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Hepatitis B screening among women birthing in Alice Springs Hospital, and immunisation of infants at risk

Rosalie Schultz, CDC Alice Springs

Hepatitis B infection is an important cause of morbidity and mortality worldwide, leading to 620 000 deaths per year.^{1,2} Australian Aboriginal communities were identified in the 1960s to be a population with high prevalence of hepatitis B infection.³ and they remain so today.⁴

Hepatitis B virus is transmitted vertically, and from blood or sexual secretions from an infected person penetrating skin or touching a mucosal surface. In populations where rates of infection are high, vertical transmission from infected mothers to their infants and young children accounts for a large proportion of hepatitis B infections.² This may include Australian Aboriginal populations.⁴

To prevent vertical transmission of hepatitis B, Australian recommendations are for screening of all pregnant women for infection. All infants should receive active immunisation with a birth dose and a further 3 doses of hepatitis B vaccine over 6 or 12 months. The birth dose should be administered within 7 days of birth. In addition, babies born to infected women should be passively immunised by administration of hepatitis B immunoglobulin within 12 hours of birth. These recommendations can reduce transmission by 90%, and have been recommended in Australia since 2000.⁴ Active immunisation alone, including a birth dose of vaccine, reduces transmission by 70%. This provides an effective safety net in case

of delays or errors in testing and reporting of mother's status.^{4,5}

An audit of the completeness and timeliness of hepatitis B immunisation to infants born to women in

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Editor: Vicki Krause

Assistant Editors: Lesley Scott
Peter Markey
Chris Nagy
Julie Graham

Production Design: Lesley Scott

Website: <http://www.nt.gov.au/health/cdc/bulletin/index.shtml>
Email: vicki.krause@nt.gov.au

Centre for Disease Control
PO Box 40596
Casuarina
Northern Territory 0811



Northern Territory Government
Department of Health and Community Services

Darwin infected with hepatitis B has been published.⁶ The present study was performed to provide comparative data for Alice Springs.

Methods

This audit followed the methods used in the study of women who gave birth at Royal Darwin Hospital in 2003:⁶ and involved;

1. Examining hospital medical records of all women who gave birth at Alice Springs Hospital in 2005 for hepatitis B surface antigen (HBsAg) screening, either during the current pregnancy, or prior. Which of these hospital records with discharge codes for hepatitis B infection was noted.
2. Examining hospital medical records and the NT Childhood Immunisation Database (CID) of infants born to HBsAg positive women for evidence of administration of Hepatitis B immunoglobulin and hepatitis B vaccine. Four doses of hepatitis B vaccine are recommended. The 2nd dose must be at least 4 weeks after the 1st dose or it is not a valid dose of vaccine. The 3rd dose must be at least 8 weeks after the 2nd dose or it is not a valid dose of vaccine.^{4,5,6}
CID was searched to identify all neonates who received hepatitis B immunoglobulin during 2005 in Alice Springs, in particular those who had not been identified from the mother's hospital records.
3. Determining whether hepatitis B infections detected on antenatal screening had been notified in the Northern Territory Notifiable Disease System (NTNDS).
4. Estimating the prevalence of hepatitis B infection among the population of women who gave birth at Alice Springs Hospital, and in Aboriginal and non-Aboriginal women. Confidence intervals for prevalence were calculated using the calculator on <http://faculty.vassar.edu/lowry/VassarStats.html>; Continuity corrections were made.

Results

HBsAg Screening of women who birthed at Alice Springs Hospital in 2005

There were 797 women who gave birth at Alice Springs Hospital during 2005 identified from hospital discharge codes for delivery (37.0-37.9). Of these, 433 were identified as Aboriginal, 363

as non-Aboriginal, and 1 had no ethnicity stated. There were 4 women identified as Aboriginal and Torres Strait Islander, and these women have been included with the other Aboriginal women. The records of 796 women were examined, while 1 record could not be found.

High rates of screening for hepatitis B were documented. 792 of the women had an HBsAg result, including 782 in the current pregnancy, as outlined in Table 1.

Table 1: Maternal Hepatitis B surface antigen status testing during pregnancy

Status	Number	%	Note
Testing this pregnancy	782	98.2%	
Declined testing this pregnancy, previously negative	7	0.9%	Presumed negative for estimates of prevalence
No documentation of testing this pregnancy, previously negative	3	0.4%	Presumed negative for estimates of prevalence
No documentation of testing at any time	4*	0.5%	Excluded from estimates of prevalence
Total	796	100%	

*Includes 1 private patient whose hospital record was examined, but private doctor's notes were not examined.

Management of babies born to women who were hepatitis B carriers

All 16 babies born to mothers infected with hepatitis B received timely immunoglobulin and active immunisation at birth. Immunoglobulin was administered between 25 minutes and 12 hours after birth in 15 of the infants. No administration time was documented for one baby, but date of administration showed that it was within 12 hours.

Hepatitis B vaccine was given within 3 days of birth to all the infants, well within the 7 day recommendation. None of these babies were under 32 weeks gestation, a group for whom testing of post vaccination antibody levels is recommended.⁴

All infants born to women who had no documentation of their hepatitis B status

Table 2. Completed months of age at which infants born to women with hepatitis B infection received hepatitis B immunisation

Infant number*	Birth dose	2 nd dose (due at 2 months)	3 rd dose (due at 4 months)	4 th dose (due at 6 months)
1	0	2	4	6
2	0	2	4	7
3	0	2	4	7
4	0	2	4	12
5	0	2	4	#
6	0	3	5	7
7	0	2	5	16
8	0	2	6	#
9	0	3	6	#
10	0	1	7	12
11	0	2	7	#
12	0	6	8	13
13	0	4	9	#
14	0	5	9	#
15	0	3	14	#
16	0	3	16	#

*Infants are sorted by timing of completion of immunisation, which is achieved with administration of the 3rd dose of vaccine at adequate intervals.

prior dosages given outside the recommended time frames to qualify for having had 4 valid doses and this may have compromised timeliness.

received a birth dose of hepatitis B vaccine within the recommended time of 7 days.

Administration of the subsequent valid doses was less prompt, and the timing of these completed doses and the infant/child's months of age is shown in Table 2. Hash marks under the 4th dose indicate that while a 4th dose was given, prior doses were administered too soon after a preceding dose and only 3 of the 4 given were "valid".

The CID identified a further 5 infants who received hepatitis B immunoglobulin at birth but had not been identified by the review of maternal hospital records. The mothers of 2 of these infants were not identified from the review of hospital records because they did not give birth in Alice Springs Hospital. One gave birth outside the hospital and had not had HBsAg tested during the pregnancy; HBsAg was negative after delivery but immunoglobulin had already been given. One gave birth interstate and the information was provided to the database from interstate. Of the 3 whose records had been reviewed, 2 had negative HBsAg during the

pregnancy. Testing during the pregnancy was declined by 1 mother, but had been negative during a previous pregnancy.

An alert system for immunisation of infants born to women infected with hepatitis B was recommended in 2006 after the audit in Darwin.⁷ This was implemented for 1 infant who was born in February 2005, but none of the others in this group.

Documentation of hepatitis B and immunisation status

Of the 16 women identified as HBsAg positive, 10 had discharge codes that included hepatitis B infection during pregnancy.

Of the 16 doses of hepatitis B immunoglobulin administered to the infants 13 were reported to the CID.

Of the 16 hepatitis B infections 14 had been reported on the NT Notifiable Diseases System.

Prevalence of hepatitis B infection

Among women who gave birth at Alice Springs Hospital in 2005, the prevalence of hepatitis B infection was approximately 2.0%, being 3.2% in Aboriginal women and 0.6% in the non-Aboriginal women, as shown in Table 3.

Discussion

Antenatal screening

Overall, screening for HBsAg among pregnant women in Alice Springs was well documented. While no targets for screening are published, a rate of 94% was considered 'good' in the review of screening of women giving birth in Darwin and therefore the 98% achieved in Alice Springs might be considered 'excellent'.

