

Water Facts #14

Shock Chlorination of Wells and Springs

A Common Problem

Bacterial contamination is one of the most common water quality problems in private water wells and springs. A recent survey of 450 private wells in Pennsylvania found that about 35 percent contained coliform bacteria. Past studies have shown that springs are even more susceptible to bacterial contamination. These bacteria are a potential problem because they may cause serious gastrointestinal illnesses. For more detailed information on coliform bacteria consult *Water Facts #13: Coliform Bacteria* available on the Penn State Water Resources Extension Web site at <http://water.cas.psu.edu/>.

Homeowners often assume that a positive test for coliform bacteria in their well or spring indicates a contamination problem that must be treated continuously with a disinfection treatment system such as ultraviolet light or chlorination. However, some positive bacteria tests are the result of a less serious, one-time contamination incident. For example, bacteria may be introduced when a new submersible pump is installed in a well or from surface runoff during an unusually heavy rainfall. Shock chlorination is a simple and inexpensive process that can be used to disinfect water supplies that have been contaminated as a result of these one-time contamination incidents. When done properly, shock chlorination will kill all the bacteria existing in a well. A recent Penn State study of wells contaminated by coliform bacteria found that shock chlorination and installation of a sanitary

well cap successfully removed the bacteria for one year in 15 percent of the wells. This procedure was most successful in wells that had small numbers of coliform bacteria (fewer than 10 colonies per 100 mL) and no *E. coli* bacteria.

Water Treatment Equipment Concerns

Before shock chlorinating your water system, it is important to determine if any susceptible water treatment equipment is installed in your home such as a softener, carbon filter, or a reverse osmosis system. Some water treatment equipment can be damaged or exhausted by high chlorine concentrations in water. Contact your water treatment company or equipment manuals to determine if your equipment should be bypassed during shock chlorination.

Disinfection Procedure for Wells

1. **Clear the water:** If your water is cloudy or contains any suspended particles, the well should be pumped until the water clears. Cloudy water will greatly reduce the ability of the chlorine to kill bacteria.
2. **Obtain chlorine:** Unscented household chlorine bleach containing 5.25 percent available chlorine may be used to shock chlorinate private water supplies; however, only chlorine products with label information specifying use in potable water supplies can be recommended. These must be obtained from water treatment vendors or well drilling contractors. Consult Table 1 to determine the amount of bleach you will need for your well.

When to Shock Chlorinate Your Well or Spring

- After construction of a new well (many well drillers do this as a standard practice)
- After working on an existing well or installing a new submersible pump
- After receiving a positive water test report for coliform bacteria

Table 1. Amount of household bleach required to disinfect a water well.

Water Depth (feet)	Well Diameter (inches)					
	6	8	10	24	32	36
10	1 c	1 c	2 c	3 qt	4 qt	6 qt
20	1 c	2 c	4 c	5 qt	8 qt	10 qt
30	2 c	4 c	3 pt			
40	1 pt	2 pt	4 pt	c = cup pt = pint qt = quart		
60	2 pt	3 pt	6 pt			
80	2 pt	4 pt	7 pt			
100	3 pt	5 pt	4 qt			
150	5 pt	4 qt				

Note that the water depth shown in this table refers to the actual depth of water in the well, not the total depth of the well. In some cases, it may be difficult to determine the actual depth of water in the well. This information may be stamped on the inside of the well cap or written on the well completion report you received from the well driller. If you are unable to determine the actual depth of water in the well, use a minimum of 0.5 gallon of bleach if you estimate the water depth to be less than 80 feet and the well diameter is 8 inches or less. For wells with greater water depth and diameter, use 1 gallon of bleach. *It is always better to use too much chlorine than too little!*

3. **Apply chlorine to well:** Remove the cap from the top of the well and mix the chlorine with 5 to 10 gallons of water in a nonmetallic container. Be careful to keep the chlorine solution away from your skin and clothing. Slowly pour this solution into the well. Remember to bypass any sensitive water treatment equipment before proceeding.
4. **Mix chlorine within well:** To adequately mix the chlorine solution in the well, run a garden hose from an outside faucet into the well and circulate water into the well, washing down

the sides of the casing until a strong odor of chlorine occurs in the water from the hose. It may take up to 15 minutes for enough mixing to occur. (Note: If a strong chlorine odor is not noticeable at the hose after mixing, too little chlorine was added to the well—more chlorine should be added.) Close the hose faucet and replace the well cap.

5. **Turn on inside faucets:** Inside the home, turn on each faucet throughout the house (one at a time) until a strong chlorine odor is noticeable in the water. You should run both the cold and hot water at each faucet until you notice the strong chlorine odor (Note: It will take quite some time for chlorine odor to be noticed at the first cold and hot water faucet that is turned on.) Once the odor is noticeable, turn off the faucet. This will ensure that the chlorinated water has been dispersed throughout the plumbing system. If a strong chlorine odor is not apparent at any of the faucets, more chlorine should be added to the well (see step 4 above).
6. **Provide contact time:** Allow the water to sit in the plumbing for at least 12 hours.
7. **Purge high-chlorine water from the well:** The first water used following shock chlorination will be of a chlorine

concentration similar to that used for bleaching laundry. The first water may also appear very discolored due to iron or other metals from the well casing or in the water. Disposal of this high-chlorine water must be done carefully. If your home is connected to a central sewer system, you can dispose of the water by letting each of the faucets in the home run until the chlorine smell dissipates to an acceptable level. Note that complete removal of the chlorine smell may take several days of normal water use. Do not use water that has a strong chlorine odor for bathing, cooking, washing, or drinking. This water may cause skin irritation and damage to clothing. If your house has a septic system, do not run all the chlorinated water into the system as it may overload the system. In this case, use a garden hose to pump some of the chlorinated water to a safe disposal area. Bare ground is the best disposal area, or the water can be sprinkled on grass. Avoid applying the high-chlorine water to foliage of flowers or ornamental shrubbery or near any water body containing fish.

8. **Retest your water:** After following the procedures outlined in this fact sheet, you should retest your well water for coliform bacteria approximately 10 to 14 days after the shock chlorination. If no coliform bacteria are present, wait an additional two to three months and have the water tested again. If the bacteria return in either of these subsequent tests, a continuous disinfection treatment system will be necessary.

Disinfection Procedure for Springs

Shock chlorination of springs is difficult and rarely successful because the water often runs through the spring box too quickly to provide adequate contact with the chlorine to kill bacteria. Disinfection of the spring box should not be attempted if the spring overflow (the water that does not enter the house) enters a stream, pond, or wetland area where high chlorine water may cause environmental damage especially a fish kill.

1. **Wash spring box walls:** Shock chlorination of a spring can be attempted by mixing 0.5

cup of household bleach with 5 gallons of water to scrub the walls.

2. **Disinfect spring box water:** Estimate the volume of water in the spring box in gallons (there are 7.5 gallons of water in each cubic foot of storage). For each 100 gallons of water in the spring box, create a disinfection solution by mixing about 3 pints of chlorine solution with a few gallons of water. Pour the disinfection solution into the spring box.
3. **Follow well disinfection steps 5–8:** Use the instructions above to disinfect each of the faucets in the home and run the water to a disposal site the next day. Because of the prevalence of bacteria in springs and the difficulty in adequately shock chlorinating the spring source, installing continuous disinfection treatment equipment for spring sources with coliform bacteria is often necessary.

More Information

For more information on private water system management including continuous disinfection of bacteria problems, consult the Penn State Water Extension Web site at <http://water.cas.psu/> or contact your local cooperative extension office.

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