CENTRE FOR DISEASE CONTROL

THE NORTHERN TERRITORY
DISEASE CONTROL
BULLETIN

Vol. 8, No. 4, December 2001 ISSN 1440-883X

Pertussis hits the NT in 2001

Christine Selvey, Head of Immunisation
David Peacock, Head of Surveillance, CDC, Darwin

Australia is in the grip of a pertussis epidemic. This paper gives current notification counts and then outlines some of the practical issues associated with the notifying and diagnosis of pertussis.

Current disease epidemiology

So far this year, there have been over 7,100 pertussis notifications throughout Australia. The following tables indicate the Northern Territory situation as at the 6 December (based on the date of symptom onset).

Table 1 Northern Territory Pertussis notifications by health district

	Alice Springs	Barkly	Darwin	East Arnhem	Kath.	TOTAL
1992			1			1
1993	2		5			7
1994	52	1	87	3	43	186
1995	8	4	71	14	35	132
1996	4	9		1		14
1997	5		13	1	5	24
1998	4		16		4	24
1999	1		1			2
2000	5		2		2	9
2001	52	1	51	3	6	113*
TOTAL	133	15	247	22	95	512

* as at December 6th

Interestingly, the bulk of the cases from Central Australia occurred in the middle of the year whereas cases in the Darwin district are continuing to be diagnosed. About one-quarter (28/113) of the cases are under 5 years of age with most of them under 1 year (22/113); 60% (68/113) were 10 years or older. Females (55%) slightly predominated.

Contents

TERRITORY HEALTH SERVICES
Northern Territory Government

Table 2 NT Pertussis notifications by month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOT
1992												1	1
1993	1		2		1			1	2				7
1994	1		1		7	5	4	12	15	15	48	78	186
1995	46	25	15	10	14	6	3	4	2	3		4	132
1996		4	6	2	1						1		14
1997	6	3	2			1		2	4	1	2	3	24
1998	2	2	2	2		4	6	1		1	2	2	24
1999			1									1	2
2000	1							1			3	4	9
2001		2	4	9	16	15	11	10	11	12	23	*	113
TOT	57	36	33	23	39	31	24	31	34	32	79	93	512

* as at December 6th

Pertussis is a notifiable disease

Cases suspected on clinical grounds should be notified immediately to the nearest Centre for Disease Control (CDC) while waiting for laboratory confirmation.

Case definition

⇒ A clinically compatible illness lasting 2 weeks or more with one or more of paroxysmal cough, inspiratory whoop without apparent other causes and post-tussive vomiting or syncope.
OR
⇒ Isolation of *Bordetella pertussis* from a clinical specimen.
OR
⇒ Detection of *B. pertussis* by PCR.
OR
⇒ Elevated *B. pertussis*-specific IgA in serum or *B. pertussis* antigen in a nasopharyngeal specimen using immunofluorescence with a history of clinically compatible illness.
OR
⇒ An illness characterised by a cough lasting at least 2 weeks in a patient who is epidemiologically linked* to a laboratory confirmed case.

* Epidemiological relatedness means close contact with a confirmed case within 3 weeks of onset of cough in that confirmed case. Close contacts are defined as:
- members of the same household
- members of a childcare centre
- school class mates
- if the case can name a person with confirmed pertussis with whom they had contact

For clinicians, where laboratory confirmation of the contact may be difficult to ascertain, epidemiological relatedness in this setting means close contact with a confirmed or suspected case within 3 weeks of onset of cough in that case.

Why notify?

Erythromycin treatment of cases and prophylaxis of contacts can reduce transmission of pertussis if the case is diagnosed early in the course of the disease (within 2-3 weeks of cough onset). Most cases that have been notified so far have been diagnosed too late to institute effective control measures. This is in part due to the non-specific nature of symptoms early in the disease and delays in laboratory confirmation of disease, but is also due to delays in notifying by health staff.

What should be notified?

In the current setting of an epidemic, practitioners need to have a high index of suspicion for notifying pertussis.

Editor: Vicki Krause Email: vicki.krause@nt.gov.au

Assistant Editors: Sandra Downing
David Peacock
Peter Markey

Centre for Disease Control
Block 4, Royal Darwin Hospital
PO Box 40596
Casuarina
Northern Territory 0811

Production Design: Sandra Downing

Website: http//www.nt.gov.au/nths/cdc/bulletin/index.shtml

Symptoms suggestive of pertussis include:

- severe cough occurring in paroxysms;
- vomiting after a bout of coughing;
- inspiratory "gasp" or characteristic "whoop" at the end of a cough paroxysm;
- subconjunctival haemorrhages caused by forceful coughing;
- persistent cough; and
- contact with another person with a persistent cough.

Which investigations are indicated?

Laboratory confirmation of pertussis is difficult as the organism resides deep in the nasopharynx, is difficult to grow and serology is often negative early in the disease. However, PCR testing and serology are useful investigations.

THINGS TO KNOW ABOUT DIAGNOSIS OF PERTUSSIS

PCR testing – nasopharyngeal aspirate or swab in the first 2-3 weeks of illness

⇒ The availability of PCR has significantly improved the ability to confirm a diagnosis of pertussis, as PCR testing for pertussis is specific and sensitive early in the disease.

⇒ Both PCR and culture are only likely to be positive during the first 2-3 weeks of illness.

⇒ The best specimen is a properly collected nasopharyngeal swab or aspirate. If it is not possible to collect these specimens, the PCR testing can be done on a throat swab although there will be a higher number of false negatives. A nose swab is not suitable.

⇒ Mayne Health Western Diagnostic Pathology will take nasopharyngeal aspirate specimens if the patient presents to their main specimen collection centre at the Darwin Private Hospital and in Alice Springs. QML Pathology will also take appropriate specimens (swab or aspirate) at their collection centres in Cavenagh Street, Casuarina and Palmerston; QML would like to be notified by the referring doctor before the patient presents for specimen collection.

⇒ To take an adequate nasopharyngeal swab, the swab must be passed through the nose into the posterior nasopharynx and left in the nasopharynx for at least 30 seconds. To be suitable for culture, the swab must be a dry swab (routine culture media are toxic to the organism) and must be a calcium alginate or Dacron swab (not cotton which inhibits growth of *B. pertussis*).

Serology

⇒ A positive serum IgA is presumptive of recent disease but a negative serum IgA does not exclude pertussis, particularly if the specimen is obtained soon after symptom onset.

⇒ The sensitivity of serum IgA increases 2 or more weeks after cough onset.

⇒ Serum IgA is less sensitive in children under 2 years of age.

⇒ Positive serum IgG indicates previous vaccination or infection. There is no proven role for serum IgM in the diagnosis of pertussis.

⇒ The best serological evidence of pertussis is the demonstration of seroconversion in paired sera. Therefore, it is worth collecting serum for IgA testing early in the illness as it may already be positive, and if not, will demonstrate seroconversion if the serum becomes positive in 3-4 weeks.

Summary

Timing of recommended investigations for pertussis diagnosis

Within 2 weeks of cough onset*	More than 2 weeks after cough onset	More than 4 weeks after cough onset and/ or previous IgA negative
Nasopharyngeal aspirate/ swab Serum IgA	Serum IgA	Repeat serum IgA

* If the patient is an under-immunised child or is in contact with an under-immunised child, then it is reasonable to request PCR testing on a nasopharyngeal specimen up to 3 weeks after onset of cough.

Case management

The current recommended treatment for pertussis is a 7 day course of erythromycin (see Antibiotic Therapeutic Guidelines). If commenced

early in the disease (soon after cough onset), erythromycin can ameliorate the symptoms; later on it does not affect the course of the disease. The patient will no longer be infectious after 5 days of erythromycin and therefore it is recommended that cases should be treated to prevent further disease transmission. However, as cases are no longer infectious 3 weeks after the onset of cough, erythromycin is not of value when the cough has been present for 3 weeks or longer.

Cases should be excluded from school/work until they have received 5 days of erythromycin or until 21 days after cough onset.

Prophylaxis and exclusion of contacts

Household contacts should be also be offered 7 days of erythromycin (see Antibiotic Therapeutic Guidelines) provided that first exposure to the case occurred less than 2 weeks previously. Generally household contacts are not excluded from school/work unless the contact is an under-immunised child aged 7 years or younger. CDC will advise on the management of contacts in child-care and household contacts who work where there are young children on a case by case basis.

Vaccination

Immunisation remains the mainstay of pertussis control. It is crucial that infants receive their scheduled DTPa vaccinations on time and that any children who are overdue are identified and vaccinated.

****

Pertussis Vaccination Coverage in the Northern Territory

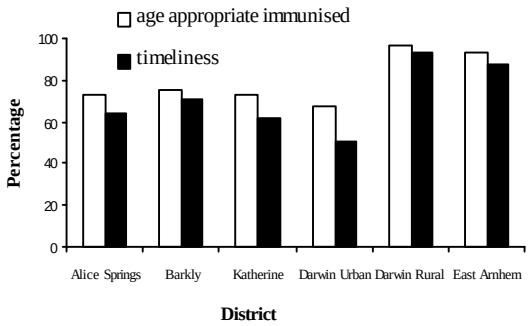
Sam Bullen, Immunisation Database Coordinator, CDC, Darwin

Information on the graph comes from the NT Childhood Immunisation Database. This database contains a record of all children who have been immunised in the NT.

- Coverage rates seen in Alice Springs, Barkly, Katherine and Darwin Urban regions may be artificially lowered due to a higher proportion of interstate transferees, visitors and short term residents moving into and out of these regions. Other reasons however need to be explored.

- Darwin Rural and East Arnhem regions have transient populations, however this movement is generally within the region rather than out of the NT and does not affect the NT immunisation data.

Graph Children aged 5 years 1 month to 6 years 1 month at 01 Oct 2001 age appropriate immunised for pertussis



Timeliness = age appropriate immunised at age 5 years 1 month

****

Northern Territory Antibiotic Resistant *Neisseria gonorrhoeae* Sentinel Surveillance Sites

Thérèse Kearns [1 2], Jan Savage[1] David Peacock[1]
Centre for Disease Control Darwin[1], National Centre for Epidemiology and Population Health, Australian National University[2]

Abstract

Summary

The Territory Health Services (THS) AIDS/STD Program identified an increasing trend in the proportion of penicillin resistant strains reported by the Australian Gonococcal Surveillance Programme (AGSP) from 1996-1999 that was approaching the World Health Organisation's (WHO) recommended threshold for changing treatment options. The increase in penicillin resistant strains threatens the acceptability of current Northern Territory (NT) treatment protocols that recommend penicillin for infections acquired locally. An analysis of the NT, Centralised Notifiable Disease Database (CNDD) was unable to support whether this was a true increase in resistant strains and so 4 sentinel surveillance sites were established.

Aim

To analyse the first 3 months data on the 4 sentinel surveillance sites that were established in the NT to monitor antibiotic resistant *Neisseria gonorrhoeae* (ARNG) in populations at risk of acquiring the infection.

Study Design

A prospective study design was used.

Study Population

Clinic attendees from the 4 sentinel sites, July 2001 to July 2002. Sentinel sites selected on the basis of past documented ARNG cases or an emerging population at risk at the sites.

Preliminary Results

From 1 July to 30 September 2000, 703 clinic attendees were tested for *N. gonorrhoea* from the 4 sites of which 47 (7%) were positive. Of those tested 506 (72%) were male, 188 (27%) female and 9 (1%) genders were not identified. Of the 47 positive results, 44 (94%) were male and 3 (26%) female. The mean age of those tested was 30 years and 29 years for those with positive results.

Ethnicity was recorded for 528 (75%) of clinic attendees tested of whom 342 (65%) were Aboriginal, 125 (24%) Caucasian, 1 Torres Strait Islander, 41 (8%) South East Asian and 19 (4%) European. Of the cases 37 (78%) were Aboriginal, 5 (11%) Caucasian, 1Torres Strait Islander, 1 South East Asian, 2 (4%) European and 1 with ethnicity not identified.

PCR tests were performed on 673 (96%), 601 (85%) had cultures and 571 (81%) clinic attendees were tested by both methods. Both a PCR and culture test were performed on 45 (95%) of which 42 (93%) were positive by both methods. Of the 44 male cases, 42 (95%) had both a PCR and culture test of which 41 (98%) were both positive. The 3 female cases were tested by both PCR and culture of which 1 (33%) was diagnosed by both methods.

From the 47 cases, 28 (64%) males and two (67%) females were asymptomatic, 3 (7%) males had a discharge, 1 female (33%) had dysuria, 8 (18%) males had both discharge and dysuria, 1 (2%) male had dysphagia and 4(9%) males did not have the symptoms recorded.

There were no antibiotic resistant strains identified during this time period.

