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Queenstown outbreak highlights future challenges for clean drinking water

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Summary

Safe, good quality drinking water is crucial to public health. The Queenstown cryptosporidiosis outbreak highlights the need for greater understanding of the connections between infrastructure, land use, regulation, and governance. It is these factors in combination that determine whether water from our taps is clean and safe to drink.

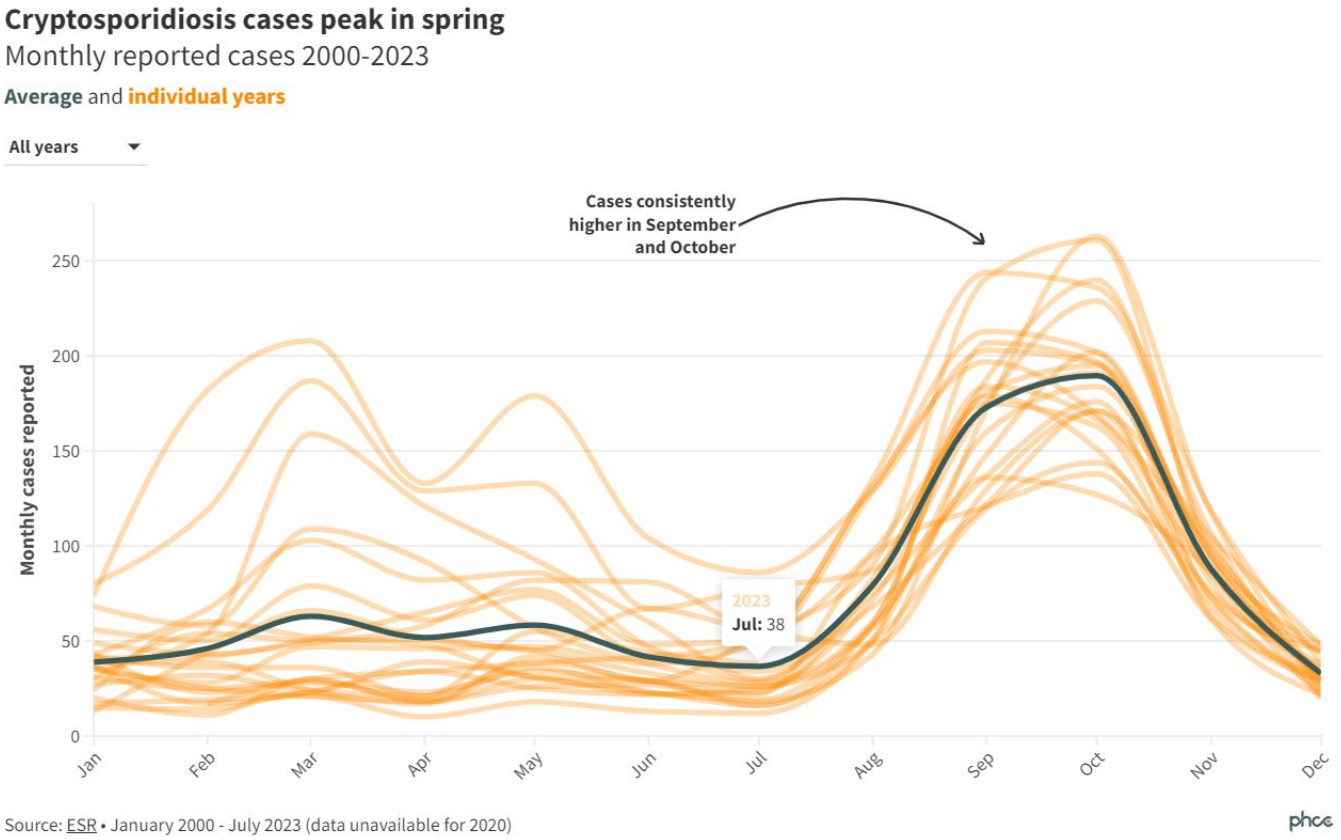
While authorities continue to investigate a range of potential source of this outbreak, they have confirmed the drinking water supply in Queenstown is vulnerable because it lacks a protozoa barrier. Regardless of the eventual findings, there needs to be more public discussion on how to keep communities' drinking water safe and more informed debate from central and local government politicians on this important issue.

While the water regulator, Taumata Arowai, has taken proactive measures, there's a need for greater clarity and planning among various agencies involved in water quality. Enhancing both treatment and source water protection measures is imperative in safeguarding communities from waterborne diseases, particularly in areas with high densities of livestock and vulnerability to flooding events.

