

Cryptosporidiosis linked to Aquatic Facilities

Prevention and Response

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Cryptosporidium and cryptosporidiosis

- Protozoan parasite. AKA “crypto”.
- Infects both humans and animals.
- Infection occurs via the faecal-oral route.
- Profuse, watery diarrhoea, often associated with cramping and abdominal pain.
- Oocysts (hardy, infective form of the parasite) are shed in large numbers in the faeces of infected individuals.



Sporozoites breaking from an oocyst
(University of Wisconsin)

Why is it a problem for aquatic facilities?

Three key characteristics of the *Cryptosporidium* oocyst:

- Excreted in large numbers by infected swimmers, even after acute symptoms have ceased (as many as 1,000,000 oocysts/gram of faeces).
- Relatively low infectious dose (ingestion of fewer than 10 oocysts may lead to infection).
- Highly resistant to normal levels of chlorine used for pool disinfection (can survive for 3.5 – 10.6 days in water chlorinated within regulatory levels).

How does this relate to outbreaks?

Two key factors contribute to outbreaks of cryptosporidiosis in aquatic facilities:

The introduction of the parasite into the water by infected bathers.

AND

The inability of many routine water treatment and disinfection processes to rapidly remove or inactivate the parasite once it has been introduced.

How are cases identified?

- Cases are notified to DHHS by doctors and laboratories.
- Group B condition.
- Confirmed case = *Cryptosporidium* identified in a specimen (generally by direct microscopy, antigen detection or PCR).

Confidential Notification of Group B condition

The following Group B conditions require written notification to the Department of Health & Human Services on initial diagnosis within five days to: Department of Health & Human Services, Reply Paid 65307, Melbourne VIC 3000 or fax 1300 651170
Please advise the case (1) has been informed of their diagnosis (2) has been advised that this information is being provided to the department (as required by the Health Act 1984, s. 207), and (3) has been informed that the department may contact them for further information about the case. Commonwealth and state privacy legislation does not require the responsibility to notify the specified condition, nor to provide the information requested on this form.

Please indicate the condition you are notifying

<input type="checkbox"/> Arbovirus infection - other, specify: _____	<input type="checkbox"/> Hepatitis C - Newly acquired	<input type="checkbox"/> Typhusvirus
<input type="checkbox"/> Borna disease	<input type="checkbox"/> Hepatitis C - Unspecified	<input type="checkbox"/> Australian B1a typhusvirus
<input type="checkbox"/> Dengue virus infection	<input type="checkbox"/> Hepatitis D	<input type="checkbox"/> Typhusvirus - other, specify: _____
<input type="checkbox"/> Chlamydia infection	<input type="checkbox"/> Hepatitis E	<input type="checkbox"/> Hepatitis viral test letter unclassified
<input type="checkbox"/> Chlamydia - Seric disease (SLE)	<input type="checkbox"/> Influenza laboratory confirmed	<input type="checkbox"/> Malaria
<input type="checkbox"/> Classical swine fever	<input type="checkbox"/> Type A	<input type="checkbox"/> Meningitis
<input type="checkbox"/> Measles	<input type="checkbox"/> Type B	<input type="checkbox"/> Murine
<input type="checkbox"/> Mumps	<input type="checkbox"/> Human virus infection	<input type="checkbox"/> Mycobacterium tuberculosis
<input type="checkbox"/> Cryptosporidiosis	<input type="checkbox"/> Leish (blood lead >5 µg/dL)	<input type="checkbox"/> Pertussis
<input type="checkbox"/> Dengue virus infection	<input type="checkbox"/> Leprosy	<input type="checkbox"/> Pneumococcal infection (pneumonia)
<input type="checkbox"/> Hepatitis B - Newly acquired	<input type="checkbox"/> Leptospirosis	<input type="checkbox"/> Rabies
<input type="checkbox"/> Hepatitis B - Unspecified	<input type="checkbox"/> Tetanus	<input type="checkbox"/> Rotavirus
		<input type="checkbox"/> Rubella
		<input type="checkbox"/> Salmonellosis
		<input type="checkbox"/> Shigella and verotoxin producing Escherichia coli (STEC/STEC)
		<input type="checkbox"/> Shingles
		<input type="checkbox"/> Tetanus
		<input type="checkbox"/> Tuberculosis
		<input type="checkbox"/> Tuberculous TB
		<input type="checkbox"/> Tuberculous TB
		<input type="checkbox"/> Varicella zoster (chickenpox)
		<input type="checkbox"/> Varicella zoster (shingles)
		<input type="checkbox"/> Varicella zoster (unspecified)

