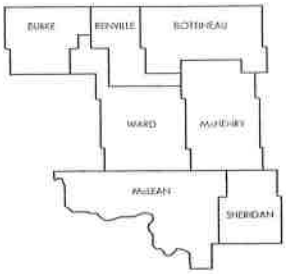

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FIRST DISTRICT HEALTH UNIT

PO Box 1268 • 801 - 11th Avenue SW • Minot, ND 58702-1268
Phone (701) 852-1376 • Fax (701) 852-5043 • www.fdhu.org

Public Health
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Coliform Bacteria

Background/Overview
Biological organisms are among the oldest health threats to drinking water quality and the agents currently responsible for most waterborne diseases. They are the most common contamination incident water operators will encounter. Organisms known to cause disease include bacteria, protozoa, and viruses; some algae and helminths (worms) may also be capable of producing disease. These disease-causing organisms thrive in the intestines of warm-blooded animals. They are easily transmitted to drinking water if the feces of an animal contaminates a water supply for which there is not suitable disinfection. Potential sources of contamination include sewers, septic systems, feedlots, and animal yards.

Role of coliforms in detecting contamination
Unfortunately, specific disease-producing (pathogenic) organisms present in water are not easily identified. It would be very difficult, expensive, and time consuming to monitor for them. For this reason, it is necessary to select an easily measured "indicator organism," whose presence indicates that pathogenic organisms may be present. A group of closely related bacteria, the total coliform, has been selected as an indicator of harmful organisms in drinking water.

Sources of coliform bacteria
Total coliform (TC) bacteria are common in the environment (such as in soil) and the intestines of animals and are generally not harmful. Fecal coliform (FC) and *Escherichia coli (E. coli)* bacteria are found in greater quantities than total coliform in animal fecal matter. If FC or *E. coli* is detected along with TC in drinking water, there is strong evidence that sewage is present; therefore, a greater potential for pathogenic organisms exists.

Response to coliform detection
FDHU monitors drinking water for public water supplies (PWSs) on a routine basis. If FC, or *E. coli* is detected in the distribution system of a PWS, the system must be disinfected. In most cases this includes emergency chlorination, which can last for two to five days. At the same time a system is being disinfected, customers of the PWS are ordered to vigorously boil their drinking and cooking water (Boil Order) for one minute before using it. Once the system has been disinfected and flushed, FDHU tests the water again for coliform bacteria. If none are detected, the Boil Order is lifted.

For questions about this document or concerning your water, contact the First District Health Unit at (701) 852-1376

If only TC is detected (without the presence of fecal coliform or *E. coli),* the source is most likely from contamination from the environment, introduced during construction or while repairs to plumbing or a water main were underway. The system will identify the source of the contamination, correct the problem, and thoroughly disinfect its system. The public will also be notified of the situation; however, unless unusual circumstances exist to cause particular concern about the safety of the water, a Boil Order will not be issued.

Exceptions

Total coliforms are not a perfect indicator of the actual or potential presence of harmful organisms. Some disease-producing organisms, especially protozoa such as *Giardia* and *Cryptosporidium,* are able to withstand treatments which kill the total coliform. These two protozoa are often found in surface waters (the principle carriers of these organisms) contaminated by human sewage or wildlife. However, for the majority of PWSs this is not a significant threat since most PWSs obtain their water from wells rather than surface-water sources such as rivers and lakes. For those PWSs that use surface water, a combination of coagulation, filtration, and disinfection has been successful and is recommended to reduce the risk of *Giardia* or *Cryptosporidium* contamination.

Health effects

Symptoms of water-borne diseases may include gastrointestinal illnesses such as severe diarrhea, nausea, and possibly jaundice as well as associated headaches and fatigue. It is important to note, however, that these symptoms are not associated only with disease-causing organisms in drinking water. They may also be caused by a number of other factors. In addition, not all people will be affected to the same degree; young children and the elderly are usually more susceptible.

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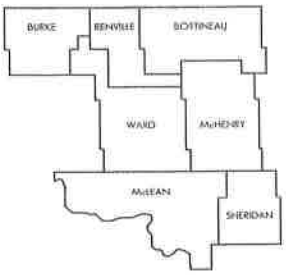

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WELL WATER DISINFECTION

The bacteriological examination of the water sample submitted indicates evidence of contamination with coliform bacteria. This coliform group of bacteria usually originates in the intestinal tract of warm-blooded animals and man. The presence of these bacteria in drinking water is therefore grounds for assuming that a health hazard exists because of the possible presence of disease causing organisms.

The construction of the well is critical to the safety of your drinking water. If the well is not properly sealed and protected, it may become contaminated at any time. Be sure the system is impenetrable to outside contaminates before continuing with the disinfection procedure.

