Disinfecting your water supply

Montana Department of Environmental Quality

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When boiling is not practical, certain chemicals will kill most harmful or disease-causing organisms.

For chemical disinfection to be effective the water must be filtered and settled first. Chlorine and iodine are the two chemicals commonly used to treat water. They are somewhat effective in protecting against exposure to *Giardia,* but may not be effective in controlling more resistant organisms like *Cryptosporidium.* Chlorine is generally more effective than iodine in controlling *Giardia*, and both disinfectants work much better in warm water.

You can use non-scented, household chlorine bleach that contains a chlorine compound to disinfect water.

Do not use non-chlorine bleach to disinfect water. Typically, household chlorine bleaches will be 5.25% available chlorine. Follow the procedure written on the label. When the necessary procedure is not given, find the percentage of available chlorine on the label and use the information in the following table as a guide (1/8 teaspoon and 8 drops are about the same quantity).

Available Chlorine	Drops per Quart/Gallon of Clear Water	Drops per Liter of Clear Water
1%	10 per Quart - 40 per Gallon	10 per Liter
4-6%	2 per Quart - 8 per Gallon (1/8 teaspoon)	2 per Liter
7-10%	1 per Quart - 4 per Gallon	1 per Liter

(If the strength of the bleach is unknown, add ten drops per quart or liter of filtered and settled water. Double the amount of chlorine for cloudy, murky or colored water or water that is extremely cold.)

Mix the treated water thoroughly and allow it to stand, preferably covered, for 30 minutes. The water should have a slight chlorine odor. If not, repeat the dosage and allow the water to stand for an additional 15 minutes. If the treated water has too strong a chlorine taste, allow the water to stand exposed to the air for a few hours or pour it from one clean container to another several times.

Shock Chlorination for Wells

What should I do if my water is contaminated with bacteria?

First, don't panic! Bacterial contamination is common. Studies show that more than 40 percent of private water supplies are contaminated with coliform bacteria. These are common bacteria that have been inadvertently introduced into your well, and they can be removed. If your well is reported to have E. coli or fecal coliform bacteria, do not use the water and contact your local health department for guidance.

Shock chlorination is a one-time treatment designed to kill bacteria in the well and water system. Shock chlorination is the preferred disinfection treatment for private well systems because it is simple, cheap and effective for most situations. The amount of chlorine used in well treatment is determined by the well's diameter and depth of water. A 200 ppm solution of chlorine in the well and plumbing system for a period of at least 2 hours is required, altough overnight is preferable. Chlorine bleach is the most often use liquid chlorine (sodium hypochlorite) for domestic well disinfection. Unless you are confident about safely performing shock chlorination yourself, contact a licensed water well contractor to perform the procedure.

Step 1. Clean exterior and accessible interior surfaces. Turn off the electricity to the well and remove the well cap. Scrub the accessible interior surfaces of the cap with the chlorine solution (1 quart of chlorine laundry bleach per 5 gallons water), avoiding electrical connections. Replace a non-sanitary well cap with a sanitary well cap (https://deq.mt.gov/Portals/112/Water/WPB/SWP/PDFs/SaniWellCapsVent.pdf)

Step 2. Calculate the amount of chlorine needed. Determine the volume in the well and holding tank or cistern using Tables 1 and 2. Add 100 gallons for the water stored in the plumbing, pressure tank and water heater. Use Table 3 to determine how much chlorine is needed per 100 gallons of water in your well and plumbing system. For most homeowners, the cheapest and simplest method is to dilute common liquid bleach with water in a clean 5 gallon bucket.

(Note: Always wear protective clothes, gloves and goggles when handling chlorine, and work in a well ventilated area. If chlorine comes into contact with the skin, and especially the eyes, stop immediately and wash thoroughly with clean water.)

Table 1. Storage capacity of well casing or pipe.	
Well diameter (inches)	Storage per foot of water depth (gallons per foot)
2	0.16
3	0.37
4	0.65
5	1.02
6	1.47
8	2.61
10	4.08
12	5.87

Table 2. Capacity of storage tanks or cisterns.					
Depth (in feet)	Diameter of round cistern or length of side of square cistern (in feet)				
	6	7	8	9	10
Round type	Cistern capacity, gallons				
5	1,055	1,440	1,880	2,380	2,935
6	1,266	1,728	2,256	2,856	3,522
7	1,477	2,016	2,632	3,332	4,109
8	1,688	2,304	3,008	3,808	4,696
9	1,899	2,592	3,384	4,284	5,283
10	2,110	2,592	3,760	4,760	5,870
Per foot of depth	211	288	376	476	587
Square type	Cistern capacity, gallons				
5	1,345	1,835	2,395	3,030	3,740
6	1,614	2,202	2,874	3,636	4,488
7	1,883	2,569	3,353	4,242	5,236
8	2,152	2,936	3,832	4,848	5,984
9	2,421	3,303	4,311	5,454	6,732
10	2,690	3,670	4,790	6,060	7,480
Per foot of depth	269	367	479	606	748

Example:
You have a 6-inch diameter well casing that is 150 feet deep and the static water level (the water level when not pumping) is 50 feet. From Table 1 you estimate that you have approximately 150 gallons of water stored in the well casing (100 feet of water x 1.47 gal per foot of 6″ pipe = 147 gallons). Add an additional 100 gallons for the plumbing system (150 + 100 = 250 gallons of water needing treatment). From Table 3, you determine that 3 pints of household bleach are needed per 100 gallons of system capacity.

$$250\ gallons\ capacity\ X\ \frac{3\ pt\ bleach}{100\ gallons\ capacity} = 7.5\ pt\ bleach$$

Table 3. Chlorine mix ratio for a 200 ppm solution.

Chlorine Product	% Active Chlorine	Amount needed for 200 ppm solution
Liquid laundry bleach	5.25%	3 pt/100 gallon

Step 3. Add the chlorine solution to the well and circulate. Pour the chlorine solution into the well. Turn on the electricity. Using a hose connected as near to the well as possible, run water back down the well for at least 15 to 20 minutes to circulate the chlorinated water. Rinse the sides of the well casing and the pitless adapter during recirculation. Take care to avoid electrical wiring and connections.

Step 4. Disinfect the household plumbing. Before disinfecting the household plumbing system, disconnect or bypass any carbon filters or reverse osmosis equipment. Open the cold and hot water faucets, one at a time, and let the water run until a strong chlorine odor is detected from each faucet. Flush toilets until chlorine odor is apparent. Do not allow more than 100 gallons of chlorine-treated water to enter the septic system. Once the chlorine has reached all points in the system, allow it to stand undisturbed overnight. Turn off the hot water heater during this time and be sure the house is well-ventilated.

Step 5. Flush the system. The next morning, use an outdoor hydrant or faucet to flush the chlorinated water out of the system onto an area without desirable vegetation, such as a gravel driveway far away from any surface water or stream. Chlorine will evaporate to harmless levels within one to two days. After the chlorine is drained from the system, run water through the taps until the strong chlorine odor is gone. A slight chlorine taste and odor will remain in the water for a couple days. The water should now be safe for human consumption; however, it is advisable to retest the water for bacteria after one week to ensure the problem is resolved. You may need to clean faucet aerators or valves on the water system to remove any debris broken loose during the disinfection process.

REFERENCES

USEPA Factsheet EPA 816-F-05-021 What to Do After the Flood