A multi-jurisdictional outbreak of hepatitis A related to a youth camp — implications for catering operations and mass gatherings.

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Abstract

In June 2003, Australian state and territory health departments were notified of an outbreak of Hepatitis A in people who had attended a five-day youth camp. Approximately 350 people attended the event in Central Australia between 24 and 28 April 2003. The public health investigation comprised of case identification, food handler interviews, an environmental health investigation of the campground and associated food premises, laboratory analysis of blood specimens and food/water samples, and an epidemiological study. Twenty-one cases fitted the case definition for the outbreak. A retrospective cohort study involving four states was conducted, with 213 people interviewed. Coleslaw and cordial were significantly associated with illness, however when the two exposures were adjusted for each other to account for confounding, only coleslaw remained significantly associated with illness (adjusted RR 2.5, 95% CI 1.09 – 5.77). The investigation highlighted a number of food hygiene and safety issues relating to the catering of mass gatherings. Implementation of food safety programs in these settings are likely to reduce the occurrence of such outbreaks. The recent proposal by Food Standards Australia New Zealand to mandate food safety programs for catering operations is supported. *Commun Dis Intell* 2004;28:521–527.

Keywords: Hepatitis A, camp, multi-jurisdictional, catering operations, mass gatherings

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Introduction

Hepatitis A is a notifiable disease in every state and territory of Australia. Although the disease can vary in severity, symptoms and duration, the illness is generally mild and characterised by fever, malaise, anorexia, nausea, dark coloured urine, abdominal pain and jaundice.[1] Asymptomatic infection may occur, however this is more predominant in children under five years of age.[1] Infection can occur through person-to-person transmission, or by ingestion of contaminated food or water. In Australia, the illness is usually associated with household or sexual contact with a case, illicit drug use, childcare facilities, institutions or overseas travel, with foodborne disease outbreaks attributed to contaminated shellfish or foods contaminated by infectious food handlers.[2–7]

Background

Between the 29 May and 4 June 2003, the Public and Environmental Health Service of the Department of Health and Human Services in Tasmania, received four separate notifications of laboratory-confirmed Hepatitis A. Initial interviews indicated that the cases had travelled by bus (3) or aeroplane (1) to the Northern Territory in late April to attend a five-day youth camp. Discussions with the camp organisers indicated that approximately 350 people had travelled to the camp by bus from Queensland, Victoria, New South Wales, Western Australia, and Tasmania, which prompted an investigation to identify other possible cases and the source of the infection.

The youth camp was held at a large campground in Central Australia from 24–28 April 2003. People attending the camp were accommodated in three separate areas of the campground. Each state bus group brought their own portable kitchen, which was used to provide all but one meal for their state attendees. The camp program included visits to local tourist attractions, group discussions, and social activities. There were two occasions where all state groups were present at the same time: a social function on the evening of Friday 25 April, and a Saturday (26 April) afternoon festival, which included social activities, a barbeque, concert and water ceremony relating to Indigenous reconciliation.

Methods

Case identification

Jurisdictional health departments were alerted to the possibility of a nationwide outbreak through Communicable Disease Network Australia and OzFoodNet. Travel histories of hepatitis A notifications received since the start of the year were reviewed to ascertain whether the case had travelled to Central Australia, whilst newly notified cases were asked if they had attended the camp.

A letter advising of the outbreak and symptoms of hepatitis A was forwarded to all people who had attended the camp. As a control measure, household and close contacts of cases were contacted and advised to visit their general practitioner for immunisation with normal human immunoglobulin.

Environmental health investigation

A Regional Environmental Health Officer from the Northern Territory Department of Health and Community Services conducted an environmental investigation on 11 and 12 June 2003. The investigation focussed on the temporary kitchen used for the preparation of group meals, local food premises used to supply ingredients for the camp, water treatment and supply, wastewater disposal, the constructional and hygiene standards of camp facilities, and campground layout. Samples of water and ice obtained during the inspection were submitted to the Water Microbiological Laboratory (Northern Territory Department of Business, Industry and Resource Development) for microbiological analysis.

Food handler interview

State and territory health departments interviewed food handlers on their food handling activities at the camp and their knowledge of food hygiene principles.

The interview included questions on preparation methods of high-risk foods and history of illness before, during and after the camp.

