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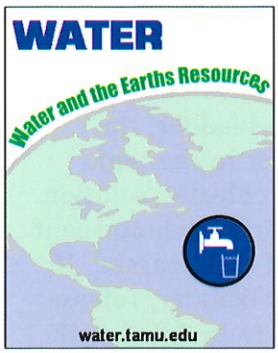

Shock Chlorination of Wells

Mark L. McFarland, Associate Professor and Extension Soil Fertility Specialist
Monty C. Dozier, Assistant Professor and Extension Specialist — Water Resources
The Texas A&M University System
R. Craig Runyan, Program Coordinator, Extension Plant Sciences Department,
New Mexico State University

Shock chlorination is a method of disinfecting a water well. It is recommended when a water system is contaminated with bacteria. Contamination can occur when the well is installed, when repairs are made to the pump or plumbing, or when rainfall runoff enters the well.

If the groundwater itself is the source of bacteria, the system will be contaminated again every time water is pumped into the plumbing. In that case, continuous chlorination (or the use of another continuous disinfection method) will be necessary to ensure the safety of the water supply.

Shock chlorination introduces very high levels of chlorine into a water system. During the disinfection process, water from the system is not suitable for consumption and neither people nor animals should have prolonged contact with it. Make the treatment when faucets and toilets will not be in use for at least 12 hours, preferably 24 hours. If there is an automatic watering system for animals and irrigation, provide an alternate water source during the treatment period.

Most water treatment equipment (such as water heaters, softeners and pressure tanks) should also be disinfected. Drinking water filters, such as carbon filters, should be temporarily disconnected or by-passed during shock chlorination. Activated carbon filters left in place during the chlorination process will actually remove the chlorine until they become overloaded. Before treating equipment, read owner's manuals or manufacturers' literature to avoid damaging components.

Chlorine Sources

Chlorine is highly toxic to bacteria at concentrations of 200 milligrams per liter and above. Shock chlorination of a well involves adding a chlorine solution to the water supply until it reaches a concentration of 200 milligrams per liter, and then circulating it to disinfect all parts of the water system.

Chlorine is available in several different forms. The two most often used for well disinfection are dry chlorine and liquid household bleach. Dry chlorine contains about 65 percent calcium hypochlorite; bleach contains about 5.25 percent sodium hypochlorite. When used properly, they are equally effective for disinfecting wells. Do not use bleach with a "fresh scent," lemon fragrance or other additives because it may contain chemicals not suitable for human or animal consumption.

Chlorination Procedure

The amount of chlorine needed is determined by the amount of water standing in the well. Contact the company that constructed your well to find out the water well depth and static water level. The standing water depth in the well will be the well depth minus the static water level. For example, a water well 110 feet deep with a static water level of 90 feet would contain a standing water depth of 20 feet (110 feet - 90 feet = 20 feet). Table 1 lists the amount of ordinary household bleach (5.25 percent hypochlorite) needed for shock chlorination based on the casing diameter of the well and the standing water depth in the well. If the standing water depth of the water in the well is unknown, use a volume of bleach equal to two times the depth value for the appropriate casing diameter. For example, an 8-inch casing diameter with unknown standing water depth would require 3 gallons of household bleach. Do not use more bleach than recommended because it is not necessary and will require additional flushing before you can use the water. Table 2 shows the amount of dry chlorine (high-test hypochlorite) to use. High-test hypochlorite is available in powder or tablet form.

To treat a well:

1. First, drain as much water from the system as possible. If the system has a pressure tank that contains a bladder, the rubber air-water separator in the tank may be damaged by the chlorine solution. Check your manufacturer's guide to see if the pressure tank should be bypassed. If the pressure tank has no bladder, release the air to allow the tank to be filled with chlorinated water. Also drain all hot water heaters to allow chlorinated water to circulate through the hot water system.
2. Remove the plug or screen on the well cap so you have access to the inside well casing. Dilute the liquid bleach by placing the

Table 1. Amount of chlorine bleach needed for shock chlorination.

