of the water line with 91% alcohol in case your sponge brushes against them when you swab.

4. Wipe down a pair of extra-long tweezers (these need to be 6 to 8 inches long) with alcohol or dip in alcohol. Use a flame starter to burn off alcohol and sterilize tweezers.

Cleaning the tweezers.

5. Remove the cap of the swab vial while being extremely cautious not to touch the edge of the vial or the inside of the cap against anything.

6. Put the sterilized tweezers into the vial and grasp the sponge. Push the sponge against the inside of the vial and turn to squeeze out the excess moisture.

Removing the sponge.

7. Remove the sponge from the vial and insert into the end of the open pipe, being extremely careful not to touch anything as the sponge enters the pipe.

Inserting the sponge.

8. Insert the sponge at least 4 inches into the pipe, twisting it as you go in and back out.

Taking the sample.

Swabbing water lines can be done for any type of line, but just make sure to remove any parts that will prevent you from getting the sponge into the true water line.

9. Replace the sponge into the BPD or sterile water in the 50 ml vial and tightly close the cap to prevent leakage. Vigorously shake the vial to release an even number of bacteria from the sponge into the BPD solution. Carefully label the sample with a waterproof marker and then store the sample at refrigeration temperature (40°-45°F), even in transport until the sample arrives at the lab. For best results, samples should be submitted to the lab within 24 to 48 hours.

Repeat this procedure for each testing site, being sure to sterilize the tweezers before using them for each sponge.

10. Once the sample is back in the lab, it is vigorously shaken to evenly distribute the bacteria. A 1 ml sample is pulled from the sample to plate onto the desired media, for example:

    - 3M's Aerobic Plate Count, incubated for 48 hrs at 30°C.
    - 3M's E. Coli/Coliform, incubated for 24 hrs at 30°C.
    - 3M's Yeast and Mold Films, incubated for 3 to 5 days at room temperature.

11. Serial dilutions and subsequent plating of those dilutions are performed as well, depending on the expectant load of bacteria (i.e., unsanitized

pipe samples would dilute out to, say, the fourth or fifth dilution while sanitized samples may only dilute out to the second or third dilution).

According to the guidelines of the company (3M) that makes the product on which the water will be incubated, the bacteria that will appear on the petrifilm are actually more than single bacteria. They are whole colonies of bacteria and are counted as colony-forming units per milliliter (CFU/ml).

Normally the sponge that was used to swab the inside of the water line is not tested for bacteria growth, but it could be done.

Interpretation of Results

Results are shown as CFU/ml or colony-forming units of Total or Aerobic Plate Count bacteria per milliliter. This can also be listed as APC or TPC. APC includes all bacteria which require oxygen for survival and does not differentiate between pathogenic and non-pathogenic bacteria. While 10,000 or more APC CFU/ml does not mean the bacteria are harmful, it does indicate that the water line contains contamination. Samples have been reported ranging from 0 to 20 million CFU/ml for both swab and drip samples. Desirable results are counts of 0-100 CFU/ml. Results in the range of 1,000-10,000 CFU/ml indicate that a marginal level of contamination is present. If results are greater than 100,000 CFU/ml, the water system would benefit from a thorough cleaning.

While at this time there is no firmly established link between water line contamination and farm performance, there is a trend that farms with consistent poor performance do tend to have higher microbial levels in water systems. And there is a trend that farm performance improves after thorough and effective water line cleaning, provided management and environment are also optimal. When drinking water lines within the barns are heavily contaminated, it is important to note that underground lines can also serve as a source of recontamination, and it is recommended that they should also be cleaned.

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