Laboratory analysis

All known food handlers involved in preparing group meals were asked to submit a blood specimen for hepatitis A viral (HAV) serology to determine whether they could have been infectious around the time of the camp. States reporting cases associated with the outbreak were asked to send blood specimens from cases to the Institute of Medical and Veterinary Science, Adelaide—for genotyping using reverse transcriptase polymerase chain reaction methodology.[8]

Epidemiological investigation

Following a review of notifications and initial case interview, a retrospective cohort study was conducted, involving the four states (Queensland, Tasmania, Victoria and New South Wales) that

reported cases associated with the camp. The cohort was defined as persons who attended the camp between the 24 and 28 April 2003. This epidemiological approach was chosen as the population who attended the camp was well defined and the names and contact details of attendees were obtainable.

The case definition for the outbreak was a person with serologically confirmed hepatitis A, who had attended the camp, with a definitive onset date of hepatitis A-like illness within fifty days of the camp.

From discussions with the organisers of the camp and hypothesis generating interviews with cases, a questionnaire was developed for interviewing the cohort. Questions were designed to obtain information about contact with known or suspected cases of hepatitis A, HAV immunisation status, illness history, food items consumed, drinking water sources, tourist attractions visited, contact with local indigenous communities, camp activities attended, frequency of hand washing and hand washing technique. Potential risk factors associated with hepatitis A infection including sexual contact, sharing of cigarettes and drug paraphernalia, and sharing of eating and drinking utensils were also addressed. State health departments conducted telephone or face-to-face interviews. Risk ratios (RR) were calculated for common food items, tourist attractions visited, drinking water sources, amenities used (including male/female facilities), attendance of events, and other risk factors associated with hepatitis A infection, using Stata Statistical and Data Analysis package, Version 8.0.[9]

Results

Case identification

Through laboratory notifications, 21 cases of hepatitis A were identified among those people attending the youth camp in the Northern Territory. An additional case was identified as a result of the cohort study. When reviewing the case histories, one case was identified as not fitting the case definition and was excluded from the cohort study. There were no other cases of hepatitis A infection reported in people who visited the locality before, during or after the camp.

Environmental health investigation

The environmental health investigation was conducted whilst equipment used at the organisation's campsite was being dismantled. It was noted that the temporary kitchen used for food preparation for the camp did not have a designated hand washing facility. Food premises that had supplied ingredients for food and drinks served during the camp were inspected and found to comply with the legislation. Samples from an ice machine that was used to supply the camp with ice complied with microbiological criteria.

The campground and nearby town were supplied with treated bore water. Camp organisers used water from this source to fill bulk containers with water and cordial, which were supplied for group activities. There were no problems identified with the water treatment or water supply system around the time period of the camp, and samples of water taken during the environmental health investigation complied with microbiological requirements for drinking water. Amenity blocks at the time of the inspection were found to be clean and supplied with soap and disposable towels. Constructional standards of other camp facilities were satisfactory.

Laboratory results

Blood specimens from eight of the nine food handlers were submitted for serology. All specimens were IgM anti-HAV negative. One food handler declined to be tested. Thirteen blood specimens from cases associated with the outbreak were sent to the Institute of Medical and Veterinary Science for genotyping. HAV ribonucleic acid sequence data indicated that at least ten and most likely twelve of the cases were the result of an infection with a common HAV isolate. One sample could not be genotyped. The HAV isolate was closely related to genotype 3A reference sequence.[8]

Epidemiological investigation

Twenty-one people fitted the case definition for the outbreak, however one case was lost to follow up between the initial case interview and the cohort study, and therefore not included in the epidemiological investigation. In total 213 camp participants were interviewed. Demographics and attack rates for states and the cohort overall were calculated (Table 1). Nausea was reported as the predominant symptom (100%), followed by jaundice (95%), anorexia (75%), body aches, headaches and dark urine (70% each). Onset dates for the cases ranged from the 19 May to the 5 June 2003. (Figure)

Attack rates and risk ratios for food items are outlined in Table 2. None of the non-food variables were found to be significantly associated with illness and have not been shown in the table.

