

Cryptosporidiosis outbreaks in aquatic facilities

Prevention and response plan

Version 1.0

January 2018

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Section 1: Introduction

1.1 Background

Cryptosporidium is a protozoan parasite that causes the gastrointestinal illness cryptosporidiosis in both humans and animals. *Cryptosporidium* oocysts (the infective form of the parasite) are shed in large numbers in the faeces of infected individuals, have a relatively low infectious dose, are extremely hardy in the environment and are highly resistant to commonly used chemical disinfectants.¹

The main symptom of cryptosporidiosis in humans is profuse, watery diarrhoea, often associated with cramping and abdominal pain. Symptoms generally resolve without treatment within 30 days; however, immunocompromised individuals can experience prolonged and potentially life-threatening illness. Asymptomatic infections are also common.²

Ingesting swimming pool water contaminated with *Cryptosporidium* oocysts excreted by infected swimmers is a common mode of transmission. Swimming in public swimming pools is a common risk factor associated with cryptosporidiosis in Victoria, interstate and overseas.³⁻¹¹

Cryptosporidiosis is the third most commonly notified gastrointestinal infection in Victoria, with 804 confirmed cases notified to the Department of Health and Human Services ('the department') in 2016. This figure probably underestimates the true incidence of cryptosporidiosis in the Victorian community; it is likely that only a small fraction of cases present for medical treatment and have a stool specimen collected and tested for *Cryptosporidium*. The under-notification fraction for cryptosporidiosis has not been estimated in Australia; however, it is estimated that for every salmonellosis and campylobacteriosis case notified to a health department, there are an additional seven and 10 unreported cases in the community respectively.¹² Higher case numbers have been observed among young children, particularly those under five years of age.¹³ Young children are particularly prone to introducing *Cryptosporidium* into pools due to their poor hygiene, reduced continence and use of ineffective swim nappies.¹⁴

Three key characteristics of the *Cryptosporidium* oocyst make the contamination of aquatic facilities particularly problematic:

- They can be excreted in large numbers by infected swimmers (up to 50,000,000 oocysts per millilitre of faeces) even after acute symptoms have ceased.⁷
- They have a relatively low infectious dose (ingestion < 10 oocysts can lead to an infection in a healthy adult).¹⁵
- They are highly resistant to normal levels of chlorine used for pool disinfection (oocysts can survive for more than 10 days in a pool maintained within regulatory chlorine levels).¹⁶

Outbreaks of cryptosporidiosis are commonly linked to aquatic facilities both in Australia and overseas.¹⁷ Victoria most recently experienced a series of large, statewide outbreaks of cryptosporidiosis linked to aquatic facilities in 2013, and the department and local government stakeholders continue to identify and respond to multiple outbreaks each year.

1.2 Purpose

This plan details the Victorian arrangements for preventing and responding to cryptosporidiosis outbreaks linked to aquatic facilities.

1.3 Objective

The objective of this plan is to:

- provide direction and role clarity to departmental staff, local government environmental health officers (LGEHO) and aquatic facility operators involved in preventing and responding to cryptosporidiosis outbreaks linked to aquatic facilities
- ensure a coordinated and consistent multi-agency response to cryptosporidiosis outbreaks linked to aquatic facilities across departmental units and local government partners.

1.4 Scope

This plan applies to all aquatic facilities in Victoria, including facilities that may not be covered under the aquatic facilities regulatory provisions of the Public Health and Wellbeing Regulations 2009. This includes zero-depth interactive water features (also known as 'splash pads').

1.5 Authorising environment

In Victoria, aquatic facilities are regulated under the Public Health and Wellbeing Regulations. Aquatic facility operators are responsible for complying with these regulations. Compliance monitoring is primarily undertaken through routine inspections of aquatic facilities by LGEHOs. This role is not specifically set out in the regulations. Rather, it is undertaken as part of councils' general public health function under s. 24 of the *Public Health and Wellbeing Act 2008* ('the Act').

