

Short reports

A COMMUNITY OUTBREAK OF MENINGOCOCCAL SEROGROUP B DISEASE IN WESTERN SYDNEY: THE CHALLENGES OF IDENTIFICATION AND SIGNIFICANCE

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Abstract

The Communicable Diseases Network Australia guidelines provide information for early clinical and public health management of meningococcal disease, including community outbreaks. While community outbreaks of meningococcal serogroup C infections have been reported, community outbreaks of meningococcal serogroup B infections have not been declared in Australia. Three cases of meningococcal serogroup B disease occurred in 2 adjacent suburbs in western Sydney in Spring 2008. Although the temporal and geographic proximity of these cases fulfilled the criteria for a community outbreak, difficulties in establishing an epidemiological or serosubgroup link, and arbitrary definition of the term 'community' provide challenges for identifying such outbreaks. In addition, the declaration of a community outbreak of meningococcal B infection does not provide guidance for the public health response because a vaccine is not available and community-wide prophylaxis is not recommended. *Commun Dis Intell* 2009;33:221–224.

Keywords: meningococcal disease, outbreak, public health management, *Neisseria meningitidis*, prevention and control

Introduction

The Communicable Diseases Network Australia (CDNA) guidelines¹ define a community outbreak of meningococcal disease as 'three or more confirmed cases with onset in a 3 month interval, where the available microbiological characterisation of the organisms is the same, *and* incidence is at least 10 per 100,000 total community population in a 3 month interval' (p 52). Community outbreaks tend to be more difficult to define and manage than organisation-based outbreaks for several reasons. Firstly, it is difficult to distinguish a community outbreak from normal fluctuations in disease incidence because of the arbitrary nature of choosing geographic boundaries for defining the population at risk in metropolitan areas. Secondly, if there is no obvious epidemiological link between cases, the

public health response may include conducting expensive and logistically challenging mass vaccination clinics. The CDNA guidelines explicitly state that 'Community-wide clearance antibiotics should not be used' (p 57). Finally, other consequent public health activities such as active surveillance and mass media alerts can result in stigmatisation of the defined community.

The average annual notification rate of meningococcal infections (all serogroups) has decreased similarly in both New South Wales and Australia from approximately 3.5 to 1.5 per 100,000 population since the meningococcal serogroup C (MSC) vaccine was added to the National Immunisation Program in 2003. A number of organisation-based outbreaks of MSC were reported in Australia prior to or just after the vaccine was introduced. These were in secondary schools,^{2,3,4} a university college,⁵ and clustered within a family.⁶ Two MSC community clusters have been described previously in western Sydney, the first a community outbreak in Campbelltown⁷ and the second associated with a nightclub in Penrith.⁸

Since the introduction of the MSC vaccine, meningococcal serogroup B (MSB) has been most commonly identified in laboratory confirmed cases both in New South Wales and nationally, accounting for 68% and 80% of notifications respectively in 2006.⁹ However, MSB only causes sporadic cases in Australia.¹⁰ Isaac-Toua and colleagues reported a number of community-based cases of MSB within a 3 month period in the Australian Capital Territory in early 2004.¹¹ However, they did not have sufficient numbers to reach the criterion of 10 cases per 100,000 population and therefore did not declare a community outbreak of MSB.

Methods and results

Description of the outbreak and public health investigation

Three cases of MSB disease occurred in 2 adjacent suburbs in the Penrith Local Government Area (LGA) in western Sydney with a combined population of approximately 28,000.¹² This equated to

10.7 cases per 100,000 population across the 2 suburbs within 1 month, which met the CDNA definition of a community outbreak.¹ A summary of critical events in the outbreak is shown in the Figure.

Case 1 (female, aged 9) had complained of a sore stomach and headache during the days prior to presenting to a general practitioner on 26 September 2008. By this time further symptoms had developed (rash, numb legs) which suggested meningococcal disease. The patient was immediately treated with intramuscular benzyl penicillin and taken to hospital. Although a blood culture was attempted, there was no bacterial growth.