The majority of hepatitis B infections in Australia are asymptomatic infections of adults acquired through sexual transmission.^{1,4} Estimating a person's likelihood of infection based on ethnicity or social characteristics has been demonstrated to be inaccurate.^{4,5} Therefore relying on historical testing for infection may be inappropriate, especially in a population of relatively high prevalence. Australian recommendations are that women should be tested during each pregnancy.⁴

Table 3. Prevalence of hepatitis B surface antigen by Indigenous status for women of known hepatitis B status

Indigenous status	Number	Number HBsAg +ve	Prevalence (95%CI)	Number HBeAg+ve	Proportion HBeAg+ve
Aboriginal	432	14	14/432=3.24% (1.85 %, 5.51%)	5*	5/14 = 35.7% (14.0%, 64.4%)
Non-Aboriginal	359	2**	2/359=0.56% (0.01%, 2.23%)	0	0
Unknown	1	0	0	0	0
Total	792	16	16/792=2.02% (1.20%, 3.33%)	5	5/16 = 31.2% (12.1%, 58.5%)

* one woman was negative for both HBeAg and HBeAb; one woman was not tested for e antigen status because of insufficient serum

** Difference in HBsAg prevalence between Aboriginal and non-Aboriginal women statistically significant (p=0.01)

HBsAg testing at Alice Springs Hospital requires transport of specimen to another facility for testing. The time between specimen collection and result availability is at least 24 hours. However, administration of hepatitis B immunoglobulin is recommended within 12 hours of birth. Inability to determine HBsAg status promptly may have contributed to the administration of 1 unnecessary dose of immunoglobulin. However the birth dose of vaccine is recommended to provide protection for this infrequent event.^{4,5}

Immunisation of infants

All babies born to mothers with hepatitis B infection received hepatitis B immunoglobulin and the birth dose of hepatitis B vaccine on time. Other babies potentially at risk because of no documentation of the mother's hepatitis B status also received the birth dose of vaccine which is the current recommendation in the NT Vaccination Schedule.

Administration of subsequent doses of vaccine was less satisfactory. Although all 16 infants received 4 doses of vaccine, 8 received doses too soon to provide a 'valid' 4th dose.

However 3 doses of vaccine provided at 0, 2 and 4 months of age provide adequate protection against hepatitis B.⁵ Periods between doses of at least 4 and 8 weeks ensure adequate immune response.^{4,5} Therefore, all of these infants were eventually protected against hepatitis B infection. However combinations of delayed administration and inadequate periods between doses meant that immunisation of some of the infants was suboptimal (see Table 2). The immunisation schedule of 4 doses of hepatitis B-containing vaccine is needed to ensure that every infant eventually receives 3 valid doses.

There is no NT recommendation for testing of infants for infection or immunity so adequacy of the immunisation as provided is not routinely monitored.

Prevalence of hepatitis B infection

The prevalence of HBsAg among all women giving birth in Alice Springs Hospital in 2005 is 2.0%. This is close to the prevalence of HBsAg among women giving birth in Royal Darwin Hospital in 2003, 2.3%. A higher proportion of births in Alice Springs was to Aboriginal women, 54%, compared with 36% in Darwin.

The HBsAg prevalence in the Aboriginal women giving birth in Alice Springs 14/432 (3.2%) is similar to that in Indigenous women in Darwin, 22/540 (4.1%) (p=0.39). HBsAg prevalence among non-Aboriginal women was similar, although the numbers were small (Alice Springs 14/432 (0.56%), Darwin 22/540 (1.2%); p=0.48).

Prevalence of HBsAg among Aboriginal schoolchildren in Alice Springs was reported in 1992.⁴ Prevalence of HBsAg was 3.0% in urban and 14.6% in rural schoolchildren. Reasons for the difference may require further investigation, although the total number of children in a study by Gardner was only 155.⁴

The prevalence of HBeAg among the HBsAg positive women in this study is high at over 30%. This level of HBeAg is seen in populations in Asian and Pacific Island countries.¹ These women are at much higher risk of transmitting the virus and demonstrate a need to actively screen and manage hepatitis B infection in obstetric settings. British guidelines recommend the administration of immunoglobulin only to babies born to HBeAg positive women.^{10,11}

Current Australian guidelines make no recommendation for testing of infants born to women who carry HBsAg.^{5,9} However, guidelines from elsewhere recommend testing these infants between 9 and 12 months of age. This can demonstrate immunity or the need for booster immunisation, or the need to educate contacts to prevent horizontal transmission.^{5,10,11}

Reporting of hepatitis B infection and immunisation

The documentation in this study demonstrates that communication between the hospital, laboratory and primary care providers about hepatitis B infection and vaccination is not ideal.

Information on provision of hepatitis B immunoglobulin would enable the immunisation database to alert primary care services to these children who are at high risk of hepatitis B infection. These infants should be prioritised for provision of timely hepatitis B vaccine. Such alerts would also identify children who should be considered for testing for hepatitis B immunity or infection by 12 months. While this is not currently a formal recommendation in the NT the soon to be released 9th Edition of the Immunisation Handbook (personal communication Dr Julie Graham) will recommend that, "Anti-HBs and HBsAg levels should be measured in infants born to known HBsAg/HBeAg positive carrier mothers 3 to 12 months after completing the primary course".

Consistent notification of hepatitis B infection by laboratories would enable Centre for Disease Control to support public health management of hepatitis B infection.

Conclusion

HBsAg screening of pregnant women birthing at Alice Springs Hospital, and management of infants born to women infected with hepatitis B during 2005 was satisfactory.

The provision of 3 doses of vaccine is adequate to complete the course of hepatitis B immunisation, but in some cases is delayed. Improvement in the delivery of vaccine in primary health care could optimise immunisation outcomes. Testing of infants born to women who are HBsAg positive at 9 to 12 months is recommended by CDC Atlanta guidelines⁵ and

soon to be recommended in Australia and the alert system of infants who received immunoglobulin would identify this group.⁷ Such an alert may also improve the timeliness of immunisation. Strategies to improve notification of hepatitis B to the NT Notifiable Diseases System are also being investigated.

It is likely that Aboriginal women in Central Australia have similar prevalence of HBsAg to their compatriots in Darwin.

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An analysis of public hospital admissions for water related injuries in the Northern Territory, Australia 2002-2006.

Justine Glover & Steven Skov, Centre for Disease Control

Summary points

- There were 503 admissions to NT public hospitals for water related injuries over the 5 years 2002-2006.
- This represents 1.7% of all injury related hospital admissions.
- The number of admissions each year showed little variation, ranging between 89 and 111.
- The majority of admissions involved Territorians (424), followed by interstate visitors (48), overseas visitors (26) and 5 of unknown origin.
- There was 1 death after admission to hospital – attributed to drowning.
- 72% of all admissions were males.
- 48 admissions were attributed to unintentional drowning and non-fatal submersion.
- The leading cause of injury was contact with a marine animal (202 or 40%).
- Swimming and fishing were the most commonly recorded activities leading to the injury.
- There were 84 injury events involving watercraft, of which 40 involved a fishing boat.

Introduction

The Northern Territory (NT) is well known for its waterways and associated activities. It is rimmed by the Arafura and Timor seas and has many rivers, gorges and waterholes that attract locals and tourists for the popular leisure activities of fishing and swimming. Every year a significant number of Territorians and visitors are admitted to NT public hospitals with water related injuries.

Methods

Hospital admission data during the calendar years 2002-2006 were searched using ICD-10 codes for a broad range of water related injuries. These included codes for drowning or

submersion injuries including unintentional events (W65-W74), intentional self harm (X71), assault (X92) and events of undetermined intent (Y21); contact with marine animals (W56); contact with venomous marine animals and plants (X26). Also included were admissions where the principle cause of admission was a physical injury of any sort and the place of occurrence of the injury involved a water source (Y92.32, Y92.80-83) or the cause of injury included diving, jumping or falling into water (W16); water transport accidents (V90-V94); and activities related to boating and water sports (U 53 and U54).

Results

Water related injuries are a regular cause of hospital admission in the NT but when compared to the overall injury burden the numbers are relatively small. Over the 5 year data collection period there were 29,601 admissions to NT public hospitals attributed to management of an injury, of which 503 or 1.7% were water related admissions. The numbers admitted showed little variation over time with between 89 and 111 admissions each year (Figure 1).

The majority of water related hospital admissions occurred in the coastal centres of Darwin and Nhulunbuy (also known as Gove). Royal Darwin Hospital (RDH) admitted 361 (72%) and Gove District Hospital (GDH) admitted 89 (18%) of the 503 water related admissions.