In terms of managing cryptosporidiosis outbreaks linked to aquatic facilities, the Secretary of the department (or delegate) may give a written direction to an authorised officer appointed by a council (usually an environmental health officer) to investigate or limit the spread of cryptosporidiosis under r. 75(1) of the Public Health and Wellbeing Regulations. Once a direction is received, an authorised officer can provide a subsequent written direction under r. 76(1) to anyone to implement the directions given by the Secretary (or delegate). These powers can be used to require the timely disinfection (hyperchlorination) of aquatic facilities linked to cryptosporidiosis outbreaks.

The Act's nuisance provisions can also be applied to aquatic facilities linked to cryptosporidiosis outbreaks through improvement or prohibition notices under s. 194 of the Act.

Victoria's Chief Health Officer may grant authorised officers (either state or local government officers) additional powers to investigate, eliminate or reduce a risk to public health. These powers may be exercised to manage cryptosporidiosis outbreaks linked to aquatic facilities in exceptional circumstances.

[The Act and its regulations](http://www.legislation.vic.gov.au/) can be accessed online <<http://www.legislation.vic.gov.au/>>.

For more information about the obligations and powers under this legislation in a local government context, refer to the [Public Health and Wellbeing Act 2008 guidance manual for local government authorised officers \(Municipal Association of Victoria\)](http://www.mav.asn.au/policy-services/health/) <<http://www.mav.asn.au/policy-services/health/>>.

Section 2: Prevention

Aquatic facilities should recognise the risk posed by *Cryptosporidium* and have management strategies in place to minimise this risk. The most effective way to minimise the risk of cryptosporidiosis to aquatic facility patrons is to prevent or limit the introduction of *Cryptosporidium* oocysts into the water.

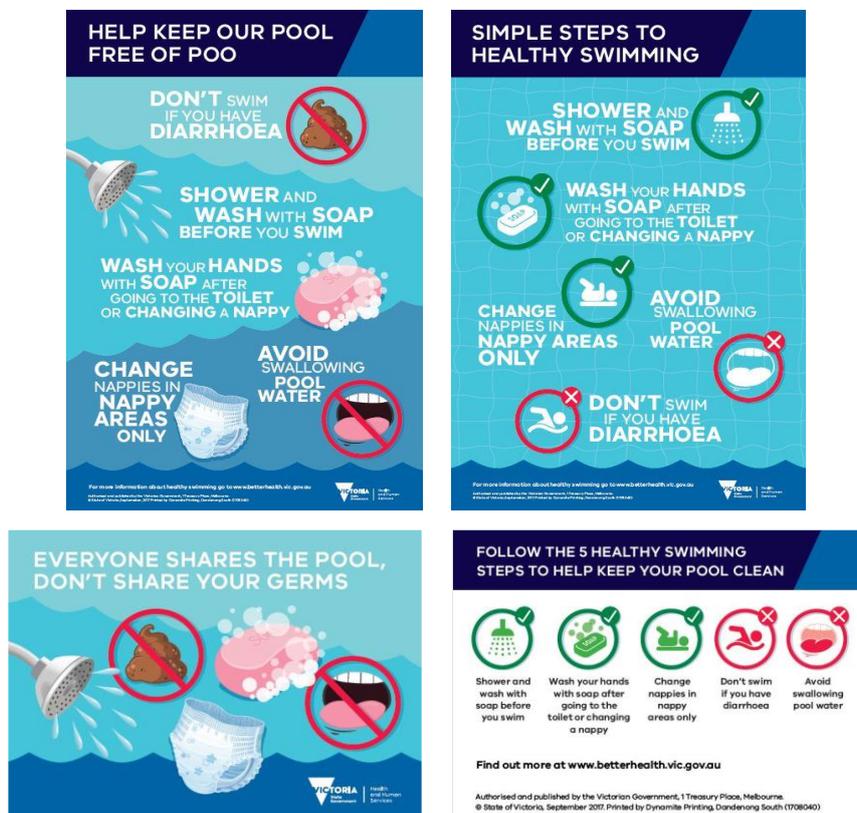
2.1 Healthy Swimming messages

The department's Healthy Swimming campaign aims to educate aquatic facility users on ways they can help to keep public swimming pools clean and safe. The key Healthy Swimming messages are:

- Don't swim if you have diarrhoea.
- Shower and wash with soap before swimming. Make sure your bottom is clean.
- Wash your hands with soap after using the toilet or changing a nappy.
- Only change nappies in nappy change areas.
- Avoid swallowing pool water.

