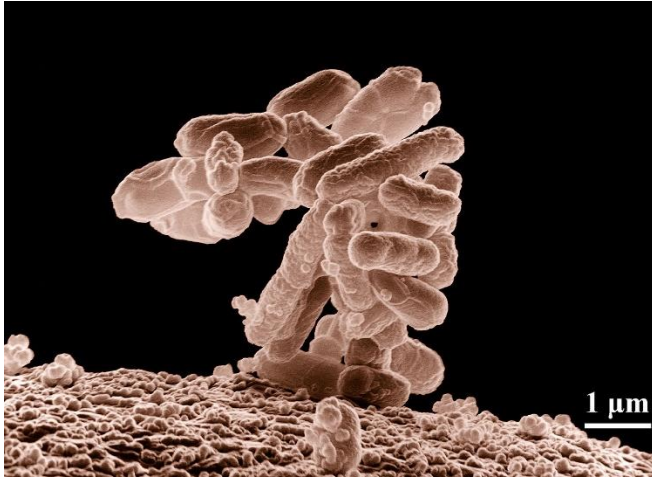




Coliform Bacteria in Drinking Water

What are Coliform Bacteria?



Escherichia coli magnified 10,000 times

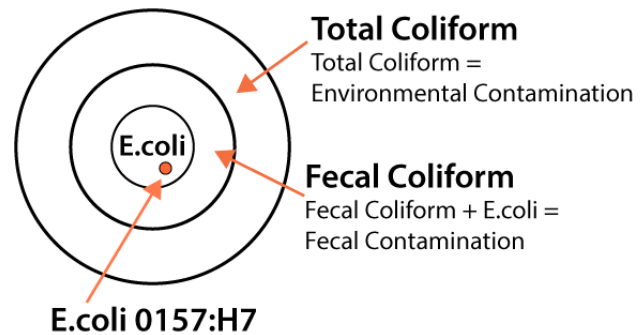
Coliform bacteria include a large group of many types of bacteria that occur throughout the environment. They are common in soil and surface water (such as lakes and streams) and may even occur on your skin. Large numbers of certain types of coliform bacteria can also be found in waste (fecal) from humans and animals. Most of these coliform bacteria are harmless to humans, but some can cause mild illnesses, and a few can lead to serious waterborne diseases.¹

Coliform bacteria are often referred to as "indicator organisms" because they indicate the potential presence of disease-causing bacteria in water. The presence of coliform bacteria in water does not guarantee that drinking the water will cause an illness. Rather, their presence indicates that a contamination pathway exists between a source of bacteria (surface water, septic system, animal waste, etc.) and the water supply.²

There are three groups of coliform bacteria. Each is an indicator of water quality and has a different level of risk associated with its presence.

Total coliform bacteria are common in the environment (soil or vegetation) and are generally harmless. If a lab detects only total coliform bacteria in a drinking water sample, the source is probably environmental and fecal contamination is unlikely. However, if environmental contamination enters the drinking water distribution system, pathogens could also invade the water supply.

Total Coliform, Fecal Coliform and E.coli



Fecal coliform bacteria are a subgroup of total coliform bacteria. They exist in the intestines and feces of people and animals.

***Escherichia coli* (or *E. coli*) bacteria** is a subgroup of the fecal coliform group. Most *E. coli* bacteria are harmless and exist in the intestines of people and warm-blooded animals. However, some strains can cause illness. The presence of *E. coli* in a drinking water sample usually indicates recent fecal contamination. That means there is a greater risk that pathogens are present. A specific strain of *E. coli* known as ***E. coli* O157:H7** causes about 36% of the waterborne illness outbreaks involving *E. coli*. However, when a drinking water sample is reported as "*E. coli* present," it does not necessarily mean that the *O157:H7* strain exists as the contaminant.



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How do coliforms contaminate our drinking water?

If only total coliform is detected (without the presence of fecal coliform or *E. coli*), the source is most likely environmental contamination, introduced during construction or while repairs to plumbing or a water main were underway. Bacteria and other microorganisms in a potable water distribution system may also be associated with biofilm. Biofilms are an accumulation of microorganisms, extra cellular material and debris attached to storage tanks (cooling towers), interior walls of distribution system pipes, tanks, and reservoirs in areas where water sits for long periods of time and becomes stagnant. Biofilm organisms do not usually pose a direct health risk. However, biofilm can be responsible for microbiological water quality violations such as growth of total coliform bacteria.