Case details - please answer all questions

Last name: _____

First name(s): _____

Date of birth: _____ Sex: Male Female Other, specify: _____

Residential address: _____

City: _____ Postcode: _____

Tel home: _____ Tel mobile: _____

Parent/guardian/next of kin name: _____

Is the case of Aboriginal or Torres Strait Islander origin?
 No Aboriginal Torres Strait Islander Both Aboriginal and Torres Strait Islander

Country of birth: _____ country: _____
 Australia Overseas > _____ year arrived in Australia

Interpreter required: _____ language: _____
 No Yes, language > _____

Works in a high risk occupation
 Child care worker Health care worker
 Commercial food handler Other, specify below: _____

Occupation and/or school and/or child care attended: _____

Has the case recently travelled interstate or overseas?
 No Yes, specify where/when > _____

Abroad deceased:
 Alive Died due to this condition > _____ date of death
 Died due to other cause > _____

Date of onset of illness: _____

Has laboratory testing been requested?
 No Yes, specify lab > _____
 Pending, specify lab > _____

Clinical comments - include risk factors, mode of transmission, history of illness, symptoms etc.: _____

Notifying doctor/hospital/laboratory details

Doctor/hospital/laboratory name: _____

Address: _____ Medicare provider no. _____ Department use only

City: _____ Postcode: _____

Telephone: _____ Fax: _____ Date: _____

Public Health & Wellbeing Regulations 2009 Notifiable Conditions in Victoria April 2010

How are cases investigated?

A portion of confirmed cases are referred to local government for investigation as single incidents, based on:

- Standard referral criteria:
 - The case lives in (or the illness may have been acquired in) a health care or institutional setting.
 - Two or more associated cases have been notified.
 - A possible source of has been named (water, environmental).
 - The case is a child in child care or a child care worker.
- Spatial / temporal clustering identified by an epidemiologist.

Cases are also investigated internally at DHHS.

How are crypto outbreaks identified?

An outbreak is considered to be linked to an aquatic facility if:

Two (2) or more confirmed cases used the same aquatic facility within 12 days of illness onset.

AND

There is less than 28 days between illness onsets for each case.

Cases in the same family are considered as one (1) case for the purposes of the outbreak definition.

How do we respond to outbreaks?

EHO onsite assessment of the facility:

- Pool configuration?
- Treatment systems (disinfection/filtration?)
- Hygiene facilities (soap provided?)
- Faecal incident policy (staff awareness?)
- “Healthy Swimming” messages promoted?



Reactive superchlorination:

- Must achieve CT value of 15,300 to be effective against crypto (e.g. free chlorine 20.0 mg/L for 12.75 hours, or higher concentration for shorter time).
- Pool must be closed to the public during this time.
- Must be returned to within regulatory limits before reopening.

How do we respond to outbreaks?

- **Issues with this approach:**
 - Superchlorination can be a very costly process (consumables, staff, downtime).
 - A pool can be recontaminated by infected swimmers as soon as chlorine levels are returned to regulatory limits.
- **Recurrent outbreaks at a facility may require a more detailed investigations into treatment efficacy, staff knowledge etc.**

What are the options to reduce the risk?

- 1. Prevent/minimise the introduction of crypto oocysts into the pool.**
- 2. Use alternative (secondary) disinfectants to inactivate oocysts.**
- 3. Use more effective filtration to remove oocysts.**

Ideally, a combination of all three options will be used.