On 18 September 2023, the Queenstown Lakes District Council issued a boil water notice to residents of Queenstown and Frankton. The warning came after several people were diagnosed with cryptosporidiosis; a gastrointestinal illness caused by the cryptosporidium parasite. Symptoms typically include watery diarrhoea and gastrointestinal pain. So far, there have been 45 confirmed cases and three hospitalisations. Te Whatu Ora has multiple recommendations for the public about how to limit their exposure to potential sources of infection, as well as to reduce transmission from infected people, as described in the Appendix.

Cryptosporidium can be transmitted by direct contact with infected animals or people, and from faeces contaminated recreational water, drinking water, or food. The source of the Queenstown outbreak is unknown at the time of writing. It is possible that the cryptosporidium contamination came from contaminated recreational water, food, or drink. However, water regulator Taumata Arowai's regulatory head Steve Taylor told RNZ that: "on the information available at the moment there is a material risk as it relates to drinking water".

Drinking water can be contaminated from both human sources, such as untreated sewage, and animal sources, including wild and farmed animals. Each year, identified cryptosporidiosis cases peak in September and October, coinciding with the spring lambing and calving seasons, suggesting that animal sources make a large contribution.[1] We provide more background on cryptosporidiosis outbreaks in the Appendix.



Lessons from Havelock North drinking water outbreak

Contaminated drinking water was the cause of the 2016 Havelock North campylobacter outbreak, which led to an estimated 6,000 to 8,000 cases of gastroenteritis, 42 hospitalisations, three people developing long-term health conditions, and four deaths.[2]

Since then there has been a greater focus on drinking water quality, including the establishment of a new national drinking water regulator, Taumata Arowai, in 2021. The government has also emphasised the protection of drinking water sources in national policy through the Te Mana o te Wai framework.[3]

However, recent political party policy announcements and the revelation of delayed upgrades to Queenstown's drinking water plant suggest that, as the Havelock North Inquiry predicted, the serious consequences of drinking water contamination are being forgotten by some and overtaken by "competing pressures". Even if the current disease outbreak is eventually found to be unrelated to the water supply, reduced confidence in the Queenstown supply, due to the lack of a protozoa barrier, has meant that boil water notices were required, with considerable disruption to businesses and households.

Safe, good-quality drinking water relies on a multi-barrier approach beginning with source water protection, and including adequate treatment and sound infrastructure.[3-5]

Protecting New Zealanders from drinking water outbreaks

First, all New Zealanders should be pleased to see that the drinking water regulator, Taumata Arowai, has been proactive and firm with the Queenstown Lakes District Council. The regulator has served the council with a compliance order, requiring a boil water notice to stay in place until the plant's water treatment is satisfactory. We have criticised Taumata Arowai in the past for being too hands-off. It is essential that it is resourced and empowered

to perform its regulatory function.

However, the exact role of Taumata Arowai is still unclear and it is only one of several government agencies with responsibilities relating to water.

- The Ministry for the Environment, the Ministry for Primary Industries, and the Department of Conservation are involved in protecting the quality of freshwater in various ways.
- Local government bodies such as regional councils are responsible for regulating land use (including source water protection) and the use of water.
- Water suppliers themselves are responsible for the quality of the water they provide and for writing Source Water Management Plans (though not the implementation of the plan).
- Other agencies maintain disease surveillance systems and become involved if an outbreak is detected, notably the National Public Health Service of Te Whatu Ora. Other health agencies also have a monitoring and policy interest including the Public Health Agency, Ministry of Health, and Te Aka Whai Ora.

It is not clear how all these organisations work together effectively. We need more clarity and clear planning for cross-agency collaboration in preventing or responding to outbreaks of waterborne disease.

Secondly, as the Havelock North Inquiry stressed, the protection of communities' *source water* "provides the first, and most significant, barrier against drinking water contamination and illness". Source water refers to the waterbodies (streams, rivers, aquifers, etc.) that communities draw their water from. Treatment alone should not be the only barrier enforced by Taumata Arowai. We need greater urgency and emphasis from the drinking water regulator and regional councils on source water protection.

In 2020, New Zealand researchers found that water sources in catchments with higher densities of ruminants like cattle, sheep, and goats had higher concentrations of protozoa, including cryptosporidium.[1] They concluded:

"Our study highlights that an effective way to limit pathogens in raw source water is to manage catchment landuse; protected watersheds of predominantly native vegetation is certainly a strategy used effectively in Australia, New Zealand and the USA. While current landuse may preclude such comprehensive approaches, it could still be possible to limit agricultural intensity and/or utilise riparian vegetation buffers to help reduce the prevalence of pathogens in many waterways."

