

PATHOGENS



The Australian Water Quality Centre (AWQC) is dedicated to ensuring and responding to the public health requirements relating to the provision of water and wastewater services for communities in Australia and across the world.

— Specialist water services
Ensuring public health

Pathogens – *Campylobacter*, *Salmonella* and Sulfite Reducing Clostridia (including *Clostridium perfringens*).

The AWQC provides a range of NATA accredited analyses catering for pathogen testing, including *Campylobacter*, *Salmonella* and Sulfite Reducing Clostridia (including *Clostridium perfringens*).

Campylobacter spp. are transmitted by the oral route and cause gastrointestinal illness. Thermophilic campylobacters are present in raw sewage. Their occurrence in surface waters is dependent on rainfall, water temperature and the presence of wild birds.

Salmonella spp. are widely distributed in the environment and gain entry into water systems through faecal contamination from live stock, native animals, drainage waters and incompletely treated waste discharges. Faecal contamination of water is the main cause of waterborne outbreaks of salmonellosis.

Sulfite Reducing Clostridia (including *Clostridium perfringens*) are present in the faeces of humans and other mammals, in wastewater and in soil. As these organisms may form endospores, which allow the bacteria to survive in almost any habitat, SRC counts are a useful indicator of past pollution in ground water, estuarine and ocean environments.

Clostridium perfringens may cause wound and surgical infections, which may lead to gas gangrene.

Method

Isolation of thermophilic *Campylobacter* spp. is achieved by concentration of the organisms on a membrane filter, inoculating into an enrichment broth and subculture onto a selective solid agar media (AS 4276). The differentiation between *Campylobacter jejuni* and *Campylobacter coli* is undertaken using a hydrolysis test.

The presence of Salmonella in water can be determined by concentration followed by culturing on selective media (AS 4276). Serotyping of species is available.

The enumeration of Sulfite Reducing Clostridia is achieved by membrane filtration and confirmation steps involving selective media (AS 4276). The AWQC developed an alternative rapid method for the identification of *C. perfringens* using an alternative selective fluorogenic broth. This rapid method has improved sensitivity and specificity for confirming *C. perfringens*.

Importance of Analysis

Campylobacter have been associated with a few water related outbreaks worldwide. The main sources were found to be unchlorinated surface water and faecal contamination of water storage reservoirs by wild birds. Contamination of drinking water reservoirs by water fowl excrement should be controlled, particularly if *Campylobacter* contamination is suspected. Hygienic precautions should be improved in case the water is distributed without disinfection, or disinfection is interrupted.

Campylobacter spp. survive well at low temperatures, and can survive for several weeks in cold groundwater or unchlorinated tap water. The presence of thermophilic *Campylobacter* organisms in piped water supplies, whether treated or untreated, suggests a serious fault in the design or management of the system.

Salmonella has been isolated from a number of source waters in Australia and occasionally from reticulated waters. *Salmonella* was associated with contamination of a reservoir and a distribution system in Alamosa, Colorado in 2008.

Most illnesses resulting from *Salmonella* infection are derived from contaminated foodstuffs, e.g. poultry and livestock. Waterborne *Salmonella* spp. play only a minor role in causing disease.

The presence or absence of Sulfite Reducing Clostridia is commonly used to evaluate the sanitary quality of water, sediment and animal samples. The advantage of using *C. perfringens* as an indicator is that they do not replicate in natural waters due to their strict growth requirements. They are extremely resistant to disinfection processes and environmental stresses as most of the populations form spores. Under unfavourable conditions Clostridia can survive for a long time as spores in lake water and sediment.

Components:

- *Campylobacter* (*C. jejuni*, *C. coli*)
- *Salmonella*
- Sulfite Reducing Clostridia/*C. perfringens*

Limit of Reporting (LOR):

- *Campylobacter* spp.: <4/L
- *Salmonella* spp.: presence/absence
- Sulfite Reducing Clostridia: 1 /100mL

Sampling Requirements:

- Sterile 600 mL PET bottle, Sodium thiosulphate dosed
- Air gap essential – *Campylobacter* and *Salmonella*
- No air gap required – Sulfite Reducing Clostridia
- Transport and store at 4°C
- Process within 6 hrs of collection up to max 24hrs (AS/NZS 2031)

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