

Ohio Department of Health
Bureau of Environmental Health

Disinfection Fact Sheet for Drinking Water Wells
Simple Procedures for Homeowners

Revised August 2011

The following well disinfection procedures may be carried out by homeowners on an existing well. Disinfection is performed after the well is sampled and found to be coliform positive if a presence / absence test was done, has total coliform detected above the acceptable level of four colony forming units (CFUs), or is *E. coli* positive. A total coliform bacteria sample is used as an indicator of cleanliness of the well. *E. coli* is used to determine the sanitary condition of a well. Prior to beginning this procedure you may want to consider doing a resample of the well for coliform bacteria in case there was possible sampling error (remember to keep your fingers out of the sample bottle).

This disinfection procedure can also be followed when the presence of large numbers of non-pathogenic bacteria such as slime formers or iron bacteria have been identified. Do not attempt this disinfection procedure on your own if the well borehole conditions are potentially unstable as a collapse of the well is possible. Be aware that this procedure could also potentially damage old corroded plumbing.

If total coliform or *E. coli* positive samples persist after disinfection, then an experienced registered private water systems contractor should be contacted to professionally disinfect your well using enhanced disinfection methods and the construction of the well should be evaluated. (See Contractor Disinfection Fact Sheet)

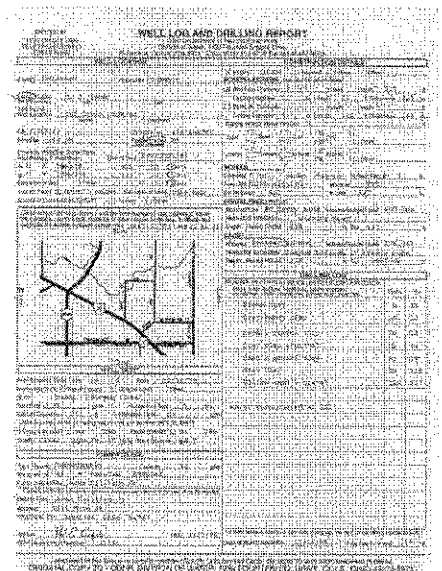
<http://www.odh.ohio.gov/odhPrograms/eh/water/PWSreg.aspx>

Step 1. Pump the well

Turn on at least one outside spigot and run the water for several hours (24 hours if possible) to waste in the yard or other drainage way. The well should be heavily pumped to completely flush the well borehole and the geologic formation that supplies the water. If you have a low yielding well, be careful not to pump so hard that the pump runs dry (as this could damage the pump). You may want to consider re-sampling your well for total coliform after pumping because in some cases heavy pumping can result in an acceptable total coliform result. Do **not** discharge this water to the septic system, as it will cause the system to become overloaded.

Step 2. Determine the total volume of water stored in your well.

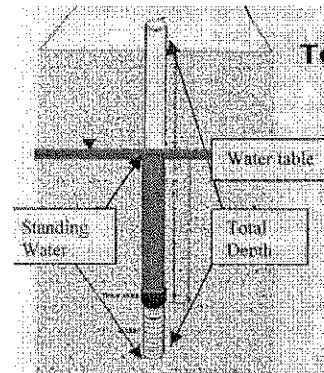
The volume of chlorine used for disinfection depends on the total volume of water stored in the well casing and the distribution lines (plumbing). The total volume of water stored in the well casing can be calculated based on the total depth of the well and the static water level in the well.



Information on the total depth and static water level (water level under non-pumping conditions) of the well can be obtained from the well log. The well log is a record of the construction, depth and geologic materials encountered in the well and is filled out by the water well driller. After the well is drilled, copies of the well log are filed with the Ohio Department of Natural Resources, Division of Water, the local county health department, and a copy is provided to the well owner. If you do not have a copy of your well log, search their website at www.dnr.state.oh.us/water/maptechs/wellogs/app/, or contact ODNR, Division of Water at (614) 265-6740. The total depth of the well will be recorded at the right side of the well log, and the static water level will be recorded under the well test section of the well log. Subtract the static water level from the total depth of the well to determine the total feet of water held in the well casing.

Step 3. Determine the volume of chlorine to use for disinfection

Once the total feet of water stored in the casing is known, then the volume of water stored in the casing can be calculated based on Table 1. Take the total feet of water stored in the well, and based on the well diameter, multiply the total feet times the appropriate gallons per foot of water.



Example:

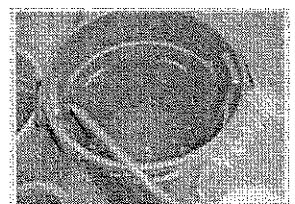
Total well depth is 100 feet, static water level is 60 feet, well casing diameter is 5 inches.
 $100 \text{ feet} - 60 \text{ feet (static water level)} = 40 \text{ feet of water in the well casing}$
 From Table 1, a 5 inch casing has 1 gallon stored per foot.
 $40 \text{ feet of water in the casing} \times 1 \text{ gallon per foot} = 40 \text{ gallons volume of water in casing}$

Diameter of well (inches)	Gallons per foot of water
3	0.37
4	0.65
5	1.0
6	1.5
8	2.6

The total volume of chlorine to be used for disinfection can be calculated based on the Table 2. For the example cited above (40 gallons of water in the well casing), use approximately one-half of the amount of chlorine necessary to disinfect 100 gallons.