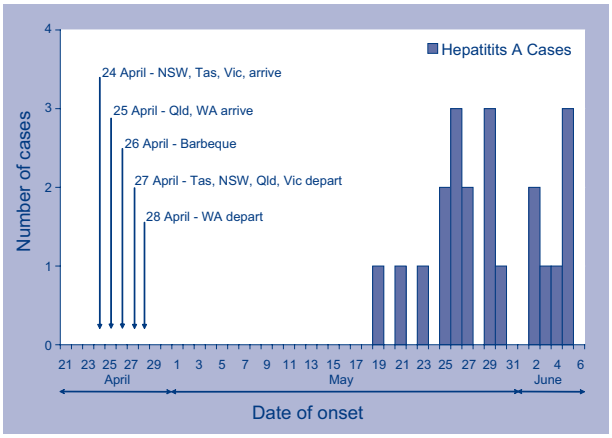
Reported consumption of both coleslaw and cordial served at the barbeque was significantly associated with hepatitis A infection, with crude RRs of 3.42 and 2.46 respectively. When coleslaw and cordial were adjusted for each other to control for confounding, only the association between coleslaw and illness remained statistically significant (Mantel Haenzel adjusted RR 2.5, 95% CI 1.09–5.77).

Table 1. Attack rates and demographics of states attending a Youth Camp in Central Australia during April 2003 (n=213)

State	Number attending	Number interviewed	Number of cases		Attack rate (%)	Median age (range) - interviewed
			Notified *	Interviewed		
State A	45	23	1	1	4.3	17 (10–49)
State B	84	50	8	8	16.0	15 (11–52)
State C	111	95	8	7	7.4	18 (11–61)
State D	49	45	4	4	8.9	16 (12–57)
Overall	289	213	21	20	9.4	16 (10–61)

* includes only those people who fitted the case definition

Figure. Epidemic Curve of cases of hepatitis A among people attending a Youth Camp in Central Australia during April 2003, by Onset Date (n=21)



The Queensland bus group consumed leftover sausages and coleslaw from the barbeque the following day. Variables for the two products served at the barbeque and as leftovers were combined as 'coleslaw (BBQ and/or leftovers) and sausage (BBQ and/or leftovers). Coleslaw (BBQ and/or leftovers) was found to have a significant association with illness (RR 4.92, 95% CI 1.8–13.2). Attributable risk percentages were calculated for coleslaw (BBQ and/or leftovers) (79.7%) and coleslaw served at the barbeque (70.7%).

Discussion

We have found strong evidence that this outbreak of hepatitis A was associated with a five-day youth camp in the Northern Territory. We found a temporal relationship between attendance at the camp and development of symptoms within the incubation period. Genotyping of available sera suggested that the cases were related. Elevated risk ratios were identified for exposure to coleslaw and coleslaw (BBQ and/or leftovers) with disease. Attributable risk percentages for coleslaw and coleslaw (BBQ and/or leftovers) were high (70.7% and 79.7% respectively). This evidence suggests that coleslaw was the likely vehicle for the outbreak.

Two batches of coleslaw were made for the barbeque on the Saturday night. A large batch was prepared in a portable kitchen by two food handlers associated with one of the state groups. A second, smaller batch was prepared by a local resident in their own home. Both batches were made from ingredients (cabbage, carrot, capsicum, apple and commercial mayonnaise) purchased from a local food premises. The leftover coleslaw was given to the Queensland bus group for consumption the following day.

Three cases from Queensland did not attend any of the activities on the Saturday, including the barbeque where the coleslaw was served. However, one case could recall eating leftover coleslaw the following day, whilst the other two cases were unsure whether they consumed the leftover product. The RR for eating coleslaw (BBQ and/or leftover) was 4.92 (95% CI 1.8–13.2), supporting the proposition that coleslaw was the likely vehicle for this outbreak. However five cases did not report eating coleslaw at either the barbeque or as leftovers. This suggests that there may have been other exposures, or that cases who did not report eating coleslaw could not recall, or possibly did not know what the coleslaw was. Some errors in recall are likely given the inevitable time lapse between exposure and the commencement of the investigation, and possibly the age of the cohort.