A range of Healthy Swimming [promotional resources](https://www2.health.vic.gov.au/public-health/water/aquatic-facilities/healthy-swimming) <<https://www2.health.vic.gov.au/public-health/water/aquatic-facilities/healthy-swimming>> are available for digital download and for hard copy orders (free of charge). Examples are provided at Figure 1.

Figure 1: Healthy Swimming campaign promotional resources



These materials should be displayed in prominent places throughout aquatic facilities, such as the entry foyer and change rooms. Aquatic facility operators can also use the messages to customise their own communication materials based on specific patron or user group needs and preferences.

2.2 Policies and procedures

All aquatic facilities should have policies and procedures in place to minimise faecal contamination in pools and to ensure an effective response when obvious faecal contamination events do occur.

The following policies should be in place, and all staff should be trained in their implementation:

- **Faecal incident policy** – the policy should identify a liquid faecal incident as a potentially high-risk *Cryptosporidium* contamination event and detail procedures to effectively address this risk. For further information, refer to the department's [Faecal incident response – recommendations for aquatic facilities](https://www2.health.vic.gov.au/public-health/water/aquatic-facilities/faecal-incident-response) <<https://www2.health.vic.gov.au/public-health/water/aquatic-facilities/faecal-incident-response>>.
- **Ill-swimmer exclusion policy** – ill patrons should not swim 14 days after diarrhoea has ceased. Offering make-up lessons to parents of ill children can help achieve compliance with this policy.
- **Pre-swim shower policy** – encourage showering with soap and water before swimming, especially for young children.
- **Swim nappy policy** – all non-toilet-trained children should wear tight-fitting waterproof pants or swim nappies. Parents should be made aware that wearing a swim nappy is not a substitute for regular toilet breaks and nappy changes, as their ability to contain faeces in the water for any length of time is extremely limited.

These policies should be actively promoted to parents of children enrolled in swimming lessons – for example, in an information pack provided at the time of enrolment.

Aquatic facilities should keep a register of potential water-quality incidents, documenting that appropriate corrective actions were taken in response.

2.3 Treatment barriers

Because residual chlorine disinfection cannot effectively inactivate *Cryptosporidium* oocysts in pool water, additional treatment barriers should be considered as part of a broader *Cryptosporidium* risk management strategy.

Although a detailed exploration of facility design and pool water treatment is beyond the scope of this plan, applying some basic principles can improve the inactivation and/or removal of *Cryptosporidium* oocysts from pool water. These include:

- adequate circulation, coagulation, filtration and primary disinfection
- secondary disinfection with ultraviolet or ozone
- effective backwashing practices.

A pool treatment specialist should be consulted on the optimal treatment methods for individual aquatic facilities.

For further information on pool water treatment, refer to the department's [Pool operators' handbook](https://www2.health.vic.gov.au/about/publications/researchandreports/Pool-operators-handbook) <<https://www2.health.vic.gov.au/about/publications/researchandreports/Pool-operators-handbook>>.

Section 3: Outbreak investigation and response

The department's Water Unit will lead the overall response to cryptosporidiosis outbreaks linked to aquatic facilities, supported by Communicable Disease Prevention and Control (CDPC), Communicable Disease Epidemiology and Surveillance (CDES), divisional public health officers (DPHO) and LGEHOs.

The Chief Health Officer (or delegate) and Public Health Communications will also support the response when required.