Demographic profile

Although approximately two thirds of both male and female admissions were in people under 35 years of age, the total age range varied from children under one to people over the age of 75 years. Males represented 72% of all admissions.

Non-Indigenous people accounted for 71% of all admissions, (Table 1). However, at GDH Indigenous people comprised 65% of water related hospitalisations compared to 18% at RDH.

Figure 1. Water Related Injury Hospital Admissions 2002-2006: year and hospital

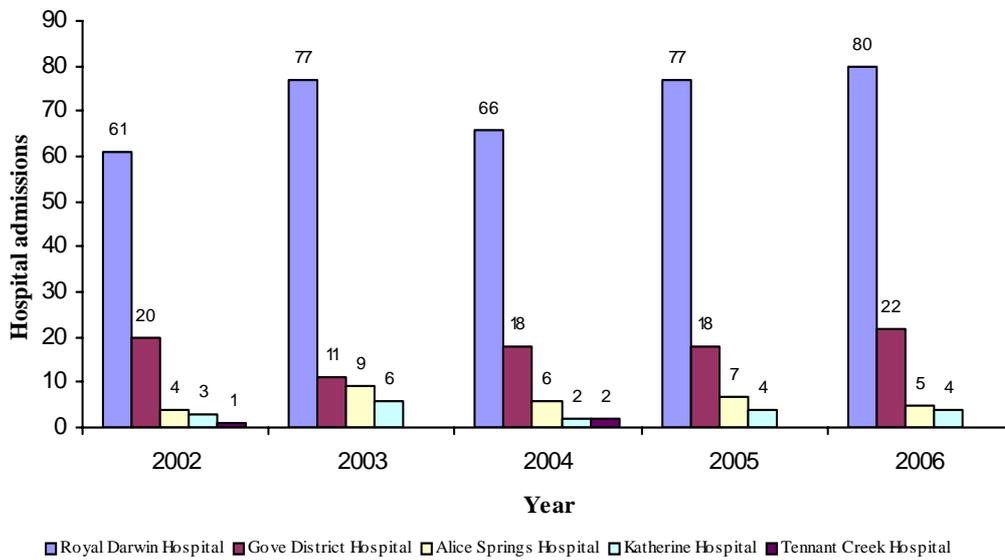


Figure 2. Water related injury hospital admissions by month

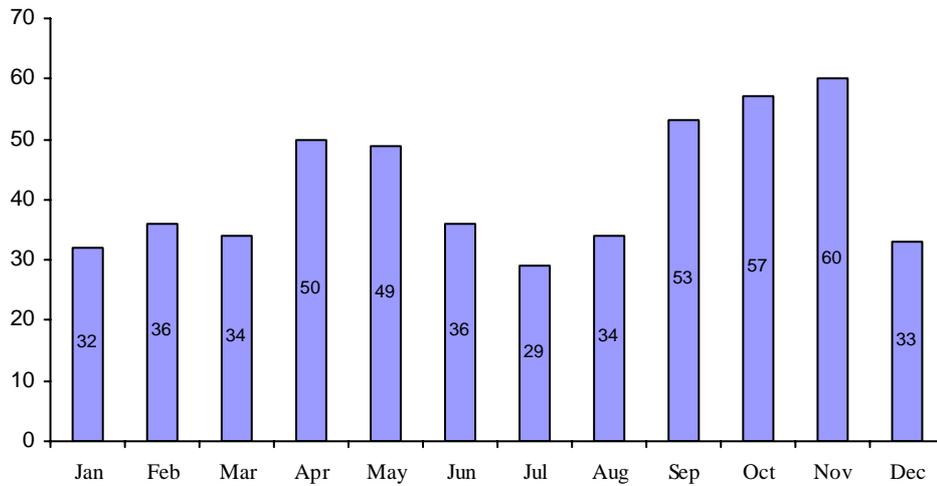


Table 1. Water injury related hospital admissions 2002-2006: Sex & Indigenous status

	Indigenous	Non-Indigenous	Total
Female	60	80	140 (28%)
Male	87	276	363 (72%)
Total	147 (29%)	356 (71%)	503 (100%)

The majority of admissions involved Territorians [424 (84%)], followed by interstate visitors [48 (10%)], overseas visitors [26 (5%)] and 5 (1%) were unknown.

Seasonal variation

Water related hospital admissions peaked over October and November with a second peak in April and May. (Figure 2).

Place of Injury

The leading place of injury was a 'large area of water' [187 (37%)], presumably the sea in most cases. Other events identified the place of injury as being 'the beach' [37 (7%)], 'a stream of water' [35 (7%)], 'other & unspecified place in the home' [35 (7%)], 'area of still water' [17 (3%)] or 'swimming centre' [7 (2%)]. The place of injury was not specified in 185 (37%) of admissions.

Injury causes

Drowning and Non-Fatal submersion

During 2002-2006 there were 48 hospital admissions attributed to "unintentional drowning and non-fatal submersion". Of these people, 1 died following admission to hospital. The number of admissions ranged between 7 and 12 each year. (Table 2).

Males comprised 31 (65%) of these admissions. Of all those admitted, 20 (42%) were Indigenous

Table 2. Hospital admissions for unintentional drowning and non-fatal submersion

2002	2003	2004	2005	2006
9	7	8	12	12

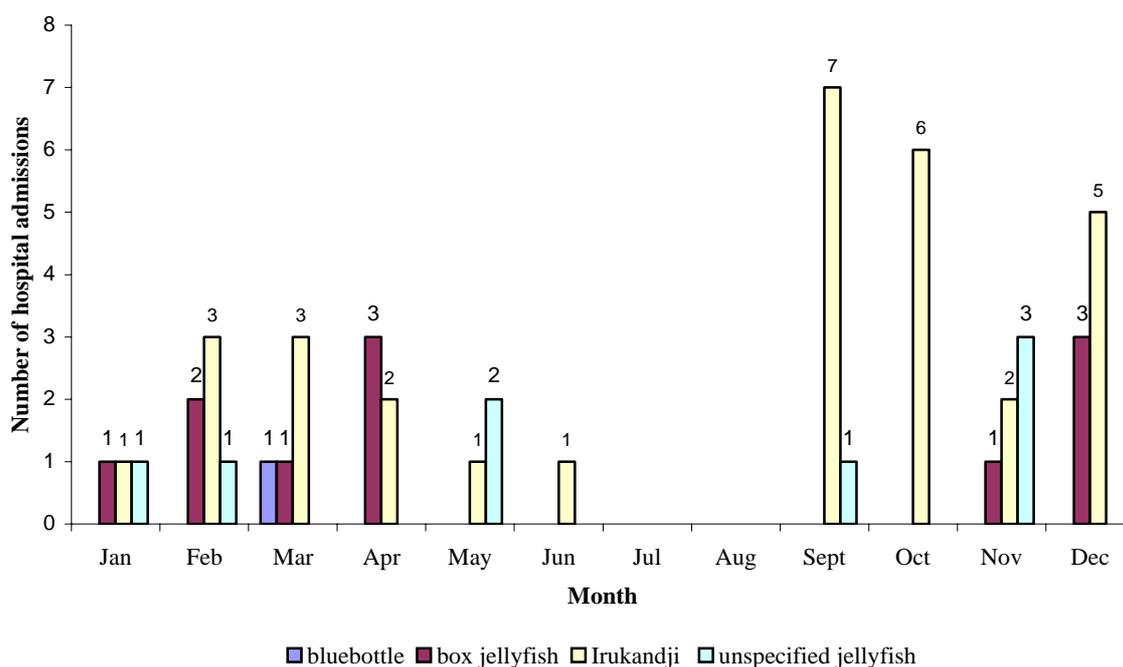
and 28 (58%) were non-Indigenous people. Children aged 0-4 years accounted for 34 (71%) of admissions (Table 3).

The site of the drowning and non-fatal submersions varied with 19 taking place in a swimming pool, 12 in natural waters and 7 in a

Table 3. Drowning and non-fatal submersions 2002-2006 by age & Indigenous status

Age Group	Indigenous	Non-Indigenous	Total
0-4	16	18	34
5-9	0	1	1
10-14	1	0	1
15-19	1	3	4
20-24	0	2	2
25-29	0	1	1
30-34	0	0	0
35-39	0	1	1
40-44	0	0	0
45-49	0	0	0
50-54	1	1	2
55-59	0	0	0
60-64	0	1	1
65+	1	0	1
Total	20	28	48

Figure 3. Hospital admissions attributed to jellyfish stings



bathtub. In the remaining 10 instances the site was not specified.

