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# PUBLIC HEALTH MANAGEMENT OF INCREASED INCIDENCE OF MENINGOCOCCAL DISEASE IN THE AUSTRALIAN CAPITAL TERRITORY: 2003 TO 2004

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## Abstract

This paper describes a sudden increase of meningococcal notifications in the Australian Capital Territory within a 3 month period, and the public health strategies used to manage it. There were 15 cases of meningococcal disease notified to the Communicable Disease Control (CDC) section, Australian Capital Territory Health (ACT Health), between 6 November 2003 and 5 February 2004. This was much higher than the annual average of 6 cases. The cases were notified in 2 clusters. The first cluster of 8 cases, all serogroup C, was notified between 6 November to 8 December 2003. Seven of these cases had an identical phenotype C:2a:P1.4 suggesting a common source. The second cluster of 7 cases was notified between 30 December 2003 and 5 February 2004. Of these, 5 were serogroup B, 1 was serogroup W-135 and 1 was serogroup C, whose phenotype (C:2a:P1.4) was identical to the phenotype of the first cluster of serogroup C cases. Phenotypes were not avail-

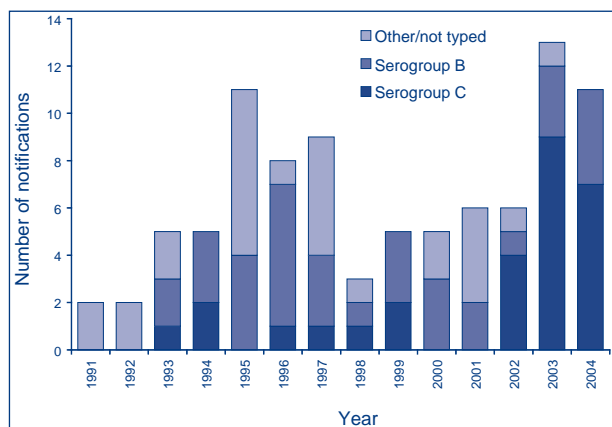
able for the serogroup B cases. There were 4 main interventions developed to manage the increased incidence based on the epidemiology of the cases; these were implemented concurrently. Factors that supported investigation and management were good surveillance systems, quick turnover of laboratory tests, regular communication with relevant health agencies and maintaining public awareness. As the number of cases notified was much higher than the annual average, the possibility of a community outbreak was considered. The *Guidelines for the Early Clinical and Public Health Management of Meningococcal Disease in Australia* (national guidelines) were consulted to determine whether there was an outbreak and the influence this had on management is also discussed. *Commun Dis Intell* 2007;31:112–118.

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## Introduction

The average notification rate of meningococcal disease (including all serogroups) in the Australian Capital Territory between 1991 and 2002 was 1.9 cases per 100,000 population per year, with an annual average of 6 cases (range 2–11). The Australian average notification rate per year for the same period was 3.1 cases per 100,000 population.<sup>1</sup> The majority of notifications in the Australian Capital Territory were of serogroup B until 2002 when an increase in serogroup C cases was noted. This trend occurred Australia wide. All notifications in the Australian Capital Territory between 1991 and 2004 are presented in the Figure, with serogroup B and C cases highlighted. The obvious increase in notifications in 2003 and 2004 includes the cases discussed in this paper.

**Figure.** Notifications of meningococcal disease, Australian Capital Territory, 1991 to 2004



All cases of meningococcal disease in the Australian Capital Territory are notified to the Communicable Disease Centre, ACT Health. Close contacts as defined by the national guidelines<sup>1</sup> are traced and offered clearance antibiotics to eliminate carriage of the bacteria to prevent further transmission.

Free meningococcal serogroup C vaccine for certain age and risk groups became available in the Australian Capital Territory in early 2003 as part of the four-year National Meningococcal C Vaccination Program.<sup>2</sup> All school attendees aged 15–19 years were offered free vaccine as part of this program through special immunisation clinics run between August and December 2003. The program for non-school attendees aged 15–19 years was planned to commence from mid-December 2003. As of 2004, meningococcal serogroup C vaccine has been made available through general practitioners (GPs) for all children and young adults who turned 6 to 19 years in 2003.

## Methods

### Interviews

All cases of meningococcal disease notified during the period of increased incidence were interviewed within 24 hours of notification for identification of close contacts, epidemiological links and common risk factors as per the national guidelines.<sup>1</sup> Close contacts were offered clearance antibiotics to eliminate carriage of the bacteria to prevent further transmission, and if eligible, were offered meningococcal serogroup C vaccination.