PERFORM THE FOLLOWING PROCEDURE TO DISINFECT YOUR WATER SYSTEM

1. Chlorine can be purchased in the form of laundry bleach. Be sure the active ingredient is at least 5.25%.
2. Draw off all of the water that may be needed for the household in the next 12-24 hours.
3. Determine the amount of water in the well by referring to TABLE I on the back of this sheet. If there is a cistern on the system, be sure to add in the number of gallons it contains.
4. Use the total number of water gallons in the system to determine the amount of chlorine compound necessary to give a dosage of 50 ppm, as indicated on TABLE II.
5. The chlorine may be added directly to the well or mixed with water in a 5 gallon bucket. Pour the chlorine into the opening between the casing and the drop pipe. Chlorine can destroy only the bacteria with which it comes into contact. Agitation of the water in the well may be required to assure thorough mixing. Deep wells with high water may require the chlorine solutions be added through a hose inserted down the well casing.
6. Open all faucets until chlorine odor is detectable. This assures distribution of chlorine throughout the pressure system, destroying any bacteria existing there.
7. Allow chlorine solution to remain in the system 12-24 hours.
8. Run water until the odor of chlorine has disappeared.
9. Another sample should be submitted for testing to determine the effectiveness of the treatment. If you choose to do so, please request another bottle.

PURIFICATION OF AVAILABLE WATER

When in doubt of the water supply or if emergency purification is needed, the following precautions should be taken:

- Boil water vigorously for at least one full minute.
- Use a constant chlorinator on the well system.
- For immediate use, when boiling is not available, purify with any one of the following:
    - Laundry bleach (5.25% sodium hypochlorite) – add four drops per quart of water, mix thoroughly, and let stand for 30 minutes before using. Double the amount of bleach and time if water is colored or turbid.
    - Iodine – add 10 drops per quart of water mix thoroughly and let stand 30 minutes before using.
    - Tablets of iodine or chlorine – follow instructions on package.

Contact the Environmental Health Division at First District Health Unit with any questions at 701-852-1376.

TABLE I - GALLONAGE CALCULATOR

Diameter of pipe → / Height or length of pipe or tank in feet ↓	2-inch	3-inch	4-inch	5-inch	6-inch	7-inch	8-inch	10-inch	12-inch	14-inch	16-inch	3-feet	5-feet	6-feet	9-feet	12-feet
1	0.164	0.369	0.655	1.03	1.48	2.01	2.62	4.1	5.9	8.02	10.5	53.1	147.4	213	478	849
2	0.328	0.738	1.31	2.06	2.96	4.02	5.24	8.2	11.8	16.04	21	106.1	294.8	425	955	1698
3	0.492	1.107	1.965	3.09	4.44	6.03	7.86	12.5	17.7	24.06	31.5	159.2	442.2	637	1433	2546
4	0.656	1.476	2.62	4.12	5.92	8.04	10.48	16.4	23.6	32.08	42	212.2	589.6	840	1920	3395
5	0.8	1.845	3.275	5.15	7.4	10.05	13.1	20.5	29.5	40.1	52.5	265.2	737	1061	2387	4243
10	1.64	3.69	6.55	10.3	14.8	20.1	26.2	41	59	80.2	105	530.4	1474	2122	4774	8486
20	3.28	7.38	13.1	20.6	29.6	40.2	32.4	82	118	160.4	210	1060.8	2948	4244	9548	16,972
30	4.92	11.07	19.65	30.9	4.14	60.3	78.6	123	177	240.6	315	1591.2	4422	6366	14,322	25,458
40	6.56	14.76	26.2	41.2	59.2	80.4	104.8	164	236	320.8	420	2122	5896	2488	19,096	33,944
50	8.2	18.45	32.75	51.5	74	100.5	131	205	295	401	525	2652	7370	10,610	23,870	42,430
100	16.4	36.9	65.5	103	148	201	262	410	590	802	105	5304	14,740	21,220	47,740	84,860
500	82	185	327.5	515	740	1005	1310	2050	2950	4010	5250	26,520	73,700	166,100	238,700	424,300
1000	164	369	655	1030	1480	2010	2620	4100	5900	8020	10,500	53,040	147,400	212,200	477,400	848,600

TABLE II CHLORINE DOSAGE CALCULATOR

DOSAGE DESIRED 50 PPM

Number of gallons to be chlorinated ↓	Amount of chlorine to use at 5% sodium hypochlorite ↓	Amount of chlorine to use at 8% sodium hypochlorite ↓
25,000	25 gal	16 gal
10,000	10 gal	6.4 gal
5000	5 gal	3.2 gal
2000	2 gal	1.25 gal
1000	1 gal	2.5 qt
500	2 qt	1.3 qt

Number of gallons to be chlorinated ↓	Amount of chlorine to use at 5% sodium hypochlorite ↓	Amount of chlorine to use at 8% sodium hypochlorite ↓
200	25.6 oz	16.4 oz
100	12.8 oz	8.2 oz
50	6.4 oz	4.10 oz
25	3.2 oz	2.05 oz
10	1.28 oz	0.82 oz
5	.64 oz	0.41 oz