If fecal coliform or *E. coli* are detected along with total coliform in drinking water, they are most likely coming from sewage that has been introduced into the drinking water. Waste from humans, rodents, or farm animals can be a principal source of bacteria in the water, particularly from run-off.

What are the health effects of coliforms in drinking water?

In water, coliform bacteria have no taste, smell, or color. They can only be detected through a laboratory test. The health effects of exposure to disease-causing bacteria, viruses, and parasites in drinking water area varied. The most common symptoms of waterborne illness include nausea, vomiting, and diarrhea. Highly-susceptible populations; such as, infants, the elderly, and those with compromised immune systems may suffer more severe effects. In extreme cases some pathogens may infect the lungs, skin, eyes, nervous system, kidneys, or liver and the effects may be more severe, chronic, or even fatal.

What are the regulations for coliforms in drinking water?

The Total Coliform Rule (TCR), a National Primary Drinking Water Regulation (NPDWR), was published in 1989 and became effective in 1990. The rule set both a health goal (Maximum Contaminant Level Goal (MCLG)) and legal limits (Maximum Contaminant Levels (MCLs)) for the presence of total coliforms in drinking water. The Environmental Protection Agency (EPA) set the MCLG for total coliforms at zero because there have been waterborne disease outbreaks in which researchers found very low levels of coliforms. The purpose of the 1989 TCR is to protect public health by ensuring the integrity of drinking water distribution systems and monitoring for the presence of microbial contamination. The rule requires all public water systems (PWSs) to monitor for the presence of total coliforms in the distribution system at a frequency proportional to the number of people the PWS serves.

The Revised Total Coliform Rule (RTCR) was published by the EPA in 2013 and became effective in 2016. The RTCR is intended to improve public health protection by requiring PWSs more



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vulnerable to fecal contamination to conduct an assessment to determine whether or not sanitary defects are present and to correct defects.

What if coliform bacteria are found in my water?

When coliform bacteria are found, PWS authorities investigate the route of entry of contamination. They will further analyze the system by conducting more thorough inspections while collecting additional water samples. Collecting additional samples from various sampling points will help determine whether an actual problem exists by examining all areas of the system. If the lab detects bacteria in any of the additional samples, the initial findings are “confirmed.”

If a lab confirms total coliform bacteria in your drinking water, the PWS manager must conduct an assessment to determine the route of contamination. If the assessment identifies the cause of the contamination, PWS operators can usually correct the problem with system repairs, treatment, or improved operation and maintenance practices. PWS authorities will also notify their customers of the test results as soon as possible. The notification will explain mitigation measures, discuss a timeline of resolution, and provide customers with educational material to support them during the mitigation process until the water is determined to be fit for human consumption.

Due to the severity of illness *E. coli* contamination poses in a water distribution system, PWS authorities will immediately issue a “health

advisory” within 24 hours to alert all water users of a potential health risk associated with the water supply. The advisory usually recommends using boiled or bottled water for drinking, preparing food, and brushing teeth. This notification will also explain the mitigation measures taken to eliminate the contamination.

How Does This Apply on Navy and Marine Corps Installations?

It is Department of the Navy (DON) policy that all Navy and Marine Corps PWSs be operated and maintained to comply with Federal and State laws and regulations as well as Department of Defense (DoD) and DON policies. For many overseas DoD installations, host nation environmental final governing standards (FGS) for drinking water quality have been established. The FGS reconcile the requirements of applicable international agreements and host nation environmental standards with the DoD overseas environmental baseline guidance document. The FGS normally reflects the more protective requirement, unless a specific international agreement with the host nation mandates a different applicable standard for installations. Navy medical department personnel at each Navy and Marine Corps installation conduct medical surveillance of drinking water quality that includes testing for coliform bacteria to protect the health of all installation PWS consumers. The installation water quality compliance program conducted usually by Navy Facilities Engineering Systems Command (NAVFAV) or Public Works Department offers more extensive testing of the water supply system.

For more information on Coliforms visit:

Learn more: [General Information and Facts \(navy.mil\)](https://www.navy.mil);

Learn more: [Revised Total Coliform Rule and Total Coliform Rule | US EPA](https://www.epa.gov)

Learn more: [Coliform Bacteria \(psu.edu\)](https://www.psu.edu)

¹ Swistock, B., Sharpe, W., June 2016, What are coliform bacteria? Penn State Extension. [Coliform Bacteria \(psu.edu\)](https://www.psu.edu)

² Ibid.