Conclusion

This preliminary analysis on the first 3 months data from the sentinel sites provides an insight into how well the health services have implemented the specimen collection and data recording expected of each site. The most outstanding data omission is that of ethnicity and the timely receipt of monthly data. The other unexpected finding was the low numbers of females being tested. Increasing the female sentinel population is essential if the sites are to remain representative of the population for which emerging ARNG infections are suspected and the population for which *N. gonorrhoeae* is known.

Introduction

N. gonorrhoeae is endemic in the Aboriginal population of the NT, with the non-Aboriginal population also experiencing higher rates of infection than that observed in the rest of the nation (1). Of increasing concern is the proportion of isolates reported by the AGSP that are resistant to penicillin either by chromosomal or plasmid mediated mechanisms (2-5). The WHO recommends changing the antibiotic treatment when the proportion of isolates resistant to an antibiotic reaches 5 % (6).

In 1999 the proportion of penicillin resistant strains in the NT was 4.4 % (5). The NT still recommends penicillin as first line treatment for infections acquired locally (7) however an alternative regimen may need to be implemented if the increase is not confined to a sub-population. Alternative treatments however, are more expensive, more difficult to prepare and less acceptable to clients.

To develop empirical testing and treatment guidelines pertinent to the NT, improved knowledge on the epidemiology of all antibiotic resistant strains and in particular the penicillin resistant strains (penillinase producing *N. gonorrhoeae* – PPNG and chromosomally mediated resistant *N. gonorrhoeae* – CMRNG) is needed. Sentinel sites have been recommended by the AGSP (8) and WHO (6) as a suitable surveillance scheme for the collection of this data. Subsequently 4 sites have been established in the NT and are located in Darwin, Katherine and Alice Springs. They are expected to yield data that are representative of the known and suspected populations who are at risk of acquiring antibiotic resistant *N. gonorrhoeae* (ARNG).

The aim of this report is to present the first 3 months data on the clinic attendees tested for *N. gonorrhoeae* from the four sentinel surveillance sites that commenced in July 2001.

Objectives of the surveillance system

- To describe the epidemiology of ARNG in identified populations.
- To determine what proportion of *N. gonorrhoeae* diagnosed by culture is ARNG.
- To determine the extent of undiagnosed antibiotic resistant *N. gonorrhoeae* that occurs with PCR testing only.
- To enable the AIDS/STD Program at Territory Health Services (THS) to make an informed decision on the suitability of the current recommended antibiotic treatment policy for *N. gonorrhoea*e in the NT.

Methods

Study setting

The study setting is 4 health services; 2 in Darwin and 1 each in Katherine and Alice Springs.
The criteria used for the selection of the sites were that the:

- population included cases of previously diagnosed ARNG;

or

- population was considered to be at emerging risk of ARNG (i.e. Aboriginal and female).

Other criteria considered included:

- most common source population of notification for ARNG;
- population in which the majority of *N. gonorrhoeae* is diagnosed;
- population for which ARNG is suspected;
- population in which ARNG has potential to exceed the WHO threshold of 5%;
- health service willing to be involved;
- health service from which data is easily able to be collected;
- health service prepared to incorporate changes to clinical practice;
- source from which 200 culture isolates will be obtained within one year.

Study population

The study population is the clinic attendees tested for *N. gonorrhoeae* at the 4 sentinel sites, some of whom self presented and the remainder participated in screening programs. More than 1 site was required to get sufficient numbers and to represent the at risk population while recognising the inherent bias. Detailed demographic data on clinic attendees from the proposed sites was not available, however it is expected that males will be represented slightly more than females and Aborigines more than non-Aborigines. Indonesian nationals and other SE Asian visitors in whom penicillin resistant strains are known to be high are also expected to be captured in the sentinel site populations. The expected age range of the clinic attendees is 15-35 years.

Case definition

A person who attends the sentinel surveillance sites between 1 July 2001 and 30 June 2002 to be tested for *N. gonorrhoeae* by polymerase chain reaction and/or culture.

Data collection

The sentinel sites utilised the Recommended Testing Guidelines produced by the AIDS/STD Program in October 2000 to guide the clinical practice of health providers when testing and

screening symptomatic and asymptomatic clinic attendees.

De-identified data on all tested is provided to the AIDS/STD Program each month either by the sentinel site or the testing laboratory. The information is provided either electronically or as a hard copy and contains the date of birth, gender and ethnicity, as well as the date of the test, the diagnostic method used and the result of the test.

After the sentinel site receives a positive laboratory notification identifying *N. gonorrhoeae,* a notification form to collect further epidemiological detail on cases is expected to be filled out and either sent in with the monthly client attendee data or faxed. The other antibiotic resistant strains are identified by the AGSP. It presents a quarterly report and sentinel site clients are identified by location, test date and date of birth.

The monthly data is entered into an Excel 1997 database and transferred into Stata Version 7 for analysis. The chi square test was used to determine associations between categorical variables. A p value <0.05 was considered statistically significant.

Ethics approval was obtained from the Top End Health Research Committee and the Central Australia Ethics Committee.

Results

1 July 2001 - 30 September 2001

There were 703 clinic attendees tested for *N. gonorrhoea* from the 4 sites of whom 506 (72%) were male, 188 (27%) female and 9 (1%) had no gender identified. The mean age was 30 years from a range of 0.04 -77 years. Ethnicity was recorded for 528 (75%) clinic attendees tested of whom 342 (65%) were Aboriginal, 125 (24%) Caucasian, 1 was Torres Strait Islander, 41 (8%) were South East Asian and 19 (4%) European.

By gender, 301 (59%) of males tested were Aboriginal, 93 (18%) Caucasian, 37 (7%) South East Asian, 10 (2%) European and in 65 (13%) the ethnicity was not identified. In the female sentinel population, 40 (21%) were Aboriginal, 30 (16%) Caucasian, 1 Torres Strait Islander, 3 (2%) were South East Asian and 8 (4%) European. In 106(56%) ethnicity was not identified.

From the 703 clinic attendees, 673 (96%) PCR tests were performed, 601 (85%) had culture tests and 571 (81%) had both PCR and culture tests. Of the male attendees, 484 (96 %) had a culture test and 498 (98%) had a PCR, whereas females had 110 (59%) culture tests performed and 166 (88%) PCR tests.

From the 703 clinic attendees tested, 47 (7%) had a positive result of whom 44 (94%) were male and 3 (26%) were female (x^2=10.9, p<0.01). The rate of infection from the study population for males is 86 per 1000 and 16 per 1000 for females. Of the positive results 45 (96%) were diagnosed by PCR (Positive PCR diagnosis by initial and confirmatory testing, unless culture positive), 44 (94%) by culture and 42 (89%) by both methods. Of the 44 male cases, 42 (94%) had both a PCR and culture test of which 41 (98%) were both positive. All 3 female cases were tested by both PCR and culture of which one (33%) was diagnosed by both methods.

Of the 47 cases, 37 (78%) were Aboriginal, 5 (11%) Caucasian, 1 was Torres Strait Islander, 1 South East Asian, 2 (4%) were European and 1 had no ethnicity identified. The average age of clinic attendees with positive results was 29 years from a range of 16-59 years. From the 47 positive notifications, 30 (64%) had the home location recorded with 11 (37%) from Alice Springs district, 12 (40%) Darwin urban, 4 (13%) Katherine district, 1 (3%) East Arnhem, 1 (3%) South Australia and 1 (3%) South East Asia.

Positive results were identified from urine samples in 24 (51%), all of whom were male, 12 (26%) from urethral swabs, 3 (6%) from the vagina, 1 from pharynx, 1 from both the pharynx and rectum and in 5 (11%) no site was identified. Additionally, 30 (64%) cases were asymptomatic, 3 (6%) had a discharge, 1 (2%) had dysuria, 8 (17%) had both dysuria and a discharge, 1 had dysphagia and 4 (9%) had no symptoms recorded. Twenty-eight (64%) males were asymptomatic, 3 (7%) had a discharge, 8 (18%) had both discharge and dysuria, 1(2%) had dysphagia and 4 (9%) were not recorded. Two (67%) females were asymptomatic and 1 (33%) had dysuria.

A co-infection was recorded in 19 (40%) cases (all males) of which 13(68%) were chlamydia, 3 (16%) were syphilis. Two of the cases with chlamydia and 1 with syphilis also had hepatitis B. Thirteen (68%) of the cases with a coinfection were asymptomatic and 5 were recorded as symptomatic with either discharge or dysuria. Of the 5 symptomatic infections, 3 were co-infected with chlamydia, and 2 with syphilis. Of the 13 co-infected males with chlamydia 11 (85%) were asymptomatic.

Twenty one (62%) of the cases had heterosexual partners, 3 (9%) had same sex partners and 10 (29%) the sex of the partner was either not known or not identified. There were only 2 cases that had recorded a travel history outside of the NT, one to NSW and the other the Philippines.

There were no antibiotic resistant strains identified during this three-month period.

Discussion

The 4 sites commenced in July 2001 and will operate for a minimum of 1 year. It is anticipated that the sites will continue longer than the 12-month trial period and so negotiations to set up a fifth sentinel site in Darwin are under-way. It is expected that this site will increase the proportion of women in the study population as it was originally thought that only slightly more males would be tested than females.

These preliminary results have highlighted several deficits in the data collection that require attention. For example, each month's data was expected to be sent monthly, however some sites provided 2 and 3 months data at one time which delayed the identification and rectification of omitted data fields.

The recording of ethnicity was a new practice for most of the health services and it had been anticipated that it would take some time to gain acceptance of recording this new information. However omission of ethnicity data was limited predominantly to 1 health centre where it is known that mainly Aboriginal women are tested. This site accounts for the large number of females with unidentified ethnicity. As feedback has been given, it is anticipated that the recording of ethnicity will improve at this site in the ensuing months.

From anecdotal evidence it is believed that the testing practices of health providers in the Top End changed in 1996 when the introduction of new specimen collection methods and PCR testing began. Unfortunately this could not be analysed as the diagnostic method recording is incomplete on the CNDD and also it does not allow for the recording of results from more than 1 diagnostic method (9). The 10 % difference in the use of the 2 diagnostic methods in this study so far suggests that the sites are using both PCR and culture where possible and that the 'Recommended Testing Guidelines' are being followed.

Since the introduction of PCR testing in the NT gonorrhoea notifications have increased, with the rate higher in females than males (9). This sentinel site data however does not reflect the CNDD finding as the detection rate is 5 times greater in males than females. Although found to be statistically significant, the sentinel sites are testing almost 3 times as many men as women. This is not presumed to be the expected testing practice in the NT, but could not be confirmed because the number and gender of all people tested for gonorrhoea in the NT i.e. the denominator tested is unknown.

Presently the sentinel site data is not generalisable to the NT population due to the under representation of females and so the NT population was not used as a denominator to calculate the gender prevalence rates. Until the sentinel site population distributions are more evenly balanced it has been presumed that the much higher rate of male cases than females in this study population is reflective of the sample chosen.

Up until 2000, ARNG notifications had predominantly been non-Aboriginal males acquiring the infection overseas. The population now considered potentially at risk of emerging ARNG infection is Aboriginal and in particular females as a quarter of the PPNG notifications in 2000 were in Aboriginal women who had no known travel history outside of the NT (9). Unfortunately testing of their named contacts did not include culture so it is uncertain whether their partners (Aboriginal or other) also had the penicillin resistant strain.

From the limited demographic data available for all sites it was anticipated that there would only be slightly more males than females, however it

would appear that males and Aboriginals have been over represented and females under represented.

It is believed that once the ethnicity codes are better recorded that the Aboriginal female population will be higher than that already recorded. This is important for screening as this is a population considered at increased risk for emerging ARNG (which includes PPNG) infection.

The proportion of male sentinel cases that were asymptomatic (64%) was higher than expected. Generally only 10 % of males have an asymptomatic infection compared to 80 % of females (10). From this 3 months data, it would appear that males are reported as having more asymptomatic infections than that described in the literature. Almost 90 % of the male asymptomatic cases were from the two sites that are serviced by the same health care provider that may bias these results. However the number of male gonorrhoea cases is still small and care should be taken with interpreting this data until more cases have been reported.

The NT averages 8 PPNG notifications per year of which the majority are reported from November through to March, so the detection of no antibiotic resistant strains in the first 3 months (July to September) is not unexpected. The reason for this 'seasonality' is unclear. In the next 3 months it is anticipated that the proportion of an antibiotic resistant strain notified will be greater than 5%, which is the WHO threshold for changing treatments. This proportion however, cannot be used in isolation as the epidemiology of the resistant cases must also be taken into account to determine if the current treatment protocols are effective.

This analysis has identified deficits in the sentinel site population, data recording methods and identified an unexpected finding in male asymptomatic infection that requires further monitoring.