Case 2 (female, aged 2), from the same suburb as case 1, became ill on 28 September 2008 and progressively worsened over the next few days until she was admitted to hospital with suspected gastroenteritis on 29 September 2008. The diagnosis was changed to meningococcal infection the following day as classic symptoms (stiff neck and photophobia) became apparent. A blood culture was requested and gram negative diplococci were identified.

Case 3 (female, aged 13), from a suburb adjacent to cases 1 and 2, saw a general practitioner on 18 October 2008 with fever and vomiting and was diagnosed with viral gastroenteritis. However the patient deteriorated rapidly and was admitted to the Intensive Care Unit of a local hospital a few

hours later. A lumbar puncture was carried out and gram negative diplococci were identified in the cerebrospinal fluid.

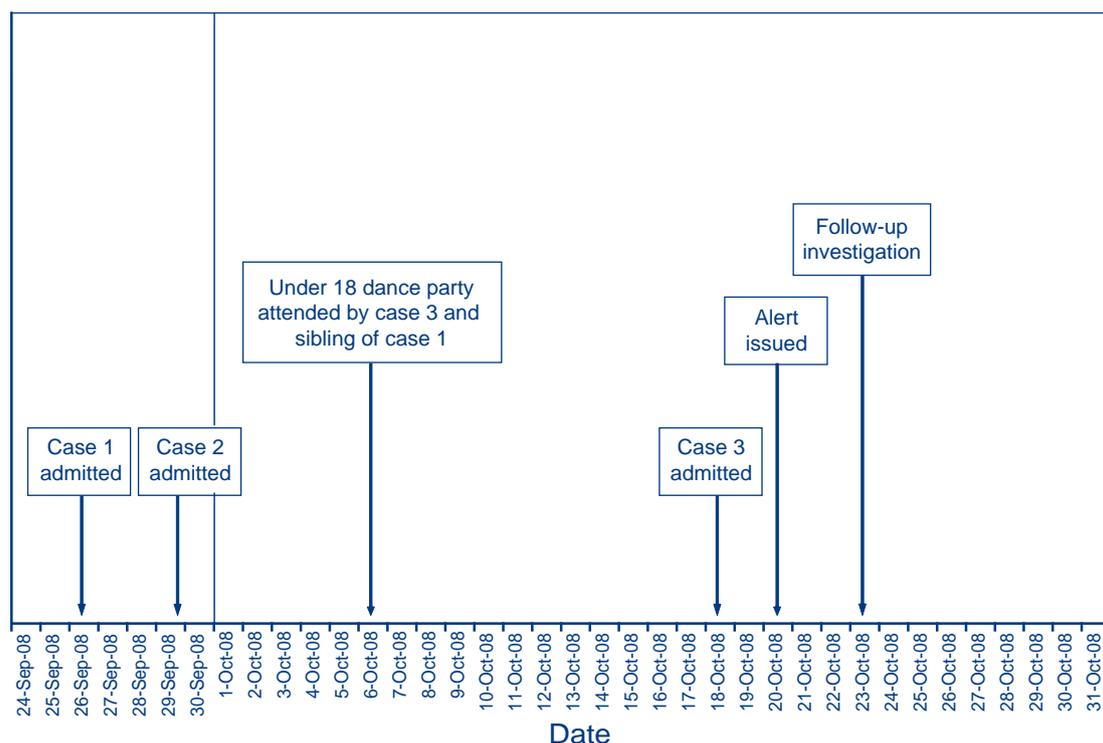
All cases fully recovered after a period of seven to 10 days in hospital with treatment in accordance with the CDNA guidelines.

Routine case histories were taken at the time of notification to the public health unit using the NSW Health Department Meningococcal Disease questionnaire,¹³ noting in particular any special functions or extra-curricular school activities. Contacts of cases were identified and managed in accordance with Australian guidelines, including the provision of information and clearance antibiotics.

All cases were fully vaccinated for age against MSC, confirmed by the Australian Childhood Immunisation Register records for cases 1 and 2, and school program vaccination records for case 3. Case 1 had only attended school on 1 day in the week before symptom onset, due to absence with earlier symptoms of stomach ache and headache. Case 2 was too young to attend school and was not in child care. Case 3 attended school in the week prior to symptom onset, but not the same school as case 1.