### Laboratory diagnosis

Initial diagnosis of meningococcal disease was conducted in the Australian Capital Territory by meningococcal specific polymerase chain reaction (PCR) testing<sup>3</sup> and serogrouping was done in Sydney by the New South Wales National Neisseria Network Reference Laboratory.<sup>4</sup> Serotyping and serosubtyping to determine phenotype were done by the South Western Sydney Area Pathology Services.<sup>5,6</sup> Samples that were PCR positive but culture negative were sent to the Melbourne Diagnostic Unit for genotyping to establish serotype and serosubtype.<sup>7</sup> Cases need to have the same microbiological classification established through phenotype to be included in the determination of outbreak notification rate as per the national guidelines.<sup>1</sup>

## Results

There were 15 cases of meningococcal disease, notified in 2 clusters to CDC, ACT Health between 6 November 2003 and 5 February 2004. The first cluster was notified between 6 November and 8 December and the second cluster was notified between 30 December 2003 and 5 February 2004.

The first cluster of 8 cases were all of serogroup C. Seven of these cases were Australian Capital Territory residents while the eighth case was a New South Wales resident who worked as a taxi driver in the Australian Capital Territory. The first 4 cases were notified within a period of 6 days between 6 and 12 November. Two of these cases were notified on the same day. The remaining 4 cases were notified between 24 November and 5 December 2003. The 8 cases had an age range of 3–58 years (median age 18.5 years) with a male to female ratio of 1:1. Four cases were aged between 15–19 years. Three cases were not attending school and none were immunised against meningococcal serogroup C disease.

Phenotyping was done for the 7 Australian Capital Territory cases with all 7 returning an identical phenotype of C:2a:P1.4 suggesting the possibility of a common source. Interviews with the 8 cases did not reveal a common contact, but 5 of the cases

had visited the Australian Capital Territory Central Business District (CBD) during their incubation period, and 2 persons aged 15–19 years had visited the same group of nightclubs within the CBD.

The second cluster of 7 cases notified within 25 days of the first cluster, comprised 5 serogroup B cases, 1 serogroup C case and 1 serogroup W-135 case. The serogroup C case had the same phenotype as the 7 Australian Capital Territory cases in the first cluster and also had a definite epidemiological link to one of the cases in the first cluster. Phenotyping was not available for the serogroup B cases. Investigation and interviews with the 5 serogroup B cases did not reveal any common contact or epidemiological link. The W-135 serogroup case had been in contact with a family member who had returned from an area endemic for this serogroup<sup>8</sup> and was assumed to be part of the background Australian Capital Territory rate.

### Public health management

Public health investigation and management commenced with the notification of the first 4 serogroup C cases of the first cluster. After extensive discussions with relevant agencies within and outside of ACT Health, 4 main interventions were developed and instituted concurrently with the aim of minimising transmission and preventing further cases. The response was coordinated by CDC, ACT Health, with continuing advice from the Infectious Diseases Unit of The Canberra Hospital and the Communicable Diseases Network Australia (CDNA).

#### Intervention 1: Free immunisation for all 15–19 year olds

At the time of the notifications, the establishment of immunisation clinics in the Australian Capital Territory as part of National Meningococcal C Vaccination Program<sup>2</sup> for school students aged 15–19 years, was close to completion. The program for non-school attendees aged 15–19 years was to commence within 2 weeks in mid-December. As the majority of notifications were amongst persons aged 15–19 years who were not in school, a decision was made to bring forward the commencement of the program for this group, and continue the program for persons aged 15–19 years in school. Free vaccine was made available for both groups through the special school immunisation clinics already in progress; through existing child immunisation clinics; and extended to general practices. The main emphasis was to promote immunisation through general practice due to impending school holidays and the closure of school immunisation clinics.

#### Intervention 2: Poster campaign

A poster targeting persons aged 15–19 years was developed to heighten awareness of the disease and to encourage uptake of the free vaccine. The poster was distributed to all nightclubs and other venues commonly accessed by this age group within the CBD, as there appeared to be a geographical link with this area.

#### Intervention 3: Media releases

There were several media releases from the Chief Health Officer during this period to increase public awareness of symptoms and availability of immunisation.

#### Intervention 4: Information/communication to relevant groups

The Medical Director of CDC, ACT Health updated relevant agencies, including the CDNA; CDC; and other public health units, on a regular basis through a series of email alerts. To increase sensitivity for diagnosis of meningococcal disease, general practices and hospitals within the Australian Capital Territory and surrounding regions were sent information regarding signs and symptoms and clinical management.

These interventions continued through the month after the notification of the first cluster of cases and were also used for the second cluster of cases.

### Discussion

The only common risk factor identified through interviews with the first cluster of cases was accessing the Australian Capital Territory CBD and some common nightclubs in the CBD during the incubation period. The association with nightclubs was considered important as in 3 previous Australian meningococcal disease outbreaks, nightclubs were identified as a potential common source.<sup>9–11</sup> Whether there was a need to identify an ongoing common source to target interventions more specifically was discussed. The possibility of conducting a second level of interviews with close contacts of cases for this purpose was considered, particularly in regard to the older cases and the case aged less than 5 years. However, this option would have been resource intensive and would most likely have not changed public health management. It was therefore decided not to pursue this course.

