

## The pool parasite we all want to control

**Cryptosporidium represents a significant threat to pool users and pool operators alike. Robbie Phillips explains why this organism is so dangerous and how it can be managed to protect your swimmers and your business.**

Cryptosporidium is a protozoan parasite that causes acute gastroenteritis, which can last up to two weeks but has been known to last even longer. Illness can also result in chronic, long-term infection.

Cryptosporidium inhabits the human gut, where it thrives and multiplies. Part of its life cycle involves the formation of dormant spores that act like a protective shell. These spores (known as cryptosporidium oocysts) are the mechanism for the transmission from one human host to another.

“10B.”

The oocysts are about five microns in diameter and are shed via stools in huge numbers ( $10^6$  to  $10^7$  per gram stool). Ingestion of fewer than 10 oocysts may be sufficient to cause infection. In addition, cryptosporidium oocysts are especially resistant to the chlorine and bromine disinfection in swimming pools, where they can survive for many days.

Patients can shed the cryptosporidium oocysts for up to two weeks after the symptoms have ceased. This is why it is crucial that people with diarrhoea must not swim and why people with cryptosporidiosis must not swim for two weeks after symptoms have ceased.

Cryptosporidiosis is a very unpleasant illness, whose main symptoms are watery diarrhoea, abdominal pain, fever and vomiting.

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Cryptosporidiosis outbreaks are more frequently linked to learner/toddler pools than in main pools, which reflect the vulnerability of young children who could also be the source of infection. The oocysts sink only very, very slowly and because children often drink the water near the surface, the parasite has ready transmission to the intestine to cause infection and continue its life cycle. Similarly the introduction of interactive play features and young children defecating and drinking water from the sprays has presented other high risk factors.

The STA recommends that babies and children should not wear normal nappies in pools and similar facilities but a purpose-made costume with a purpose-made waterproof nappy. This aids the containment of solid stools and is referred to as the “double-nappy” system, where a second protective swim nappy layer is used over a disposable or reusable swim nappy.



However, even this double-nappy system does not fully contain loose, runny stools and specifically oocysts. Two thirds of cryptosporidiosis cases are among children, and mostly in the under-fives. With diarrhoea being more frequent within this age group and outbreaks more readily noticed, this group is the highest risk. Young children are also more susceptible to infection and a study by Dufour et al (2006) estimated that during a 45-minute swim a child would consume 37ml of water compared to an adult, who would ingest about 16ml. Very young children were not included in this study and the presumption would be that they consume more water, putting them at even more risk of infection.

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### Highly infectious

Cryptosporidium is highly infectious and research indicates that it can survive in a swimming pool for more than 10 days (see table below from the Centres of Disease Control & Prevention). Evidence also shows that cases of cryptosporidium peak in the spring and

autumn, so it is essential that bathers and operators are educated about the risks that the organism poses.

Agent	Disinfectant Times for Faecal Contaminants in Chlorinated Water
E. coli 0157:H7 (Bacterium)	less than 1 minute
Hepatitis A (Virus)	approximately 16 minutes
Giardia (Parasite)	approximately 45 minutes
Cryptosporidium (Parasite)	approximately 15,300 minutes (10.6 days)
<b>Notes:</b>	
<ul style="list-style-type: none"><li>• 1 mg/L (1ppm) free chlorine at pH 7.5 and 25° C (77° F)</li><li>• These disinfectant times are only for pools that do not use chlorine stabilizers such as Cyanuric acid. Disinfection times would be expected to be longer in the presence of a chlorine stabilizer.</li><li>• Approx a 90% reduction rate.</li></ul>	

A swimming pool is often an underrated provision until things go wrong and they have to shut. It is therefore essential that leisure pool operators fully appreciate the consequences that a detected outbreak of cryptosporidium can have. These can include:

- loss of reputation and users
- loss of income
- substantial remedial works
- negative effect on staff confidence
- illness or worse among users, even fatalities of the immune-compromised.

## Best defence

We must keep cryptosporidium OUT of the pool to prevent outbreaks and the best defence is education, good hygiene and filtration. This can be summarised as follows:

- Ensuring all user groups have clear information and understand all the procedures:
  - Advertise that people with diarrhoea must not swim for 48 hours afterwards. Those who have been diagnosed with cryptosporidiosis must not swim for 14 days after diarrhoea has stopped.
  - Encourage parents to adopt practices which will limit the chances of faecal contamination; for example, display education posters in the leisure centre and changing rooms.
  - Persuade bathers to wash and shower before swimming; again use posters at poolside and in the changing rooms.
- Operators should be able to identify the type of filtration they have for the individual pools or facilities ie medium or high rate (or any other type, eg *diatomaceous earth* etc.) and apply the proven protocols diligently.
- Continuous low-level dosing of a flocculant/coagulant is recommended

for all pools to improve the filtration efficiency with medium rate filtration.

- Correct backwashing protocol is critical:
  - Backwashing of filters should be done at least once a week or more frequently as the filter pressure differential dictates and according to the manufacturer's literature for the filters installed.
  - Backwashing should not take place during bathing and should allow the filters to re-compact before any use, normally last thing at night. Only one filter should be backwashed at a time.
- Ensure there is an appropriate emergency action plan (EAP) for a loose runny stool; also appropriate documentation and awareness.
- For pools with high rate filters there should be volumes of chemicals present to attain the super chlorination and de-chlorination together with flocculant/coagulant to administer; training in this area is important.
- Ensure there is an effective disinfectant residual and an appropriate pH at all times.
- Surface water treatment should be present and effective.
- Clear schematics of the pool/feature purification systems should be clearly understood by the designated operator.
- Having competent, trained staff with site-based knowledge.
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- Ensuring a robust maintenance programme is in place to ensure pool plant and circulation systems operate effectively.
- Ensuring clear records and graphics of all recommended plant checks (eg filter condition) are undertaken and recorded.

These protocols also apply to any closed-circuit wet leisure provisions, such as conventional pools, hydro pools, paddling pools, interactive play features and fountains.

**Robbie Phillips is the STA's pool plant expert and is a regular contributor to the Leisure Review.**

**For further information contact the STA visit [www.sta.co.uk](http://www.sta.co.uk)**

- **10 headline facts about cryptosporidium**
  1. An illness caused by cryptosporidium is characterised by diarrhoea, abdominal cramps, loss of appetite, low-grade fever, nausea, and vomiting.

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2. Especially common in children.
3. The largest numbers of outbreaks are caused by recreational swimming pools.
4. 8% of patient cases continue to use a pool while infected.
5. 5 to 7-day incubation period.
6. 12.7 days: the average duration of illness.
7. 14% of infected patients in one study were admitted to hospital for an average of three days.
8. The parasite can continue to be shed after symptoms have ceased.
9. Can be prolonged and life-threatening in severely immunocompromised patients; management of high-risk patients is especially difficult owing to a lack of proven treatment regimes.
10. 2012 showed the highest number of cases in the UK and Europe for over 20 years.

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