It is possible that the raw ingredients used to make the coleslaw were the source of the contamination. Overseas, hepatitis A outbreaks associated with fruit and vegetable consumption have been linked to the use of contaminated fertilisers or irrigation supplies, or by people handling the product during harvesting or packing process.[10–16] However, hepatitis outbreaks implicating these products have not been detected in Australia. The ingredients used for the coleslaw could have been contaminated at a farm level, how-

Table 2. Attack rates and risk ratios for exposure to specific foods in people attending a Youth Camp in Central Australia during April 2003 (n=213)

Exposure	Exposed			Not exposed				
	Number ill	Total	Attack rate (%)	Number ill	Total	Attack rate (%)	Risk ratios	95% CI
Social Activity: Friday 25 April								
Hot Chocolate	10	125	8.0	10	88	11.4	0.70	0.31–1.62
Marshmallows	10	119	8.4	10	94	10.6	0.79	0.34–1.82
Barbeque: Saturday 26 April								
Sausage	14	148	9.5	6	65	9.2	1.02	0.41–2.55
Sausage (BBQ &/or leftovers)	16	153	10.4	4	60	6.7	1.57	0.55–4.50
Vegetable Patty	3	20	15.0	17	193	8.8	1.70	0.55–5.31
Bread	16	160	10.0	4	53	7.5	1.33	0.46–3.79
Sauce	11	135	8.1	9	78	11.5	0.71	0.31–1.63
Coleslaw	12	65	18.5	8	140	5.4	**3.42**	**1.47–7.96**
Coleslaw (BBQ &/or leftovers)	13	73	17.8	5	138	3.6	**4.92**	**1.8–13.2**
Onion	9	79	11.4	11	134	8.2	1.39	0.60–3.2
Choc. Cake	9	100	9.0	11	113	9.7	0.92	0.40–2.14
Butter Cake	3	31	9.7	17	182	9.3	1.04	0.32–3.33
Cordial at BBQ	10	64	15.6	9	142	6.3	**2.46**	**1.05–5.77**
Water at BBQ	6	47	12.7	13	159	8.2	1.56	0.63–3.88
Water Ceremony: Saturday 26 April								
Water	16	178	9.0	4	35	11.4	0.79	0.28–2.21
Afternoon Programme: Saturday 26 April								
All water	10	102	9.8	10	111	9.0	1.09	0.47–2.51
All cordial	15	141	10.6	5	72	6.9	1.53	0.58–4.05

ever if this were the case, an increase in hepatitis A notifications in a region or across Australia would be expected and was not found.

It is most likely that an infectious food handler contaminated the coleslaw. It is possible that there was an infectious food handler not known to the investigating team and therefore missed in the interview and testing process. There were reports of camp participants assisting in serving food at the barbeque, however the designated food handlers did not substantiate this report. Another possibility is that the food handler who refused to submit a blood specimen for serology was infectious at the time of the camp. When interviewed, the food handler denied having hepatitis A symptoms before, during or after the camp. It should be noted that this person had prepared meals for one of the state groups on the bus trip to and from Central Australia and if infectious with hepatitis A, a higher attack rate for this state would've been expected. This was not evident. Another explanation is that the second batch of coleslaw was contaminated. Although the person preparing the product had provided a blood specimen for serology, household contacts were not approached for testing. Whilst these three scenarios may possibly explain the contamination of the coleslaw by an infectious food handler, they are difficult to prove.

Contaminated water was initially a hypothesis of the investigating team, and was a major focus of the environmental health investigation. There were no problems identified with the water treatment facility, and microbiological samples obtained during the inspection complied with drinking water guidelines. Although it is possible that the water supply was the source of the infection, water consumption at any of the activities did not have an association with illness, and there were no cases of hepatitis A reported in people who did not attend the camp.

This outbreak highlights a number of important issues concerning catering operations associated with mass gatherings. Interviews with camp organisers and anecdotal reports together with the environ-

mental health investigation suggested there were a number of concerns associated with construction of the temporary food premises, food handler training, preparation of food in designated food premises and the hygienic preparation of food. It is felt that a food safety program and audit process would have addressed the problems found in relation to food hygiene and food safety, and could have ultimately reduced the likelihood of this outbreak occurring.

Food Standards Australia New Zealand recently released an initial assessment report (Proposal 290) recommending that food safety programs are a mandatory requirement for catering operations.[17] This proposal is based on the report released by the National Risk Validation Project, which identified high-risk food industries, and the costs/benefits associated with implementation of food safety programs in these sectors. Catering operations that served potentially hazardous foods to large numbers of people were classified as high risk, with 30 per cent of food-borne illness outbreaks being attributable to this sector.[18] In consideration of this outbreak, the recommendation by Food Standards Australia New Zealand to mandate food safety programs to this sector should be supported.

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