Of the 34 admissions involving children under 5:

- 16 were Indigenous and 18 non-Indigenous
- 14 were female and 20 male
- 17 events occurred in the home, 6 in the bathtub
- 12 involved a fall into the water source

In addition to the 48 admissions for unintentional events, there were also 5 admissions attributed to intentional self-harm and near drowning. None of these people died.

Jellyfish

There were 51 hospital admissions attributed to jellyfish stings during the study period. Admissions for jellyfish stings occurred in every month except July and August with most admissions occurring during the period September to December (Figure 3).

The majority of people admitted for jellyfish stings were Indigenous [36 (70%)]. Of all people admitted, 30 (59%) were male and 26 (51%) were under 5 years of age.

Persons suffering from Irukandji syndrome accounted for 31 (61%) jellyfish related admissions with 26 (84%) of these cases being admitted to GDH.

Fish and other marine animals and plants

There were 151 hospital admissions for water related injuries attributed to contact with a marine animal, excluding jellyfish (Table 4). Of the 151 cases, 109 (72%) were male, 96 (63%) were Non-Indigenous and 69 (46%) were aged between 20-40 (Table 4). RDH admitted 111 patients, GDH 30 patients and Katherine District Hospital (KDH) 10 patients with an injury caused by contact with a marine animal or plant.

Injury Type

Physical trauma

There were 197 admissions for management of physical trauma attributed to a water related event. Injuries included 112 open wounds, 64 fractures, 6 traumatic amputations, 9 burns and 6 dislocations.

Skin infections

There were 43 admissions attributed to treatment of cellulitis and 29 for treatment of abscesses following a water related injury. Of these, 25 (59%) were male and 22 (51%) were non-Indigenous people.

Caissons Disease

Caissons disease, also known as decompression sickness, is caused by scuba diving. One episode may require several admissions. There were 38 admissions attributed to Caissons disease

Table 4. Hospital admissions for water related injuries attributed to contact with a marine animal (excluding jellyfish) by Indigenous status, sex and age.

	Indigenous	Non-indigenous	Male	Female
Shark	0	5	4	1
Stingray	14	8	19	3
Stonefish and other stinging fish	12	23	22	13
Possible contact with sea-snake	0	2	2	0
Bitten or struck by a crocodile	4	7	8	3
Other species of marine animal	20	39	42	17
Venomous marine animal or plant	5	12	12	5
Total	55	96	109	42

involving 20 people, all of whom were non-Indigenous

Activity

Fishing was the most frequent activity recorded (119 admissions) followed by swimming (51 admissions). There were 84 injury events involving watercraft, of which 40 involved a fishing boat. No activity was specified for 276 admissions. Only 12% of persons for admitted for water craft related injuries were Indigenous.

Regional variations in cause of injury

Of the 361 admissions to RDH the main causes were attributed to contact with marine animals or plants [123 (34%)], Caissons disease [38 (10%)] and unintentional drowning [31 (9%)].

At GDH, 69 (76%) of all water related injuries were attributed to contact with a marine animal or plant.

At KDH 10 (53%) admissions were attributed to contact with a marine animal or plant.

In the regions of Alice Springs and Tennant Creek the causes of injury were mainly attributed to diving, jumping or falling into swimming pools and submersion in bathtubs.

Discussion

As is generally the case for all injury hospitalisations, males represented nearly three quarters of all admissions. In contrast with many other causes of morbidity, Aboriginal people are not over-represented for water related injury admissions. They comprised 29% of all people admitted; a proportion virtually identical to their proportion of the total population. However, they did represent a greater proportion of persons admitted for jellyfish stings perhaps reflecting their greater degree of contact with the water during traditional fishing activities. In contrast, Aboriginal people comprised only 12% of persons injured on a boat which probably reflects their economic disadvantage and subsequent lesser access to boats. There were fewer admissions during the cooler months of June to August and during the wet season. Admissions peaked over October and November and in April and May. This coincides with periods of increased fishing activity during the build up when barramundi activity increases and

seas are calmer and during the "run off" following the wet season.

Water related injuries represent a small proportion (1.7%) of all injury related admissions to NT public hospitals. This should not detract in any way from the importance of preventing water related injuries. Near drowning can have severe and prolonged sequelae that can confer a major burden on the victim and the community. It has been reported that 28% of near drowning victims suffer an ongoing selective deficit, with 3% surviving in a permanent vegetative state.¹ In addition, as with all injuries, hospital admissions only represent a fraction of all water related injuries. Much larger numbers of injured people present to health centres, clinics and emergency departments and are not admitted to hospital. For example, Currie and Jacups² reported that only 8% of persons presenting to hospital with stings from the major box jellyfish (*Chironex fleckeri*) required admission to hospital. Unfortunately data concerning non-admitted presentations is not routinely available in the NT.

The majority of admissions for jellyfish stings involved Irukandji syndrome, which may be caused by a range of jellyfish species. Irukandji syndrome is just that, a syndrome defined by severe generalised pain, distress, hypertension, cardiotoxicity with potential for cardiogenic pulmonary oedema frequently requiring complex monitoring and management in hospital.³ A much smaller proportion were attributed specifically to the major box jellyfish (*Chironex fleckeri*). Most *Chironex fleckeri* stings can be managed with analgesia and wound care and do not require admission. However, of all jellyfish stings in the NT, the great majority are due to *Chironex fleckeri*.²

While this is a study of water related injuries that required hospitalisation, it should be noted that deaths from drowning which did not reach the hospital are not included and that over 2005 - 2006 there were 4 drowning deaths and in 2006 - 2007 that number has doubled with final statistics yet to be confirmed by the coroner. None of these deaths were in people under 5 years of age (statistics provided by the NT water Safety Branch).

The data presented in this report reminds us that young children remain the most vulnerable

group to the most serious forms of water related injury in the NT: drowning and jellyfish stings. Nearly three quarters of near drowning admissions were in children under 5 and over half of all admissions for jellyfish stings were in this age group. As well as being potentially the most catastrophic of water related injuries, they are also the most preventable. Fencing of swimming pools and increased awareness of the danger of open bodies of water remain the most important preventive measures against childhood drowning. Since the fencing of private swimming pools became mandatory in the NT there have been no deaths of children in swimming pools in the NT. However, there is no room for complacency as while there have been no deaths, near drowning events continue to

occur. Avoiding going in the sea during the "stinger season" of October to May and the wearing of protective clothing when swimming the rest of the time are the best means of preventing jellyfish stings.

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EDITORIAL

Gearing up to protect our children

The report by Glover and Skov in this issue of the *Bulletin* reminds us of the vulnerability of young children to jellyfish stings. Children, because of their small size, are more susceptible than adults to virtually all envenomations and this is particularly so in relation to jellyfish stings. The last 10 Northern Territory (NT) stinger deaths have all been in children. Children cannot make decisions about their own safety; they rely on adults. Children should not be in the sea at all during stinger season (1 October - 1 June). At other times it is strongly recommended that they wear protective clothing, at least a short sleeve top like a 'rashie' and board shorts, to protect their bodies from stings. These recommendations apply to all people but are particularly important for young children.

Full length 'stinger suits' are available from some sporting goods stores and from the Surf

Life Saving Society, but have the disadvantage of a significant cost and not being useful for other purposes. However, 'rashies', T shirts and board shorts are affordable, can be worn at other times and are more acceptable in a fashion sense. They can provide very substantial protection to much of the body while swimming.

If stings do occur, dousing the affected area in vinegar will prevent further firing of stinger cells in contact with the skin and so reduce total envenomation. It is advisable then to go to hospital for a check up and for some pain relief, which will be the major problem for most people who are stung. Because of the need for a prompt response in case a sting occurs, young children who do swim in the sea should be closely supervised by an adult at all times.

Mosquito vector control in the Northern Territory

Peter Whelan, MEB, CDC Darwin

Background

In 1972 the Northern Territory (NT) Department of Health established a small Medical Entomology Branch (MEB) to investigate and organise control of insects of medical importance in the NT, with an emphasis on the mosquito vectors of malaria. The NT was one of the first States or Territories to set up such a unit devoted solely to the above purpose and to have a full-time medical entomologist with state wide responsibility.

