WELL EDUCATED

Coliform and E. coli Bacteria
Fact Sheet

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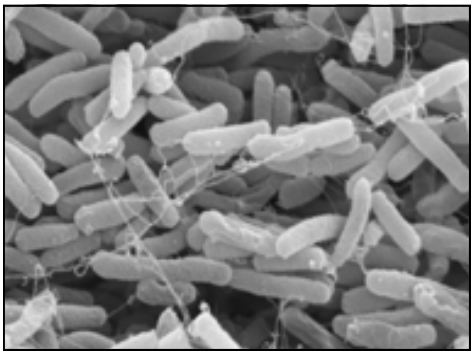
What are Total Coliform and E. coli Bacteria?

Total Coliform is a group of bacteria which are present all around us and are not thought to be directly dangerous to human health. However, these bacteria are not naturally present in groundwater and are an indication that more harmful organisms might be present. Fecal Coliform is a group of total coliform that comes from the feces of warm blooded animals. If a drinking water sample tests positive for total coliform, a second test is run for E. coli (a group of fecal coliform). **PRESENCE of E. coli indicates** that the water has been exposed to feces and **an immediate risk to human health exists**.

Escherichia Coli (E. coli) bacteria



Immediate Action to take with a Positive E. coli Test

If E. coli were found present in your water sample, discontinue consumption of the water unless you treat it. Treatment can be achieved by boiling the water for at least a minute. Water should be treated for drinking, making baby formula, washing produce, brushing teeth, and making ice cubes. An alternative to treatment is use of bottled water. Contact your county sanitarian or water quality district about addressing the contamination problem.

Total Coliform in Groundwater

If a well water sample tests positive for total coliform but negative for E. coli, it is still important to find out where the bacteria entered the system. It is possible that the sample was contaminated during the sampling process and that the bacteria was not in the water. It is also possible that the bacteria are coming from the supply lines between the well and the house. Leaking pipes or improperly maintained water treatment systems are examples of this type of source. Another possibility is that the bacteria has moved into the groundwater around your well.

Bacteria may reach groundwater due to:

- Well located in gravely or sandy soil where surface water moves quickly down to groundwater
- Contamination during the process of well maintenance or installation
- Old or improperly constructed wells which are not sealed between the casing and the soil
- Wells located in areas that pond or concentrate water on the ground surface
- Wells which are not capped and screened properly to keep water, animals and insects out
- Wells which are located too close to septic systems or animal waste sources

Take an inventory of your system and determine what the likely source of the bacteria is. Address this source to prevent further contamination of your water by more harmful pathogens in the future. If you find your system to be well maintained and free from likely contaminant sources, resample your water for total coliform, taking the utmost care to prevent contamination during sampling.

Treating a Well for Bacteria Contamination

If your well water sample tests positive for E. coli, contact your county sanitarian to inquire about what steps to take to address the problem. If there is a source of fecal coliform bacteria reaching your well, chlorinating the system will kill the bacteria in the well but the system will soon be contaminated again.

The following instructions (adapted from the MT DEQ, Water Supply and Subdivision Bureau) are designed to provide assistance in disinfecting wells which have been contaminated with bacteria. A chlorine solution is the simplest and most effective agent for disinfecting a well, pump, storage tank or piping system. Liquid household bleach is the most commonly available source of chlorine. Regular Purex or Clorox may be used, but **DO NOT USE LAUNDRY DETERGENT** with bleach added.

If shock chlorination is not effective and/or additional bacteria control in desired, an ultraviolet or chlorination disinfection system can be installed to treat for bacteria and other pathogens.

Shock Chlorination of a Well

Note: During the disinfection process your water supply will be chlorinated and not fit for consumption.
Note: Before disinfecting, it is a good idea to have a few gallons of pure (possibly bottled) water on hand to rinse the chlorine off the hardware and well casing after circulating the disinfectant to avoid possible oxidation of the metal causing rusting.

Well Diameter (in inches)

Depth of Water in Well this is the distance from the bottom of the well to the water level (in feet)	**2**	**3**	**4**	**5**	**6**	**8**	**10**	**12**	**16**	**20**	**24**	**28**	**32**	**36**	**42**	**48**
5	1C	1C	1C	1C	1C	1C	2C	2C	1Q	1½Q	2Q	2½Q	3½Q	1G	1½G	1¾G
10	1C	1C	1C	1C	1C	2C	3C	1Q	2Q	2½Q	3½Q	1¼G	1¾G	2G	2¾G	3¾G
15	1C	1C	1C	1C	2C	3C	1Q	1½Q	2½Q	1G	1½G	2G	2½G	3G	4¼G	5½G
20	1C	1C	1C	2C	2C	1Q	1½Q	2Q	3½Q	1¼G						
30	1C	1C	2C	2C	3C	1½Q	2Q	3Q	1¼G	2G						
40	1C	1C	2C	3C	1Q	2Q	2½Q	3½Q	1¾G	2½G						
60	1C	2C	3C	1Q	1½Q	2½Q	1G	1½G								
80	1C	2C	1Q	1½Q	2Q	3½Q	1¼G	1¾G								
100	1C	3C	1Q	2Q	2½Q	1G	1¾G	2¼G								
150	2C	1Q	1½Q	2½Q	3½Q	1½G	2½G	3½G								

C = Cups Q = Quarts G = Gallons

First, use the table above to determine how much bleach to use based on the diameter and the depth of water in your well (well water depth should be available from the Montana Bureau of Mines and Geology website referenced below). Open the well cap and slowly pour the required amount of chlorine into the well.

Next, turn on an outdoor faucet with a hose that will reach the well head. Run the water until you can smell the chlorine at the nozzle. At that point the chlorine is circulating in the system and you can use the hose to disinfect the parts of the well above the water line. After thoroughly washing down the well cap, the inside of the casing, the pitless adaptor, and other hardware inside the well, turn off the hose. If you want to disinfect the cold water system to the house, turn on each cold water faucet until the chlorine can be detected.

> **Note:** If you want to disinfect your hot water system, more chlorine will be necessary to account for the increased volume from your hot water heater.

Next, if pure water is available, pour it down the well along the sides and over the pitless adaptor and hardware to wash off excess chlorine to avoid oxidation of the metal.

Finally, allow the chlorine solution to remain in the well and service line for 12 to 24 hours. After disinfection, run an outside faucet (to avoid sending the water to your septic system) until the odor of chlorine can no longer be detected at the nozzle. After clearing the chlorine from the outside line, similarly run the inside faucets until chlorine can no longer be detected. If possible, connect a hose to inside faucets to run the water outside. Water should be discharged onto gravel surfaces or areas without vegetation. All traces of chlorine must be removed before collecting another water sample for testing. It is also important to remove the chlorine from the system before using the water for drinking because household bleach is not appropriate for human consumption.

After disinfecting, the effectiveness of the process should be checked by testing water samples for the presence of total coliform bacteria again. This should be done at least 72 hours after the chlorine is cleared from the system and should follow the same method used for the first sample.

Additional Resources:

MSU Homeowner's Guide to Water Quality
http://waterquality.montana.edu/docs/homeowners.shtml

EPA E. coli in drinking water
http://www.epa.gov/safewater/ecoli.html

Montana Bureau of Mines and Geology (MBMG), Groundwater Information Center (GWIC)
http://mbmggwic.mtech.edu/

How to Shock Chlorinate or Disinfect Your Private Water Supply or Water Well
http://www.water-research.net/shockwelldisinfection.htm