Conclusion

This preliminary analysis on the first 3 months data from the sentinel sites provides an insight into how well the health services have implemented the specimen collection and data recording expected of each site. The most outstanding findings were the data omissions are that of ethnicity and the delays in receipt of monthly data. This will hopefully improve. The other unexpected finding was the low numbers of females being tested. Increasing the female sentinel population is essential if the sites are to remain representative of the population for which emerging ARNG infections are suspected and the population for which *N. gonorrhoeae* is known.

References

1. Dunn M. Tampon Testing - improving access to STD screening for women. The Northern Territory Disease Control Bulletin 5[2], 5-7. 1998.
2. The Australian Gonococcal Surveillance Programme. Annual report of the Australian Gonococcal Surveillance Programme 1996. Communicable Diseases Intelligence 21[14], 189-192. 10-7-1997.
3. The Australian Gonococcal Surveillance Programme. Annual report of the Australian Gonococcal Surveillance Programme 1997. Communicable Diseases Intelligence 22[10], 212-216. 1-10-1998.
4. The Australian Gonococcal Surveillance Programme. Annual Report of the Australian Gonococcal surveillance Programme 1998. Communicable Diseases Intelligence 23[7], 193-197. 8-7-1999.
5. The Australian Gonococcal Surveillance Programme. Annual report of the Australian Gonococcal Surveillance Programme 1999. Communicable Diseases Intelligence 24[5], 113-117. 2000.
6. World Health Organization and Joint United Nations Programme on HIV/AIDS 1. Guidelines for Sexually Transmitted Infections Surveillance. www.who.int/emc-documents/STIs/docs/STI%20Guidelines.html . 18-8-2000.
7. Clinic 34 AIDS/STD Program. Recommended Testing Guidelines for Genital Tract Infections. 2000. Territory Health Services.
8. Tapsall J. Antimicrobial Resistance in Neisseria Gonorrhoeae. A technical review. 1-35. 1999.
9. Centre for Disease Control THSNTG. Centralised Notifiable Disease Database. 2001.
10. Centres for Disease Control and Prevention. 1998 Guidelines for the Treatment of Sexually Transmitted Disease. http://wonder.cdc.gov/wonder/STD/STD98TG/STD98T09.HTM . 23-1-0098.

****

Neisseria gonorrhoeae: Understanding antimicrobial susceptibility

Sarah Huffam[1], Gary Lum[2], Jan Savage[1].
[1]AIDS/STD Unit Darwin, [2] Pathology THS

Sulphonamides were the first antimicrobial agents used to treat infections with *N. gonorrhoeae* and were reported to have high cure rates in the 1930s. Penicillin became the treatment of choice in the 1940s when clinical failure to sulphonamides emerged and it remained the treatment of choice until the 1980s.[1] Within 10 years reduced susceptibility of *N. gonorrhoeae* to penicillin was noted and progressively higher doses were needed. Later the addition of probenecid was used to overcome the incremental rise in the mean inhibitory concentration (MIC). Since the 1980s alternative agents have been required in many regions for treatment of *N. gonorrhoeae* infection due to widespread penicillin resistance.

There are 2 broad mechanisms of penicillin resistance to *Neisseria gonorrhoeae; 1)* enzyme production (plasmid mediated) and 2) target alteration (chromosomally mediated).

Plasmid mediated resistance is characterised by a marked increase in the MIC of the antimicrobial to which the microorganism would otherwise have been susceptible. Currently *N. gonorrhoeae* is considered susceptible to penicillin if the MIC is <1 mg/L. Microorganisms possessing plasmid mediated resistance typically have MIC ≥16 mg/L. The mechanism involves the production of a single enzyme, which functions as a β-lactamase or penicillinase. The structure of most penicillins includes a thiazolidine ring, a β-lactam ring, and a side chain. The β-lactam ring is essential for antibacterial activity. β-lactamase is a serine protease similar to penicillin binding proteins which bind to the β-lactam bond which subsequently undergoes hydrolysis, destroying the activity of the drug. Organisms producing these are known as penicillinase producing *N. gonorrhoeae* (PPNG). The penicillinase gene containing the plasmid can readily be transferred from one bacteria to another conferring penicillin resistance. PPNG was first documented in the mid 1970s and tetracycline resistance in the mid 1980s.[2] Both spread rapidly throughout the world, and here in the Northern Territory (NT) we are one of the few areas where the dominant strain of *N. gonorrhoeae* does not carry the penicillinase producing gene.

Chromosomally mediated resistance results from multiple chromosomal mutations that accumulate slowly in a microorganism population. The main mechanisms for chromosomal mediated penicillin resistance of *N. gonorrhoeae* are reduced binding affinity and altered permeability of the penicillin binding proteins (PBPs) of the bacteria for penicillin. Penicillin inhibits bacterial growth by binding to PBP and alterations in these target proteins can result in penicillin resistance. Chromosomal resistance usually results in much lower MICs than plasmid mediated resistance, with a stepwise increase in MIC occurring over time. Clinical failure may not be immediately evident, as there may be partial suppression of the organism without complete eradication.

Ciprofloxacin resistance also results from additive effects of multiple chromosomal mutations, possibly due to selective effect of the uncontrolled use of flouroquinolones. This was first noted in the late 1980s [1] and is associated with clinical failure in isolates from Africa and Southeast Asia and has been found in Australia.

Antimicrobial susceptibility testing of *N. gonorrhoeae* isolates involves the detection of β-lactamase using the nitrocefin test performed at Royal Darwin Hospital (RDH), and methods which measure the MIC are performed in dedicated reference laboratories outside the NT. In addition to this, the RDH Microbiology Laboratory is testing penicillin MICs using gradient strip technology (Etest®). MIC testing is traditionally performed using broth or agar culture with doubling dilutions of antimicrobial, the MIC being determined by the concentration at which growth is inhibited. Using the gradient strip method, a strip of plastic impregnated with a gradient antimicrobial concentration is placed on the culture medium inoculated with the organism and the MIC is read off the strip at the point where growth of the organism is inhibited. These are not reported as results but are correlated with the reference laboratory interstate.

Typing of isolates using auxotyping (a typing system based on nutritional requirements of the organism), serotyping with monoclonal antibodies, and molecular typing methods are performed in reference laboratories and are important epidemiological rather than direct clinical application tools. The need for standardisation of susceptibility testing has been recognised by the World Health Organisation (WHO). Standardised testing will provide a mechanism for comparison between different geographic areas, and for treatment studies. The development of a global network for the surveillance of *N. gonorrhoeae* antimicrobial susceptibility has also been initiated by WHO.[3]

WHO suggest that when endemic resistance to an antibiotic reaches 5%, use of that antimicrobial in that population be ceased. In the NT we are nearing this threshold for penicillin, and continued surveillance is vital to guide our protocols for treatment of *N. gonorrhoeae* infection.

The introduction and ready acceptance of more sensitive diagnostic methods using nucleic acid amplification, such as polymerase chain reaction (PCR), has led to an increase in the number of cases of *N. gonorrhoeae* diagnosed annually in the NT. PCR does not provide information on antibiotic susceptibility or resistance. It is important that this information on resistance patterns is available to inform *N. gonorrhoeae* treatment guidelines. To this end clinicians are asked to request that specimens are cultured.

References

1. Elbelding E, Quinn TC. The impact of antimicrobial resistance on the treatment of sexually transmitted diseases. Infect Dis Clin North Am. 1997 Dec;11 (4):889-903.
2. Mandell GL et al. Principles and Practice of Infectious Diseases. 5th edition 2000. Churchill Livingstone.
3. Lind I. Antimicrobial resistance in Neisseria Gonorrhoeae. Clin Infect Dis. 1997 Jan; 24 Suppl 1:s93-7.

****

Editorial Comment

Jan Savage, Head of AIDS/STD Program, CDC, Darwin

The report of preliminary results from the *Neisseria gonorrhoeae* sentinel surveillance sites is of interest from two perspectives. Firstly, it confirms the high prevalence of gonococcal infections in the NT in selected populations and secondly, it highlights the importance of access to high quality data such as this. Antimicrobial resistance remains one of the most significant barriers to the control of gonorrhoea, particularly in areas of high prevalence. Although no cases of antibiotic resistant gonorrhoea were detected to date, should further study support a change in treatment guidelines, from oral amoxycillin to ceftriaxone injection, the impact on both cost and compliance will be considerable.

This project has required the cooperation and collaboration of CDC staff, NT public and private laboratories and health service providers. Their participation has contributed to its success to date. All service providers are reminded of the importance of collecting appropriate specimens for gonococcal culture and requesting culture and susceptibility testing from their laboratories.

****

HIV and AIDS in the Northern Territory (1985-2000)

Jan Savage, Head of AIDS/STD Program, CDC, Darwin

Introduction

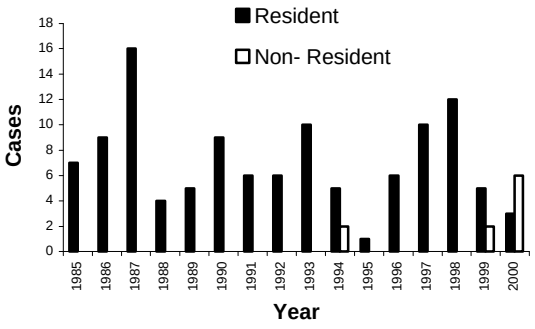
Cases of human immunodeficiency virus (HIV), where there is laboratory evidence of infection by the virus, and acquired immunodeficiency syndrome (AIDS), which is defined by the presence of HIV plus particular illnesses (see pg. 15), continue to be diagnosed in the Northern Territory (NT) (1). The numbers are small and the rates lower than the national average. There are differences between patterns of infection seen in the NT and other parts of Australia. Nationally, HIV is predominantly diagnosed in white urban males who have acquired the infection by male-to-male sexual contact. The same is true in the NT, but we have also noted an increase in heterosexually acquired cases; the emergence since 1999 of cases in foreign nationals working in East Timor and an increase in the proportion of cases in the Aboriginal population. AIDS cases have decreased in line with national trends. A summary of the notification data from 1985 until 2000 will be presented and issues arising from them discussed.

HIV and AIDS epidemiology

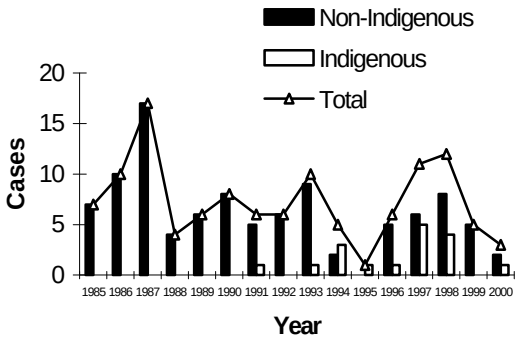
HIV and AIDS are notifiable conditions under the NT *Notifiable Diseases Act*. Information on HIV cases is maintained in a database in the AIDS/STD Program in the Centre for Disease Control (CDC), Darwin. Age, gender, aboriginality, date of diagnosis, exposure category, CD4 (T cell) count and residential status are recorded. This information is de-linked, a name code consisting of the first 2 letters of the surname and first name is used. Further information about clinical status is requested from clinicians who report cases of AIDS.

Since 1985, there have been 118 cases of HIV notified in NT residents. An additional 10 cases have been reported in non-residents, 8 of these have been diagnosed since September 1999 in foreign nationals working in East Timor. The number of cases reported each year in NT residents ranges from 1-17, with an average of 7.4 (see figure 1). The majority of notifications occur in resident men (92%), 8 of the 10 non-resident cases were also in males. Since 1985, 14% (17) of cases have been notified in Aboriginal people. The first Aboriginal notification was in 1991 and over a 10 year period, has risen to 26% of all resident notifications (see figure 2). Approximately 28.5% of the population of the NT are Aboriginal (2). The majority of all cases (80%) continue to be diagnosed in Darwin.

Graph 1 NT HIV notifications and residential status



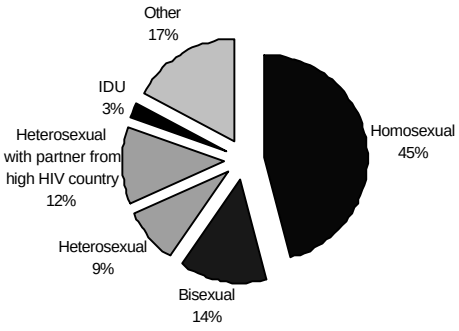
Graph 2 NT HIV cases and Indigenous status



Male-to-male sexual exposure accounts for the majority of HIV infection in NT residents (59%), followed by heterosexual exposure (21%) and multiple/other/unknown factors (17%) (see figure 3). More than half (57%) of the cases of heterosexually acquired infection reported sexual partners from high HIV prevalence countries.

