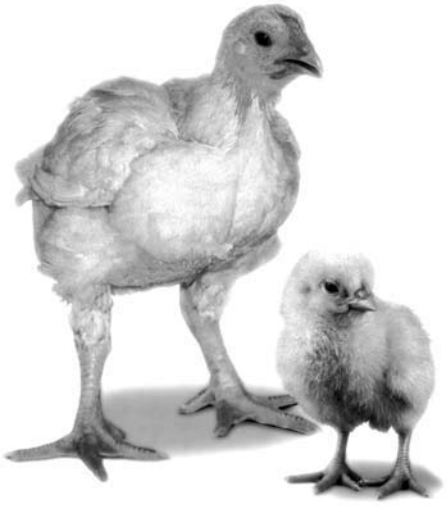
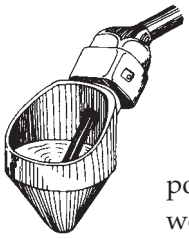
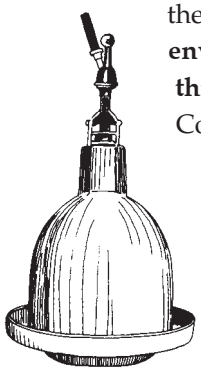
Chlorination For Poultry Water Supplies

WATER: THE #1 NUTRIENT



Ask any veterinarian or feed specialist what the #1 nutrient is, and you may get a variety of answers. **Poultry, however, will consume an average of twice as much water as any other substance.** Water is critical for any animal's health, but its importance is often overlooked when production problems arise. There are a number of water-conditioning options, with *water softening, filtration, sequestering, and sanitizing,* being the most common. Because bacterial contamination is the primary concern in poultry production, the focus of this article is on water sanitation.





Water systems can become contaminated either from groundwater sources or from the environment in the barn. It is possible for coliform bacteria to enter a well due to poor construction, shallowness of the well, or abandoned wells in the area. **However, the barn environment is by far the biggest threat for bacterial contamination.** Coliform bacteria is easily conveyed to the waterers by the birds during their daily activities.

There are a number of ways to control bacteria. Chlorination, ozone, UV light, oxygenation, and hydrogen peroxide have all been promoted to get this job done. **However, only chlorine has a well documented biocidal residual.** Chlorine residual is the chlorine that stays active in the system to insure continual sanitation. **Without chlorine residual, disease-causing bacteria are free to recontaminate the water system through the natural activity of the birds in the barn.** Diseases such as bordetellosis, coryza, blue comb, salmonella, cholera, and intestinal tract enteritis can all be spread through the watering system. As these disease-causing bacteria are reintroduced to the watering system, they are continually being sanitized by the chlorine residual. Without chlorine residual, these bacteria would multiply unchecked.

TYPES OF CHLORINATION

There are three common ways to chlorinate:

1. **Gas chlorine** is often used in large municipalities. It is the most economical, but also the most dangerous form of chlorine. Cities have trained employees to monitor gas chlorination equipment. Because of its hazards, many cities have replaced gas chlorine with liquid or dry chlorine.

2. **Liquid chlorine** (sodium hypochlorite) is one of the most commonly used forms of chlorine in the poultry industry. It is available in strengths of 12-15%, but the most commonly used is liquid bleach at 5.25%. Liquid chlorine has the following limitations:

    - Liquid chlorine has a poor shelf-life. In 3-4 months, half of the available chlorine may be lost.

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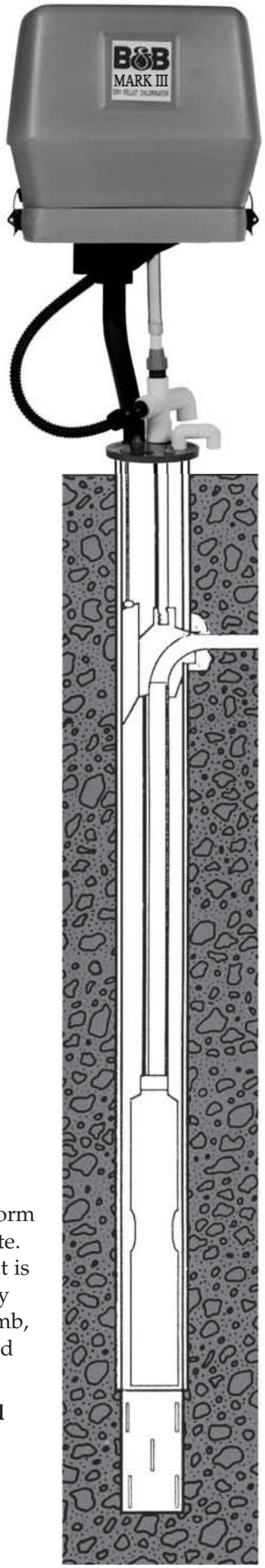
(Liquid chlorine, continued)

- Because of its aggressive nature, liquid chlorine is hard on chemical feed pumps.
- liquid chlorine is dangerous to handle.
- Low concentrations make it bulky and inefficient.
- It easily dissipates from holding tanks and open waterers.