Polymerase chain reaction testing of blood (n=1) or cerebrospinal fluid (n=2) samples from each case confirmed *Neisseria meningitidis* serogroup B in all

Figure: Time line of investigation into meningococcal serogroup B cluster in western Sydney



3 cases. The isolate on case 2 was serosubtyped as B:4:P1.4. Further typing on cases 1 and 3 was not possible as isolates were not available.

The community outbreak was declared following the 3rd case and on 20 October 2008 a public health alert was issued to all general practitioners, emergency departments, paediatricians and infectious diseases specialists in the Sydney West Area Health Service. The alert outlined the unusual increase in cases of invasive meningococcal disease and requested that all suspected cases be notified to the public health unit as soon as possible following the implementation of antibiotics and initial investigations.

A follow-up epidemiological investigation was instigated to identify common links or exposures between the cases. The primary carer of each case was re-interviewed on 23 October 2008 to seek additional information to that collected at the time the case history was taken. No direct connections were apparent and only 2 tenuous associations could be identified. Cases 2 and 3 had close contacts in the building and construction industry, but no associations between these contacts could be identified. A sibling of case 1 also attended the same under-18 dance party on 6 October 2008 as case 3, however the sibling had already completed a course of clearance antibiotics at the time of the party.

Discussion

A community outbreak of MSB occurred in the Penrith LGA of western Sydney with 10.7 cases per 100,000 population within a month. However, we were unable to identify any common exposures or direct links between the cases. The finding that two of the 3 cases had close contacts in the construction industry is not surprising as this is a common occupation in the region.¹² The dance party which occurred on 6 October 2008, after the sibling of case 1 had received clearance antibiotics and over a week before case 3 developed symptoms, excludes the possibility of the sibling transmitting MSB to case 3. However, the event provides a possible opportunity for transmission of the meningococcus from a contact of the sibling to case 3 and earlier to case 1. Further exploration of this scenario was not possible due to the unavailability of data.

In addition to failing to establish an epidemiological link between the cases, a major limitation of this investigation was that serosubtyping of the MSB isolates for two of the cases could not be carried out as one could not be cultured and the other isolate was not available for processing in the typing laboratory. In the absence of an epidemiological link, the establishment of a biological link would assist interpretation. If the cases had different serosubtypes, then they would be sporadic cases whereas cases

with the same serosubtype could provide evidence for a cluster. Whether the cases were sporadic or part of a cluster remains undetermined.

The serosubtype identified from case 2 (B:4:P1.4) is commonly identified in sporadic cases in the eastern states of Australia with 14 cases in 2006 and 12 in 2007.⁹ The same serosubtype has also been implicated in MSB outbreaks in New Zealand and elsewhere for many years.¹⁴ It will be important to obtain isolates for serosubtyping in all local cases of MSB to monitor the occurrence of this strain in New South Wales.

Although the 3 cases described here were linked in time and place, the public health investigations highlighted the difficulty in defining a geographic boundary for a community outbreak in a suburban area. The 2 suburbs in question are contiguous with other suburbs without clear natural or man-made boundaries. We chose to calculate incidence rates based on the population of the 2 suburbs of residence, however a lower incidence rate would result if other geographical boundaries (such as local government area or all adjacent suburbs) were selected. Nevertheless, the choice of the 2 suburbs of residence as the population denominator makes epidemiological sense in that the 2 adjacent suburbs had a common public bus service, and one of the suburbs acted as a hub with a suburban shopping centre, local library and other services, and large sporting fields.

In addition to the challenges in identifying the presence of a community outbreak, it is difficult to determine the significance of the outbreak when MSB is involved. Mass or risk-group-specific vaccination programs are not possible because of a lack of a suitable vaccine in Australia. In addition, clearance antibiotics are not recommended for community-wide application,¹ and therefore the possible public health response is limited.

Despite the success of the MSC vaccine and subsequent reduction in numbers of cases caused by that serotype, MSB rates have remained relatively constant in the community over the last 10 years. This study demonstrates that community outbreaks of MSB as well as sporadic cases can occur, but identification of the source or location of the source of a community outbreak of MSB can be difficult, as can the planning and implementation of an adequate public health response.

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