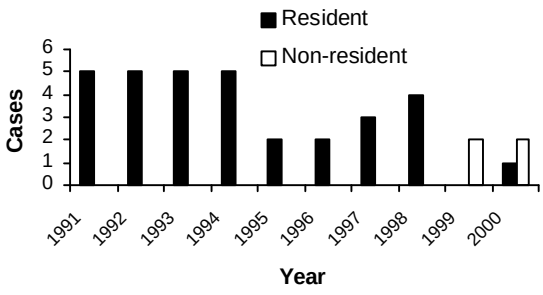
Nationally, homosexually acquired infection makes up 78% of all HIV diagnoses, with 10% due to heterosexual contact (3). The proportion of cases of HIV acquired through injecting drug use remained low at 3%. Of cases notified in non-residents 92% had been acquired heterosexually in countries with high HIV prevalence.

Graph 3 Major NT HIV exposure categories



There have been 37 cases of AIDS reported in NT residents until the end of 2000 and an additional 4 cases in non-residents during 1999 and 2000. The numbers remain small, ranging between 0-5 cases each year. In 1999 and 2000, there were respectively zero and one case reported in NT residents (see figure 4). *Pneumocystis carinii pneumoniae* pneumonia (PCP) and *Mycobacterium avium* complex (MAC) contribute nearly one quarter each of all AIDS diagnoses. Late diagnoses (where the AIDS diagnosis is made within 3 months of the HIV diagnosis) account for 29% of cases in residents, and all of the cases in non-residents. The period between HIV diagnosis and the development of AIDS ranges from 0 to 168 months. There have not been any HIV related deaths since 1996.

Graph 4 NT AIDS cases and residential status 1991-2000



Discussion

It is difficult to draw more than guarded conclusions about this data because of the small numbers involved. However the overall numbers of notifications of HIV and AIDS appear stable, if not declining, and male-to-male sexual exposure is still the major mode of transmission.

The proportion of Aboriginal cases of HIV has increased since 1991. These cases have been largely confined to Darwin, occurring mostly in urban men who have acquired their infection through male-to-male sexual exposure. The NT Department of Correctional Services screens all prisoners for HIV and other blood borne viruses on reception. To date there have not been any new cases of HIV diagnosed in Aboriginal men there. This screening practice acts as a *de facto* surveillance system for Aboriginal men from across the NT who are an over-represented group in the prison system. The absence of HIV detected through the prison system is particularly significant when considered with the much higher rates of other sexually transmissible infections (STIs) notified there. It is known that many STIs facilitate the transmission of HIV (4,5). It is unclear why HIV is limited to urban men, but limited cross-cultural sexual mixing may be one reason.

The greater proportion of heterosexually acquired infection in the NT (21% vs. 10% nationally) may be due to infections acquired by NT males travelling to high prevalence countries in the region and to a lesser extent, Aboriginal cases. The 8 cases of HIV in foreign nationals working in East Timor has led to consideration of the possible impact on both East Timor and the Top End. There is no evidence to suggest that these workers acquired their infection in East Timor, rather that they travelled there, unaware of their diagnosis and/or the advanced stage of their infection. Very limited HIV surveillance has been undertaken in East Timor. This, and anecdotal information, suggests that East Timor is country a with a very low HIV prevalence. It is quite plausible that HIV will be transmitted to the East Timorese from the foreign workers, leading to a major shift in HIV epidemiology. A similar scenario was seen after the fall of the Pol Pot regime in Cambodia in the early 1990's and the entry of foreign peacekeepers into the country. In Cambodia the first case

of HIV was notified in 1991; by 1998 46% of commercial sex workers were HIV positive and an estimated 4% in adults between 15 and 29 years (6). Cambodia now has the highest rates of HIV in the SE Asian region (3).

In the NT there have been two cases of HIV resulting from sexual contact between a Darwin woman and a foreign worker visiting from East Timor. Social and economic links between the NT and East Timor are being developed and strengthened. If an HIV epidemic develops in East Timor, the NT will undoubtedly have a role in both prevention and treatment issues. The risk of infection to NT workers visiting and living in an epidemic area must also be considered.

Since the introduction of effective and accessible antiretroviral therapy in Australia in 1996 there has been a dramatic reduction in the number of cases of AIDS diagnosed and of reported AIDS deaths (3). As the numbers in the NT are so small, similar trends cannot be confidently defined, although this data, in combination with reports from the clinics managing people with HIV is encouraging. As for the NT, PCP is the most commonly notified AIDS defining illness in Australia (28%). In contrast, MAC is reported for 5.5% of AIDS cases nationally, whereas in the NT, MAC notifications equal PCP at 22% (2). This difference may reflect the small sample size or the high level of population based MAC as reported in an NT review of non tuberculous mycobacterial disease (7).

Recent cases highlight the need for practitioners to think of HIV, of its prevention, early detection and treatment. Two recent cases were acquired as a result of very brief sexual encounters – both may have been suitable for post exposure prophylaxis for HIV. Early detection of infection is not just an opportunity for early treatment, but has been found to be an effective prevention strategy (8). Other cases have been diagnosed after individuals presented with symptoms of STIs. Indeed there is an Australian legal precedent (9) that not to offer testing for HIV when another STI is diagnosed is negligent not just to the primary patient, but also to others they may go on to unwittingly infect.

References

1. Centre for Disease Control. Communicable Disease Surveillance in the Northern Territory: guidelines for the reporting of notifiable conditions 2000. Northern Territory Government. Darwin.
2. NT government website www.nt.gov.au
3. National Centre in HIV Epidemiology and Clinical Research. HIV/AIDS, viral hepatitis and sexually transmissible infections in Australia Annual Surveillance Report 2001. National Centre in HIV Epidemiology and Clinical Research, University of NSW. Sydney.
4. Grosskurth H, Mosha F, Todd J, Mwijarubi E, Klokke A, Senkoro K et al. Impact of improved treatment of sexually transmitted diseases on HIV infection in rural Tanzania: randomised controlled trial. Lancet 1995; 346: 530-536.
5. Laga M, Alary M, Nzila N, Manoka AT, Tuliza M, Behets F et al. Condom promotion, sexually transmitted diseases treatment, and declining incidence of HIV-1 infection in Zairean sex workers. Lancet 1994; 344: 246-248.
6. UNAIDS/WHO Working Group on Global HIV/AIDS and STI Surveillance. 2000 www.who.ch/emc/diseases/hiv
7. O'Brien D, Currie BJ, Krause V. Nontuberculous mycobacterial disease in Northern Australia: a case series and review of the literature. CID 2000; 31:958-68.
8. The Voluntary HIV-1 Counselling and Testing Efficacy Group. Efficacy of voluntary HIV-1 counselling and testing in individuals and couples in Kenya, Tanzania and Trinidad: a randomised trial. Lancet 2000; 356:103-112.
9. BT v Oei. 1999 NSW Supreme Court 1082.

****

Acquired Immunodeficiency Syndrome (AIDS) Reporting

Only confirmed cases should be reported.

Confirmed case

A confirmed case requires laboratory evidence AND clinical evidence.

A. Laboratory evidence

Definitive diagnosis of HIV-1 infection (see case definition for HIV-1 infection)

B. Clinical evidence

A diagnosis of at least one of the following clinical conditions:

- Candidiasis of the bronchi, trachea or lungs – definitive diagnosis only
- Oesophageal candidiasis – definitive or presumptive diagnosis
- Invasive cervical cancer – definitive diagnosis
- Coccidioidomycosis, disseminated or extrapulmonary – definitive diagnosis only
- Cryptococcosis, extrapulmonary – definitive diagnosis only
- Cryptosporidiosis of more than one month's duration – definitive diagnosis only
- Cytomegalovirus retinitis, with loss of vision – definitive or presumptive diagnosis
- Encephalopathy, HIV related – definitive diagnosis only
- Herpes simplex: chronic ulcer(s) of more than one month's duration
- Bronchitis, pneumonitis or oesophagitis – definitive diagnosis only
- Histoplasmosis, disseminated or extrapulmonary – definitive diagnosis only
- Isosporiasis, chronic intestinal, or more than one month's duration – definitive diagnosis only
- Kaposi's sarcoma – definitive or presumptive diagnosis
- Lymphoma, Burkitt's – definitive diagnosis only
- Lymphoma, immunoblastic – definitive diagnosis only
- Lymphoma, primary, of brain – definitive diagnosis only
- Mycobacterium tuberculosis complex, any site, pulmonary or extrapulmonary – definitive or presumptive diagnosis
- Non-tuberculous mycobacterial disease, disseminated or extrapulmonary – definitive or presumptive diagnosis
- Pneumocystis carinii pneumonia – definitive or presumptive diagnosis
- Pneumonia, recurrent bacterial – definitive or presumptive
- Progressive multifocal leukoencephalopathy – definitive diagnosis only
- Salmonella septicaemia, recurrent – definitive diagnosis only
- Toxoplasmosis – definitive or presumptive diagnosis
- Wasting syndrome due to HIV infection – definitive diagnosis only
- Bacterial infection affecting a child less than 13 year s of age – definitive diagnosis only
- Lymphoid interstitial pneumonia and/or pulmonary lymphoid hyperplasia affecting a child less than 13 years of age – definitive or presumptive diagnosis

Human Immunodeficiency Virus (HIV) Reporting

Clinical features

Asymptomatic infection or seroconversion illness or AIDS.

Case Definition

Demonstration of antibodies to HIV in blood by enzyme immunoassay, confirmed by Western Blot.

****

Well Men's Check

Kirsty Smith, Tristate STI/HIV Project Co-ordinator, Alice Springs.
Warwick Beever, Remote Mens Educator, Sexual Health Unit, Alice Springs.

The Wells Men's Check (WMC) resources were developed by the Tristate STD/HIV project with wide consultation and input from male Aboriginal and non Aboriginal health workers practicing in Central Australia. The Tristate Project came into being as a response to the high rates of STI's in central Australia and potential for an HIV epidemic. Key result areas of the project include:

- clinical management of clients with STIs
- health care provider education and training
- STI/HIV surveillance systems
- education and prevention in communities
- coordination of STI/HIV control activities including facilitating exchange of information

The original version of the WMC form was developed by Wendy Hartly (RAN) and Riley Williams (AHW) with the original layout and design by Kerry Taylor. Among other things, the WMC is seen as a means to increase the uptake of screening for Sexually Transmitted Infections (STI) amongst men. At present it is undergoing further review to assess whether further gains can be achieved in relationship to health promotion and brief interventions.

There is evidence that Aboriginal men in Central Australia are not seeking health advice and treatment for a wide range of problems. This problem can in part be attributed to the lack of male practitioners working in clinics. The aim of the "Well Men's Check" is to increase access to health care by Aboriginal males in Central Australia. Community men have received the concept of 'Well Men's Checks" positively. This is largely attributed to the extensive consultation process that took place in the development of resources. These checks provide a crucial starting point in changing behavioural patterns in Aboriginal men seeking health treatment and care.

The aim of the "Well Men's Check" resources is to facilitate Aboriginal Health Workers to conduct health checks on all men over 15 years of age in their community. The use of diagrams on the form and flip chart were designed to support varying degrees of literacy. Ideally these checks are to be carried out on a yearly basis to monitor changes in health status and initiate early intervention.

The resources include a form based on the adult health check in the CARPA Standard treatment Manual, for recording the check-up, and a flip chart. The flip chart is designed to help practitioners explain to men what will be happening during the checks, giving reasons behind the individual checks, ideal ranges for blood sugar levels and blood pressure etc, and brief intervention messages. It can be utilised either for group use, or one-to-one education in the clinic.

Many deaths, diseases and disabilities experienced by Aboriginal people can be attributed to issues to do with the physical and social environment, and to direct causative factors such as smoking, alcohol, poor nutrition, lack of exercise, poor health knowledge and late presentation. The WMC is designed to be tailored to the individual health needs and circumstances of the man: for example if a man says he drinks in excess of the recommended of the recommended safe levels, education about cutting down is provided; if a known diabetic is being checked, bloods for HbA1C can be taken.

WMC's resources have been distributed to all health services and clinics in Central Australia. Training in the use of the resource is being coordinated by the Sexual Health Unit, Central Australian Remote Health Development Services and Ngaanyatjarra health Service. Training is aimed at male AHW's, RAN's and community men and takes place at Men's Health workshops.

At present most checks are being carried out either as opportunistic checks when the man presents to the clinic, or else as specific WMC forums. There is currently an evaluation-taking place to assess the extent of use, any issues to do with the use of the resources, as well as to iden-

tify any areas of change required in the form. Areas of training and educational needs are also being reviewed. Areas that are being evaluated include information about who is doing the check (gender, AHW/RAN/DMO), and in what context a check is performed (opportunistic or request by man). From preliminary investigation, two areas that at appear to be neglected are follow-up of abnormal results and reference to family history, however evaluation is ongoing. Any findings that result from the evaluation will need to go back to the original steering committees for consultation, as WMC belongs to the community men.

