The Measles Outbreak in Darwin
February-March 1991

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Background

Measles is not a harmless childhood disease. In the USA, 89 measles related deaths occurred between January and May 1991. Measles is a highly infectious disease which spreads rapidly in a susceptible population. The 1981 measles epidemic in NSW resulted in an estimated 100,000 general practice consultations, 2,200 hospital admissions and 12 deaths. An epidemic in 1984 in NSW resulted in 662 hospital admissions and three deaths.

In March 1990, measles became notifiable in the Northern Territory.

On 18 February 1991, the Disease Control Centre (DCC) received laboratory reports confirming two cases of measles. Telephone calls to general practitioners and laboratories revealed two more clinically diagnosed cases. All four cases were students attending Darwin High School.

This report summarizes the investigation, the results and the measures that were instituted to control the outbreak. The complete paper and references are available upon request.

Subjects and Methods

Case definition

We applied the clinical case definition of measles based on the following criteria:

1) history of generalized maculo-papular rash lasting three or more days;
2) history of fever, equal to or greater than 38°C; and
3) history of any of the following: cough, coryza or conjunctivitis.

A confirmed case was one that was either serologically confirmed or epidemiologically linked to another confirmed case of measles.

Case finding and surveillance

We notified medical practitioners, community health centre staff, the Department of Education and school nurses in the Top End of the first four cases of measles on 19 February 1991. A media release was issued informing the community of the outbreak and control measures. Control measures for the outbreak were in accordance with the NT Measles Outbreak Protocol (researched and developed by Chris Noonan).
RESULTS

Figure 1 shows the epidemic curve of the outbreak. A total of 76 cases (48 females, 28 males) were reported to DCC during the outbreak. The mean age was 14 years, the youngest was five months and the oldest, 36 years.

The index case attended Darwin HS on 29 January, the first day of the new term and became symptomatic the following day. The secondary cases occurred in four of the five grade levels at the school. Secondary spread from the index case affected 23 children, 22 at Darwin HS and one infant aged 1.2 years. On 31 January 1991, the infant and the index case visited the same doctor’s surgery and were in the waiting room at the same time. This was the infant’s only known contact with a case of measles.

Of the 76 cases, 15 were serologically confirmed and 61 were clinical diagnoses of measles. Forty one of these 61 cases had an identifiable contact with a confirmed case, the rest were suspected cases. None of the cases required hospitalisation for measles.

Figure 2 shows the distribution of cases by age group or student status.

Darwin High School
Sixty one percent (46/76) of the reported cases attended Darwin HS (student population, 1172). The attack rate was 39/1000. Four of the reported cases had a documented history of vaccination. Six cases gave a history of vaccination that could not be verified. Thirty six cases had not been vaccinated.

Nine percent (107/1172) of all students had a documented history of previous measles vaccination. An additional 11% (126/1172) gave an unconfirmed history of previous vaccination. The highest estimate of vaccine coverage was only 20% (233/1172).

Other Cases
A smaller outbreak occurred at Casuarina Secondary College (8 of the 76 cases) with an attack rate of 6/1000. The remaining 22 cases were distributed throughout the Darwin area; 13 cases were not students and nine were under five years of age. Case investigation of the Darwin HS cases indicated spread to four siblings attending other schools.

Vaccination campaign

Eighty three percent of Darwin HS students were vaccinated during two vaccination campaigns at the school. Ten students developed measles within 1 - 5 days of being vaccinated and were probably incubating measles at the time of vaccination. At Casuarina SC 41% were vaccinated during the two vaccination campaigns.
The community health centres vaccinated 714 persons aged one to 18 years during the weekend campaign of 23-24 February 1991. The 76 notified cases with measles visited medical practitioners on 81 occasions. The maximum number of doctors visited by a case was four and some of the cases made two or three visits to the same doctor. The overall increase in medical practitioner consultations resulting directly from the outbreak is not known.

**Discussion**

Measles vaccination within 72 hours of exposure to a case can prevent new cases of infection. Twenty-three secondary cases resulted from contact with the index case between 29 and 31 January. Early notification of the index case would have enabled the NT Measles protocol to be implemented earlier.

The expected failure rate of measles vaccine, i.e. the proportion of the vaccinated children that may develop measles is 2-5%. We were unable to reliably calculate the vaccine efficacy for this outbreak because it was not possible to determine the proportion of all children in the Darwin/Palmerston area who previously vaccinated.

A recent study in New South Wales indicated that 46% (94/204) of children with a documented history of measles vaccination were seronegative for measles antibody. The authors suggested that inadequate adherence to the cold chain could have been one cause of sero-conversion failure.

Contact with a confirmed case could not be established in one third of the cases. It is possible that a contact was not recognized or acknowledged as such, and therefore not reported during our case investigation. The contact between the index case and the infant in the doctor’s surgery should sound a cautionary note. The investigation of a measles outbreak in a paediatric practice in the USA demonstrated: 1) droplet nuclei generated in an examining room used by the source patient were dispersed throughout the entire office suite; 2) airborne spread was the most likely mode of transmission; and 3) when airborne, the measles virus can survive at least one hour. We recommend that patients with suspected measles be seen quickly and sent home and that vaccination be offered to all susceptible patients visiting the surgery after the index patient on the same day.

