Improve performance – just add water

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Algae, bacteria, rust, and other contaminants can build up on the inner surfaces of poultry house water lines over time. Although flushing water lines between flocks is recommended, flushing cannot always remove the slime layer or bio-film of bacteria or algae. Therefore, more poultry growers are incorporating some form of organic acids to their water system flushing procedures. In addition to suppress bio-film formation in the water lines, this procedure will reduce harmful bacteria, improve animal performance as well as food safety.

From feed formulation to delivery, great attention has been paid to the feed your bird receives. Poultry nutritionists have fine tuned their feed formulations based on years of research and how this research performs in the field. Hence today's rations contain nutrients in amounts and proportions that support optimum bird performance. Feed manufacturers place great importance on feed and pellet quality while ingredient purchasers set strict standards to assure consistent ingredients are purchased every time. Poultry producers maintain secure storage facilities to protect the quality of the feed delivered to their birds. Although feed quality has received much attention, the quality of the water that birds drink is often overlooked.

Substandard water quality – water contaminated with microorganisms, algae, dust, and rust – is relatively common and can have a profound adverse impact on poultry performance. In some aspects, water quality can have a greater negative effect on bird performance than feed quality because it is a well known fact that birds consume more water than they consume feed.

According to several studies, more than 40% of privately owned individual drinking water supplies – typically found on US poultry farms – are contaminated with coliform bacteria. In some regions of the world, more than 70% of the water supplies are contaminated with coliform bacteria. The micro-organisms can enter a water supply from a variety of sources including sewage, animal wastes, or dead animals.

Although some of the micro-organisms found in the drinking water can be potentially harmful, others are not. For example, iron bacteria are a major nuisance in many well-water supplies (iron bacteria should not be confused with iron dissolved in water that causes red water and stains on clothing and plumbing fixtures.) Iron bacteria do not cause disease, but do form a reddish-brown slime that coats the inside of pipes, fouls pumps, and clogs waterers. All of which represent a major challenges for poultry growers.

Algae are another type of micro-organism that contaminates poultry water supplies. Some algae produce compounds which are toxic to poultry. In extreme cases, algae-produced compounds cause offensive flavours – described as 'muddy' or 'plastic' – in poultry meat.

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Table 1. A procedure for shocking water lines with organic acids and detergent in commercial poultry houses.

- **Step 1:** Raise the water lines to approximately 3ft off the ground.
- **Step 2:** Turn off the water service from the source and drain the entrained water from the lines by opening the ends of the lines.
- **Step 3:** Shock solution recipe: Add three ounces of liquid dishwashing detergent and three ounces of blue food colour to one gallon of a concentrated solution (65-85%) of organic acids and mix thoroughly.*
- **Step 4:** Open the water regulators to the 'Flush' mode to accelerate the shock solution through the water line.
- **Step 5:** With a medication metering pump, dispense the shock solution though the water line – including the hoses used to fill the drinkers – at a rate of one ounce per gallon.
- **Step 6:** Turn off the regulators and then close the ends of the water lines.**
- **Step 7:** Allow the shock solution to remain in the water line and drinkers for approximately 12 hours.
- **Step 8:** Flush the shock solution from the water line, including the drinker filling hoses.
- **Step 9:** Prepare a solution of Activate WD**, a proprietary blend of organic acids from Novus International for drinking water applications, according to directions, and flush the water line. Do not add blue food colour to this solution.
- **Step 10:** Measure the pH of the water at the end of the water line. It should be less than 3.5, the optimum pH for Activate WD to have a maximum antibacterial effect.

* The shock solution will be dark blue. Once it has travelled through the entire water line, a light blue solution will be observed coming out of the end of the water line. Once this occurs, allow 2.5 gallons of water to flow out of the water line to ensure that undiluted shock solution is present in the entire water line. If bell drinkers are used, it is essential that undiluted shock solution flows into the bell drinker. This may require emptying the drinkers several time before the blue shock solution is observed. When the shock solution appears, allow the shock solution to fill the drinkers to the lip to sanitise the drinkers.

** When using the regulator set on 'Flush' the procedure can damage the diaphragm if the regulator is not turned off before closing the drain valves at the end of the water line.

***Activate WD is different from other organic acid blends because it includes Alimet feed supplement.

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Because bacteria and algae contaminated water may cause disease or in some cases, depress the bird's immune system poultry flock performance suffers. In addition, some non-pathogenic bacteria and algae impart an offensive odour or taste to the water, which in turn results in water refusal, leading to a drop in feed intake and poor bird performance.

A major contributing factor to the presence and intensity of bacteria or algae contamination in poultry drinking water is the amount of dissolved nutrients – specifically phosphorus and nitrogen – in the water. These nutrients facilitate the growth of bacteria and algae through a biological process known as eutrophication.

In a major study conducted several years ago by the US Geological Service at the Massachusetts Military Reservation near Cape Cod, researchers concluded that the phosphorus was a common cause of eutrophication. Over time, eutrophication can progress to a point where the bacteria or algae form a visible slime layer – or bio-film – on the inside surface of water pipes.

Poultry growers find that water-borne bacteria and algae are difficult to kill. The cells of these micro-organisms are encased in a cell wall. Common disinfectants and sanitisers cannot penetrate or degrade the cell wall. Bio-films provide bacteria and algae with additional protection from chemical assaults.