A great deal of time and effort by a variety of individuals has gone into the development of "Well Men's Check". With ongoing commitment to its refinement and use, coupled with adequate training of appropriate people, WMC is a positive initiative towards enhancing the health of Aboriginal men in Central Australia.

Well Men's Checks Resource
Contact Kirsty Smith

Ph 0889517553. Fax 0889517555

****

STIs in the NT: A Refresher Course

The AIDS/STD Unit, in collaboration with the Top End Division of General Practice (TEDGP), is running a refresher course on the diagnosis, investigation, management and population health aspects of STIs in the NT. This has been developed from the results of the 1999 GP STD survey, as well as the findings of the STI/HIV Strategy development process.

When: Saturday, 2nd March
9AM-3PM
Where: TEDGP, Shepherd Street, Darwin

Topics to be covered include:

- Epidemiology of STIs in the NT
- Population Health Aspects of STI Control
- Syndromic management of urethritis and vaginal discharge
- Interpreting Syphilis Serology
- Update in STI diagnostics and therapeutics
- Pelvic Inflammatory Disease – issues in diagnosis and management
- Vulval pain

An application for CME points will be made.
For more information please contact:

Simon Morgan
Telephone: 8946 7079
Email: simon.morgan@racgp.org.au

Stephen Baguley
Telephone: 8922 8929
Email: stephen.baguley@nt.gov.au

Meningococcal Disease in the Northern Territory between 1991 and 2000

Tony McMullen, FAFPHM Trainee; David Peacock, CDC Darwin

Introduction

Each year, around the world, there are at least 500,000 meningococcal disease cases, which result in around 50,000 deaths[1]. Meningococcal disease typically affects children in the 0 to 4 years age group but also occurs in young adults[2]. In Australia, meningococcal disease remains a rare condition but notifications have been increasing since 1987 when the rate was <0.5 per 100,000. This has been attributed to an outbreak of serogroup A disease among the Aboriginal populations in Central Australia, in the early 1990's, and a rise in notifications of group B and C disease thereafter.

The national rate of meningococcal disease has risen from 1.6 per 100,000 in 1991 to 3.1 per 100,000 in 2000. Serogroup B represented 56% of all isolates reported to the National Notifiable Diseases Surveillance System (NNDSS) in 2000. Predominance of serogroup B occurred in all states except Victoria, where 53.7% of cases notified were serogroup C[3].

The causative organism, *Neisseria meningitidis*, is spread to close contacts by droplets from an infected person's saliva through coughing, sneezing, kissing or sharing drink bottles and eating utensils. The bacteria has an incubation period from 2 to 10 days. Asymptomatic nasopharyngeal carriage of meningococcus occurs in approximately 5 to 10% of the general population[4].

Clinical disease results from systemic bloodstream invasion with or without meningeal involvement. Early features of the disease are fever, headache, irritability and restlessness, rapidly progressing to signs of meningitis and septicaemia. A petechial or purpuric rash is present in two-thirds of cases[5].

Early diagnosis, treatment with systemic antibiotics and the introduction of better supportive measures have been associated with a reduction in mortality[6]. Nevertheless, in 1999, the reported overall mortality remained at 9.1%. There was a significantly higher mortality in serogroup C infections **(**14.9%) than in serogroup B infections (6.4%)[7].

Reducing transmission of meningococcal disease in an outbreak depends on eliminating meningococci from any carrier within the network of close contacts of a case. A carrier of meningococcus is considered to be a more efficient transmitter of the disease than the patient who is ill with meningococcal disease. For this reason, chemoprophylaxis with rifampicin, ceftriaxone or ciprofloxacin is given to close contacts of the case[8].

Vaccination with tetravalent polysaccharide vaccines against serogroups A, C, Y and W135 of *N.meningitidis* has only a limited role to play in prevention of spread of outbreaks of meningococcal disease in the community. It has poor immunogenicity against serogroup C in young children, a short duration of antibody response (typically 3 years), fails to reduce carriage rates and there is a 10 to 14 day lag between vaccination and production of adequate levels of protective antibodies[9].

Epidemiology of meningococcal disease in the NT

Meningococcal case details in this paper came from the Northern Territory Notifiable Disease System (NT-NDS) that records all cases notified to the NT Centre for Disease Control. To be notified, cases had to have both a clinically compatible illness and laboratory identification of *N. meningitidis*.

Incidence Rates

In the 10 year period between January 1991 and December 2000, 96 cases of meningococcal disease were notified in the NT with 57.3% of the cases in this decade occurring during 2 peaks of transmission in 1991/92 and 1997/98. The annual average incidence rate for this period was 5.3 per 100,000 population. In 2000 the incidence rate (4.6 per 100,000) remained well above the national average of 3.1 per 100,000.

Table 1 Annual NT incidence rates of meningococcal disease 1991 to 2000

Year	Count	Rate/100,000
1991	14	8.5
1992	12	7.1
1993	2	1.2
1994	5	2.9
1995	8	4.5
1996	9	4.9
1997	15	8.0
1998	14	7.4
1999	8	4.2
2000	9	4.6
Total	96	

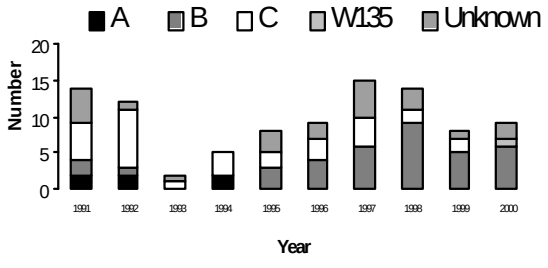
Meningococcal strain differentiation

Of the 96 cases, 37.5% (36) have been confirmed as serogroup B; 31.25% (30) as serogroup C; 6.25% (6) as serogroup A; and 1 as serogroup W135. There have been no serogroup A cases confirmed in the NT since 1994 but, prior to 1994, this serogroup made up 18% of confirmed cases. In 25% of isolates, the serogroup was not identifiable.

Meningococcal strain differentiation has followed the pattern in most other Australian states during the nineties. In the early part of the decade serogroup C strains predominated, whereas serogroup B strains have predominated since 1995.

In the Aboriginal and Torres Strait Islander population, serogroup B was confirmed in 26/64 (40.6%) of cases, and serogroup C in 21 (32.8%). In the non-Aboriginal population serogroup B was confirmed in 9/29 (31%) of cases, and serogroup C in 6 (20.7%) of cases . However, in 12 (41.4%) of the non-Aboriginal cases, the serogroup was unknown.

Graph 1 Annual NT meningococcal disease notifications by serogroup



Seasonality

According to national data, a winter peak of meningococcal disease is usual[10]. In the NT this seasonal pattern is less established. However, for the past decade, most cases have occurred in August and October each year, towards the end of the dry season.

Table 2 Annual NT meningococcal disease notifications by month 1991 to 2000

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOT
1991	4	4		1	1		1		1	2			14
1992	1	2			3		1	2	1		1	1	12
1993									1		1		2
1994		1					1	2				1	5
1995	1					1	2	3		1			8
1996		1		2				1	1	3	1		9
1997			1	2	1	2		2	2	4		1	15
1998	1		1	1		2		5		2	1	1	14
1999	2			1	1	1		2		1			8
2000		1			2	1		1		1	1	2	9
TOT	9	9	2	7	8	7	5	18	6	14	5	6	96

Geographical distribution

The majority of cases (45.8%) have been reported in the Alice Springs region though the highest average annual incidence rate is reported from the East Arnhem region, with an annual incidence rate of 14.9 per 100,000 between 1991 and 2000 (although, on average, there have only been 2 cases/year notified).

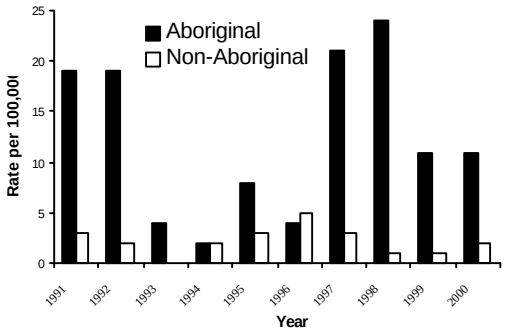
Table 3 Annual NT incidence rate of meningococcal disease by health region (cases/100,000)

	Alice Springs	Barkly	Darwin	East Arnhem	Kath.
1991	29			24	7
1992	17		1	40	
1993		16		8	
1994			2	8	12
1995	3		5	16	
1996			6	8	6
1997	16		4	23	6
1998	37				
1999	10	14	1	7	6
2000	8		3	15	5

Aboriginal status, age and gender distribution

Overall, 66% of cases have been reported in Aboriginal or Torres Strait Islanders. Incidence rates for Aboriginals far exceed those of the non-Aboriginal group, as illustrated in Graph 2.

Graph 2 NT Incidence rates for meningococcal disease by Aboriginal status



In the NT meningococcal disease is predominantly a disease of the under 5 year olds. Between 1991 and 2000 nearly half (47.9%) of confirmed cases were diagnosed in this age group. The average annual rate for the 0-4 year age group during this period was 26 per 100,000 (Range: 6 to 45 per 100,000). Gender distribution is fairly equal with 52% of cases being female**.**

Table 4 Annual NT incidence rates for meningococcal disease by age (cases/100,000)

	0-4	5-14	15-44	45-64	65+
1991	30	7	5	4	23
1992	30	10	4		
1993	6	3			
1994	6	3	3		
1995	17	3	2	4	19
1996	34		3		
1997	45	9	3	3	
1998	39	6	3	6	
1999	28		3		
2000	28	3	2	3	

Outcomes

During this period 4 (4.1%) of the 96 reported cases died, 42.7% survived, and in 54.2% of cases the outcome is not known. This mortality rate is less than half that of the national average reported in 1999.

Group C meningococcal disease in the NT

Between 1991 and 2000, there were 30 notifications of serogroup C meningococcal disease with 20 cases occurring prior to 1996 when the average annual case number was 3.8. Since then the average has dropped to 2.0 cases per year.[11]

Females (62%), Aboriginals (71%) and children less than 5 years have been the most affected (Table 5).

Table 5 NT Group C meningococcal disease notifications by age

Age (yrs)	Count	Percentage (%)	Rate/100,000
0-4	10	33.33	5.7
5-14	8	26.67	2.6
15-44	11	36.67	1.1
65+	1	3.33	1.8
Total	**30**		

Twenty nine (90.6%) of the cases were admitted to hospital and stayed an average of 19 days (Range: 1 to 88 days), though a high rate of co-morbidities in the Aboriginal 15 to 44 years age group may account for some of the longer stays. One case died prior to hospitalisation.

Group C meningococcus accounted for 3 of the 4 known deaths from meningococcal disease reported in the 10 years between 1991 and 2000 in the NT. The case-fatality rate for Group C meningococcal disease in the NT was 9.4 %, which is lower than the national average of 14.9%. In 16 cases where contact-tracing data was available, a total of 574 contacts (average: 39 per case) were treated with prophylactic antibiotics and given counseling or information on meningococcal disease. Approximately half of these received oral rifampicin and the other half received intramuscular ceftriaxone.

To vaccinate...or not? - the serogroup C conjugate meningococcus vaccine

A vaccine has been developed in which the meningococcus C surface polysaccharide is conjugated with a protein to provide long-term immunity and greater efficacy in young children. This vaccine was introduced in the UK in 1999 in response to an increase in the total number of cases of meningococcal disease, and an increase in the proportion of cases caused by group C[12]. One report from Gambia has shown this vaccine to be effective in producing sustained immunological memory over 5 years in infants[13]. In England, another report has described an efficacy of 97 % in adolescents and a 92 % efficacy in infants nine months after a single dose[14].

The vaccine is not yet available in Australia but its possible use is currently being considered by the Australian Technical Advisory Group on Immunisation. In the USA, it has been proposed that targeting of at-risk populations may prove to be the most effective public health measure for controlling meningococcal disease.

Appropriate public health responses to each case of invasive serogroup C meningococcal disease are expensive. An outbreak at 2 Victorian secondary schools this year incurred direct public health costs and vaccine charges of approximately $22,000 per case[15]. The cost-effectiveness of vaccination with a polysaccharide vaccine has recently been estimated in the Australian setting[16]. This study found that vaccination, assuming 5 years duration of protection, was cost-effective in 15 to 19 year olds if the incidence rate was over 14 per 100,000 population.

In purely economic terms, it is unlikely that the use of the serogroup C meningococcal vaccine would be cost-effective in the NT setting, given a peak incidence rate of 5.7 per 100,000 in the under 5 year group in the NT and the 'break-even' incidence rate of 14 per 100,000. In broader terms, non-economic issues such as feasibility of implementation and community risk perception are likely to play a role in the policy decision-making process. The immunization schedule for the highest risk group, Central Australian Aboriginal children under 5 years, already includes nineteen vaccinations before the age of 5 years and compliance with an increase in the number of vaccinations could be contentious issue.