As a result of the 1974 Australian encephalitis outbreak, the need for research and control of mosquito borne diseases on an Australia-wide basis became apparent. The Commonwealth Department of Health established financial assistance to the State and Territories in late 1974, under the Australian Encephalitis Control Program. This early assistance contributed towards the equipment and operational needs of the MEB and aided the establishment of mosquito control programs in Alice Springs, Darwin, Nhulunbuy and Alyangula. The control programs in the various towns were carried out with assistance from the various local councils, corporations or mining companies, in cooperation with the local departmental health surveyors or with direct assistance from the MEB. The guidance of vector control operations by the various operational bodies was undertaken by the Medical Entomology Section. The process of gathering medical entomology data on a Territory wide basis was started, in order to establish vector control operations on a more scientific basis.

From the beginning, with a single entomologist and a part-time tearoom laboratory, the MEB evolved into a distinct branch of the NT Department of Health, with a well equipped laboratory, professional and technical staff and a comprehensive vector surveillance and control program. The activities of MEB have been reported regularly in the Annual Reports of the NT Department of Health and in the MEB annual reports.

This paper was prepared for a workshop on vector control organised by the National Disease

Control Program in Canberra in 1987. It summarises the main elements of the NT Vector Borne Disease Control Program and highlights some of the results and achievements of this program. This paper was revised in 2007 to reflect current methods and altered situations.

Vector control problems peculiar to the Northern Territory

Different geographic areas

The NT has a range of geographic areas, from the tropical monsoonal north to the semi-arid desert areas of Central Australia. In the northern area, the timing of vector surveillance and control operations can be scheduled with some degree of certainty, depending on the arrival and the end of the monsoon season and tidal predictions. Vehicle access to many of the areas during the wet season can be very limited, posing particular problems. In the semi-arid areas, the timing of surveillance and control operations is variable and dependent on seasonal conditions. After widespread rains, vast areas can be covered with water and become inaccessible. Even within one geographic area in the NT, differing land forms and swamp systems produce different peak periods of abundance of mosquitoes due to variable vegetation and water characteristics. The differing habitats within the one region mean that many habitats require individual assessment for vector prevalence and vector control requirements.

Widespread and small population

Major towns in the NT are widely dispersed, and stretch the time and available resources of the MEB to the limit. In addition there are many small communities, frequently with housing styles or at locations that expose people to relatively high numbers of mosquitoes. Mosquito surveys of small communities must necessarily be on a relatively long return cycle in the NT, and even some of the major towns pose problems for regular vector surveillance and control operations. Much of the assistance with vector control and surveillance operations in major towns other than Darwin is carried out by environmental health officers (EHOs) or other people whose main job does not necessarily involve mosquitoes.

Wide range of mosquito species

There are many pest and vector mosquitoes in the NT with over 100 species of mosquitoes. They include all the major potential and actual mosquito borne disease vectors in Australia with the exception of the dengue mosquito *Aedes aegypti*. The habitats of the mosquitoes range from freshwater swamps, brackish water lagoons, salt marshes and temporary flood waters to artificial mosquito breeding sites such as storm drains and household water receptacles. Each mosquito species has particular periods of prevalence and particular control challenges.

Numerous potential mosquito borne diseases

Unlike some of the southern states, the NT has to contend with the threat of malaria reintroduction, arbovirus diseases from infection with Murray Valley encephalitis and Ross River virus, as well as the potential reintroduction of *Aedes aegypti* and other exotic mosquito species.

These diverse problems, together with the relatively small resources available in the NT, have required a somewhat different approach to vector control than in other states. In the NT, the program includes a mosquito borne disease surveillance program, regular mosquito monitoring at major population centres, planning inputs in urban areas, larval vector control operations in major towns, and source reduction and major engineering projects in those towns where cost benefits are maximized. All of these various components of the program are linked with a wide-spread mosquito awareness program, which aims to raise the public awareness of mosquito borne disease and to encourage self protection and avoidance measures.

Mosquito borne disease surveillance

Malaria

The NT is both vulnerable and receptive to malaria with:

- A history of malaria up until 1962
- The presence of all the major Anopheles vectors of malaria
- The receptivity of many population centres, with large numbers of mosquitoes in close proximity to urban areas
- The proximity of malarious countries in South-East Asia and the Pacific, and regular tourist traffic.

Malaria prevention in the NT relies largely on the health services detecting any malaria cases. Once a case is detected and confirmed by blood examination, the NT Department of Health and Community Services (DHCS) Centre for Disease Control (CDC) has the responsibility to coordinate the gathering of information and to organise any necessary medical response. Entomological assessments are carried out for each detected malaria case. If warranted an entomological investigation will then be carried out. This investigation involves examination of vector control maps or other mosquito distribution data, the review of the epidemiological data, the inspection of residences and places visited by the patient, the setting up of carbon dioxide baited mosquito traps, the location of nearby and significant mosquito breeding and harbouring areas, and the assessment of responses necessary, including adult mosquito fogging.

An important component of the malaria control program is the reduction of receptivity in the Darwin urban area. The Darwin urban area is home for nearly 50% of the Territory population and a reduction in receptivity by source reduction measures such as draining and filling mosquito breeding areas has a maximum cost benefit.

Dengue

The MEB has comprehensive programs to ensure that the NT remains free of *Aedes aegypti* and *Aedes albopictus*, the principal vectors of dengue fever. The NT has a history of dengue including a large outbreak reported during World War 2. The vector, *Aedes aegypti* was present in the NT at least until 1956. By 1969 Darwin was regarded as being free of *Aedes aegypti* from 1973 to the present, except in Tennant Creek where an importation was detected in February 2004 and in Groote Eylandt when another importation was detected in November 2006. In response the MEB established *Aedes aegypti* eradication programs which eradicated the dengue mosquito in Tennant Creek in 2006 and is currently active in an eradication program on Groote Eylandt. The Dengue Surveillance

Program consists of a number of elements including those below.

DHCS Aedes aegypti ovitrap surveillance Darwin

Special *Aedes* ovitraps are placed in each suburb in Darwin, other major towns of the NT and at vulnerable points of introduction such as the various port areas, airport, caravan parks and in interstate transport terminal vicinities. The ovitraps are inspected fortnightly for any mosquito larvae and all larvae are identified in the MEB laboratory. This program enables the rapid detection of any importation or introduction of *Aedes aegypti* or other exotic *Aedes* species.

Quarantine ovitrap surveillance at the airport and wharf

An ovitrap surveillance program is conducted at the various Darwin port facilities and airport under the operation of the Australian Quarantine Inspection Service (AQIS). The AQIS officers routinely submit mosquito larvae to the MEB for identification. This program is aimed at intercepting any importation or introduction of *Aedes aegypti* at the most vulnerable points.

Quarantine inspections

All incoming overseas vessels and cargo are inspected by AQIS for the presence of mosquito larvae, and all overseas planes are routinely sprayed for exotic insects. AQIS, in cooperation with the MEB, conducts routine surveillance around ports and airports for mosquito breeding. AQIS in cooperation with the MEB also conducts or investigates source reduction and precautionary sprays of receptacles in the port areas.

Northern Territory-wide Aedes aegypti surveys

Regular surveys are conducted in communities and cattle stations between Tennant Creek and the Queensland border to detect the possible introduction of *Aedes aegypti* from Queensland. As opportunity permits, other towns and communities throughout the NT are surveyed. *Aedes aegypti* has been intercepted on a number of occasions very soon after introduction, in both towns and on board visiting boats. In each case

the mosquitoes have been eliminated and their continued absence has been confirmed.

The importation of *Aedes aegypti* as eggs in receptacles such as used pot plant drip trays or old tyres remains a possibility, as evident from the Tennant Creek importation in 2004. A major point of a public awareness program has been to outline that the reduction in available domestic mosquito breeding sites will reduce the probability of a successful reintroduction of exotic *Aedes* species.

Arbovirus surveillance

A number of arboviruses are present in the NT including Murray Valley encephalitis virus, Kunjin virus, Ross River virus and Barmah Forest virus. Cases of vector borne disease are assessed by the MEB and entomological investigations are conducted during outbreaks of arbovirus disease.

