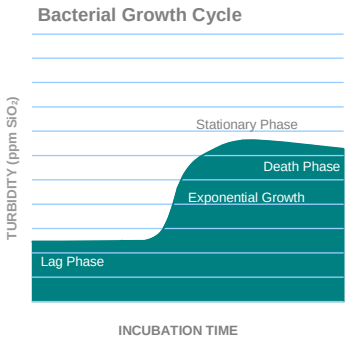
# Bacterial regrowth potential of drinking water

Plant operators can use the bacterial regrowth potential results to optimise water treatment processes for removal of assimilable organic carbon.




## IMPORTANCE OF MEASUREMENT

Bacterial regrowth is the term used to describe any increase in the number of bacteria in the distribution system, downstream of the disinfection process. Increased bacterial numbers in drinking water are unacceptable because they may cause taste and odours as well as increasing the possibility of pathogens being present. Bacterial regrowth may be the result of the passage of viable bacteria through the treatment process, release from biofilms or by introduction through a break in the distribution system.

Conventional water treatment processes focus on either killing microorganisms before they enter the distribution system (through the use of disinfectants) or reducing the level of nutrients present in the water. The nutrient that limits the growth of bacteria in water supplies is biologically available organic carbon, known as assimilable organic carbon (AOC). Only very low levels of AOC are necessary for regrowth problems to occur. Chemical analyses are unable to detect these low levels of carbon, so a microbiological test was developed that measures the increase in bacterial concentration using turbidity.

## THE METHOD

A sample of water is filtered to remove any bacteria; the mixed population of bacteria is resuspended in saline solution. A known volume of this bacterial suspension is then inoculated into the sample and the resulting bacterial growth is measured by turbidity over a period of several days.

In the bacterial growth cycle, there is an initial lag phase as the bacteria readjust to their new environmental conditions followed by exponential growth where the population increases by a constant factor over time. Eventually the population reaches a stationary phase; it has stopped growing as nutrients are limited.

From the resulting growth curve, the growth rate and the growth factor can be determined. These two values determine the bacterial regrowth potential (BRP) of a water.

The growth rate is the slope of the curve during exponential growth and correlates to the quality of the substrate, while the growth factor is the increase in turbidity over time and correlates to the quantity of the substrate.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## APPLICATION

German researchers have classified water, with a growth factor of <5 and a growth rate of <0.10, as biologically stable water that can be distributed with no or limited disinfection. The average change in turbidity can be related to an acetate carbon equivalent. Biologically stable water with a growth factor <5 equates to an acetate carbon equivalent below 40 µg/L.

The BRP of waters can be used by plant operators to optimise water treatment processes for the removal of AOC. However, BRP results are only comparative within the same sample batch; therefore samples for the evaluation of treatment processes should be analysed simultaneously.

## SAMPLE REQUIREMENTS

Sterile 1L glass bottles with an air gap, in duplicate.

If disinfectant residuals are present at time of sampling, AWQC must be informed.

Transportation on ice and analysis within 24 hours of sampling.

Anaerobic samples with high iron levels are unsuitable, as the iron flocculates out interfering with the turbidity measurements.

Highly turbid samples may not be suitable for this analysis and alternative tests (eg. BDOC) should be considered.

As only limited analyses can be undertaken, advance notice is required.

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