Possible community immunity to Small Round Structured Virus gastroenteritis in a rural Aboriginal community

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Abstract

In April 1998 an outbreak of gastroenteritis affected visitors, but none of the Aboriginal residents, at a Territory Health Services luncheon in a rural Aboriginal community in Central Australia. The epidemiological features and identification of Small Round Structured Virus (SRSV) from two participants suggest that this was an outbreak caused by a SRSV. The attack rate in the visitors who ate or drank food at the luncheon was 73% (11 of 15). Seventeen Aboriginal residents were interviewed, none had gastroenteritis. The community potable wa ter supply was contaminated with faecal bacteria around the time of the outbreak. No particular food could be implicated and laboratory examination of foods was not possible. It is proposed that past exposure to SRSVs may have resulted in the Aboriginal residents developing clinical immunity to infection. The process and consequences of the investigation in this community are also discussed. *Commun Dis Intell* 2000;24:48-50.

Keywords: Small Round Structured Virus, SRSV, gastroenteritits, immunity, Norwalk-like virus

Introduction

On Wednesday 1 April 1998, 17 people from Alice Springs, Darwin and Germany attended a Territory Health Services (THS) function at a rural Aboriginal community of 400-500 residents in Central Australia. The residents and visitors were invited to a shared luncheon after the ceremony. The organisers brought cold meats, fruits, pickles and salad for the luncheon in Alice Springs and scones were obtained from a local registered food outlet.

On the following Monday, 6 April 1998, the Disease Control Unit of the Population Health Unit (PHU) in Alice Springs was informed that several visitors who attended the function had symptoms of gastroenteritis. Early reports indicated that the community residents had not been affected to the same extent as the visitors. An investigation was carried out to determine the source and nature of the outbreak and to investigate the difference in attack rates between Aboriginal residents and the visitors.

Methods

A retrospective cohort study of the visitor group of luncheon participants was performed. In addition, a descriptive study of community residents who participated in the luncheon was undertaken. A case was defined as a person who attended the luncheon and had one of the following symptoms: diarrhoea; nausea; vomiting; fever or body aches, within 5 days.

Case finding

The community was visited to establish the course of events and review health centre attendance records. The health centre staff, who have knowledge about the community, were asked if they were aware of any recent cases of gastroenteritis. All the available community residents who attended or prepared food for the luncheon were also interviewed. Local Aboriginal health workers facilitated administration of a foods and symptoms questionnaire. Visitors were traced from an invitation list.

General practitioners and Emergency Department doctors in Alice Springs were interviewed and the incidence of notifiable diarrhoeal diseases were reviewed for indications of a wider epidemic of gastroenteritis.

Laboratory investigation

Stool specimens were requested from any participant who experienced any symptoms and from community members who prepared the food. The microbiology laboratory at Alice Springs hospital tested the stool specimens for *Campylobacter* spp., *Cryptosporidium* spp., *Shigella* spp., *Salmonella* spp. and rotavirus.

Stool samples were referred to the Victorian Infectious Diseases Reference Laboratory (VIDRL) for electron microscopy (EM) and Reverse Transcriptase - Polymerase Chain Reaction (RT-PCR) testing for a range of SRSVs.

Environmental health inspection

An environmental health officer (EHO) examined the kitchen in the Cultural Centre where the luncheon had been prepared. Results of monthly bacterial testing of the community's potable water supply, performed by the Power and Water Authority (PAWA), from July 1997 to November 1998 were reviewed.

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Results

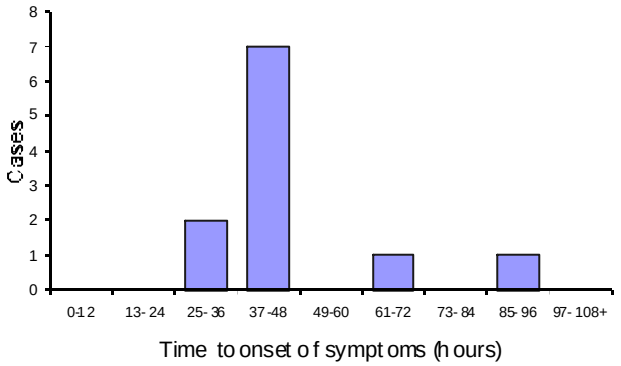
Participation Rate

Thirty-eight people completed the questionnaire, 16 visitors and 22 community residents (17 Aboriginal and 5 non-Aboriginal). The visitor participation rate was 94% (16 out of 17) and the community participation rate was between 28% and 73 % (22 out of an estimated 30-80). The community interviews were conducted 7 days after the function and visitors completed the questionnaires between 7 and 12 days after the function. The age and sex composition of the visitor and interviewed Aboriginal resident groups were similar. The median age of visitors was 39.3 years (range 22.3-55.0) and of Aboriginal residents was 41.2 years (range 33.5-60.9).

Epidemiological investigation

There were 13 cases of gastroenteritis, 11 were visitors and 2 were non-Aboriginal community residents. The most commonly reported symptoms in the visitor cohort were diarrhoea (91%) and nausea (73%). The median incubation period was 46 hours (Figure 1) and the median duration of symptoms was 36 hours.