It has been noted that maintaining high community awareness is important in the management of clus-

ters and outbreaks in order to allay public concern and to assist with the implementation of planned control measures such as a mass immunisation campaign.<sup>1,12-14</sup> Regular email alerts to relevant health professionals were aimed at keeping them informed, increasing sensitivity for early clinical diagnosis and management, and promoting immunisation in persons aged 15-19 years. The poster campaign and regular media alerts were aimed at raising public awareness, promoting health care seeking behaviour and increasing vaccine uptake in persons aged 15-19 years. As most of the cases were out of school and the school year was close to completion, specific targeting was not done through the school system. Locations considered to be associated with the outbreak and to be frequented by this age group were targeted instead.

There was extensive media coverage of 2 serogroup C cases, 1 of which was fatal while the other had partial amputation of a lower limb. This would most likely have heightened public awareness to the increased incidence and consequences of meningococcal disease. CDC, ACT Health received many phone calls from worried parents of the age group most affected, which suggests awareness of the situation. The impact that the poster campaign had on decreasing the incidence in the 15-19 age group is also difficult to estimate, as this could only be evaluated by conducting a survey amongst that age group.

A quick turnover of initial laboratory results with early confirmation of diagnosis, assisted with timely and appropriate public health management. The availability of phenotyping was a key factor in the decision making processes in relation to investigation and management, particularly with the first cluster of serogroup C cases with an identical phenotype, which suggested a common source. The importance of phenotyping was highlighted in the investigation and management of 2 of 3 outbreaks associated with nightclubs.<sup>9,11</sup> Six of 10 cases in a New South Wales outbreak with the same phenotype C:2a:P1.5, were linked to the same nightclub in Western Sydney,<sup>11</sup> while 4 of 5 notified cases of phenotype C:2a:P1.4 in a Victorian outbreak were associated with a nightclub in Portland.<sup>9</sup> Phenotyping for the second cluster of serogroup B cases may have been useful in establishing if they were linked as interviews did not reveal any common source or risk factors.

The 8 cases of meningococcal serogroup C disease (7 Australian Capital Territory cases and 1 New South Wales case) notified in the 1 month between November and December 2003 suggested the possibility of a community outbreak of meningococcal disease. There was extensive discussion on whether the increased notification rate constituted a community outbreak as per national guidelines. The

national guidelines<sup>1</sup> define a community outbreak as '3 or more confirmed cases within a three-month interval, where the available microbiological characterisation of the organisms is the same, and incidence at least 10 cases per 100,000 total community population in the three-month interval'. Age group specific or social group specific notification rates can also be calculated, and are recommended<sup>15,16</sup> to establish if there is a problem in a specific population group, so that interventions can be tailored to that group.

There are 2 types of meningococcal disease outbreaks that can be declared as per the national guidelines,<sup>1</sup> one being a community outbreak and the other an organisational outbreak. An organisational outbreak is within a grouping of people that makes epidemiological sense, such as work colleagues within an organisation, school students or class mates and soldiers in military barracks. The threshold to declare an organisational outbreak is much lower than a community outbreak, and is defined as 'two or more probable cases with onset in a four-week interval in a grouping which makes epidemiological sense; or two or more confirmed cases with onset in a four week interval where the available microbiological characterisation of the organisms is the same in a grouping which makes epidemiological sense'.<sup>1</sup> The at-risk group is usually more clearly demarcated and identifiable in comparison to a community outbreak. These definitions in the guidelines are based on an arbitrarily set notification rate and provide a useful guide to develop appropriate management strategies.

Public health management of a community outbreak as per the national guidelines<sup>1</sup> includes mass immunisation of the at-risk population, provision of clearance antibiotics for close contacts and mass media to increase public awareness. It has been noted that mass immunisation of the population in which an outbreak is occurring may not be easy due to difficulties identifying the actual population at risk.<sup>11,12,15</sup> In addition, mass immunisation campaigns are resource intensive and can cause unwarranted public panic.<sup>13</sup>

Rates were calculated to establish whether the number of notifications in the first cluster between 6 November and 8 December 2003 fulfilled the criteria for an outbreak as per national guidelines.<sup>1</sup> As one of the criteria for a community outbreak was for cases to have identical microbiological characterisation, notification rates within a 3 month period were calculated for the first cluster of serogroup C cases for whom a common phenotype was identified (n=7, the New South Wales case was not included as the phenotype was not available). This notification rate was 8.64 cases per 100,000 (Australian Capital Territory population June 2003: 322,830) and was



slightly lower than the community outbreak rate as specified by the national guidelines (10 cases per 100,000 population within a 3-month period), but supported the possibility of an occurring outbreak. Assuming that the eighth case (the New South Wales resident for whom phenotyping was unavailable) was linked to this cluster as the case worked in the Australian Capital Territory, and adding the case into the calculation, made the notification rate 9.88 cases per 100,000 population. However, this represents an overestimation as the Australian Capital Territory non-resident working population is not included in the calculation.

