

# CRYPTOSPORIDIUM AND GIARDIA



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

## Testing for *Cryptosporidium* and *Giardia*

### Overview

The protozoan *Cryptosporidium* is an important human pathogen and one of the most frequent causes of waterborne disease. A microscopic parasite, it causes the gastrointestinal illness Cryptosporidiosis, which produces symptoms of severe diarrhoea. These organisms occur in the gut of infected warm-blooded animals. The parasite can survive outside the body for long periods protected by an outer shell that also renders it resistant to chlorine disinfection.

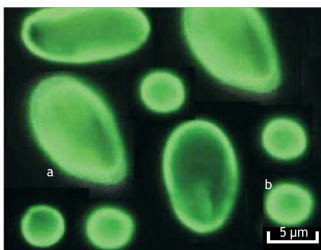
*Giardia duodenalis* is a human intestinal protozoan parasite that can survive in the environment as cysts. The cysts are shed in faeces in large numbers and are highly infectious. Symptoms of *Giardia* infection include diarrhoea that can last for days or weeks, abdominal cramps, fatigue and weight loss. The cysts are typically ingested via contaminated waters, swimming in ponds, drinking from streams, etc.

The AWQC has held NATA accreditation for the collection and analysis of water samples for *Cryptosporidium* and *Giardia* detection and enumeration since 2000. Using various probes, fluorescent in situ hybridisation (FISH) and genotyping techniques we are able to speciate and determine the origin of *Cryptosporidium* oocysts and *Giardia* cysts present in water samples. This test can be conducted on all water types, including source waters, drinking water, swimming pools and sewage effluent. The AWQC can also provide a *Cryptosporidium* infectivity assay to determine if the detected *Cryptosporidium* is infective or not; this assay has been optimised for key human infectious species.

### Application and benefits

Outbreaks of infection caused by *Cryptosporidium* and *Giardia* have devastating effects on the health of communities. There have been several serious outbreaks around the world with the largest (Milwaukee, 1993) affecting 400,000 people. Closer to home there have been several incidents and outbreaks of Cryptosporidiosis in Australia, mostly associated with private water supplies and swimming pools.

The information generated by AWQC's analysis is invaluable in managing the operation of water supply systems and public health risk, from source water to tap. Not all *Cryptosporidium* species are able to infect humans. In case of a detection our analysis enables us to determine speciation of *C. hominis* and *C. parvum* (two key human infectious species) by coupling the FISH technologies with specific probes. Additionally, our *Cryptosporidium* infectivity assay measures the number of infective *Cryptosporidium* in a sample and employs genotyping to determine the species (*C. hominis* / *C. parvum* or other) of any infective *Cryptosporidium* present.



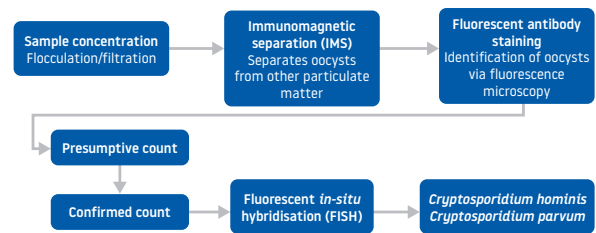
Fluorescent microscopy image showing *Giardia* cysts (a) and *Cryptosporidium* oocysts (b).

### Method

This method detects both *Cryptosporidium* and *Giardia*. Isolation of *Cryptosporidium* and *Giardia* is achieved by concentration of the organisms from large volumes of water or wastewater samples (see sampling requirements) by flocculation or filtration (UEPA Method 1623). Corrections for recovery rates are made for each individual sample with results expressed as number of organisms detected per sample volume tested.

FISH results can be available the same day as the *Cryptosporidium* counts, allowing well-informed operational and management responses to detections.

Please contact us to discuss your requirements and to request a competitive quotation for your testing needs.



### Terminology and Interpretation of Results

In line with our NATA accreditation, AWQC reporting terminology for *Cryptosporidium* and *Giardia* maintains consistency with current international reporting practice. The AWQC uses the following terminology when reporting for enteric protozoa:

- *Cryptosporidium* is reported as oocysts/volume.
- *Giardia* is reported as cysts/volume.
- "Presumptive *Cryptosporidium* or *Giardia*" refers to samples where (oo)cysts are detected by antibody staining and microscopy and is a total count of all organisms. This includes organisms which are fully intact and those that are not intact or lack internal structures, e.g. split or crushed (oo)cysts.
- "Confirmed *Cryptosporidium* or *Giardia*" refers to samples where antibody-positive (oo)cysts (as described above) react positively to a DNA stain (i.e. the (oo)cysts contain DNA), or where antibody-positive (oo)cysts are impermeable to the DNA stain but have recognisable internal structures consistent with *Cryptosporidium* or *Giardia*. "Confirmed" means that nuclei and/or sporozoites/median bodies are present in the (oo)cyst and thus the (oo)cyst is potentially infective, including human infective.
- *Cryptosporidium* and *Giardia* Positive Control: All samples are seeded with an internal control of a known number of labelled *Cryptosporidium* and *Giardia* (ColorSeed™). This allows calculation of a recovery rate for the sample, enabling AWQC to report a more accurate, quantitative result which allows for any losses during processing.
- Recovery rate: A high recovery rate is desirable; this is affected by a number of factors, including the sample matrix.
- Enteric Protozoa - Sample Volume: This refers to the actual sample volume processed.
- Percent Sample Processed: The percent of the concentrated pellet processed from the original sample.
- Together with sample volume, the percent sample processed and the recovery rate are used to provide the final result per volume (e.g. per 10L).

### Components:

- *Cryptosporidium*
- *C. parvum*
- *C. hominis*
- *Giardia*
- *G. duodenalis* assemblage A or B
- All *Cryptosporidium* species and *G. duodenalis* assemblages by genotyping
- *Cryptosporidium* infectivity

### Limit of reporting (LOR):

- 1 *Cryptosporidium* oocyst / 1 *Giardia* cyst per volume analysed

### Sampling requirements:

- Two sterile plastic 10L containers for most samples (analysis available for 1 to 100 litres depending on the water /wastewater type), sodium thiosulphate dosed if water is chlorinated.
- Transportation and storage at 20°C or lower if practical.
- Process within 96 hrs of collection.

### Turnaround time (TAT):

- Standard: 7 days
- Priority: 3 days
- Emergency: within 24 hours