3.1 Case definition

- 3.1.1 A confirmed case of cryptosporidiosis requires laboratory-definitive evidence only.
- 3.1.2 Laboratory-definitive evidence is detection of *Cryptosporidium* in a specimen.
- 3.1.3 Commonly used methods in Victoria for detecting *Cryptosporidium* include direct microscopy, antigen detection and polymerase chain reaction (PCR).

3.2 Case notification and referral

- 3.2.1 Confirmed cases are notified to the department by medical practitioners and/or laboratories. Cryptosporidiosis is a Group B notifiable condition under the Public Health and Wellbeing Regulations and must be notified within five days of diagnosis.
- 3.2.2 **CDES** will refer confirmed cases as cryptosporidiosis single incident or cluster notifications to **DPHO** for investigation based on:
 - **sporadic cases** – standard referral criteria as per the [guidelines for the investigation of gastroenteritis](https://www2.health.vic.gov.au/public-health/infectious-diseases/infection-control-guidelines/gastrointestinal-illness-investigation-guidelines) <<https://www2.health.vic.gov.au/public-health/infectious-diseases/infection-control-guidelines/gastrointestinal-illness-investigation-guidelines>>
 - **clustered cases** – geographic/temporal clustering (three or more cases in two weeks within the same municipality)
 - the judgement of a **CDES** epidemiologist.
- 3.2.3 The **DPHO** will send cryptosporidiosis single incident or cluster notifications to the relevant **LGEHO** for investigation.
- 3.2.4 Cases may also be investigated internally by **CDPC/CDES**.

3.3 Sporadic case investigation

- 3.3.1 Cases are contacted by phone by the **LGEHO** and interviewed using the [Cryptosporidiosis single incident questionnaire](https://www2.health.vic.gov.au/about/publications/researchandreports/Case-questionnaire-for-Cryptosporidiosis) <<https://www2.health.vic.gov.au/about/publications/researchandreports/Case-questionnaire-for-Cryptosporidiosis>>, as per the [Guidelines for the investigation of gastroenteritis](https://www2.health.vic.gov.au/public-health/infectious-diseases/infection-control-guidelines/gastrointestinal-illness-investigation-guidelines) <<https://www2.health.vic.gov.au/public-health/infectious-diseases/infection-control-guidelines/gastrointestinal-illness-investigation-guidelines>>. Reported exposures to aquatic facilities in the two weeks prior to illness onset are recorded on the questionnaire.

- 3.3.2 Completed single-incident questionnaires are reviewed by the **DPHO**. Aquatic facility exposures are recorded in the Public Health Event Surveillance System (PHESS) by linking the case to the facilities (as exposure sites).
- 3.3.3 If a case reports an aquatic facility exposure that is located outside the **DPHO**'s division, they will inform the **DPHO** for the division in which the aquatic facility is located.

3.4 Cluster investigation

- 3.4.1 If a case is referred for investigation as part of a cluster, the **DPHO** will complete the questionnaire package in PHESS for the case in addition to the actions in 3.3.
- 3.4.2 If a case reports an aquatic facility exposure during their incubation period the **DPHO** will check the PHESS Aquatic Facility Report (automatically generated and sent daily to **DPHOs**) to determine if the outbreak definition criteria (see 3.5 below) has been met.

3.5 Outbreak definition

- 3.5.1 An cryptosporidiosis outbreak is considered to be linked to an aquatic facility if:
- two or more confirmed cases used the same aquatic facility within 12 days of illness onset
 - and
 - there is 28 days or less between illness onsets for each case.
- 3.5.2 For the purposes of the outbreak definition, multiple cases from the same family/household are considered as one case due to the possibility of person-to-person transmission within the household.
- 3.5.3 When an aquatic facility outbreak meets the above criteria, the **DPHO** will initially notify **CDPC** by phone and email a *Cryptosporidiosis* outbreak referral proforma with the details of initial cases to <water@dhhs.vic.gov.au> and <CDI&R@dhhs.vic.gov.au>.
- 3.5.4 **CDPC** will confirm the outbreak via email to the **Water Unit** and the **DPHO**, create an outbreak record in PHESS, and link initial cases to the outbreak record.
- 3.5.5 Subsequent confirmed cases identified during an outbreak will be linked to the outbreak record on PHESS by the **DPHO**.