Ross River virus and Barmah Forest virus surveillance

Ross River virus (RRV) is the most common arboviral disease in the NT. Under the *Notifiable Diseases Act* laboratories notify confirmed cases of RRV and Barmah Forest virus (BFV) to CDC where they are recorded on the NT Notifiable Diseases System. Resident location is recorded on the system and this has allowed identification of the most vulnerable areas for the transmission of these diseases.

Arbovirus research

The MEB has established the presence of the various arboviruses in the NT by the isolation of virus from wild caught mosquitoes. This program has involved the collection and processing of many thousands mosquitoes. The result of this program has been the isolation of arbovirus from certain species of mosquitoes.

The viruses isolated have included numerous isolations of RRV, BFV, Sindbis virus, with a few isolates of Murray Valley encephalitis virus (MVEV) and Kunjin virus. *Aedes normanensis* from the semi-arid areas and *Aedes vigilax* from the Top End have been indicated as an important potential vectors of RRV with numerous viral isolates of these species. *Culex annulirostris*

yielded isolates of Sindbis virus, RRV, MVEV and Kunjin virus. This work confirms the potential disease risks posed by the various mosquito species in the NT. When this is correlated with the prevalence and distribution of the various species of mosquitoes, it allows some degree of assessment of the potential diseases in the various areas. Those areas with high numbers of vectors, or where transmission has been demonstrated are given a higher priority for vector control or public awareness needs.

Mosquito monitoring

Mosquito monitoring operations are carried out over as much of the NT as possible, with emphasis on the major towns. This program has built up an information base of the species and prevalence of mosquitoes over a wide area of the NT. A comprehensive reference collection of the mosquitoes from the NT has been assembled and new species and new Australian and NT records have been established.

Mosquito Monitoring Darwin

Mosquito monitoring using carbon dioxide (CO₂) baited light traps has been conducted continuously in Darwin since 1979. Over 20 trap sites are currently utilized and these traps are set weekly at the various sites, adjacent to major swamps near urban areas. This program allows a rapid assessment of any mosquito problems in the Darwin area and is used to determine the need and assess the success of larvicide operations and the mosquito engineering works. The monitoring also allows assessment of risks for malaria transmission as part of the Malaria Surveillance Program. Additional traps are set for actual or potential mosquito problems associated with developmental projects and mosquito complaints. The graphs of mosquito monitoring at Leanyer Swamp (Darwin) are shown in Appendix 1 to demonstrate the dramatic reduction in mosquito numbers from 1983, before the enhanced engineering program and the helicopter applied insecticide program, to 1986 when both programs were in operation.

Mosquito Monitoring Northern Territory-Wide

A comprehensive picture of the prevalence and distribution of mosquito species in the NT has

been built up by a program of ad hoc mosquito surveys throughout the Territory at communities, towns, cattle stations and in non-populated areas. These surveys include collections along the Victoria Highway to the Western Australian border and collections throughout the Barkly Region, to establish, among other things, the distribution of *Anopheles farauti*, the Australian malaria mosquito. For new tourist, mining, and urban development projects, detailed monitoring surveys for 12 months or over are undertaken to provide detailed information on the potential mosquito problems.

Mosquito Monitoring Major Towns

Regular adult and larval mosquito monitoring is carried out at the major centres of Darwin, Katherine, Nhulunbuy, Jabiru, Alyangula, Tennant Creek and Alice Springs, with these towns except Nhulunbuy receiving assistance for monitoring from the MEB under the NT Centre for Disease Control (CDC) Program. In most of these towns, CO₂ traps are set either once per week or once per month by either health surveyors, mining personnel, town council or town corporation employees. Catches of mosquitoes are forwarded to the MEB for identification and comment. The monitoring data for mosquitoes from these communities is used to determine the need and timing of vector control operations or public awareness notices.

Planning and mosquitoes

DHCS places a large emphasis on planning as a means to reduce people-mosquito contact. There has been a large input of information to the Department of Infrastructure Planning and Environment, on a diverse range of proposed mining, aquaculture, semi-rural residential, urban residential and recreation developments.

Project Development

MEB comments on preliminary environmental reports or environmental impact statements on many development projects including new airports, proposed mines, proposed dams, industrial developments, new urban developments and many others. The aims of these comments are to prevent the creation of new mosquito breeding areas and to ameliorate or rectify any existing mosquito breeding areas.

Rural Development

In Darwin, MEB has had inputs into the Land Use Objectives formulated by the DIPE. The input includes comments on certain activities (sand mining in low lying areas), locations (residential developments near major mosquito breeding areas), population densities (blocks below 2 hectares in size for rural residential development adjacent to large mosquito breeding areas are discouraged), and access (for maintenance reasons). The result of these inputs is to encourage planning which minimises people-mosquito contact, thus avoiding expensive rectifications at a later date when mosquito problems become obvious.

Residential Urban Development

Creation of new towns (such as Palmerston), and the expansion of residential development in existing towns (such as Darwin and Alice Springs) may place people near existing mosquito breeding areas or create additional mosquito breeding sites. The mosquito breeding area can be inadvertently created by activities such as the construction of road embankments, storm water drain construction and disposal, sewerage pond construction and disposal of excess effluents, and soil borrowing and sand mining operations. MEB has an input into the planning stages and assists the planners to consider biting insects when making detailed plans for urban and other developments.

Palmerston is a model of a well planned tropical urban area with minimal mosquito problems. The storm water drainage system has been designed as wide grassed open floodways with subsoil low flow drains. This has minimised mosquito breeding in the actual drains. The drain end points are directed to the daily flushed tidal areas, thus avoiding ecological changes and subsequent mosquito breeding that has been a feature of the older residential areas in Darwin. Mosquito breeding areas have been drained, filled, recontoured or reconstructed and in one instance a large shallow reed lagoon was excavated and formalised to create an aesthetic water feature that does not produce mosquitoes.

An important feature of MEBs inputs has been the acceptance that urban residential developments should be excluded from within 1

kilometre of large expanses of mangroves and within 1.6 kilometres of large and uncontrollable mosquito breeding areas.

Recreational Development

Mosquito surveys are undertaken in recreation areas to determine the species and relative numbers of mosquitoes, to assist park management in the siting of camping and other developments, and assess the need for public awareness information on mosquitoes. Surveys have been undertaken in Kakadu National Park, Litchfield National Park and Charles Darwin Park and the results have highlighted the need for public education on personal protection against mosquitoes in particular areas.

Vector Control

Vector Control in the NT is conducted under 3 linked programs, with each program aimed at specific mosquito stages, species or breeding areas. The underlying philosophy of vector control operations in the NT is to aim for the long-term source reduction of mosquito breeding areas around population centres. Insecticide treatment near urban areas is regarded as a stopgap measure until source reduction measures can be achieved. For most urban centres, larval control measures are carried out within urban areas, while adult control measures are limited to mosquito breeding and harbouring areas during a vector borne disease outbreak or a period of enhanced potential disease transmission.

The NT Vector Borne Disease Control Program Operations

The NT Vector Borne Disease Control Program is the major ongoing vector control program covering the principal population centres. The approach to vector control is different in each town, due to the particular type and location of the mosquito breeding areas and the local resources available. In Darwin, the Darwin City Council carries out larval control operations at specific sites, on advice from the MEB. The bacteria product *Bacillus thuringiensis var israelensis* (*B.t.i.*) and the insect growth regulator methopren are the principal insecticides used and are applied by hand held pressure sprayers, motorized backpack units, or quad bike mounted spray units. No regular adult

mosquito control operations are carried out in Darwin except directly by the MEB around potentially transmissible malaria cases.

In Alice Springs the Alice Springs Town Council carries out a regular larval monitoring and control program within the municipality. An adult mosquito control program is carried out around Ilparpa swamp outside the urban area. All larvae and adult mosquito monitoring samples are identified by MEB in Darwin and advice is given on the frequency and timing of mosquito control operations.

Jabiru, with its enormous pest and vector mosquito numbers (sometimes in excess of 30,000 mosquitoes per trap night), has little opportunity for any significant source reduction. Mosquito monitoring is used to alert residents of periods of increased vector numbers.

Many other smaller communities are visited by MEB under this program and particular mosquito breeding areas are located and advice is given on the control of specific mosquito problems.