Improving the treatment of drinking water supplies reduces the risk of outbreaks such as that in Queenstown, but we also need to protect our lakes, rivers, and aquifers from contamination in the first place.

What is new in this Briefing?

- The source of a cryptosporidiosis outbreak in Queenstown is unknown, but the incident highlights challenges in protecting our drinking water from protozoan pathogens.
- This outbreak reminds us about the importance of source water protection, given the increasing impact of intensified agriculture, human settlement, and climate change on freshwater quality.

Policy implications

- Central government must ensure water regulator Taumata Arowai is empowered and resourced to meaningful protect source water.
- More clarity on responsibilities for safe drinking water is needed across government agencies, including sufficient resources for effective surveillance, investigation, and enforcement.

Author details

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Appendix: Cryptosporidiosis outbreak control measures, sources, and contributing factors

Cryptosporidiosis outbreak control measures

Te Whatu Ora has highlighted measures for prevention and control of the current outbreaks.

See: http://www.southernhealth.nz/cryptosporidium

These measures are intended to **limit further infections from potential sources**, including:

- From contaminated drinking water – For people on a boil water notice, Boil water for 1 minute and store in a clean container with a lid. See: Boil water notice issued for Queenstown and Frankton.
- From other water sources – Don't drink untreated water, or swallow pool water.
- From infected people, animals, and surfaces – Practise good hand hygiene. Wash hands with soap and water for at least 20 seconds and dry them thoroughly with a clean towel. Alcohol-based hand sanitisers are not effective against cryptosporidium oocysts.

Additional measures are needed to **limit secondary person-to-person transmission from infected people**.

- People who live, work, or have visited Queenstown and Frankton on or after August 18 2023, and have symptoms of diarrhoea and/or stomach cramps, should call their GP or health provider to inform them and arrange testing if needed or call Healthline on 0800 611 116 for advice.
- Do not return to work, school, or preschool until free of symptoms for 48 hours. This includes food handlers, early childhood workers and healthcare workers.
- Do not use swimming pools, hot tubs, or splash pads for at least 2 weeks after your symptoms stop.
- Avoid visiting people in hospital or long-term care facilities for at least 48 hours after your symptoms stop.
- If possible, do not prepare food for anyone else until 48 hours after your symptoms stop.
- Disinfect toilets regularly, Use your own towel; do not share with anyone else, Bathe separately or bathe sick children after others.
- Wash hands regularly with soap and hot water, especially after visiting the toilet. Dry hands thoroughly after washing.

Sources of cryptosporidiosis outbreaks and contributing factors

Cryptosporidium can be transmitted by direct contact with infected animals or people, and from faeces contaminated drinking water, recreational water, or food (including beverages). The source of the Queenstown outbreak is unknown at the time of writing. It is possible that the cryptosporidium contamination came from contaminated recreational water, food, or another source. However, water regulator Taumata Arowai's regulatory head Steve Taylor told RNZ that: "on the information available at the moment there is a material risk as it relates to drinking water".

Each year identified cryptosporidiosis cases peak in September and October, coinciding with the spring lambing and calving seasons.[1] This pattern is not seen with giardiasis, the other major enteric protozoan disease under close surveillance (both are notifiable by the diagnosing doctor and laboratory).[6]

While livestock is one potential source of cryptosporidium, it should be noted that there have also been previous reports of wastewater and sewage overflows into Lake Wakatipu and rivers near Queenstown.

Treatment of potentially contaminated drinking water is difficult, as cryptosporidium oocysts are not prevented by basic filtration or chlorination. An expensive protozoa barrier is usually required to prevent parasites from entering the water supply. This barrier is only in place for a minority of NZ drinking water supplies. Water regulator Taumata Arowai reports that about 190 supplies, serving about 13% of New Zealand's population, have similar source water characteristics to the Queenstown supply and have reported they do not have a protozoa barrier at the treatment point (such as UV treatment and membranes).

Internationally, cryptosporidiosis outbreaks have also been frequently linked to contaminated drinking water, though there are other important sources.[7; 8] Cryptosporidium was the cause of what is probably the largest documented drinking water outbreak, where an estimated 403,000 people had watery diarrhoea attributable to this organism in Milwaukee in 1993. [9]

Climate change introduces another layer of complexity to the issue of water quality. [10] Climate change is causing more frequent and intense rainfall events, increasing the

likelihood of water contamination. This factor was underscored by the extreme weather and flooding in Queenstown that occurred last week (though after the start of this outbreak). Rising temperatures also affect the development and persistence of pathogens in the environment.

Extreme weather events, which are predicted to become more common in the future, can damage water infrastructure or overload treatment facilities, and introduce contamination into drinking water supplies.

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