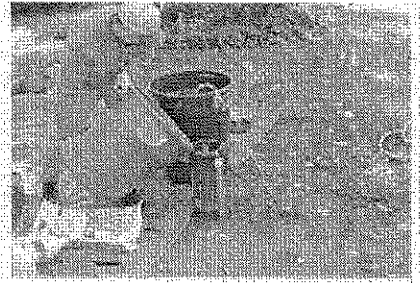
Chlorine concentration (parts per million)	Gallons of 5.25% sodium hypochlorite - liquid bleach	Pounds of dry calcium hypochlorite	Minimum contact time
250	0.5 gallons	0.38	8 hours
500 ppm	1 gallons	0.75 pounds	8 hours

If the total volume of water stored in the well casing is unknown, add one gallon of fresh 5.25 % unscented laundry bleach, also called sodium hypochlorite, to five gallons of water and three gallons vinegar.



Step 4. Prepare a vinegar and chlorine solution.

Use about three parts white vinegar to one part 5.25% chlorine to lower the pH for better disinfection. Mix the vinegar with five gallons of water then add the amount of chlorine that was determined to be needed in Step 3.



Mix the solution in a new clean garbage can, or clean and line a garbage can with a new plastic garbage bag. Laundry bleach loses its effectiveness the longer it sits on the shelf in the store or in your home. Solid chlorine pellets, which are 65% to 70% calcium hypochlorite, should be dissolved in five gallons of water. Use only chlorine pellet products intended for water well disinfection. Do not use solid chlorine products used for swimming pools because they may contain additional chemicals, such as algaecides.

Step 5. Add the chlorine / vinegar solution to the well

Remove the cap from the well. Place the can next to the well to pour the solution or siphon the chlorine /vinegar solution from the can directly into the well. Ideally the vinegar should be added to the well bore first through a 1 inch plastic line then followed with the chlorine solution to provide a better opportunity for complete disinfection.

Step 6. Flush and re-circulate.

By-pass all water treatment units during the initial chlorination process to avoid damage to the resin bed. The resin bed of the water softener can provide a place for bacteria to grow, and must be chlorinated at lower concentrations. The water softener should be disinfected separately using ¼ to ½ cup of chlorine bleach placed into the small fill tube in the large brine tank followed by a manual recharge. Remove and discard any carbon filters or cartridge filter elements and thoroughly clean the inside of the filter housing.

With a garden hose, re-circulate this solution back into the well washing down the sides of the casing for approximately ten minutes. Debris may begin to slough off the side of the casing, and iron or manganese in the water may begin to turn solid as the chlorine reacts with the minerals. Run the well to waste outside long enough and hard enough to reduce the debris that has come loose before you run anything inside the house - especially the washing machine. You may need to re-treat the well with another vinegar and chlorine solution before continuing to the next part of Step 6.



After the water has run clear for a while turn on **all** faucets connected to the well throughout the house and outside the house, including the hot water faucets. Make sure to turn on faucets that rarely or never get used, especially yard hydrants and outside spigots. Remember to run water into the washing machine and flush all toilets. Run the water until the chlorine smell is detected.

Step 7. Maintain sufficient contact time.

Once the odor of chlorine is detected in all water lines, shut off the faucets and let the water sit in the plumbing for 8 to 24 hours.

Step 8. Flush the chlorine from the water system.

After sufficient contact time has elapsed, run the water to waste until the entire odor of chlorine is gone. This will take a while depending on the volume of the well and the plumbing. Do **not** run the water into your septic system as this will cause the system to become overloaded.

Step 9. Retest the well for total coliform

Wait a few days, and then contact the local health district to have another sample collected for total coliform bacteria. Make sure that the water is checked for chlorine before collecting the water sample. If there is any indication of chlorine in the water, the sample should not be collected. This helps avoid getting an indication of a safe sample that may be due only to the continuing activity of leftover chlorine and may not reflect the true condition of the water. Do not replace carbon filters or filter elements until an acceptable total coliform result has been achieved.

What if the well has unacceptable levels of total coliform after disinfection?

There are many instances where the previously described disinfection procedures may not work sufficiently in reducing the levels of bacteria in the water well. In some cases the pH of the water may need further adjustment in order to get the optimum disinfection from the added chlorine, or enhanced disinfection methods may be required. The well casing may also need a thorough scrubbing or cleaning to remove non-pathogenic slime forming or iron bacteria that can build up on the well casing and borehole walls. Removal of this type of bacteria often requires the use of specially formulated well cleaning products and drilling equipment and is best performed by a registered contractor. If total coliform levels persist above four colony forming units (CFUs), if *E. coli* bacteria persist in water samples, or the condition and stability of the well is questionable, then contact an experienced registered private water systems contractor to professionally disinfect your well. Persistent bacteria problems may also indicate that your well has deteriorated or that there is an existing issue with the aquifer. Contact your local health district when you experience any problems with your well or for additional assistance on private well issues.

The Ohio Department of Health registers and bonds private water systems contractors. Please contact your local health district or check <http://www.odh.ohio.gov/odhPrograms/eh/water/PWSreg.aspx> for the most current list of registered contractors and other information. Questions? Send E-mails to BEH@odh.ohio.gov

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