3.6 Outbreak response

- 3.6.1 The **Water Unit** will contact the **DPHO** to request the following standard response actions from the **LGEHO**:
- Ascertain whether an effective hyperchlorination (CT 15,300 mg-min/L) has been conducted after the last exposure date for the cases, and assess whether further hyperchlorination is required.
 - If required, direct the facility operator to hyperchlorinate all affected pools to achieve CT 15,300 mg-min/L, to begin overnight on the day the facility is notified (at the latest). Refer to the [Hyperchlorination procedure – *Cryptosporidium* contamination](https://www2.health.vic.gov.au/about/publications/policiesandguidelines/hyperchlorination-procedure-cryptosporidium-contamination-recommendations) <<https://www2.health.vic.gov.au/about/publications/policiesandguidelines/hyperchlorination-procedure-cryptosporidium-contamination-recommendations>> for further information. The facility can use the [Contact time record – hyperchlorination to inactivate *Cryptosporidium*](#)

<<https://www2.health.vic.gov.au/about/publications/formsandtemplates/contact-time-record-hyperchlorination-to-inactivate-cryptosporidium>> to document the hyperchlorination.

- Ensure the facility is promoting the Healthy Swimming messages ([promotional resources](https://www2.health.vic.gov.au/public-health/water/aquatic-facilities/healthy-swimming) <<https://www2.health.vic.gov.au/public-health/water/aquatic-facilities/healthy-swimming>> are available for digital download and hard copy orders).
- Conduct an assessment of the facility's *Cryptosporidium* risk management using the [Cryptosporidium risk management – aquatic facility evaluation](https://www2.health.vic.gov.au/about/publications/formsandtemplates/cryptosporidium-risk-management-aquatic-facility-assessment) document <<https://www2.health.vic.gov.au/about/publications/formsandtemplates/cryptosporidium-risk-management-aquatic-facility-assessment>>.

3.6.2 The **Water Unit** can provide advice to the **DPHO**, **LGEHO** and the aquatic facility operator regarding *Cryptosporidium* risk management as required.

3.7 Outbreak communications

3.7.1 A [communication plan template for aquatic facilities](https://www2.health.vic.gov.au/about/publications/formsandtemplates/communication-plan-template-for-aquatic-facilities) <<https://www2.health.vic.gov.au/about/publications/formsandtemplates/communication-plan-template-for-aquatic-facilities>> is available to help aquatic facilities manage communication with their staff, visitors and other stakeholders during a cryptosporidiosis outbreak.

3.7.2 **Public Health Communications** can provide guidance and advice on outbreak communication materials as required.

3.7.3 The department's **Media and Events Unit** undertakes regular media monitoring and can assist in managing media enquiries, including coordinating state and local government media.

3.8 Directive powers

3.8.1 If a pool operator is unwilling to comply with the request to disinfect within the time specified, the **DPHO** should inform the **Water Unit**.

3.8.2 The **Water Unit** may provide the **LGEHO** with a written direction under r. 75(1) of the Public Health and Wellbeing Regulations, specifying a timeframe for the hyperchlorination to be completed.

3.8.3 On receiving such a direction, the **LGEHO** will direct the facility operator to hyperchlorinate all affected pools to achieve CT 15,300 mg-min/L within the timeframe specified in the direction. This should take the form of a written direction to the responsible person at the aquatic facility under r. 76(1) of the Public Health and Wellbeing Regulations. A template direction for authorised officers is available by request from the **Water Unit**.

3.8.4 It is an offence under r. 76(2) for a person to fail to comply with a written direction of an authorised officer within the time specified.