3. **Dry chlorine** (calcium hypochlorite) is commonly found in strengths of 65-75% chlorine. It is dispensed through erosion feeders, batch mixing, or dry pellet chlorinators. *Erosion* feeders are primarily used in swimming pools, where accuracy is not as important. *Batch* mixing is labor intensive but very accurate. A *dry pellet chlorinator* - because it is wired into the pump circuit - dispenses chlorine on a per-gallon-pumped basis.



ADVANTAGES OF DRY CHLORINE

1. Dry chlorine is proven to be more effective than liquid chlorine in the presence of organic matter.*
2. Maintains a chlorine residual much longer than liquid chlorine.*
3. Has a longer shelf life. Only loses 4-5% of available chlorine per year in storage.
4. Is highly concentrated. One gallon of dry chlorine equals 16 gallons of household bleach.
5. Is easy to store and handle.
6. Is safer to use.
7. Is more economical.

WHAT IS DRY PELLET CHLORINATION?

A *dry pellet chlorinator* is most often mounted on the well and drops a compressed chlorine pellet down the well shaft into the well water. The chlorinator can also be mounted on a holding tank. **It is wired into the pump's electrical circuit and runs only when the pump is running, metering chlorine in proportion to water usage.** An adjustment mechanism accounts for variation in pump size and water quality. As the pellet sinks to the bottom of the well and dissolves in the water, it releases chlorine that reacts with contaminants in the well. These contaminants may be **living organisms**, which can be sanitized, or **dissolved solids**, which can be oxidized.

LIVING ORGANISMS IN WATER

Recontamination of the watering system in a poultry barn is a constant concern. Every time a bird drinks, contamination is possible from *coliform-type bacteria. Nuisance bacteria,* such as *iron or hydrogen sulfur bacteria* may also be present from the well.

Coliform Bacteria

Coliform bacteria is the standard used in well testing. *Coliform* is present in many warm-blooded animals as a normal part of their digestive tracts. Its presence in a water supply is an indication that animal or human waste is making its way into the water supply. Coliform bacteria may have no detectable smell or taste. The coliform itself may not be a problem, but is an indicator that other *pathogenic bacteria* may be present, causing diseases such as blue comb, coryza, bordetellosis, salmonella, cholera, and intestinal tract enteritis.

Because chlorine is a sanitizer, it will kill these bacteria if applied properly. In laboratory conditions, chlorine at 1 ppm residual, takes 20 minutes contact time to achieve 100% kill of coliform bacteria. If the

bacteria are exposed for less time or at lower levels, they may still be present when the water is consumed. By dropping dry chlorine pellets into the well, treatment is started at the earliest possible time, and in most cases, the 20-minute mark will be met.

However, in a poultry barn, the bacteria are introduced into the water on an ongoing basis. Warm weather encourages the bacteria to increase at a dramatic rate. Maintaining a high chlorine residual will keep these bacteria in check. Poultry producers maintain varying chlorine levels, but 1-5 ppm in the drinker is common.

The sanitizing power of chlorine is dependent on the ph of the water. When the ph is 7 or below, chlorine acts predominantly as a sanitizer and will be very effective at killing bacteria. At 7.4, chlorine will act equally as a sanitizer and oxidizer, but as ph rises, the chlorine will act predominantly as an oxidizer. The most common forms of chlorine - sodium hypochlorite (liquid bleach) and calcium hypochlorite (dry chlorine) - may raise the ph of the water. Water that is at a ph of 7 or higher may need to be lowered for the chlorine to be at the optimum efficiency for killing bacteria.

Nuisance Bacteria

Iron bacteria is most noticeable by the slimy, red coating it leaves in the water system. Severe cases can plug pumps, pipes and filters, increase operating costs, and lead to premature pump failure. Leaky waterers, red staining, and low water pressure are common symptoms of iron bacteria.

Hydrogen sulfide is a by-product of a sulfur-feeding bacteria and is noted by its distinct smell. Rotten egg, sulfur, and sewer gas are common descriptions. Hydrogen sulfide may lead to decreased water consumption. It is also accompanied by a black, slimy accumulation that can cause many of the same problems as iron bacteria.

When chlorine is introduced into the water lines, it:

1. Kills the bacteria causing the problem.
2. Oxidizes the iron into a filterable form.
3. Breaks loose the slimy deposits coating the system.

The amount that breaks loose depends on how high the chlorine is and the severity of the problem. The level of chlorine at which any system should be dosed will depend on how the system reacts to the chlorine.

