

# Microbial Indicator Organisms



Australian  
Water  
Quality  
Centre

Analysis for:  
Coliforms

Thermotolerant coliforms  
E.coli  
Heterotrophic Plate Count (HPC)

Limit of Reporting:  
Coliforms - 1/100mL

Thermotolerant coliforms - 1/100mL  
E.coli - 1/100mL  
Heterotrophic Plate Count – 1 /mL

Sampling Requirements:

- Sterile 600 mL PET bottle, Thiosulphate dosed
- Air gap essential
- Transport & Store at 4°C
- Process within 6 hrs of collection up to max 24hrs (AS/NZS 2031:2001)

## Microbial Monitoring

Monitoring for specific bacterial pathogens is usually complex, expensive and time consuming. The AWQC tests for a select group of organisms known as indicator organisms, which are used to verify water quality.

Indicator organisms can be divided into two groups, those which are used as indicators of faecal contamination and those used as indicators of the efficacy of treatment.

## Thermotolerant Coliforms and Escherichia coli – Indicators of Faecal Contamination

Most waterborne pathogens are introduced into drinking water supplies via contamination with human or animal faeces. These pathogens cause a range of conditions ranging from mild to severe gastroenteritis, diarrhoea, dysentery, hepatitis and cholera.

Thermotolerant coliforms (faecal coliforms) are always present in high numbers in human and animal faeces. E. coli is the most common thermotolerant coliform present in faeces (typically >90%) and is regarded as the most specific indication of recent faecal contamination. While most thermotolerant coliforms are non pathogenic, there are some pathogenic subspecies of E. coli that can cause gastrointestinal illness.



*E. coli* (or thermotolerant coliforms) should not be detected in a minimum 100mL sample of drinking water. If detected, immediate action should be taken as it is an indication of faecal contamination and suggests a potentially serious fault in the quality of the water.

Treatment by chlorination or other acceptable forms of disinfection inactivates these microorganisms in water, provided the turbidity is low.

## Total Coliforms and Heterotrophic Plate Count – Indicators used in Operational Monitoring

Coliforms are a diverse group of bacteria including *Escherichia coli* (*E. coli*) and other thermotolerant coliforms. 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.

Total coliforms (excluding *E. coli*) are no longer recommended as indicators for faecal contamination. As coliform bacteria occur widely in soil and water environments there are many environmental coliforms that are not of faecal origin.

Total coliforms can be used as indicator organisms for monitoring the efficiency of water treatment and disinfection process. The presence of these organisms may indicate inadequate treatment, breakdowns in system integrity (leaks, fractures or repair work) or the presence of biofilms.

Total coliforms can also be used as a reasonable indication of the presence of pathogenic bacteria. Coliforms are relatively easy to identify, are usually present in larger numbers than pathogenic bacteria. They also respond to the environment, water and wastewater treatment similarly to many pathogens.

No guideline value has been proposed for total coliforms due to the lack of direct health significance. Numbers, if used, should be established on a system specific basis, taking into consideration relevant historical data and an understanding of the characteristics of the system.

Heterotrophic plate count reflects the number of heterotrophic organisms in the water supply that are able to grow and produce colonies on the growth medium. It may be used to assess the cleanliness and integrity of the distribution system and the suitability of water for manufacturing food and drink, where high counts may lead to spoilage. A significant increase in counts may be an early sign of contamination.

## Methodology

The AWQC provides a range of NATA accredited analyses for Total Coliforms and *E. coli*. These include the rapid Defined Substrate Technology (Colilert), membrane filtration (MF) and most probable number (MPN), AS 4276.21.2005, AS/NZS 4276.5 & AS/NZS 4276.7.2007 and 4276.6.6.2007 respectively.

Colilert®18 is a commercially available Defined Substrate Technology which was designed for the simultaneous detection and confirmation of Total Coliforms and *E. coli* in water. The greatest advantage of this method is that it provides improved result turnaround times. Results are available within 18-22 hrs versus 1-4 days using traditional MF and MPN techniques.

The AWQC also provides NATA accredited analyses for Heterotrophic Plate Counts (AS/NZS 4276.3.2) The count at 20-22°C will favour many environmental organisms, the count at 35-37°C will include both environmental and faecal organisms.