Prevent the introduction of crypto into the pool

The “Healthy Swimming” messages:

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



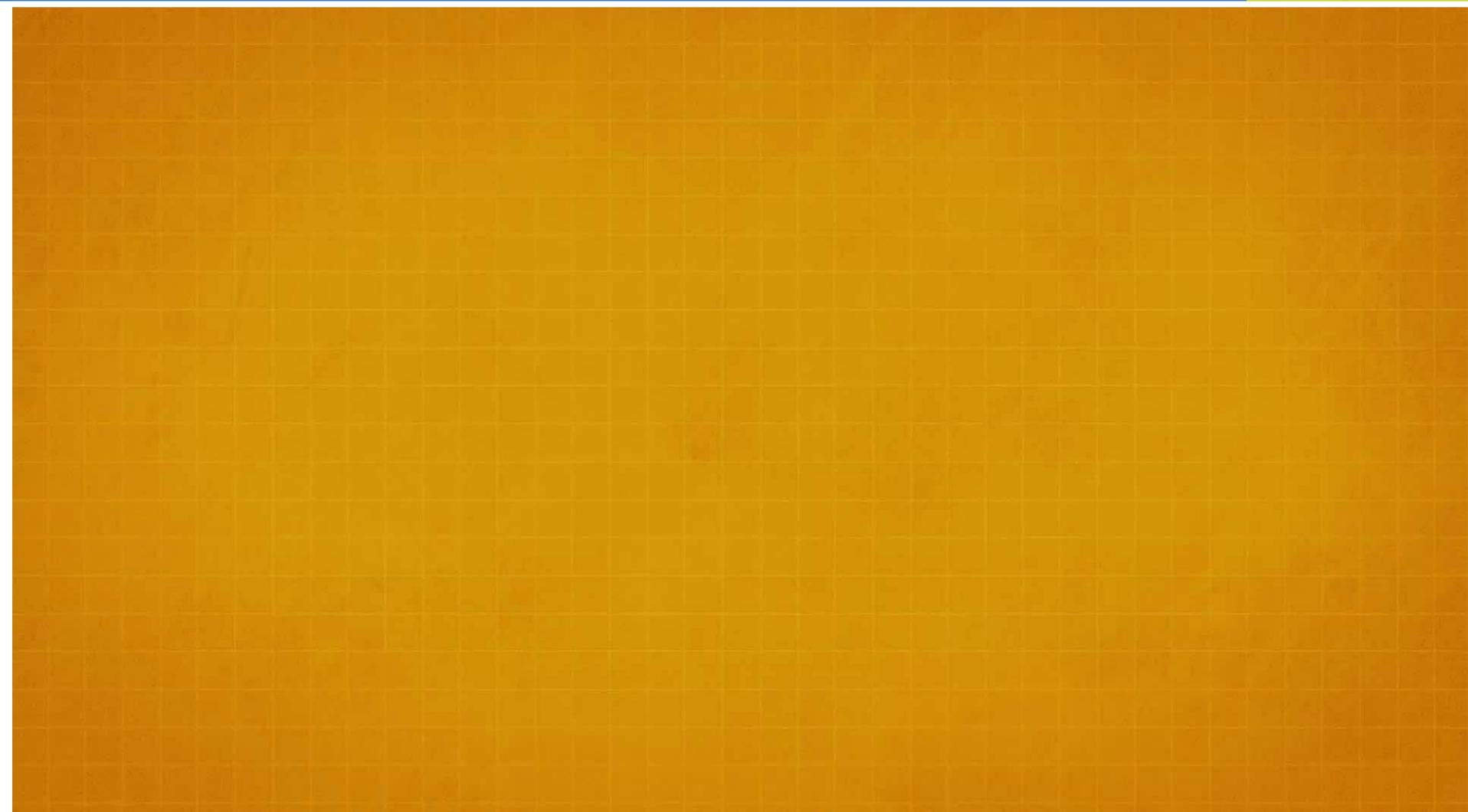
Prevent the introduction of crypto into the pool

Additional messages for parents:

- Supervise children at all times.
- Take children on toilet breaks every hour and check nappies every 30–60 minutes.
- Only change nappies in nappy change areas - do not change nappies by the poolside.
- Use tight-fitting waterproof nappies for non-toilet trained children (not very effective!).
- Report faecal accidents to pool staff immediately.