Algae and Pond Scum

Shallow wells and water drawn from ponds may be contaminated with surface runoff and biological debris from both plants and animals. Ponds are particularly prone to this, since they contain numerous forms of life that can be drawn easily into the pump. These contaminants can be filtered out physically, but the water should be sanitized for human or livestock consumption and for aesthetic and health reasons. Whether the contaminants are pathogenic or not can only be determined by a test, but these types of water sources are subject to many variables affecting their quality.

This water can be used for poultry water supplies with proper sanitation. Filtration may be necessary, depending on the level of contaminants that are oxidized.

DISSOLVED SOLIDS IN WATER

Total Dissolved Solids (TDS) are the sum of all solids that have been dissolved in the water and are generally expressed in parts per million (ppm). **Many have little or no effect on water quality. However, iron and manganese do.** Chlorine will oxidize iron and manganese, controlling or eliminating the problems associated with them.

Iron

Because 5% of the earth's crust is iron, it comes as no surprise that many wells contain iron in varying amounts. It takes just a trace of iron to cause problems: as little as .2 ppm is noticeable. In larger amounts, water can become rust colored and have a metallic taste. Iron can coat the insides of pipes with a hard, red scale, which reduces flow rates and plugs filter screens. Because exposure to air causes iron to precipitate out, the result is often leaky waterers and plugged foggers.

Whether the iron content in water affects poultry health is not well documented. Many producers feel the precipitated iron has no effect on the bird, while others feel filtration has health benefits. At 5 ppm or higher, iron can interfere with medications. The effects of iron vary from farm to farm; and the extent of the iron treatment will need to be made on an individual basis.

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Because iron is found in different forms, the treatment can vary.

• *Ferrous iron* is dissolved and appears clear out of the tap. At lower levels, it can be removed by ion exchange (water softening), but if iron bleeds through, (red staining, rusty water, etc.), it may have to be oxidized and filtered.

• *Ferric iron* is *oxidized* (precipitated) and appears red out of the tap. It consists of particles in the 30-to 50-micron range and will pass through most water softeners. An iron filter will probably be needed.

• *Heme iron* is iron bound up with organic material (often referred to as tannins). Chlorine will provide the oxidation necessary to destroy the bond between the organic material and the iron to precipitate the iron out of solution.

• *Iron bacteria* needs to be sanitized, and the precipitated iron should be filtered out.

Ferrous iron and iron bacteria occur more often. By pretreating with **dry pellet chlorination**, the different types of iron can be converted to ferric iron which can be filtered. Adequate contact time is necessary, since iron may not precipitate immediately, especially if it is bound up with tannins or iron bacteria. Generally, 30 minutes is thought to be sufficient. Over time, continuous chlorination will remove built-up iron deposits from plumbing.

Manganese is characterized by black to grayish deposits, or by black water with a metallic taste. Chemically, its treatment is similar to iron and appears in the same forms and exhibits the same problems. While not as common as iron, it will show up at much lower levels: .05 ppm is enough to cause problems. Dissolved manganese is slower to oxidize than iron so early chlorination is helpful. Unlike iron, any buildups in pipes are difficult to remove, so ignoring the problem can lead to more expense in the future.

CONTAMINATED WATER IS BEST TREATED BY A DRY PELLET CHLORINATOR IN THE WELL.

1. Treatment is started at the earliest possible time. This is important for both sanitizing and oxidizing reasons.
2. Maintenance of the well (pumps, screens, and pipes) will be reduced, as contaminants will not have a chance to build up.
3. Holding or retention tanks are usually not necessary.
4. One unit mounted on the well treats the entire water system.

This flow of water into the well casing prevents chlorine from escaping into the aquifer. Because both the chlorine demand and residual can be measured, and we know the dosage, we can determine if any measurable amount of chlorine is lost.

Common Questions

1. **Will the chlorine interfere with medications?** Chlorine will kill live vaccines. The chlorinator should be turned off 1-2 days before the live vaccine is used. Neutralizers are available. Chlorine may enhance the effectiveness of other medications by oxidizing iron and manganese.

2. **Won't the chlorine drift away in the aquifer?** This is unlikely. Most aquifer flow rates are measured in either inches or feet per year. This is because the majority of aquifers are found in rock, gravel, or sand. When the pump starts to run, it pulls the surrounding water into the well casing.

3. **How much does it cost to chlorinate?** This depends on the quality of the water and the volume used. $.20 - $.40 per 1000 gallons of water is an approximate cost.

4. **Will chlorine corrode my pipes and plumbing?** Municipalities and rural water systems use chlorine with few detrimental effects to their pipes and plumbing. Because dry pellet chlorinators can dose your well water at this same rate, you should experience no problems. Proper installation, monitoring, and maintenance are important.

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