Major Engineering Program

Engineering developments conducted by other departments and authorities may be modified on advice from the MEB, to reduce potential mosquito breeding. The MEB also supervises a large mosquito control engineering program in Darwin. This program is funded jointly by the NT Government and the Darwin City Council on a 2 to 1 basis with annual expenditure in the region of \$190,000. This program aims to physically remove mosquito breeding areas affecting the urban areas of Darwin by draining or filling and upgrading stormwater drains. This program has successfully reduced the number of mosquitoes in those swamps adjacent to many suburban areas of Darwin. The graphs in Figures 1 and 2 illustrate this reduction in numbers in Leanyer swamp that has been partly a result of reducing the source of mosquitoes by draining the swamp.

Helicopter Applied Larvicide Program

Darwin is the most populous city in the NT and the proximity to very large coastal swamps that

cannot be drained has meant that many people in residential areas bordering these swamps are exposed to high mosquito numbers. Apart from the severe pest problems, these mosquitoes pose a potential health risk from mosquito borne disease. The principal problem from these coastal swamps has been plagues of *Aedes vigilax* (the salt marsh mosquito).

The NT Government has recognised this problem and the MEB conducts a specific salt marsh mosquito control program aimed at preventing plagues of the salt marsh mosquitoes. Predictions of potential plagues are made from an examination of tide charts and rainfall data.

In Darwin tides of over 7.4 m or rainfall of over 25mm in October to January can initiate large hatches of salt marsh mosquitoes. Specific breeding places have been detected and mapped on a vector control map. A comprehensive larval control program using helicopters has been organised to apply liquid *Bti* onto the breeding areas, after breeding has been detected. This program enables large areas to be covered rapidly before the larvae reach the late 4th instar growth stage (last growth stage) and has been extremely successful in reducing the number of salt marsh mosquitoes in the residential areas. The program is outlined in the following article.

Mosquito awareness program

The Mosquito Awareness Program conducted by the MEB is carried out with assistance from DHCS Corporate Communications. The program utilises Television and radio advertisements, public mosquito displays, newspaper stories and occasional visits to schools, to enhance public awareness of mosquitoes and mosquito borne disease. Pamphlets and information sheets have been prepared to explain the principle mosquito breeding areas, the methods available to reduce mosquito breeding around the home, and recommended self protection measures. This awareness program is necessary in the NT, where many people visit areas of high mosquito activity in more remote areas for recreation, and when self protection measures are the only practical method of reducing person-mosquito contact.

Figure 1. Leanyer Dump - 1983

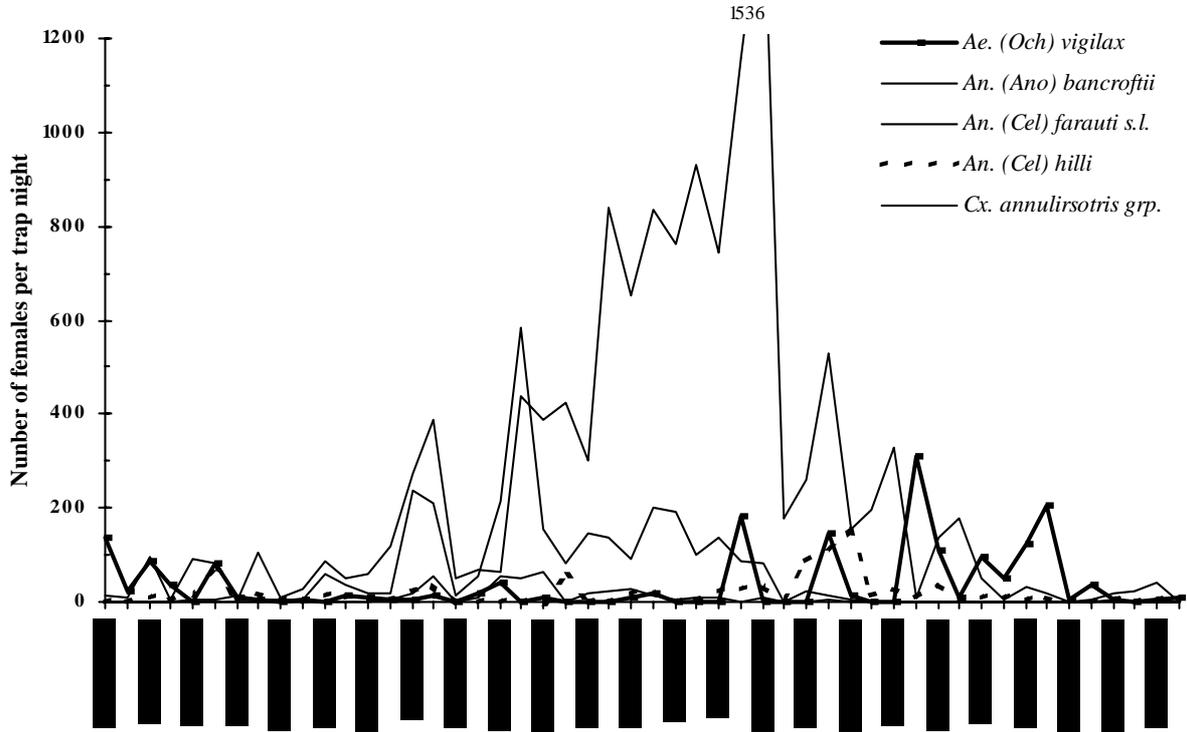
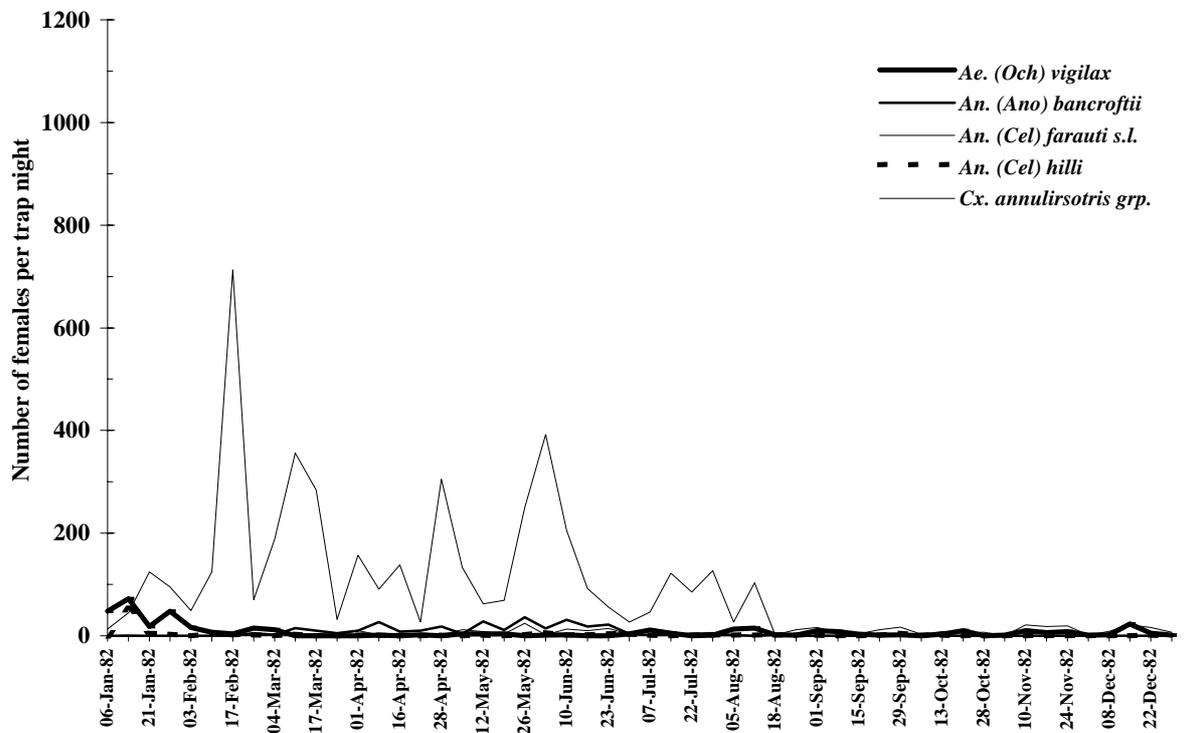


Figure 2. Leanyer Dump - 1986



Mosquito control in Leanyer Swamp

Peter Whelan, MEB, CDC, Darwin

The problem mosquitoes

Although there are up to 15 different species of human biting mosquitoes in the Northern suburbs of Darwin, 5 species are of most concern, either due to their pest levels, or for their potential to cause disease. The greatest number of public complaints occur from the suburbs bordering Leanyer Swamp, after late dry season and early wet season hatches of the salt marsh mosquito *Aedes vigilax*. This mosquito breeds principally in the tidal coastal marshes and can fly relatively long distances. Three of the five species are *Anopheles* mosquitoes that can breed in a variety of habitats ranging from fresh to saltwater. The remaining species *Culex annulirostris*, the common banded mosquito, breeds in fresh water swamps, grassy flooded areas and storm water drains. The common banded mosquito and the salt marsh mosquito can transmit a number of viruses causing disease including Murray Valley encephalitis virus and Ross River virus, while the *Anopheles* mosquitoes are potential malaria carriers.

