



Coliform Bacteria – An Indicator of Water Quality

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A safe and reliable source of water is vital to everyone. If you rely on a well for drinking water, there are several things you should know to assure its safety for you and your family.

All groundwater contains some inorganic salts and minerals and some organic materials. They are usually found at very low levels and are not considered undesirable until they exceed approved limits.

There are many tests that can be conducted to determine the quality and safety of your water. However, selected tests can be run initially as “indicator” tests to give an idea of the overall water quality and safety of the water.

Note: With respect to bacteria, the Tennessee Department of Health and Environment routinely tests for total coliform bacteria.

What is an “indicator” organism?

Water pollution caused by fecal contamination is a particularly serious problem due to the potential for contraction of disease from pathogenic (disease-causing) organisms. Since the concentration of pathogens in groundwater and natural streams from fecal contamination is generally small, and the number of different disease-causing organisms that could be present is large, it is not practical to test for all of these pathogens. Consequently, the presence of pathogens is determined with indirect evidence by testing for an

“indicator” organism such as coliform bacteria. Coliforms come from the same sources as pathogenic organisms.

What are coliform bacteria?

Coliforms are always present in the digestive tracts of animals, including humans, and are found in their wastes. They are also found in plant and soil material. Coliforms are relatively easy to identify, are usually present in larger numbers than the more dangerous pathogens and respond to the environment and treatment similarly to other pathogens. Consequently, testing for coliform bacteria can be a good indicator that other pathogenic bacteria are present.

Total coliforms versus fecal coliforms – what’s the difference?

Coliform bacteria come from a variety of places, such as soil, decaying vegetation, sewage, animal manure and human waste. Certain coliforms are only present in fecal material; these are called fecal coliforms. These organisms indicate the presence of animal or human waste. The actual designation of “fecal coliform” or “coliform” refers to groups of bacteria that can grow under specific laboratory test conditions. There is, however, a specific test to identify fecal coliforms.

In determining whether fecal coliforms are from humans or other animals, a third test must be

conducted – fecal streptococci. The ratio of fecal coliforms: fecal streptococci varies for different animals. (Table 1).

Table 1. Typical fecal coliform/fecal streptococci ratios for humans and various animals.	
Human	4.4
Duck	0.6
Sheep	0.4
Chicken	0.4
Pig	0.4
Cow	0.2
Turkey	0.1

Sources of fecal coliforms

Some coliforms come from ground runoff – from pastures, feedlots, poultry-growing operations, lagoons, septic tanks, sewage plants, woodlands and wildlife. Areas where domestic animals are concentrated contribute significant surface waters, but most groundwater is not heavily populated with bacteria. Groundwater may be contaminated directly by a waste source or through an improperly constructed well that allows surface water to enter.

Generally, bacteria contamination results from the entrance of surface water into the well.

Remember, surface water almost always contains bacteria.

Sampling water for bacteria

Improper sampling procedures or contamination of the water sample when taken may cause erroneous or high readings. Upon receiving a high reading, before taking corrective action to modify the water supply, a second sample should be carefully taken and retested.

Samples taken for bacteria testing should always be collected in sterile containers. Sample containers should be obtained from the testing laboratory. Flame-sterilize the end of the faucet with a butane torch or lighter and let the water run for five minutes **before** collecting the sample. Do not touch or contaminate the inside of the cap

while filling the container to overflowing, and then quickly replace the top. Refrigerate the sample and get it to the testing lab within six hours. Use an ice chest to transport the sample. Mailing a sample is not recommended, and you should not deliver a sample to a testing laboratory on a Friday.

Wells having high coliform counts can be disinfected using ordinary laundry bleach. Before disinfection, the source of contamination should be found and corrected. When a new well is drilled, it should be disinfected before use. In addition, whenever a well is opened for maintenance, i.e., replacement or repair of the pump, it should be disinfected before use. For details about disinfecting your well, contact your Extension agent or local environmentalist at the county health department.

Your private water supply should be tested at least annually. If you have experienced bacteria problems, it should be tested more frequently. Additional information on the water quality of private water supplies may be obtained from UT Extension publications *Safety of Private Water Supplies* (PB 1356) and *Water Quality and Private Water Supplies* (PB 1357).

References:

Brodie, H.L. Coliform Bacteria - A Measure of Water Pollution, the University of Maryland, 1986-1987.

Mancel, K.M. Bacteria in Drinking Water, The Ohio State University, 1989.

McManus, M. Safety of Private Water Supplies, The University of Tennessee Agricultural Extension Service, PB 1356, 1990.

McManus, M. Water Quality and Private Water Supplies, The University of Tennessee Agricultural Extension Service, PB 1357, 1990.

This material is based upon work supported by the U.S. Department of Agriculture Extension Service under special project number 90-EWQI-1-9238.

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SP392-B 6/07 07-0293