References

1. WHO. Meningococcal disease. WHO report on global surveillance of epidemiprone infectious diseases. Geneva: 2000.
2. Roche P, Spencer J, Merianos A. Editorial: Meningococcal disease. Commun Dis Intell 2001;25:3:126-129.
3. Tapsall J. Annual report of the Australian Meningococcal Surveillance Programme, 2000. Commun Dis Intell; 25:3:113-120.
4. Chin J. Control of Communicable Diseases. APHA Manual, 17th Ed. 2000. 340-342.
5. Mandal BK. Lecture notes on infectious disease. 5th Ed. 1996. 119-120.
6. Communicable Diseases Network Australia. Guidelines for the early clinical and public health management of meningococcal disease in Australia. 2001.
7. Tapsall J. Annual report of the Australian Meningococcal Surveillance Programme, 1999. Commun Dis Intell July 2000; 24:7:181-189.
8. Communicable Diseases Network Australia. Guidelines for the early clinical and public health management of meningococcal disease in Australia. 2001.
9. Communicable Diseases Network Australia. Guidelines for the early clinical and public health management of meningococcal disease in Australia. 2001.
10. Tapsall J. Annual report of the Australian Meningococcal Surveillance Programme, 2000. Commun Dis Intell; 25:3:113-120.
11. Communicable Disease Surveillance System, CDC, THS, Darwin, NT. October 2001.
12. Wise J. UK introduces new meningitis C vaccine. BMJ 1999; 319: p278.
13. MacLennan et al. Immunologic memory 5 years after meningococcal conjugate vaccination in infancy. J Infect Dis. 2001 Jan 1:183(1):97-104.
14. Ramsey ME, Andrews N, Kaczmarski EB, Miller E. Efficacy of meningococcal serogroup C conjugate vaccine in teenagers and toddlers in England. Lancet 2001:357.
15. Robinson et al. An outbreak of serogroup C meningococcal disease associated with a secondary school. Commun Dis Intell. 2001 Aug; 25(3): 121-5.
16. Skull SA, Butler JR, Robinson P, Carnie J. Should programmes for community-level meningococcal vaccination be considered in Australia? An economic evaluation. Int J Epidemiol. 2001 Jun; 30 (3) : 571-8.

****

New National Meningococcal Guidelines Released

The *Guidelines for the early clinical and public health management of meningococcal disease in Australia*, have recently been released by the Communicable Control Diseases Network Australia (CDNA). The CDNA Meningococcal Disease Guidelines Working Party considered the literature, practices and published recommendations in Australia and overseas in developing the document.

The guidelines are intended primarily:

- to assist primary care practitioners with the emergency management of cases of suspected invasive meningococcal disease; and
- to assist public health practitioners with the prevention of further cases after a case of invasive meningococcal disease has been reported.

Topics covered include:

- emergency management of suspected invasive meningococcal disease in general practice;
- early (emergency dept) hospital management of suspected invasive meningococcal disease;
- laboratory tests and their use;
- public health management of sporadic cases of invasive meningococcal disease;
- public health management of outbreaks of cases of invasive meningococcal disease; and
- reporting and public health surveillance of meningococcal disease.

If you have not already received a copy of the guidelines they are available on the Department of Health and Aged care web site at http://www.heatlh.gov.au or via the NT Department of Health & Community Services intranet site at http://internal.health.nt.gov.au/publich/cdc/cdc.htm

****

'About giving vaccines' – An accredited course for vaccine providers An evaluation of the first four years

Nan Miller, CDC, Darwin

Background

In 1996/97, a short course, 'About giving vaccines', was developed by the Centre for Disease Control (CDC) in response to requests from Northern Territory (NT) health care providers for formal training in the management and administration of vaccines and to fulfil the National standard for childhood immunisation practices. Standard 13 stated, "*Vaccines are administered by properly trained individuals who receive ongoing education and training on current immunisation recommendations*".

Course development

Curriculum

A committee of key stakeholders representative of: rural and urban nursing; Aboriginal education; Industrial organisations; urban and rural medical officers; Northern Territory Education and Training Authority (NTETA); Industry, Training, Authority Board; and Territory Health Services was identified.

CDC developed a competency based course curriculum, incorporating the National Framework

for Recognition of Training (NFROT). The curriculum committee discussed, amended and endorsed the final curriculum with the understanding that the course would be offered in two modes:

- External for independent study (30 hours) for nurses (registered, enrolled and nurse educators), doctors and Aboriginal Health Workers (AHW); and
- A facilitated 5-day workshop for Aboriginal Health Workers who are not comfortable with the self directed learning mode.

The 'About giving vaccines' course was recognised and Nationally accredited through NTETA in July 1996. The framework for evaluation included process, impact and outcome.

Training manual

After successful accreditation of the curriculum, a resource development committee was nominated including: Senior Health, English and Linguists lecturers, Batchelor College; Aboriginal Health Worker Trainer; Public Health nurse; and two Territory Health Services Staff Development Officers. Course resources were selected and a training manual researched and written by Senior Project Officer, CDC in collaboration with the committee.

The draft-training manual was trialed by 19 registered nurses and 14 registered AHWs for both modes of delivery in February 1997. Three months after the trial we evaluated their response to the presentation, language and content of the training manual. All recommendations were considered by the committee and implemented where appropriate. The training manual was finalised and the course was endorsed for full implementation in July 1997.

Methods

Process/participation

The course was advertised to all known NT immunisation providers. We developed and maintained an electronic register of all applicants/ participants for the course including: demographic details; profession; home and work location; relevant dates for enrolment, completion, written and clinical assessment; written assessment score; and clinical assessment outcome. We analysed the participant register by profession to determine the number of enrolments, number who completed the course, passed the written assessment (=> 80%) and received a Statement of Attainment (the determinant of clinical competency).

Outcome/participant satisfaction

An evaluation questionnaire was included with the written assessment booklet. Nearly all participants who completed and returned the written assessment responded to the evaluation. Responses to course content, coverage of immunisation issues and skills learned were analysed from the written evaluation. These results were used as an indicator of participant satisfaction. Clinical competency assessment and attainment were used as outcome indicators.

Results

All results were based on the starting time for each professional group (i.e. external mode – nurses, July 1997, medical practitioners, December 1997, - and workshop mode January 1998). For the purpose of evaluation enrolment cut off was 30 September 2000 as three months is allowed from enrolment to completion of the written assessment. All evaluations reports for the period July 1997 to December 2000 were analysed.

Process/participation/outcome

External course mode

From July 1997 to September 2000, 801 nurses, 27 AHWs and 58 medical practitioners enrolled for the self, directed external mode of the vaccine course. Of these 743 (84%) completed the course material and took the written examination which represented 694 of 801 (87%) nurses, 16 of 27 (59%) AHWs and 33 of 58 (56%) doctors. Table 1 shows the results for the 743 providers who completed the written assessment. Not all participants who passed their written assessment underwent or successfully completed a clinical competency assessment. Participants must be assessed as clinically competent to receive the 'Statement of Attainment'.

Table 1 Results for external mode participants who completed the course material and the written assessment

Profession	Written Assessment (No.)	Score (%)	Statement of Attainment No. (%)
Nurses	137	100	114 (16)
	391	90-99	326 (47)
	81	80-89	61 (9)
	85	<80	10 (1)
Sub-total	**694**	**n/a**	**511 (73)**
AHWs	3	100	3 (19)
	3	90-99	3 (19)
	5	80-89	4 (25)
	5	<80	0 (0)
Sub-total	**16**	**n/a**	**10 (63)**
Doctors	8	100	7 (21)
	18	90-98	15 (45)
	5	80-89	3 (9)
	2	Unknown	1 (3)
Sub-total	**33**	**n/a**	**26 (79)**
Total	**743**		**547 (74)**

The exam scores for 651 were within the acceptable score range of 80% or above with 90 less than 80%, and 2 scores were not recorded. Participants who did not complete the course work and those who completed but did not have the clinical assessment gave 'lack of time' as the primary reason. For AHWs 'lack of support from co-workers' was similar to that of time limitations. Other reasons for not completing included – position change, recreation leave, leaving the NT and no clinical assessor available near work area or simply forgot.

With the nurses, 801 enrolled for the course but only 547 (64 %) received accreditation; 107 (13%) of those enrolled did not proceed to written assessment and 183 (23%) took the written assessment but did not gain competency. For the 27 AHWs, 10 (37%) received accreditation, 11 (41%) did not proceed to the written assessment and 6 (22%) took the written assessment but did not gain competency.

Workshop mode

The workshop mode for AHW was not offered until January 1998. From January 1998 to September 2000 122 AHW enrolled for the workshop mode of the course. Seven workshops were held in the Top End with 5 being in Aboriginal communities and 2 in Darwin. The Central Australia Remote Health Training Unit (CARHTU) conducted an equal number in Central Australia. Of the 122 workshop participants, 119 completed the course material and took the written examination and 107 successfully completed the clinical assessment. Table 2 shows the results for the 119 AHW who completed the written assessment.

Table 2 Results for workshop mode participants who completed the course material and the written assessment

Profession	Written Assessment (No.)	Score (%)	Statement of Attainment No. (%)
AHW	26	100	26 (22)
	54	90-99	51 (43)
	34	80-89	30 (25)
	5	<80	0 (0)
Total	**119**	**n/a**	**107 (90)**

The written assessment scores for 114 (96%) were within the acceptable range, 5 scored lees than 80% and 3 did not complete the workshop. Workshop participants have the option of having their clinical competency assessment on the final day of the workshop or at a later date in their home clinic. All 7 who passed the written assessment but did not have the competency assessment had deferred.

Process/ participant satisfaction/outcome

A written assessment was completed by 484 deidentified participants between July 1997 and December 2000.

Participants were asked to rate the training manual as shown in Table 3 for layout, style, language, visuals and information coverage.

Table 3 Participant responses to the training manual

Course materials	Unsat.	Sat.	V. good	Total responses
Layout of material	4	144	332	480
Style of presentation	3	132	343	478
Language	4	138	336	478
Visual (pictures, graphics)	1	146	331	478
Coverage of information	2	101	377	480

Nearly all participants rated each of the 5 points. Less than 1% felt that the course material was unsatisfactory, 28 % rated all points as satisfactory and 72% as very good with 79% rating coverage of information as very good. In summary, 91% of 480 respondents indicated that they gained new skills/knowledge from this course that will change their vaccination practices. All (100%) indicated that they would recommend this course to other doctors, nurses or AHWs. Table 4 shows participant responses to course content.

Table 4 Participant responses to course content

Reaction to Content	No (%)
No response	11 (2%)
Heard it all before	4 (1%)
Adequately covered	456 (94%)
Not enough information	5 (1%)
Too complex	8 (2%)
Total	**484 (100%)**

When asked whether important vaccination issues were adequately covered, 70% (337) said yes, 11% (50) said no and 20% (97) gave no response.

Discussion

All vaccine providers have welcomed the opportunity to learn more about vaccination. This accredited course has been very popular with doctors, nurses and AHWs alike. This evaluation indicates that the training manual and other course materials are presented in an appropriate format; style, language and the contents adequately cover the needs of the participants.

Of the 859 nurses and doctors who enrolled for the self directed mode, 62% (536) achieved clinical competency. Some AHWs did well with this learning mode but a much larger proportion completed and gained competency through the workshop mode. Since AHWS make up a significant proportion of NT vaccine providers, it is essential to provide enough workshops to meet their needs. Workshop locations must be considered to improve access for both urban and rural health workers.

Although enrolments were good it is a concern that 36% of nurses dropped out or did not gain a 'Statement of Attainment'. The written assessment scores for all groups suggest that a pass mark (80%) is attainable yet a proportion of nurses did not pass on the first attempt. Historically nurses are the primary provider of vaccination and this may have led some to assume their knowledge was adequate to pass the written component without due study of course material. Successful completion of this course needs to be a priority with health services, clinical managers and senior nursing staff as well as vaccinating staff.

It was pleasing to have 58 general practitioners enrol in the course. All of these will have the training materials to use as reference material even though they did not complete to competency assessment. Although time constraints were the primary reason for non-completion it is possible that the goal was the learning and not the final recognition, as most NT general practitioners do not administer vaccines but delegate this function to their practice nursing staff.

This evaluation suggests that the process has been appropriately addressed and at this time there are no plans to change the presentation or the content of the materials. However, it is important that the materials are updated in a timely manner to keep pace with immunisation changes both locally and nationally.