Community consultation and cooperation and a multi-disciplinary approach between health and education services, and the media facilitated the control of this outbreak.

**MEASLES AND DIFFERENTIAL DIAGNOSIS**

Chris Noonan

The measles outbreak control protocol was widely distributed earlier this year. Confirmation of a clinical diagnosis of measles has important public health implications including mass immunisation and exclusion of unimmunised children from child care facilities and schools.

Following the measles outbreak between February and March 1991, children have been presenting with clinical signs resembling measles. These children had negative measles serology, and were subsequently diagnosed with infections caused by enteroviruses including coxsackie virus. Other viral rashes such as roseola infantum may also mimic measles.

**Blood for IgM**

When measles is suspected, a blood test for IgM serology should be obtained. Blood can be collected in a Microtainer from a finger or heel prick. At least 1 ml of blood is necessary. Microtainers and lancets, together with instructions, are available from the Disease Control Centres (formerly Communicable Diseases Centres), and laboratories. If marked "URGENT" results may be available within 24 hours. However, the specimen must reach a laboratory in time to be packaged for an early afternoon interstate flight.
Enteroviral Tests

Enteroviral infections cannot be diagnosed by serology, and should be considered as a differential diagnosis of measles. A throat swab transported in viral transport medium (readily available from laboratories) and a faeces specimen should be obtained. The specimens should be clearly marked "URGENT" and a description of the clinical signs, including the date of onset should be included on the laboratory form. The results are usually available within a few days.

IMMUNITY AGAINST RRV IN NT POPULATIONS

Dr Keat Song Tai
Menzies School of Health Research

With the 'wet' here again, it is an appropriate time to comment on the NT population's immunity against Ross River virus infection. The Menzies School of Health Research has conducted a large sero-prevalence survey of Ross River virus antibodies to compare the level of immunity between rural and urban communities. We assume that the specific antibodies detected by the Enzyme Immunosorbent Assay method developed by the School indicate immunity due to past exposure.

There is a significant difference in immunity between urban populations (from 5% to 10%) and rural populations (from 21% to 33%). In small towns with less than 10,000 residents, sero-prevalence rates are similar to rural areas. The Katherine Region has the highest rates while Alice Springs Region has the lowest rates.

The findings indicate that a higher degree of exposure to the mosquito vectors in the rural areas increases immunity to Ross River virus in people living in those areas. We also have some evidence that rural people are exposed to infection in early childhood, without suffering the typical symptoms of epidemic polyarthritis. They then become immune to further infection. In urban centres where the population is more transient, infection occurs mainly in early adulthood, and patients tend to express their infection with severe symptoms.

The detailed results are being provided to the relevant health authorities to review RRV surveillance, and institute preventive measures.

A CLUSTER OF CHILDREN WITH HAEMOPHILUS INFLUENZAE MENINGITIS IN HOWARD SPRINGS

Three cases of H. influenzae serotype b (Hib) meningitis were admitted to the RDH between 31 October - 12 November 1991. The second case presented within two days of the first. All were non-Aboriginal children aged 2 years and under and residents of Howard Springs, an outer suburb of Darwin. Symptoms of meningitis developed acutely in the youngest child aged 9 months, but the older children had upper respiratory tract symptoms for a week prior to admission. Clinical recovery was satisfactory in all cases.

The children were linked epidemiologically through their four year old siblings to the Howard Springs Pre-School. We could not establish any other common exposure among the cases.

DISCUSSION

Haemophilus influenzae type b is an important cause of childhood morbidity, especially in children under the age of 2 years, because the immune system of infants is still immature at mounting a protective response against polysaccharide antigens. Worldwide, Hib is the commonest cause of meningitis in children under the age of 5 years. In a study of 113 episodes of invasive Hib infection in the NT from 1985-88, the most frequent diagnoses were meningitis (37%) and pneumonia (33%).

The incubation period of Hib is unknown, but is probably between 2-4 days. Chemoprophylaxis with rifampicin to close contacts has been shown to reduce nasopharyngeal carriage by 95%. Young children have the highest carriage rates (2-5%)
and the greatest risk of invasive disease. Rifampicin prophylaxis is currently indicated for all household contacts if there is another child aged less than 4 years in the same household. Some authorities also recommend it for children and staff of day care centres or nurseries when two or more children develop invasive Hib disease within 60 days. However, the results of some prospective studies of Hib in day care centres do not support this recommendation.

Coincident viral or mycoplasma respiratory tract infections may facilitate invasive bacterial disease. The association between infection with a respiratory virus and meningococcal meningitis has been noted in Chad, USA and Britain. The two older cases had a prodrome of coryza before Hib meningitis. In our investigation, acute respiratory infections were very common in both the household and community contacts of the children with Hib meningitis. We took throat swabs from children attending the preschool and found that 32% of them yielded other types of H. influenzae (not group b). The implications of these findings are unclear.

TO ALL READERS: We invite your contribution, comments or suggestions for this bulletin.

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Merry Christmas

We wish you a Merry Christmas & a Happy New Year from everyone at the Disease Control Centre