Short reports

An outbreak of Shiga toxin-producing *Escherichia coli* infection associated with a school camp

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Abstract

In November 2008, a case of Shiga toxin-producing *Escherichia coli* (STEC) infection was reported to the Brisbane Southside Public Health Unit. The case had participated in a school camp. Subsequent investigations confirmed 5 other asymptomatic cases among camp attendees or visitors. Examination of the camp water supply identified that most water sources had high levels of *E. coli* and did not meet the *Australian Drinking Water Guidelines* with STEC isolated from 2 water sources. This outbreak highlights the emerging issue of asymptomatic carriage of STEC and the importance of thorough maintenance and attention to drinking water supplies in the rural and school camp setting. *Commun Dis Intell* 2010;34(1):54–56.

Keywords: *Escherichia coli*, foodborne illness, outbreak, school camp

Introduction

Shiga toxin-producing *Escherichia coli* (STEC), of which enterohaemorrhagic *Escherichia coli* (EHEC) are a sub-group, are an important cause of gastroenteritis with substantial associated mortality and morbidity. In up to 8% of cases the infection may progress to haemolytic uraemic syndrome (HUS) in children or thrombocytopenia purpura in adults.[1] Management is generally supportive with some evidence that antibiotics may prolong excretion of the organism or increase the risk of HUS.[2–4] Prevention of primary infection remains the best way to prevent the serious outcomes of STEC infection.

Large outbreaks of STEC infection are frequently reported from Europe, North America and other developed countries with contaminated food or water the most common source of transmission.[5–7] In contrast there have been few reported outbreaks of STEC in Australia.[8,9] Notifications of sporadic STEC cases have been increasing in Australia and Queensland since 2002.[10,11] This may be related to improved laboratory surveillance or an actual increase in disease incidence.[12]

In November 2008 the Brisbane Southside Public Health Unit received a notification of STEC infection in a teenage male. Case follow up identified a remote rural school camp as the likely source of infection. This paper describes an outbreak of STEC infection associated with the water supply at this camp.

Methods

Case investigation, contact tracing and collection of faecal samples was commenced in accordance with Queensland Health protocols.[13] The investigation included questionnaire and faecal sampling of household and school camp contacts of the index case.

A case was defined as:

- isolation of Shiga (-like) toxin-producing/vero toxin-producing *E. coli* from faeces: or
- detection of Shiga (-like) toxin or vero toxin from a clinical isolate of *E. coli*: or
- identification of the gene associated with the production of Shiga (-like) toxin or vero toxin in *E. coli* by nucleic acid testing on isolate or fresh faeces.

The school was contacted to provide information on other children attending the school camp. An environmental health investigation was undertaken at the site of the school camp. Water samples from rainwater tanks, bores and other potential environmental sources were collected and tested for evidence of STEC at Queensland Health Forensic and Scientific Services.

Students who attended the camp with the index case completed a questionnaire that included demographics and details of potential exposures at the camp, including water sources and facilities used, as well as animal and environmental exposures. Stool samples were requested from those who attended the school camp including school and site mainte-

nance staff. If other camp attendees were found to be positive for STEC, their household contacts were offered faecal sample testing for STEC.

Results

Various classes from the school had spent 4 weeks living in 4 dormitories (2 male, 2 female) at the camp throughout the school year. Twenty-five students, 3 teaching staff, a family of 4 residents and an unknown number of parents and family members on day visits were at the camp during the period 2–28 November 2008. Each dormitory contained its own cooking, shower and toilet facilities. No specific water source or other potential risk factors were identified among 20 students who completed the questionnaire.

A faecal sample from the index case was positive for Shiga-like toxin, had *stx1*, *stx2*, *eaeA* and *ehxA* genes detected and was serotyped as O26:H11. All faecal samples from household contacts of the index case were negative for STEC.

Thirteen other students provided faecal samples. Four students (who were asymptomatic) tested positive for a variety of STEC genes. These were: O112ab:H2 (2), O88 related:H25 (1), Ont:H7 (1), O174:H- (1), and O153:H21 (1). One of 15 household contacts of the 4 asymptomatic STEC cases tested positive for *stx2*. This was from a parent who had visited the camp for a Parents Day and consumed water from a container in one of the common areas prior to the introduction of bottled water measures.