Historically, health staff have called CDC for advice on vaccine management and/or administration questions. Although a formal assessment was not carried out, anecdotally it has been perceived that the immunisation questions to CDC have decreased since the introduction of this short course. In addition, the types of questions have changed from quite simple to more complex issues. It appears that providers have gained more confidence about vaccines and how and when they can be used. In order to further evaluate outcome of the course, consideration should be given to developing a new indicator based on vaccination errors. Staff should be encouraged to report all vaccine errors so they can be recorded, monitored and used to further develop and improve the course 'About giving Vaccines'.

Acknowledgements

A special thanks to Pauline Rosenow for dedication to course administration, competency assessment and assistance with accreditation; and Mark Ramjan for a his contribution to the development and presentation of the workshop mode.

****

NT Immunisation Coverage

Christine Selvey, Head of Immunisation, CDC, Darwin

Australian Childhood Immunisation Register

The Australian Childhood Immunisation Register (ACIR) publishes immunisation coverage rates for 2 cohorts of children for each jurisdiction every quarter.

Rates are calculated for a 3 month cohort of children aged 12-<15 months who, to be considered fully immunised, must have received the following vaccinations before 12 months of age:

- dose 3 of diphtheria, tetanus and pertussis vaccine (DTP);
- dose 3 of poliomyelitis vaccine; and
- a primary vaccination course against *Haemophilus influenzae* type B (Hib) (either dose 2 of PRP-OMP vaccine or dose 3 of HbOC vaccine).

These vaccinations should be completed by 7 months of age.

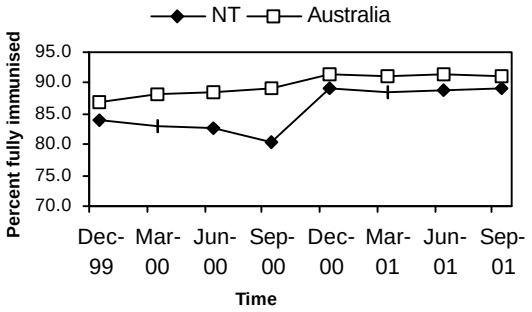
Rates are also calculated for a 3 month cohort of children aged 24-<27 months who, to be considered fully immunised, must have received the following vaccinations before 24 months of age:

- dose 4 of DTP vaccine;
- dose 3 of poliomyelitis vaccine;
- dose 1 of measles, mumps and rubella (MMR) vaccine given at or after 11 months of age; and
- a primary course and one booster of Hib vaccine.

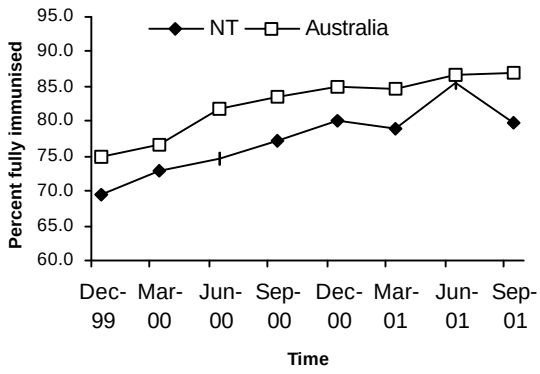
These vaccinations should have been administered by 19 months of age.

ACIR coverage rates for NT children in these 2 cohorts have continued to rise during the last 2 years (Graphs 1 and 2). Rates for all jurisdictions have also increased during this time with the overall rate for Australia for 12-<15 month old infants increasing from 87.0% to 91.2% between December 1999 and September 2001. ACIR data quality has improved with increased efforts to encourage reporting of immunisation data and a variety of data cleaning projects successfully implemented throughout Australia. In the past, ACIR immunisation coverage rates have been thought to underestimate true immunisation coverage by around 4-7%([1]). The National Centre for Immunisation Research and Surveillance (NCIRS) has recently undertaken a new survey of parents of children showing as under-immunised on ACIR. This survey indicates that, nationally, the ACIR underestimated coverage at 12-<15 months by 2.7% and at 24-<27 months of age by about 5%([2]).

Graph 1 Percentage of children aged 12-<15 months assessed as fully immunised for the NT and Australia



Graph 2 Percentage of children aged 24-<27 months assessed as fully immunised for the NT and Australia



While Australian immunisation rates are increasing the gap between the NT rates and the Australian rate is decreasing, particularly for the 12-<15 month cohort. Considerable effort has been invested in a variety of areas to improve immunisation data reporting and improve matching of NT immunisation data with Medicare generated records on ACIR. These projects have been collaborative with a wide range of immunisation stakeholders, including the Divisions of General Practice; both public and private (Aboriginal Medical Services and General Practitioners) vaccine service providers; Medicare; ACIR; and the Centres for Disease Control throughout the NT, working together to collect data and institute sustainable processes. This work includes:

- emphasising the importance of accurate Medicare registrations and the reporting of Medicare numbers with immunisation data;
- processes for Medicare enrolment of neonates prior to hospital discharge;
- identifying children with duplicate Medicare records and merging immunisation data;
- matching previously reported data with ACIR records showing incomplete immunisations;
- collection of data not previously reported;
- detailed analysis of data for the cohorts due for assessment in the three months prior to calculation of the ACIR coverage rate; and
- vaccinating children found to be truly under-immunised.

Immunisation timeliness

The algorithms used to calculate the ACIR jurisdictional coverage rates allow for the child to be immunised up to 5 months late (11 months for MMR vaccine and the third dose of PRP-OMP vaccine) and still be included as fully immunised. This is a generous margin and so these ACIR coverage rates are not a good reflection of immunisation timeliness. Additionally there is a 3 month lag between the cut-off for vaccination (the 12 and 24 month birthdays) and the date for assessment to allow time for data to be recorded on the ACIR.

However, if an even longer period is allowed to completion of the immunisations more NT children will show as fully immunised. Data extracted from the NT Childhood Immunisation Database on 23/11/2001 shows that for the 12-<15 month cohort assessed on 30/03/2001 (date of birth between 01/04/2000 and 30/06/2000 inclusive) 29 children so far have been vaccinated after they turned 12 months of age. The average number of days after the 12 month birthday that the child was vaccinated was 89, the median was 99 and the range was 6 to 171. Including these children as fully immunised increases the coverage rate by 3.11% to 92.4% (Table 1). Had these children been vaccinated on time, the NT coverage rate would have been above the national average of 91.2%.

Similarly, for the 24-<27 month cohort (date of birth between 01/04/1999 and 30/06/1999 inclusive), including children showing as immunised after turning 24 months of age (43 children) increased the NT immunisation coverage by 4.74% from 79.8% to 84.6% (Table 1). The average number of days after the child turned 24 months of age that the child was vaccinated was 58, the median was 48 and range was 1 to 214.

The additional immunisation coverage achieved by including late immunisations is greater in the NT for these 2 particular cohorts than occurs nationally. The NCIRS survey of parents found that immunisations given by 5-8 months after the 1st or 2nd birthday (respectively for the 2 cohorts) increased coverage for each cohort by an estimated 1.5%([2]).

Table 1 Cohorts assessed by ACIR on 30/09/2001 showing the percentage fully immunised by the age of 12 and 24 months respectively, and the re-calculation of the coverage rate with children immunised as of 23/11/2001

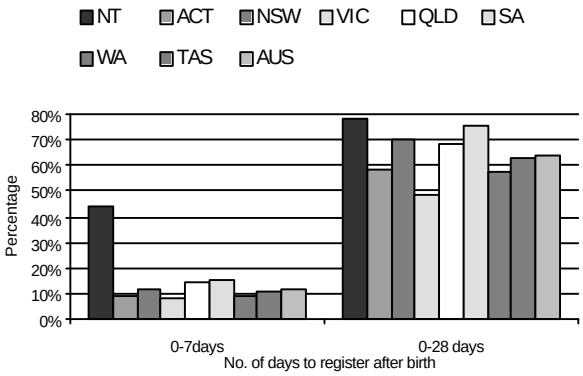
Cohort	No.	No. vaccinated on time	No. vaccinated late	Coverage on time	Coverage late	Difference
12-<15 month	931	831	29	89.3%	92.4%	3.11%
24-<27 month	907	724	43	79.8%	84.6%	4.74%

Medicare enrolment within the first 7 days of birth

On 1 October 2000, a process was initiated in all NT public hospitals to enrol Aboriginal infants with Medicare prior to hospital discharge. This is followed up with liaison between Community Health Centres and Medicare in Casuarina so that the child's name is added to the Medicare record when the child is named (personal communication, Liz White, Medicare). Mothers of non-Aboriginal children are also being encouraged to enrol their new babies with Medicare before leaving hospital. The objective is to ensure that all neonates are enrolled with Medicare and reduce subsequent re-enrolment and the generation of duplicate Medicare registrations. Early registration also allows the first immunisations to be matched with an ACIR record.

The process for early Medicare enrolment for Aboriginal children has been very successful in reducing the lag time between the date of birth and the date of Medicare enrolment. Before this process was implemented, the NT had the longest Medicare enrolment lag times of all jurisdictions. Data from the most recent Medicare Birth Lag Report shows that the NT has a greater proportion of infants who are enrolled with Medicare within 7 days of birth than any other jurisdiction (Graph 3). The first infants enrolled with Medicare under this scheme (born after 01/10/2000) are due for assessment of their immunisation status at 12-<15 months of age on 31/03/2001. It is hoped that the improvement in the timeliness of Medicare enrolment will be reflected in a reduction in the size of the cohort of NT children due for assessment (reduced duplicate ACIR records) and perhaps an increase in immunisation coverage (better matching of NT immunisation data with ACIR records).

Graph 3 Percentage of infants registered with Medicare within 7 days, and within 28 days of birth by jurisdiction



References

1. Human Capital Alliance. Evaluation of the Australian Childhood Immunisation Register. 2000 Apr. Report prepared for the Department of Health and Aged Care.
2. National Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases. Immunisation Coverage: Australia 2001 Part 1 Accuracy of the Australian Childhood Immunisation Register in estimating coverage at 12 and 24 months of age. 2001 Sep.

****

Editorial Comment

Vicki Krause, Director, CDC, Darwin

The Immunisation Section of CDC, NT Department of Health and Community Services have been very committed to improving immunisation coverage and to also having our coverage rates accurately reflected in national reporting. This review of NT coverage highlights the timeliness issue or rather lack of timeliness. This delay in receiving immunisations compromises the potential effectiveness of this protective measure to those most vulnerable to the vaccine preventable diseases—the very young. Many of the efforts being put into improved reporting should flow onto more timely information being available to the vaccine providers and parents and enhance more timely immunisation acquisition. We'll look forward to future reports to monitor the progress.

****

Conjugate pneumococcal vaccine coverage

Christine Selvey, Head of Immunisation, CDC, Darwin

Background

A 7 valent conjugate pneumococcal vaccine (7vPCV) was introduced onto the NT Childhood Immunisation schedule on 1 June 2001 for eligible infants born on or after 1 April 2001. Eligible infants are all NT Aboriginal infants and non-Aboriginal infants in Central Australia. A small number of non-Aboriginal children in the Top End have medical risk factors that make them eligible for 7vPCV. The vaccine is due at 2, 4 and 6 months of age. A booster of 23 valent polysaccharide pneumococcal vaccine is scheduled at 18 months of age for Indigenous children.

Catch up vaccination of older children with 7vPCV began officially in August/September 2001. Catch up is recommended for Indigenous children in Central Australia up to 5 years of age (born after 01/09/1996), and up to 2 years of age (born after 01/09/1999) for Aboriginal children in the Top End and non-Aboriginal children in Central Australia.

Methods

Data extracted from the NT Childhood Immunisation Database (NT CID) on 23/11/2001 was analysed to determine the proportion of infants on the database born between 01/04/2001 and 01/09/01 and eligible for 7vPCV who have received their first dose of this vaccine (due at 2 months). The number of children from this birth cohort who have received at least one dose of 7vPCV was also represented as a percentage of the eligible cohort who have received their first dose of diphtheria, tetanus pertussis and hepatitis B (DTPH) vaccine. Non-Aboriginal children in the Top End with medical risk factors for 7vPCV were not included in the analysis.

Data from the NT CID on 23/11/2001 was also analysed to determine the proportion of children eligible for 7vPCV catch up who had received at least one dose of 7vPCV.

Results

Of infants born between 1/4/2001 and 1/9/2001 who are eligible for 7vPCV, 74% had received at least one dose of 7vPCV according to the NT CID on 23/11/2001. Of those who had received their first DTPH vaccination due at 2 months of age, 89% had also received 7vPCV. Data by NT district is shown in Table 1.

