

# Water quality is vital to maintaining poultry health

By Sonja Ingmanson

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DENVER — The single most important factor in the success of any poultry production operation is water.

With 70 percent of a hen's body-weight being water and egg production tied to the quantity and quality of drinking water, it is the one aspect that should never be overlooked. Studies have shown that hens are actually more sensitive to a lack of water than a lack of feed.

However, since it isn't just the quantity of the water but the quality of the water tied to productivity, it makes sense to examine the purity of the water and its delivery system.

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When determining the quality of the water source, the amount and type of bacteria, viruses and parasites needs to be taken into consideration to prevent disease.

Also, scale and biofilm buildup can cause secondary bacteria contamination, clogged drinkers and leaking nipples which can seriously impact animal health and productivity not to mention waste water and be costly to mitigate.

Other factors affecting water quality include mineral content, in particular, iron, magnesium and manganese. High mineral content can lead to problems with water



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consumption, water system performance and health issues in poultry.

For example, high iron levels may encourage microbial growth such as pseudomonas and *E.coli*. High iron can also promote iron bacteria that can lead to diarrhea. When combined with sodium, excess magnesium becomes Epsom salt, also causing loose stools. Excessive levels of manganese can result in an off flavor, reducing water consumption.

Producers also need to be aware of potential cross contamination that may occur as well as the quality and upkeep of their water systems.

Chemicals can be used to treat these issues, but they can present a host of secondary issues such as high levels of concentration, poor taste and smell and safety implications, so alternative treatments should be explored.

With restrictive antibiotic-limit-

ing bills currently in the legislature (and future legislation on the horizon), it appears to be just a matter of time until antibiotic usage in animals and their water supplies will be restricted, if not prohibited all together. This is yet another reason to take a serious look at your water quality. Better water equals healthier birds with less need for antibiotics.

Bills in the Congress and Senate aim to phase out the non-therapeutic use of antibiotics in animal feed and water, prohibit the use of antibiotics in animals that aren't sick and to make it illegal to routinely give animals antibiotics for disease prevention and President Obama signed an executive order to create a task force to implement a national strategy to reduce antibiotic usage.

The U.S. Food & Drug Administration has asked drug companies to voluntarily phase out antibiotics

used to promote growth in the animals. The goal is to eliminate the practice of adding antibiotics to animals' drinking water or feed so that they will gain weight faster with less food and to treat and prevent diseases. Most US producers are already following this as best practice and use antibiotics only when there is an outbreak of illness that can't be managed with other methods. This echoes the standard in Europe and more and more consumers worldwide are asking for antibiotic-free poultry.

This leaves poultry producers with illness in their flock in the position of needing to explore alternatives. Healthier water translates to healthier animals with less need for antibiotics.

Since there is also a direct correlation to water quality and growth rate, feed conversion and production for

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# Water

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every stage of poultry growth, clean water can not only increase the health of your animals, but your profit margin too while decreasing the need for antibiotics.

With the direction the legislation is heading and the impact water quality can have on an poultry operation, it is important to understand the various water purification methods and options available to poultry producers today.

According to Dr. Susan Watkins from the Center of Excellence for Poultry Science at the University of Arkansas, "Water is one of the most essential nutrients birds receive, yet the quality of bird drinking water is often taken for granted. Providing flocks with a clean and wholesome supply can make a difference in performance. Should water be a suspect for flock problems, make arrangements to have water tested for total bacteria numbers as well as for mineral content. While total aerobic plate count will not tell exactly what is in the water, it is an indicator of excessive levels of bacteria that should be addressed."

Watkins explains that by promoting a regular water sanitation program on farms, producers can

prevent environments in water systems that could lead to poor bird performance. Also understanding what types of chemical contaminants are present and addressing those of which are known to cause poor performance can help growers improve their bottom line.

In a paper published by the North Carolina State University Cooperative, Thomas A. Carter and Ronald E. Sneed discuss water quality requirements for poultry. They state that bacteria contamination is identified as a major cause of loss of productivity in all forms of poultry production and it is recommended to take measures to eliminate bacteria in the water supply. The article discusses several methods for controlling bacteria contamination including chlorination and iodine-based disinfectants.

The authors explain that as bacteria quickly develops in water systems, daily cleaning of the system is recommended. Chlorine is noted as being an effective disinfectant, however it requires constant monitoring to ensure chlorine concentration does not reach toxic levels.

Handling chemicals such as chlorine can put workers at risk. Certain difficult to remove spore forming parasites and pathogens, such as cryptosporidium, are also dem-

onstrating increased resistance to chlorine. Iodine based disinfectants do not require the same diligent monitoring procedures as chlorine, but are more costly.