STEC was isolated from 2 water samples collected from the camp. The sample from the case's dormitory had O2:H8 isolated and *stx1*, *stx2*, *ehxA* and *saa* genes detected. The 2nd positive sample had O91:H10 isolated and also had *stx2*, *ehxa* and *saa* genes detected. Ten of 13 samples from rainwater tanks and their outlets had unacceptably high levels of *E. coli* (up to 310 *E. coli* per 100 ml) and did not meet the microbiological requirements of the National Health and Medical Research Council *Australian Drinking Water Guidelines 2004*.[14] The bore water was found to be microbiologically safe. No Shiga toxin genes were detected in animal faecal samples collected at the camp.

Food preparation and general camp hygiene were described as satisfactory. Bore water was supplied to the toilets and showers and there were rainwater tanks that supplied the kitchen and various other amenities blocks. These tanks varied in size, construction materials and relative age. They were not fitted with 'first flush' devices (rainwater diverters), had not been cleaned out for many years and were not subject to any form of disinfection. There was no documented evidence of a routine maintenance, chemical or microbiological testing program for either the tank or bore water supply.

At the time of the environmental health investigation all camp attendees were advised to use only bottled water for drinking and cleaning teeth and that any other illness in children or staff should be reported. Apart from the case, all other attendees or residents remained well.

Discussion

This is the 1st reported Australian outbreak of STEC among children participating in a rural school camp. It is not possible to attribute the parent case with certainty, to the consumption of camp water or subsequent household contact. However, the variety of STEC serotypes identified in camp attendees, the detection of a variety of STEC isolates and genes in 2 water sources and the high level of *E. coli* contamination of water sources, lead us to postulate that the tank water supply at this camp was the most likely source of this outbreak.

Waterborne outbreaks of STEC have been well documented in both recreational and drinking water.[15] This outbreak demonstrates the potential risks associated with rainwater tanks where there is no active maintenance program in place and/or where there is no disinfection of the water prior to consumption. Not only were 2 drinking water sources contaminated with STEC, but most of the tank water sampled did not meet the standards for the current *Australian Drinking Water Guidelines*. This potential risk is amplified in the setting of a school camp.

As a result of this outbreak, Queensland Health required remedial action to be undertaken at the school camp to ensure the safety of the drinking water supply. The tank water reticulation system has been redesigned, ultraviolet sterilisation of the drinking water sources has been instituted and all the drinking water tanks have been cleaned and disinfected. Queensland Health is also reviewing its *Guidelines for Prevention and Management of Gastroenteritis Outbreaks in Camp Facilities* to place greater emphasis on the provision and maintenance of potable water supplies.

STEC infections have been notifiable in most jurisdictions since 2000. Routinely, clinical diagnostic laboratories only culture for *E. coli* O157. Therefore, STEC infections of other serotypes are likely to be under-reported. In a recent survey over 3 months at QHFSS laboratory, 4.7% of clinical diagnostic laboratory referred faecal samples that had evidence of blood but no other pathogen isolated were positive for non-0157 STEC infection (Helen Smith,

personal communication). This referral practice was an important factor in the identification of this outbreak.

In addition, this outbreak is notable for the high degree of asymptomatic carriage of STEC in those tested. Asymptomatic carriage has been previously described in children[16,17] and in rural populations.[18] It is currently not known how long asymptomatic carriage may occur prior to the onset of infection or if there are certain physiological triggers that can switch carriage to infection. While the clinical relevance of asymptomatic carriage of STEC is undetermined, the potential serious sequelae of STEC infection places further importance on measures that improve the detection of asymptomatic carriage of STEC and support disease control measures. This outbreak also demonstrates the importance of thorough maintenance and attention to drinking water supplies in the rural and school camp setting. As testing for STEC becomes more commonplace we expect that further similar outbreaks will be identified.

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