Figure 1. Gastroenteritis cases in the 'visitor' group, April 1998, by time to onset



The attack rate was 69% (11 of 16) among the interviewed visitors. One visitor did not eat or drink at the function, giving an attack rate of 73% (11 of 15). Food specific risk ratios (RR) did not implicate any particular food or food group. The RR for consuming any non-boiled water was 1.11 (95% CI 0.46-2.66). A greater proportion of the Aboriginal resident respondents ate each type of food than did the visitor group.

There was no background increase of gastroenteritis at the time of the function. Only one person had presented with diarrhoea to the community health centre in the preceding 4 weeks and there was no increase in the notified diarrhoeal diseases in the Alice Springs region or numbers of patients with gastroenteritis at urban health services. The visitor group had not been to common meetings or functions other than the THS luncheon in the preceding 2 weeks. They worked in different buildings, had travelled in a number of different cars and had not eaten from a common source on the way to or from the community.

Microbiological testing

Stool specimens were collected from 7 visitors, between 5 and 7 days after the luncheon. No specimens were collected from asymptomatic visitors or Aboriginal people. One specimen (collected Day 6) revealed *Campylobacter jejuni* and no bacterial pathogens or rotavirus were identified in the other stools.

Two of the 7 specimens were positive for Small Round Structured Virus (SRSV) on RT-PCR testing. One of these was sequenced and found to be closely related to Camberwell virus (99.4% nucleotide identity). Foods were not available for testing and it was not possible to obtain stool samples from food handlers.

Food handling

Most of the food was brought from Alice Springs and had 4 hours of unrefrigerated time. It was prepared in the community Women's Centre without easy access to a dedicated hand washing facility, and was eaten as a buffet of finger food accompanied by tea, coffee, cordial, orange juice and water without ice.

Water supply

In the 2 months prior to the outbreak, source and reticulation samples from the PAWA were unacceptably contaminated according to 1987 National Health and Medical Research Council (NHMRC) guidelines. The level of contamination in March was 4-5 times the acceptable limit for coliforms. In the last week of March PAWA instructed a community worker to dose the water supply system with chlorine (1.5g per 1,000 litres). There are no records confirming that the treatment occurred. In April, samples again failed to meet NHMRC bacteriological standards. The PAWA suspected stagnant water in a reticulation side-line may have been harbouring the source of the contamination.

Discussion

The sequence of events and the epidemic curve implicate the luncheon event as the source of the gastroenteritis outbreak. The laboratory evidence suggests the causal agent was a SRSV, subgroup Camberwell, and is supported by the descriptive epidemiology. The source is unknown but was most likely from contaminated food (handling) or water.

Infectious agent

The median incubation period and median duration of symptoms during this outbreak were consistent with Kaplan's criteria for presumptive diagnosis of Norwalk-like (SRSV) virus infection.[1] SRSVs are recognised as causing outbreaks predominantly in adults, older children and nursing home communities. Transmission can occur via food, particularly shellfish and water,[2,3,4,5] by handlers contaminating the food and by personal contacts.[6,7] A review of SRSVs identified in south eastern Australia over the past 17 years, found the same genogroup (2B-Lordsdale/Camberwell - like) was the most common[8] The two individuals in this outbreak with evidence of SRSV were unlikely to have been incidental carriers since excretion of SRSV is thought to last only a few days after the symptoms have settled unless the person was immunocompromised.[2,9]

One specimen yielding *Campylobacter jejuni* was inadequate evidence to attribute the outbreak to this organism. *C. jejuni* can be present as a carrier state for 2-7 weeks.[10] Despite the delayed stool collection more than one positive sample would have been expected from an outbreak caused by *C. jejuni*.

Possible community immunity

Reported symptoms were confined to the visitors and two non-Aboriginal residents. If the attack rate in the residents had been similar to that seen in the visitors, then between 22 and 58 cases could have been expected in the community. The response rate in the Aboriginal participants was low and they may have interpreted the symptoms differently or been less likely to report symptoms. However, it is considered unlikely that the investigations failed to detect a large outbreak of gastroenteritis among the residents.

Immunity to infection with SRSVs is poorly understood.[2,11] The authors propose that past recurrent gastrointestinal infection or exposure to SRSVs by community residents may have led to a different pattern of susceptibility to that of the visitors. Gastrointestinal infection is very common in the Aboriginal population in Central Australia. The age standardised hospital separation rates for gastroenteritis between 1979 and 1991 were 2-6 times higher amongst the Aboriginal population of the Northern Territory than non-Aboriginals.[12] Furthermore, serological markers of the Norwalk-like group of SRSV, indicating exposure but not necessarily immunity, have been found to be almost universal in older Aboriginal children in the Northern Territory (personal communication, Dr Roger Schnagl).[1]

Recommendations and outcomes

Five months after the outbreak, the EHO and the community Women's Centre developed and delivered a training program for Aboriginal community women on safe food handling. The Women's Centre has arranged for a dedicated hand washing sink to be installed in the food preparation area. The PAWA have instigated regular flushing of a stagnant water reticulation side line. Bacteriological testing had been free of all coliforms until November 1998.

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