According to Dr Pat Welch, a poultry production consultant, bio-film is generally present in all watering systems and the only good way to suppress mature bio-films is to aggressively 'shock' water lines with a good sanitising agent between flocks.

Chemical	Effective concentration (ml or g per litre)
Acetic acid (vinegar), 5%	1,000
Ammonia (household)	125
Anthium dioxide, 5%	13
Buffered organic acids, 65-85%	1,000
Chloride, 6% bleach	125
Citric acid, 410 g/pk	250
Hydrogen peroxide, 50%	1,000
Sodium acid sulphate	125
Sodium chlorite, 0.2%	47
Virkon S	10

Table 2. Effective chemicals for poultry house water line shock treatments.

The aim of a water system shock treatment is to expose all interior surfaces of the drinking water system to a sanitising agent for a sufficient period of time to reduce the surface tension of the bio-film and dissolve mineral deposits that have accumulated in the water lines, and kill potential vegetative bacteria and algae growing in the biofilm.

Welch cautions poultry growers to exercise care when mixing acids (organic or inorganic) and detergents with chlorine products due to the release of chlorine gas which can be harmful if exposed to the eyes or upper respiratory tract. If inhaled in sufficient quantities, (chlorine gas) can be fatal. Welch advises poultry growers to don personal protective equipment before using oxidisers to shock water lines. Also, some oxidisers used for shocking water lines are caustic and cause chemical burns on exposed skin or mucous membranes.

More poultry growers are discovering the value of water quality on the performance of chickens, turkeys, ducks, and other commercial poultry. In a 2006 survey of growers conducted by Terrance O'Keefe and Gary Thornton, 33% of US broiler growers responded that acidification of drinking water was one of the most promising new technologies on the farm. The percent was higher – nearly 42% – for turkey growers. Nearly 66% of broiler growers said drinking water treatment – acidification or chlorination – was one of the most effective ways of controlling micro-organisms in poultry operations – higher than the effectiveness of vaccines and direct-fed microbials.

Yet, all acidifiers are not the same. An important distinction must be made between acidifying water versus reduction of micro-organisms in the water, performance and food safety. For example, citric acid is an organic acid commonly used by poultry producers for acidifying their water. Citric acid is an excellent acid for this mainly because it is inexpensive but also because it contains three carboxyl groups which help

decrease the pH of the water quickly. pH of the water is important when you are using sanitisers, because lower pH allows sanitisers to be more effective against certain micro-organisms. However, citric acid does not have good antimicrobial activity.

HMTBA (2-hydroxy 4-methlythio butanoic acid) is an organic acid and amino acid precursor (Alimet feed supplement by Novus International Inc). Research conducted by the CCL Institute in the Netherlands using HMTBA demonstrated its effectiveness in reducing bacterial populations such as salmonella, E. coli and campylobacter, all of which can be found in the drinking water of poultry. HMTBA is also one of the main components of Activate WD, a proprietary blend of organic acids from Novus International. While in the water, but more importantly, once consumed by the birds Activate WD plays an important role in the destruction of harmful micro-organisms that could affect the birds future performance and that also play a role in food safety concerns.

Hence a new two step poultry water shock and cleaning procedure followed by the addition of Activate WD is outlined in Table 1. Table 2 features a list of chemicals suggested by Dr Welch that can be used when shocking and cleaning the water lines prior to placing birds in the house.

Poultry growers will likely find the task of maintaining high quality water supplies more challenging in the future. Higher temperatures – possibly due to global warming – decreased precipitation, and the reduced flow of surface and ground water could concentrate contaminants (nutrients) in drinking water. This will lead to faster, more widespread, and higher intensity eutrophication.

Higher environmental temperatures will also accelerate bacteria and algae growth in water lines. Therefore, the best defence is for poultry producers to establish procedures – such as chemical shock treatments – to suppress the formation of bio-films and slime layers in their poultry water lines followed by the use of organic acids like Activate WD for controlling harmful bacteria. These practices are an important piece of a programme for improved water quality, improved live performance and improved food safety. ■

Assaying your liquid assets

Most poultry growers know how to properly collect a representative sample of feed or ingredients. However, many are not trained in how to correctly obtain a drinking water sample for quality analysis. Water sampling is distinctly different from feed or ingredient sampling. The key components of collecting a usable water sample are:

- Water samples for bacteria or algae tests must always be collected in a sterile container.
- Thoroughly wash hands with soap or wear a pair of disposable gloves to minimise the risk of contaminating the sample.
- Before collecting the sample, sterilise the inside and the end of the tap with a flame from a propane torch or a disposable butane lighter. Do not wipe the end of the tap after sterilisation.
- Do not collect a sample from a leaky tap; any tap that delivers softened, filtered or otherwise treated water, or from a hose attached to a tap.
- Run the water for two minutes to clear the lines and bring in fresh water.
- Open the sterile container being careful not to touch or contaminate the inside of the bottle or cap.
- Fill the container to the top with water without overflowing. Also, remember to not let the water flow over your hand as the water enters the bottle.
- Close the bottle immediately after collecting the water sample.
- Refrigerate the sample and transport it to the testing laboratory within 36 hours (six hours is ideal) preferably in an ice chest. Results from mailed water samples are not as reliable as results from hand-delivered samples. Note: Many laboratories will not accept water samples on a Friday or before a holiday.