The authors recommend that poultry producers seek effective measures to eliminate bacterial contamination in their water supply to achieve maximum levels of productivity. They report that field research indicates that a bacteria level of zero is desirable to obtain optimum poultry performance.

By having your water tested or analyzed, you will have a better understanding of what purification method will work best for you. A clean water supply will reduce the need for antibiotics. The use of chemicals such as chlorine may be ineffective and dangerous. They also will not solve all water quality issues. Other chemicals such as chlorine dioxide and hydrogen peroxide are also available and used successfully, but can leave an undesirable taste and smell in the water and are dangerous to transport, handle and store.

There are many alternative ways to treat water besides traditional chemicals. Filtration reduces the microorganisms and solid particulates from water. It can also keep water systems from clogging, ensuring a healthier environment. But filtration can be expensive because they need to be custom designed to fit a water system.

Aerating water can be effective for removing things like hydrogen sulphide and reducing dissolved carbon dioxide, as well as oxidizing iron and manganese. The downside of aeration is that it can be a very energy-intensive treatment method which can result in overuse of energy. In addition, aeration of water can promote algal growth in the water and can clog systems.

Water softeners can remove soluble iron, manganese and calcium. However, cloudy water is an indication that there are still undissolved contaminants.

Reverse osmosis is one of the more common options for reducing chloride, sodium and nitrates

in water. In reverse osmosis, water is moved by high pressure through a series of membranes. But it will not remove certain pesticides, solvents or volatile organic chemicals (VOCs). Additionally, the systems are expensive to operate and waste water.

Ozone rapidly reacts with bacteria, viruses and protozoans and has stronger germicidal properties than chlorination. It has a strong oxidizing power with a short reaction time. The disadvantages of ozone are that the equipment and operating costs are high, there are potential fire hazards and toxicity issues associated with generating ozone and the process can damage metal pipes and fittings.

An alternative to all of the methods mentioned is the Advanced Oxidation Process (AOP). This type of treatment mimics processes that occur constantly in nature and conditions the water using a safe and effective U.S. Environmental Protection Agency (EPA) recognized disinfection method.

AOP water treatment technologies are widely recognized for their powerful oxidizing capacity as a disinfectant, including by the EPA. AOPs are accepted as being extremely efficient at eliminating numerous contaminants such as bacteria, viruses, protozoan cysts, persistent organic compounds (*i.e.* many pesticides, herbicides, industrial and synthetic compounds, pharmaceuticals, etc.), foul taste/odor sources and general organic/inorganic matter.

AOPs are defined as technologies that generate highly reactive hydroxyl and oxygen free radicals that are produced with the help of one or more primary oxidants (*e.g.* oxygen) and/or energy sources (*e.g.* ultraviolet light) or catalysts (*e.g.* titanium dioxide) to oxidize various contaminants in water.

Traditionally, AOP's have been costly to purchase and maintain. However, a new kind of AOP works differently by using air from the surrounding environment as its feedstock. That air is passed through processor sleeves containing UV

lamps and patented components. Once through the sleeves, the air is diffused into the water to condition it. This system is easily installed, requires minimal maintenance, delivers a consistent flow of disinfectant and is very affordable because the systems are typically rented rather than purchased.

The new AOP technology generates highly reactive hydroxyl and oxygen free radicals. These in turn oxidize contaminants in the water and kill bacteria. Some of the reactive oxygen atoms produce a lasting nontoxic biocide killing bacteria throughout the system, while other oxygen atoms keep minerals, such as calcium, in solution helping to break down buildup in water lines and prevents future scaling.

An additional benefit is that minerals such as iron and manganese are oxidized and precipitated out of the water. The reactive oxygen radicals break down the buildup of calcium and biofilm stuck on pipes and drinking system components. The result is a cleaner drinking system that is less prone to clogs and is achieved without adding traditional toxic chemicals.

Producers are seeing the benefits of this AOP system in the improvement of the health of their flocks and the efficiency of their water systems.

Watkins added that, "what is intriguing about this AOP system is its simplicity and its consistency. It is simple in that one solution impacts multiple water quality issues rather than combining multiple treatment solutions to handle bacteria, scale, biofilm and minerals. And it is consistent in that it is always operating, requiring little human intervention and risk of error."

The process is also odorless and tasteless, so unlike adding chemicals, poultry will drink enough water to meet their needs and maintain their health.

Water use is the key to poultry health and productivity. Drinking water systems that work more efficiently ensure that animals stay healthy and require fewer antibiotics.



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