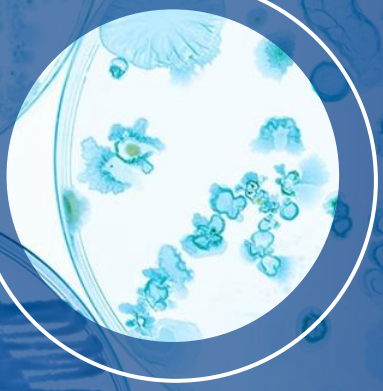


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# TVC Factsheet

## Why test for TVC at 22°C, 37°C and 30°C

**What is a Total Viable Count (TVC), also known as Aerobic Colony Count or Heterotrophic Plate Count?**

A TVC represents the microorganisms able to grow at the chosen incubation temperature, in oxygenated conditions and on the culture medium used. Testing is typically carried out using nutrient-rich media such as Yeast Extract Agar; however, not all microorganisms present in a sample will grow, particularly those adapted to low-nutrient environments. Alternative media, including R2A Agar and Plate Count Agar, may therefore be used.

These tests are used to provide an indication of the overall microbiological quality of the water being tested. Whilst TVC results alone do not determine whether water is potable, they are a valuable tool for monitoring the performance of water treatment systems and identifying potential contamination events.

The greatest value of TVC testing comes from routine monitoring. By regularly sampling the same outlets or water system over time, it is possible to establish a normal baseline and trend results. Changes in counts, rather than the absolute count itself, can often provide the most useful indication that something within the system has changed. A single sample provides only a snapshot and may not accurately represent normal conditions for that site.

It is a common misconception that Total Viable Counts (TVCs) and coliform counts are directly related. In reality, the two tests measure different groups of microorganisms using different methods. Coliforms are tested in a 100 mL sample, whereas TVCs are measured in 1 mL using different culture media and incubation conditions. As a result, high TVC counts may occur in the absence of coliforms or *E. coli*, and vice versa. The relationship between the two depends on the nature, source and location of any contamination within the water system.

## Why test at those temperatures?

Different microorganisms grow best at different temperatures. Drinking water is typically tested at both 22°C and 37°C to provide a broader picture of microbiological quality. Counts at 22°C are generally associated with environmental waterborne organisms, whereas counts at 37°C reflect organisms capable of growing at warmer temperatures.

Process waters, such as cooling towers, are commonly tested at 30°C, as this better reflects the normal operating conditions within these systems and the microorganisms likely to be present.

## Why counts change?

Some sites consistently produce very low TVC counts, often below 100 CFU/mL or with no detectable growth, while others regularly return counts greater than 1,000 CFU/mL. In some cases, a site that typically produces low counts may experience a sudden increase.

There are many factors that can influence TVC results, including sampling technique, outlet design and materials, the presence of flow restrictors, cleaning and flushing practices, and the overall condition of the water system. Storage tanks and their maintenance can also affect microbiological counts.

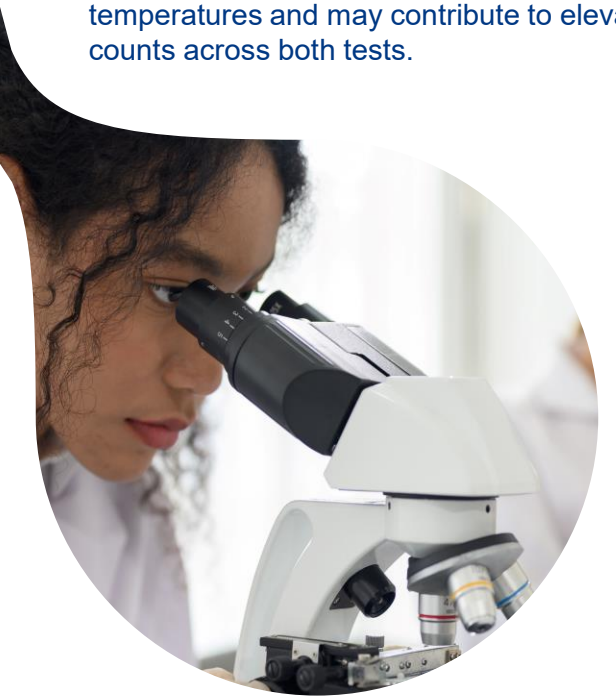
External factors may also play a role. Changes in the water supply source, for example from a borehole to a reservoir, can alter the types and numbers of microorganisms present and may also affect the taste and odour of the water.

Seasonal temperature variations can influence bacterial growth, while maintenance activities within the water network, such as burst main repairs or pressure fluctuations, can disturb sediment and biofilms within pipework, resulting in temporarily elevated TVC counts.

## Why sample counts at 22°C and 37°C do not match?

A common question is why TVC counts at 22°C and 37°C are often different. This is because different microorganisms grow best at different temperatures. The relative abundance of these organisms within the water sample will determine whether the count is higher at 22°C or 37°C.

In samples with a diverse or well-established microbial population, the counts at both temperatures may be similar. Certain microorganisms, including *Pseudomonas* spp. and yeasts, are capable of growing at both temperatures and may contribute to elevated counts across both tests.



## Counts at 22°C

The microorganisms detected at 22°C are generally considered to be environmental organisms naturally present within water systems. These may originate from the water supply itself, biofilms within pipework, or contamination introduced through outlets and fittings.

Organisms commonly detected include environmental bacteria, yeasts, moulds and *Pseudomonas* species. Whilst these organisms are not necessarily harmful, elevated counts may indicate declining water quality, biofilm development or conditions that could support the growth of other opportunistic pathogens.

## Counts at 37°C

The 37°C test is performed at approximately body temperature and detects microorganisms capable of growing under warmer conditions. As a result, the organisms detected differ from those identified at 22°C.

Microorganisms that may contribute to counts at 37°C include *Pseudomonas* species, coliforms, *Escherichia coli*, enterococci, staphylococci, streptococci, yeasts, moulds and other bacteria commonly found in water systems. It should be noted that some clinically significant pathogens require specialised media or incubation conditions and will not be detected by a standard TVC test.

## Counts at 30°C

TVC testing at 30°C is most commonly used for cooling towers, process waters, closed systems and certain industrial water applications. This temperature more closely reflects the operating conditions found within these systems.

Counts at 30°C are typically made up of environmental microorganisms capable of growing at moderate temperatures, including *Pseudomonas* species, yeasts, moulds and *Bacillus* species. The test provides an indication of the overall microbiological condition of the system rather than the presence of specific pathogens.

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