Shock Chlorination of Wells

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 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.

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.
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.

When to Shock Chlorinate Your Well

- 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.

Abbreviations: c = cup, pt = pint, qt = quart

	Well Diameter (inches)					
Water Depth (feet)	**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			
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: 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!*

Coliform Bacteria

Coliform bacteria is the most common water test done to determine the safety of private wells and springs. But what exactly are these bacteria and how can they be treated in private water systems? This fact sheet provides an introduction to the measurement, prevention, and treatment of coliform bacteria in drinking water.

What Are Coliform Bacteria?

Coliform bacteria include a large group of many types of bacteria that occur throughout the environment. They are common in soil and surface water and may even occur on your skin. Large numbers of certain kinds of coliform bacteria can also be found in waste from humans and animals. Most types of coliform bacteria are harmless to humans, but some can cause mild illnesses and a few can lead to serious waterborne diseases.

Coliform bacteria are often referred to as "indicator organisms" because they indicate the potential presence of disease-causing bacteria in water. The presence of coliform bacteria in water does not guarantee that drinking the water will cause an illness. Rather, their presence indicates that a contamination pathway exists between a source of bacteria (surface water, septic system, animal waste, etc.) and the water supply. Disease-causing bacteria may use this pathway to enter the water supply.

Specific types of coliform bacteria may be tested for, especially after a total coliform bacteria test is positive. These subgroups of coliform bacteria include fecal coliform and *Escherichia coli* or *E. coli*. Fecal coliform bacteria are specific to the intestinal tracts of warm-blooded animals, including humans, and thus require a more specific test for sewage or animal waste contamination. *E. coli* is a type of fecal coliform bacteria commonly found in the intestines of animals and humans. A positive *E. coli* result is much more serious than coliform bacteria alone because it indicates that human or animal waste is entering the water supply. There are hundreds of strains of *E. coli*. Although most strains are harmless and live in the intestines of healthy humans and animals, a few strains can produce a powerful toxin and can cause severe illness and death.

Health Effects of Coliform Bacteria

As mentioned earlier, drinking water that is contaminated with coliform bacteria does not always cause illness. Most of these bacteria are harmless to humans. If disease-causing bacteria are present, the most common symptoms are gastrointestinal upset and general flu-like symptoms such as fever, abdominal cramps, and diarrhea. Symptoms are most likely in children or elderly household members. In some cases, household residents acquire immunity to waterborne bacteria that are common in their drinking water. In this case, visitors to the home that have not acquired immunity may become ill after drinking the water. Since the symptoms of drinking water with coliform bacteria are common to many human illnesses, knowing that water is the source of the problem is difficult without having the water tested.

Drinking Water Standards

Most bacteria in the coliform group do not cause disease, but the greater their number the greater the likelihood that disease-causing bacteria may be present. Since coliform bacteria usually persist in water longer than most disease- causing organisms, the absence of coliform bacteria leads to the assumption that the water supply is microbiologically safe to drink. Therefore, the drinking water standard requires that no coliform bacteria be present in drinking water. Fecal coliform and *E. coli* bacteria should also be totally absent from drinking water.

SHOCK CHLORINATION INSTRUCTIONS

1. Determine the quantity of liquid chlorine needed:

   Pints of bleach* needed to shock-chlorinate wells:

Well Water Depth (Feet)	Well Diameter (Inches) 4	6	8
25	0.5	1.2	2.1
50	1.0	2.3	4.2
75	1.6	3.5	6.3
100	2.1	4.7	8.3
125	2.6	5.9	10.4
175	3.7	8.2	14.6
200	4.2	9.4	16.7
250	5.2	11.7	20.9
300	6.3	14.1	25.0
350	7.3	16.4	29.2
400	8.3	18.8	33.4

   *Bleach containing 5.25% NaOCl

2. Remove the cap from the top of the well. Clean mineral deposits from accessible surfaces of the well casing interior. Scrub with a strong bleach and water mixture.

3. Pour the required amount of liquid bleach from #1 over pumping equipment and the interior sides of the casing.

4. Attach a hose to a hydrant or an outside faucet. Recirculate the chlorinated water from the well through the hose and into the well again. Wet down the equipment and interior sides with the chlorinated water. Replace the cap.

5. Drain water heaters and bleed the air from the pressure tanks to allow the chlorinated water to completely fill and sanitize.

6. Open the faucets on each water line one-by-one until the chlorinated water starts to come out. You should detect a strong chlorine odor. If you don't add more chlorine to the well.

7. Normally you may backwash water softeners, sand filters, ion-exchange columns, and iron removal filters with the chlorinated water. Check with the manufacturer or distributor on these products, as well as the air bladder in your pressure tank. Do not chlorinate carbon or charcoal filters.

8. A minimum of two hours contact time is required for disinfection, but allowing the chlorine to sit overnight is recommended.

9. Run the well water to waste through the hydrant or outside faucet until the chlorine odor has disappeared. The chlorine water may be harmful to your vegetation, so take this into consideration. Also avoid discharging large quantities of water into the septic tank, as this may have an adverse effect. Indoor plumbing can be flushed after the pressure tank and well have had the chlorine removed.

10. You should retest the water after 7 to 14 days.

11. If a well has a recurring problem with bacterial contamination, contact a registered well contractor.

CAUTION: Never mix chlorine with acids or ammonia because toxic gases will form. Contact the Fayette County Environmental Health Department at 563-422-3767 if you have any questions.