

TOTAL COLIFORM BACTERIA

Water utilities, such as Rand Water, must deliver safe and reliable drinking water to their customers, 24 hours a day, 365 days a year. Safe water poses no risk to human health. Safe water, amongst others, are defined as drinking water that contains no pathogenic micro-organisms (disease causing). Drinking water contaminated with micro-organisms may cause serious health effects, including death. Fortunately, Rand Water takes many steps to ensure the supply of safe drinking water. One of the most important steps is the regular testing of drinking for micro-organism, including total coliform bacteria.

What is Total Coliform bacteria and where does it come from?

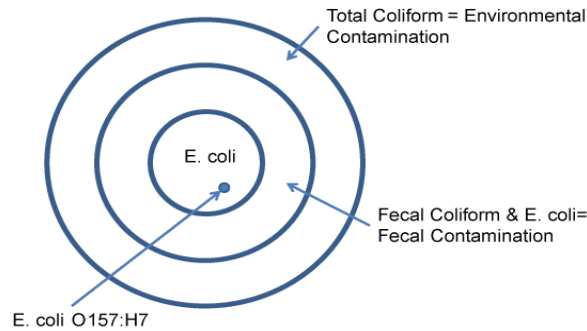
Coliform (rod-shaped) bacteria are a group of bacteria that can be found in the environment, soil and vegetation. They can also be found in the intestines of living species such as humans. The presence of these bacteria in drinking water does not necessarily mean that the drinking water will cause disease. However, it is an indication that the water supply may be vulnerable to contamination. Their presence in drinking water therefore indicates that disease-causing organisms (pathogens), may be present.

Total Coliform bacteria and the level of risk indicated

Total coliforms are a large collection of different kinds of bacteria. Total coliforms may consist of disease, and non-disease causing organisms. Fecal coliforms, is a subset of total coliforms, which are more specific to faecal pollution. *Escherichia coli* (*E. coli*), is a faecal coliform, very specifically associated with the faeces of warm blooded animals including humans.

The below schematic diagramme, published by the Washington Department of Health, illustrates the three groups of coliform bacteria:

Total Coliform, Fecal Coliform and E. coli



The majority of total coliforms are harmless and are found in the environment. If found in drinking water, their presence does not automatically mean the drinking water is unsafe for human consumption. However, one still needs to investigate the occurrence of these organisms in the drinking water supply as their occurrence might indicate contamination and the possible presence of other pathogens (disease) causing organisms.

Faecal coliform bacteria are a subgroup of total coliform bacteria. They exist in the intestines and are excreted with the faeces of people and warm-blooded animals. Their presence in drinking water supplies is a more definitive indication that the water supply might have been polluted by faecal material and therefore pose a risk to human health.

E. coli is a subgroup of the faecal coliform group. *E. coli* are only found in the intestines of humans and warm blooded animals. Not all *E. coli* species are pathogenic, but some poses a significant risk to human health. If *E. coli* is detected in drinking water, it simply indicates that the water have recently being contaminated and demonstrate greater risks as disease causing bacteria can be present. Water with *E. coli* poses an increased risks to immuno compromised individuals, babies, patients undergoing transplants and the elderly.

Which strains of *E. coli* are more dangerous and can cause outbreaks?

It takes further steps in the laboratory to determine a specific outbreak causing strain of *E. coli* . A specific strain of *E. coli* known as *E. coli* O157:H7 causes most

of the diarrhoeal outbreaks associated with drinking water. When a drinking water sample was reported as “*E. coli* present,” it does not mean that *E. coli* O157:H7 or any of the other pathogenic strains are definitely present. It however, does indicate that the drinking water was contaminated and that the pathogenic strains could likely be present.

Can boiling water kill these disease causing strains of *E. coli*?

Yes, boiling or disinfecting contaminated drinking water with chlorine destroys all forms of *E. coli*, including O157:H7. Disinfection processes has to be adequate to ensure the removal of these bacteria.

What are the standards for Total Coliform bacteria?

According to SANS 241, the drinking water standard for South Africa, drinking water should not contain total coliform bacteria in excess of 10 colony forming units per 100ml. *E. coli* should not be detected in drinking water (0 cfu/ 100ml).

Can Rand Water remove these bacteria in the drinking water supplied?

Conventional treatment process, particularly disinfection processes, as used by Rand Water, remove total coliforms (including *E. coli*). Chlorination removes bacteria making drinking water safe for human consumption. Numerous other treatment processes can also be used to disinfect drinking water:

- **Boiling:** Boiling water for about one minute effectively kills bacteria. This method is frequently used to disinfect water during emergencies at a small scale. Boiling is time and energy intensive. It is not a long-term or continuous option for water supply disinfection
- **Ozonation:** Ozone is a strong oxidant that kills bacteria. Ozone, however is an unstable gas and has to be generated at a treatment plant using electricity
- **Iodination:** Iodination is no longer considered a permanent disinfection option due to the health concerns related to long-term exposure to low levels of iodine residual in water.