Table 1 Proportion of infants born between 01/04/01 and 01/09/01 that are eligible for 7vPCV who have received at least one dose of 7vPCV by district, and the proportion of those who had had DTPH vaccine who had also received 7vPCV

District	No. eligible infants	No. had 7vPCV	% eligible infants had 7vPCV	No. had DTPH	% of those who had DTPH who had 7vPCV
Darwin Urban	98	45	46%	71	63%
Darwin Rural	109	95	87%	102	93%
Katherine	123	71	58%	92	77%
East Arnhem	111	97	87%	98	99%
Alice Springs*	365	290	79%	310	94%
Total	**806**	**598**	**74%**	**673**	**89%**

* Includes Barkly district

As shown in Table 2, overall in the NT, 40% of children who are eligible for 7vPCV catch-up have received at least one dose of this vaccine. The coverage rate varies from 22% in Darwin Urban to 81% in East Arnhem.

Table 2 Proportion of infants eligible for 7vPCV catch-up who have received at least one dose of 7vPCV by district

District	No. Eligible for 7vPCV catch-up	No. had 7vPCV	% eligible for catch-up had 7vPCV
East Arnhem	406	327	**81%**
Darwin Urban	243	53	**22%**
Darwin Rural	402	204	**51%**
Katherine	402	93	**23%**
Alice Springs*	2838	1044	**37%**
Total	**4291**	**1721**	**40%**

* Includes Barkly district

Discussion

Coverage at 2 months

The proportion of infants born between 1/4/2001 and 1/9/2001 with the first dose of DTPH due at 2 months of age recorded on the NT CID, who also have at least 1 dose of 7vPCV recorded on the NT CID ranges from 63% in Darwin Urban to 99% in East Arnhem. The low rate in Darwin Urban is probably due to both under-identification of Aboriginal status at the time of vaccination and some provider/parent resistance to receiving 3 injections at a single vaccination visit. It is also possible that there some misclassification of Aboriginal status on the CID, with urban children who are not considered to be Aboriginal by their parents being recorded as Aboriginal on the CID.

The coverage rate in Katherine district is also lower than in other districts of the NT. This is due to unavoidable delays in provider education in May/June and also due to disruption of 7vPCV supply to health centres. Vaccine supply in the Katherine district was delayed due to refrigerator failure and vaccine ordering problems.

Darwin Rural, East Arnhem and Alice Springs/Barkly districts all have coverage of over 90% of children who have had a dose of DTPH vaccine having had a dose of 7vPCV. This demonstrates a high degree of awareness and acceptance of this vaccine in these districts. The need for 3 injections at the 2 and 4 month immunisation visits has not been a significant barrier to conjugate pneumococcal vaccine uptake in these districts: this is contrary to initial expectations before the introduction of the vaccine.

Catch-up

The capacity of remote health centres to deliver an immunisation catch-up program is dependent on, amongst other factors, staffing levels and competing priorities. It is an achievement that so many communities have managed to begin their catch-up program.

East Arnhem district has achieved very high coverage of children eligible for catch-up, given that the program has been implemented for less than 3 months at the time of analysis. While Alice Springs/Barkly districts have vaccinated only

37% of their eligible children (dose 1), they have vaccinated over 3 times more children than any other district. This reflects the fact that a far greater proportion of all children up to 5 years of age in these districts require catch-up vaccination.

Providers in Darwin Urban rely on parents of Aboriginal children to present to an immunisation provider for catch-up vaccination. The conjugate pneumococcal promotion campaign (television and radio advertisements) was shown in Darwin but, because there is a lower proportion of eligible infants in Darwin, the advertising campaign was not as prominent in Darwin as elsewhere in the NT. Achieving high coverage of 7vPCV catch-up in Darwin will remain a challenge and may require alternative promotion strategies.

****

Disease Control Staff Updates

Alice Springs

Naomi Main has been appointed as the Invasive Pneumococcal Disease Project Officer in Alice Springs. Naomi has been in the NT since June 1999 and has been part of teams working on scabies, otitis media, group A streptococcus, rabies and environmental health projects. She has a Bachelor of Science (Hons) and is loving life in the NT.

The newly created position of Team Leader CDC, Central Australian Service Network has been filled by **Darren Armitage**. Darren has spent the last 2 years working in Health Development in Alice Springs and prior to that was in the Tropical Public Health Units in Townsville and Cairns.

East Arnhem

Kim Machen has recently taken over the position of Women's Health Educator in East Arnhem. Kim has previously worked at Alice Springs and Gove Hospital and Laynhapuy Homelands Health Service.

Darwin

The new role of Invasive Pneumococcal Disease Project Officer has been filled by **Heather Cook**. Heather and her family are travelling around Australia but liked Darwin so much they have decided to stay.

****

NT Malaria notifications

Merv Fairley, CDC, Darwin

Sixteen notifications of malaria were received for the third quarter of 2001. The following table provides details about where the infection was thought to be acquired, the infecting agent and whether chemoprophylaxis was used.

Number of cases	Origin of infection	Reason exposed	Agent	Chemoprophylaxis
2	PNG	holiday	P.falc & P vivax	yes
1	PNG	holiday	P.vivax	yes
1	PNG	work	P.vivax	yes
1	Malaysia	work	P.vivax	yes
1	India	holiday	P.falc	no
1	Indonesia	work	P.vivax	no
2	East Timor	work	P.vivax	yes
1	East Timor	work	P.falc	no
2	East Timor	work	P.falc & P vivax	no

****

Points to note regarding notifications on page 33

Acute Rheumatic Fever
A Rheumatic Heart Disease Project Officer has been carrying out active surveillance of Acute Rheumatic Fever in Alice Springs in 2001.

Barmah Forest
The reason for the increase in Barmah Forest notifications is unclear. There may be more requests to do specific BFV testing but this information is not known.

Campylobacteriosis
There has been a significant increase in campylobacteriosis notifications particularly in Central Australia; the reasons are unclear. All of the cases appeared sporadic with no identified links.

Influenza
Compared to last year, influenza cases have occurred earlier in the Alice Springs district.

Pertussis
The pertussis figures show the beginning of the outbreak in the NT which started in Alice Springs. (see front page article)

Pneumococcal Disease
Case numbers are up in the Alice Springs Aboriginal 15-50 year old age group in 2001.

Rotavirus
There has been a substantial rotaviral disease outbreak in the Northern Territory this year, predominantly affecting children under 2 years.

****

NT notifications of diseases by districts
1 July to 30 September 2001 and 2000

Disease	Alice Springs		Barkly		Darwin		East Arnhem		Katherine		Total	
	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000
Acute Rheumatic Fever	12	0	1	0	0	0	0	1	3	0	16	1
Adverse Vaccine React.	1	0	1	0	2	4	1	0	1	1	6	5
Arbovirus infections												
Murray Valley Enceph	0	0	0	0	1	1	0	0	0	0	1	1
Barmah Forest Virus	1	0	0	0	8	1	0	0	1	0	10	1
Dengue	0	0	0	0	7	9	1	0	0	1	8	10
Ross River Virus	0	0	2	1	10	6	1	0	0	1	13	8
Atypical Mycobacteria	0	0	0	0	1	1	0	0	0	0	1	1
Campylobacter	31	16	1	3	30	23	3	1	8	7	73	50
Chlamydia	174	166	3	2	114	91	20	23	25	28	336	310
Chlamydia Conjunct.	0	0	0	0	3	0	0	0	0	0	3	0
Cryptosporidiosis	3	5	0	1	5	4	4	3	8	4	20	17
Donovanosis	3	0	0	0	2	0	0	0	2	0	7	0
Glomerulonephritis	0	0	0	0	4	4	0	0	2	2	6	6
Gonococcal Disease	256	252	8	13	68	56	25	25	37	38	394	384
Gonococcal Conjunct.	0	1	0	0	0	0	0	0	0	0	0	1
Gon. Opthalmic.Neonatal	0	1	0	0	0	0	0	0	0	0	0	1
Haemophilus Inf type b	0	0	0	0	0	0	0	1	0	0	0	1
Hepatitis A	1	1	0	0	6	8	2	1	2	0	11	10
Hepatitis B	0	1	1	0	0	0	0	0	0	0	1	1
Hepatitis C (prevalence)	11	21	0	1	37	32	2	0	2	2	52	56
HIV infections	0	0	0	0	0	2	0	0	0	0	0	2
HTLV-1	10	8	0	0	3	0	0	0	1	1	14	9
Influenza	24	3	0	0	10	7	4	0	0	1	38	11
Leprosy	0	0	0	0	0	1	0	0	0	0	0	1
Leptospirosis	0	0	0	0	0	0	0	0	0	1	0	1
Malaria	0	1	0	0	9	28	3	0	0	2	12	31
Melioidosis	0	0	0	0	0	2	0	0	0	0	0	2
Meningococcal Infection	1	0	0	0	2	0	0	1	0	0	3	1
Mumps	0	0	0	0	1	0	0	0	0	0	1	0
Ornithosis	0	0	0	0	1	0	0	0	0	1	1	1
Pertussis	25	1	1	0	7	0	0	0	3	0	36	1
Pneumococcal Disease	21	9	0	0	10	3	1	0	0	2	32	14
Rotavirus	9	26	0	3	156	20	43	13	41	5	249	67
Salmonella	15	11	3	0	33	32	4	4	13	9	68	56
Shigella	7	11	1	1	4	7	2	3	9	1	23	23
Syphilis	80	61	3	0	10	26	6	10	20	9	119	106
Trichomonas	64	81	6	1	68	96	44	87	53	73	235	338
Tuberculosis	1	1	0	0	8	10	1	1	2	1	12	13
Typhus	0	0	0	0	0	1	0	0	0	0	0	1
Yersiniosis	0	0	0	0	1	2	0	0	0	0	1	2
Total	**750**	**677**	**31**	**26**	**621**	**477**	**167**	**174**	**233**	**190**	**1802**	**1544**

Points to note regarding notifications:

- Amoebiasis, Murray Valley Encephalitis, Kunjin, Kokobera, Botulism, Brucellosis, Chancroid, Cholera, Congenital Rubella Syndrome, Congenital Syphilis, Diphtheria, Gastroenteritis, Haemolytic Uraemic Syndrome, Hepatitis C (incidence), Hepatitis D & E, Hydatid Disease, Legionnaires Disease, Listeriosis, Lymphogranuloma venereum, Measles, Poliomyelitis, Rubella, Typhoid, Vibrio Food Poisoning and Viral Haemorrhagic Fever are all notifiable but had "0" notifications in this period.

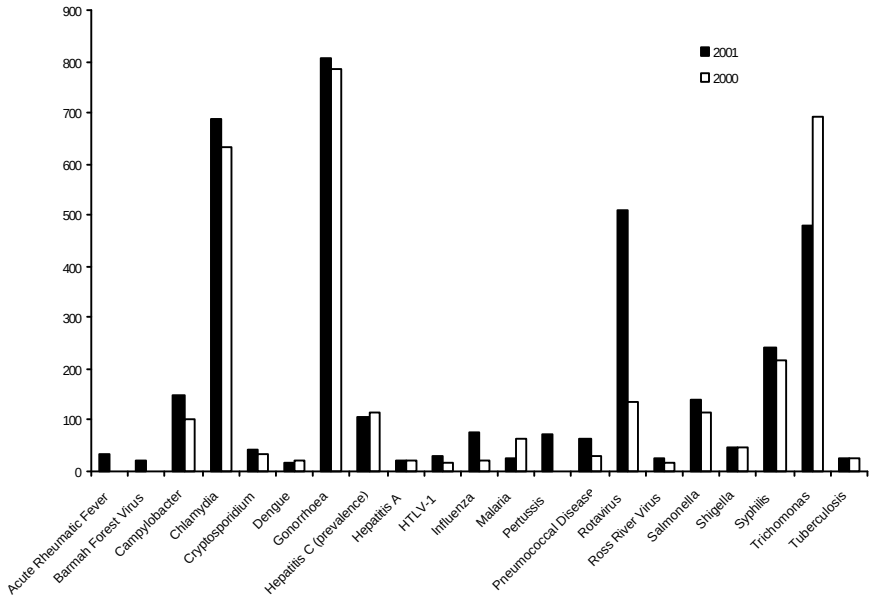
Notification of infectious diseases—Telephone: 8922 8044 Fax: 8922 8310

Notified cases of vaccine preventable diseases in the NT by report date 1 July to 30 September 2001 and 2000

DISEASES	TOTAL		No. cases among children aged 0-5 years	
	2001	2000	2001	2000
Congenital rubella syndrome	0	0	0	0
Diphtheria	0	0	0	0
Haemophilus influenzae type b	0	1	0	0
Hepatitis B	1	1	0	0
Measles	0	0	0	0
Mumps	1	0	0	0
Pertussis	36	1	13	0
Poliomyelitis, paralytic	0	0	0	0
Rubella	0	0	0	0
Tetanus	0	0	0	0

* Mumps is largely under-reported

NT wide notifiable diseases 1 July to 30 September 2001 and 2000



Rates < 10/100,000 not listed
NT est resid. Pop.—195,905 supplied by Epidemiology & Statistical Branch, THS