	Laundry bleach (about 5.25% hypochlorite)				
Standing water depth	Casing diameter				
in well (in feet)	4 inches	6 inches	8 inches	10 inches	12 inches
10	1/2 cup	1 cup	1 1/2 cups	1 pint	2 pints
25	1 cup	1 pint	2 pints	3 pints	4 1/2 pints
50	1 pint	1 quart	2 quarts	3 quarts	1 gallon
100	1 quart	2 quarts	1 gallon	1 1/2 gallons	2 gallons
150	3 pints	3 quarts	1 1/2 gallons	2 gallons	3 gallons

Table 2. Amount of dry chlorine needed for shock chlorination.

	High-test hypochlorite (HTH 65-75% hypochlorite)				
Standing water depth	Casing diameter				
in well (in feet)	4 inches	6 inches	8 inches	10 inches	12 inches
10	—	—	—	—	—
25	—	—	—	1/4 lb.	1/4 lb.
50	—	—	1/3 lb.	1/2 lb.	3/4 lb.
100	—	1/3 lb.	3/4 lb.	1 lb.	1 1/2 lbs.
150	1/4 lb.	1/2 lb.	1 lb.	1 1/2 lb.	4 lbs.

appropriate amount of bleach (see Table 1) in a 5-gallon bucket and filling the bucket with clean water. If you are using dry chlorine, place the proper amount (based on Table 2) in a 5-gallon bucket and fill the bucket with clean water to dissolve the bleach. Place a funnel in the well's access hole and pour the solution around the sides of the well casing.

3. Connect a garden hose to a nearby faucet and run the hose to the funnel in the well's access hole to wash down the inside of the well. Continue the washing process for 10 minutes and make sure a strong chlorine smell can be detected. Start and stop the well pump several times to mix the chlorine thoroughly with the well water.

4. Do not operate the water system for 2 hours.

5. After 2 hours, open the faucet closest to your well, allow water to run until a strong odor of chlorine is detected, then close the faucet. Proceed to the next faucet and repeat. Continue until chlorine is detected in all faucets. If the odor is not detected, check the rate of chlorine from Table 1 or Table 2 and add more chlorine to the well, repeating steps one through four.

6. Do not operate the water system for at least 12 hours, preferably 24 hours.

7. Next, flush the system of remaining chlorine. Begin by turning on outside faucets and letting the water run until the chlorine smell dissipates. Let the water run on the ground to reduce the load on your septic system. High loads of chlorine in the septic tank can kill beneficial bacteria and make it necessary to re-inoculate the septic system. But do not let the chlorinated water run onto lawns, gardens or other plants because chlorine can injure them. Place the garden hose so that it drains into a field or low-lying area away from desirable plants. Be careful not to discharge the chlorinated water directly into ponds, lakes, rivers or streams.

8. Finally, turn on the indoor faucets until the system is completely flushed.

9. After chlorination, have the well water tested again for bacterial contamination.

Precautions

- Wear protective eyewear and clothing (rubber boots and gloves) when mixing and using household bleach or dry chlorine.
- Be careful not to breathe the fumes from dry chlorine tablets. If you have tablets left over, store them in an airtight container, because moisture in the air will "melt" the tablets.
- Always have a 5-gallon container of clean, fresh, unchlorinated water nearby for emergencies. If you accidentally get chlorine in your eyes or on your skin, flush immediately with fresh water for 10 to 15 minutes. Then seek medical attention right away.

10. If bacteria are still detected in the well water, repeat the chlorination process and then test the water again.
11. If bacterial contamination is detected a third time, check for potential sources of reinfection such as
    - an improperly designed wellhead, or
    - livestock pens or septic tanks near the wellhead.

It might be necessary to install a continuous chlorination system or other continuous disinfection system.

For more information about wellhead protection, see the Texas Well Owner Network publications available from Texas A&M AgriLife Extension Service.

Texas Water Resources Institute
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