Prevent the introduction of crypto into the pool



Prevent the introduction of crypto into the pool

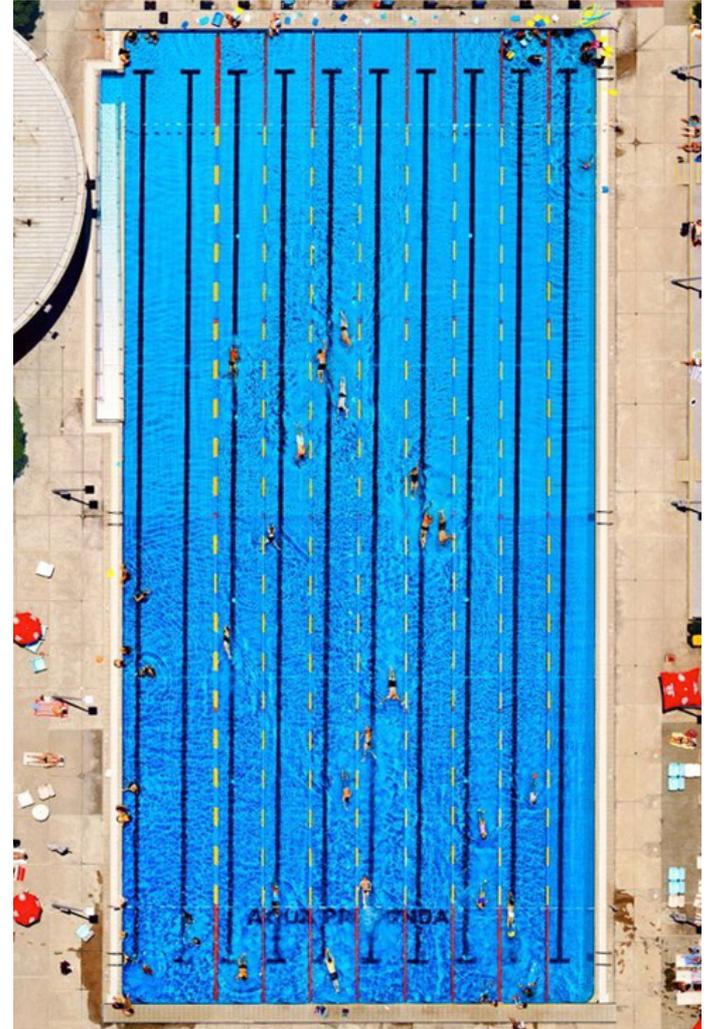
Aquatic facility operators should:

- Encourage “Healthy Swimming” behaviours amongst patrons.
- Display “Healthy Swimming” promotional material in highly visible locations.
- Have an adequate faecal incident policy in place (DHHS provides a model policy).
- Ensure pool staff are aware, trained and confident to talk to patrons about these topics.

Prevent the introduction of crypto into the pool

Challenges:

- Behaviour/cultural change is difficult.
- Most pools are not designed to facilitate effective showering before swimming.
- Especially so for large groups of children (e.g. school swim lessons).



Use alternative (secondary) disinfectants

Ultraviolet (UV)

- **Applied to full water flow.**
- **Affected by turbidity.**
- **Lamp maintenance required (degradation, biofilms).**

Ozone

- **Applied to full water flow.**
- **Must be removed prior to return to the pool.**

Neither provides a residual – they are used in addition to primary disinfection (e.g. chlorination).

Use more effective filtration techniques

Granular (sand) filter crypto removal can be improved by:

- **Coagulant/flocculent dosing (e.g. Polyaluminium chloride).**
- **Flow rate (medium/low rate).**
- **Regular, effective backwashing.**
- **Separate filtration systems for adult / children's pools.**

What can Environmental Health Officers do?

- **Maintain an up-to-date register of aquatic facilities in your municipality (including private swim schools).**
- **Build relationships with aquatic facilities before outbreaks:**
 - Talk about crypto risk management.
- **Conduct routine inspections:**
 - Compliance with regulations.
 - Display of “Healthy Swimming” messages and materials.
 - Policies and staff knowledge.
- **Where possible, influence the layout/design of new/renovated council facilities – make sure crypto risk is considered!**

What is DHHS doing?

- **Updating faecal incident response recommendations for aquatic facilities.**
- **Reviewing and finalising the draft DHHS crypto outbreak response protocol.**
- **Reviewing and updating crypto outbreak response tools – internal and external.**
- **Reviewing and updating “Healthy Swimming” materials.**
- **Reviewing and updating the Pool Operator’s Handbook.**
- **Reviewing the Aquatic Facilities regulations for the PHWR sunset – opportunities for better crypto risk management to be included?**

Questions?