With the notification of the eighth Australian Capital Territory serogroup C case with identical phenotype C:2a:P1.4 in January 2004 as part of the second cluster, the community notification rate over a 3 month period (6 November 2003 and 5 February 2004) was 9.88 cases per 100,000 population. Although this was on the borderline of a community outbreak within the Australian Capital Territory, due to the resource intensiveness of implementing community outbreak measures and possible public anxiety, a decision was made against declaring an outbreak.

As 50% of the serogroup C cases with identical phenotype were aged 15–19 years, an age-specific rate was also calculated; this was 65.64 cases per 100,000 (Australian Capital Territory population June 2003: 24,372). This notification rate fulfilled the criteria for a community outbreak in this age-group, and although the rate was very high, it represented 4 cases only. Management strategies already instituted were reviewed to make a decision on whether an outbreak in this age group needed to be declared. Two of the public health interventions implemented were specific to persons aged 15–19 years; these were access to free meningococcal serogroup C vaccine and developing targeted education campaigns. In addition, all close contacts had been provided with clearance antibiotics. By default, these interventions were outbreak measures within this age group. A decision was made not to declare an outbreak due to the smallness of numbers and to minimise public panic and anxiety.

The possibility of declaring a community outbreak was further complicated by having 2 different serogroup clusters notified and the one month interval in between the 2 clusters. The notification rate for serogroup B cases in the second cluster was 6.16 cases per 100,000 population within a 3 month period, which was lower than the required outbreak notification rate as per national guidelines. In addition to this, as phenotyping was unavailable, it would not have been accepted for the purposes of declaration of an outbreak.

In comparison, the declaration of an outbreak in an organisational setting and the implementation of outbreak management strategies such as mass immunisation could be assumed to be relatively straight forward as the at-risk group should be clearly identifiable. Anxiety and panic could be better managed as the risk group would be better demarcated. However, during the management of an organisational outbreak in a Brisbane boarding school, some discretionary judgements had to be made as some of the issues arising during the outbreak were not covered by the national guidelines.<sup>1</sup> Mass immunisation of all boarders and possible other at-risk groups associated with cases was instituted as a management strategy. Implementing this intervention on a large scale was feasible, but decisions about further defining an at-risk group with the notification of 2 subsequent cases who were not part of the boarding school but were associated indirectly, made definition of the at-risk population complicated.<sup>17</sup>

There were no more notifications after the second cluster of cases until June 2004. Six further cases of meningococcal serogroup C disease were notified between 5 June and 31 December 2004. The annual notification rates for 2003 and 2004 were 4.06 cases per 100,000 population and 3.43 cases per 100,000 population respectively, which was much higher than the average Australian Capital Territory rate. The higher than average incidence rate after clusters or outbreaks of meningococcal disease is not an uncommon finding. A sustained increase in incidence rate for a few years was noted after outbreaks in Canada<sup>18</sup> and after the Western Sydney outbreak of 1996.<sup>11</sup> For this reason, relevant health professionals in the Australian Capital Territory were encouraged to continue to have high sensitivity for possible cases of meningococcal disease.

## Conclusions

It was obvious that there was a problem in the Australian Capital Territory with increased incidence of meningococcal disease and there was a need to intervene to decrease the incidence. Whether this was managed through the declaration of an outbreak and instituting outbreak measures as per the national guidelines,<sup>1</sup> was weighted against the community notification rate being on the borderline of an outbreak, the difficulty in identifying the actual at-risk group, and the logistics that would have been involved in implementing them. As these issues were not easy to resolve, an outbreak was not declared. If there were one, two or three additional cases (serogroup C, phenotype C:2a:P1.4) within the 3 month period, the notification rate would have crossed the community outbreak notification rate threshold and would have been 11.12, 12.46, and 13.60 cases per 100,000 population respectively. In

this situation, and taking into account that the last serogroup C case was fatal, serious consideration would have been given to declaring a community outbreak and instituting outbreak measures as per the national guidelines.<sup>1</sup>

In conclusion, careful consideration of the epidemiology of cases and targeted management appears to have been effective in decreasing and preventing further cases. Community outbreak notification rates as defined in the national guidelines were used as an arbitrary guide to develop suitable investigation and management processes. Good surveillance systems, the availability of relevant laboratory technology, regular public communication, and quick assessment, diagnosis and management of cases and contacts played an important role in the management of the increased incidence. We do not know whether declaration of an outbreak with the implementation of outbreak management strategies such as mass immunisation would have delivered any further benefits.

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