3.8.5 The Chief Health Officer (or delegate) may also exercise the public health risk powers under s. 190 of the Public Health and Wellbeing Act to direct the closure and effective disinfection of facilities to reduce the risk to public health.

3.9 Recurrent outbreaks

3.9.1 A recurrent outbreak is defined as a subsequent outbreak identified at a facility following a recent effective hyperchlorination in response to a previous outbreak (two or more new cases identified

as meeting the outbreak definition criteria who swam only after the most recent effective hyperchlorination date).

3.9.2 Where a recurrent outbreak is identified at a facility, a repeat hyperchlorination will be required.

3.9.3 Standard outbreak reporting and response should be as per sections 3.5 and 3.6.

3.9.4 If a recurrent outbreak occurs within 28 days of an effective hyperchlorination, additional response measures may be instigated by the **Water Unit**, involving the **DPHO** and **LGEHO**. These measures may include:

- jointly inspecting the facility involving the **Water Unit**, **DPHO** and **LGEHO** to assess its *Cryptosporidium* risk management
- recommending/directing that the facility engages an independent pool water treatment technical specialist to report on the adequacy of treatment barriers to address *Cryptosporidium* risk
- issuing improvement or prohibition notices under the Public Health and Wellbeing Act to require the facility to adequately address its *Cryptosporidium* risk.

3.10 Community outbreaks

3.10.1 A community outbreak may be declared by the **Deputy Chief Health Officer (Communicable Disease)**, based on the advice of a **CDES** epidemiologist. Triggers for declaring a community outbreak may include multiple clusters or outbreaks occurring simultaneously that cannot be managed under business-as-usual response arrangements.

3.10.2 If a community outbreak is declared, the **Deputy Chief Health Officer (Communicable Disease)** may initiate an internal Incident Management Team (IMT) to coordinate the response.

3.10.3 The IMT will be chaired by an Incident Controller appointed by the **Deputy Chief Health Officer (Communicable Disease)**.

3.10.4 The IMT will include representatives of the **Water Unit**, **CDPC**, **CDES**, **DPHOs** and **Public Health Communications**.

3.10.5 In addition to the response measures described previously, the IMT may initiate enhanced response measures including:

- expanded public communications including Chief Health Officer alerts/advisories, media releases and social media
- expanded sector communications including regular updates on the outbreak to aquatic facilities, divisional public health units, local government, Aquatics and Recreation Victoria, Life Saving Victoria and the Department of Education and Training (for school swimming lessons and child care facilities)
- a targeted/concise outbreak questionnaire to expedite single-incident notification turnaround time and the collection of relevant information by **LGEHOs**
- referral and/or follow-up of all notified cryptosporidiosis cases to **LGEHOs** for a time-limited period
- proactive inspection of potentially high-risk facilities

- establishing an analytical epidemiology study
 - other measures/actions as agreed by the IMT.
- 3.10.6 The IMT, on advice from the **CDES** IMT representative, will decide on the criteria for the closure of a community outbreak.
- 3.10.7 Following a community outbreak, a debrief will be held involving the **Deputy Chief Health Officer (Communicable Disease)**, the **Water Unit**, **CDPC**, **CDES**, **DPHOs**, Public Health Communications, **LGEHOs** and other key stakeholders as determined by the IMT.
- 3.10.8 The issues and recommendations generated during the debrief will be used to review this plan following a community outbreak.

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Additional Resources

1. [Hyperchlorination procedure – *Cryptosporidium* contamination](#)
2. [Contact time record – hyperchlorination to inactivate *Cryptosporidium*](#)
3. [Cryptosporidium risk management – aquatic facility assessment](#)
4. [Communication plan template for aquatic facilities](#)
5. [Cryptosporidium – What pool operators need to know: information for aquatic facilities](#)
6. [Faecal incident response – recommendations for aquatic facilities](#)

All additional resources are available in alternative accessible file formats at

<https://www2.health.vic.gov.au/public-health/water/aquatic-facilities/cryptosporidiosis-outbreaks-prevention-response-plan>