Mosquito control by drainage

There has been a continuing mosquito control drainage program throughout the Darwin area which started in 1983. This has been a joint Northern Territory (NT) Government and Darwin City Council program with the Medical Entomology Branch (MEB) of the Northern Territory Department of Health and Community Services (DHCS) having a coordinating role. Under this program, Leanyer swamp has been progressively drained by a network of channels and drains. Most of the major drainage works in the western Leanyer swamp, which is closest to the northern residential suburbs, were completed in 1986 and are now in a continuing maintenance phase. As a result, the western Leanyer swamp has been altered dramatically and it is no longer the major mosquito breeding area affecting a residential area in Darwin.

Other areas of the coastal swamps, such as the former RAAF bombing range in eastern Leanyer swamp, and the Holmes Jungle swamp, cannot

be drained due to environmental or physical reasons. These areas are high productivity mosquito breeding areas which can produce mosquito pest problems due to the relatively long flight range of the various mosquito species which breed there.

Mosquito control by helicopter

The helicopter application of the biological insecticide *Bacillus thuringiensis* var. *israelensis* (*Bti*), was trialed for the first time in 1986. Large areas of Leanyer swamp that could not be drained were treated by applying the *Bti* to early stage larvae in the marsh areas. The helicopter spraying program began in October 1986, with 30ha of salt marsh breeding sites of *Aedes vigilax* successfully controlled after a large tide created suitable breeding sites. In November 1986, the combination of a large tide and heavy rain created over 220ha of mosquito breeding, and all of this area was successfully treated by similar applications over a two day period. Areas of breeding included Leanyer swamp, RAAF bomb craters, Holmes Jungle swamp, and Micketts swamp. Other spray operations were carried out in December 1986 against further hatches of the salt marsh mosquito. The results of these operations can be seen in the graphs on page 18.

This program is now a regular feature of mosquito control in Darwin and has proved a very efficient and practical method of salt marsh mosquito control, when there are often only 2 days available to treat large areas before the mosquito larvae reach the pupal stage where they cannot be controlled by insecticides.

Effectiveness of both programs

The MEB has a continuing mosquito monitoring program around Darwin, and the assessment of the results indicate the Leanyer swamp mosquito control program is a resounding success. The special mosquito traps set weekly around Leanyer swamp have verified that the programs can prevent large plagues of the salt marsh mosquitoes invading the northern suburbs. The 1986 graph indicated the first year since

mosquito monitoring began in 1976 that there was been no large plague of these mosquitoes in the Leanyer area.

Since 1983, the mosquito numbers have shown a steady drop in the Leanyer area. In 1986, there was a 70% decrease in the numbers of all mosquito species near Leanyer swamp compared with the 1983 figures. This includes an 80% reduction in the numbers of salt marsh mosquitoes. There was a 90% decrease in the numbers of the big black *Anopheles bancroftii*, falling from 2926 mosquitoes in the traps in 1983, to 294 in the traps for 1986. While there are variable results in following years due to large variations of rainfall and extent of

flooding, and operational problems at times due to unfavourable wind conditions, these gains have largely been repeated in most other years.

For the 5 most important mosquito species found around Leanyer swamp, the numbers of 4 of them have now fallen below pest levels in the adjoining suburbs. This has meant a significant increase in the quality of life for northern suburbs residents, and a large decrease in the potential for mosquito borne disease. These successful and ongoing programs demonstrate the great benefits of preventative health measures, and illustrate a successful interdepartmental and local government cooperative effort.

Letter to the Editor

Dear Editor

Good paper about *Diospyros maritima* (*The Northern Territory Disease Control Bulletin Vol 14, No. 1, March 2007*). I have seen a few other instances of severe skin irritation from this plant.

At Bardalumba Bay on Groote Eylandt in the 1980s a bloke was cutting a branch off one and sawdust landed on his chest between the lapels of his boiler suit and caused blistering and pain.

A traditional owner was digging out long yams near jungle at Cape Don in the 1990s and his arm rubbed the roots and it caused severe skin blistering and pain.

Glenn Wightman

Ethnobiology Project, Biodiversity Conservation
Dept. of Natural Resources, Environment & the
Arts
PO Box 496, Palmerston NT 0831,
AUSTRALIA

Sentinel Chicken Program results in the Top End of the NT

Peter Whelan and Nina Kurucz, MEB, CDC Darwin

The sentinel chicken program in the Northern Territory (NT) is part of a national program involving Western Australia, New South Wales, Queensland and Victoria and is designed to detect flavivirus activity (including the endemic arboviruses Murray Valley encephalitis virus (MVEV) and Kunjin virus (KUNV), as well as exotic arboviruses such as Japanese encephalitis (JE)).¹ The current NT program commenced in January 1992 and replaced an earlier program run by the Australian Quarantine Inspection Service (AQIS). Sentinel chicken flocks in the NT are maintained, bled and analysed for flavivirus in a combined program between the Department of Health and Community Services (DHCS), NT Department of Business Industry and Resource Development (DBIRD) and volunteers.

Sentinel chicken flocks are presently located at Leanyer, Howard Springs, Coastal Plains Research Station (CPRS) Middle Point, Katherine, Nhulunbuy, Tennant Creek, Jabiru, Alice Springs (2), Nathan River and Alyangula (see map). DBIRD officers or volunteers usually bleed flocks once a month and the samples are tested for MVEV and KUNV. When chickens from a flock show new antibodies to MVEV during a prime risk period (January to July), a media warning is issued for the general area. A media warning might be issued for Central Australia, the Top End or for the whole of the NT, depending on the location the chickens seroconverted, and might be re-issued if seroconversions occur after the initial one. These warnings advise residents of the need to take added precautions to avoid mosquito bites.

Chickens are replaced at least annually, and more frequently if birds die or a large proportion seroconvert. The flocks are well positioned to detect flavivirus activity near the principal towns of the NT and hence provide timely and accurate indication of risk to people in those towns.

KUNV and MVEV activity in the Top End for the last 3 financial years is outlined in Figures 1 and 2. These show new seroconversions to

KUNV and MVEV for the sentinel chicken flocks located at Howard Springs, Leanyer, the Coastal Plains Research Station, Nhulunbuy, Jabiru and Katherine only.

In the Top End, most seroconversions to MVEV occurred between February and June in the last 3 years (Figure 1). More seroconversions are expected in May and June 2007, due to the late wet season rain in the Top End this year, causing extensive flooding of wetlands and creating suitable breeding habitats for the main vector mosquito *Culex annulirostris*. The number of seroconversions to MVEV in June 2004/05 and 2005/06 indicates that more seroconversions to MVEV are likely to follow (Figure 1). The fact that 4 chickens in Jabiru have seroconverted to KUNV in early May 2007 and relatively high common banded mosquito numbers in Jabiru indicates that the vectors, bird reservoirs and environmental conditions may be favorable for MVEV transmission over the next 2 months.

Like MVEV activity, KUNV activity also mostly occurs between February and June in the Top End (Figure 2). Again even more seroconversions to KUNV are expected in May and June 2007, due to the late wet season rainfall and the fact that 2 chickens have already seroconverted to KUNV in Katherine in April and 4 in Jabiru in May 2007. Two sentinel pigs located at the Coastal Plains Research Station near Fog Dam also seroconverted to KUNV in early April 2007.

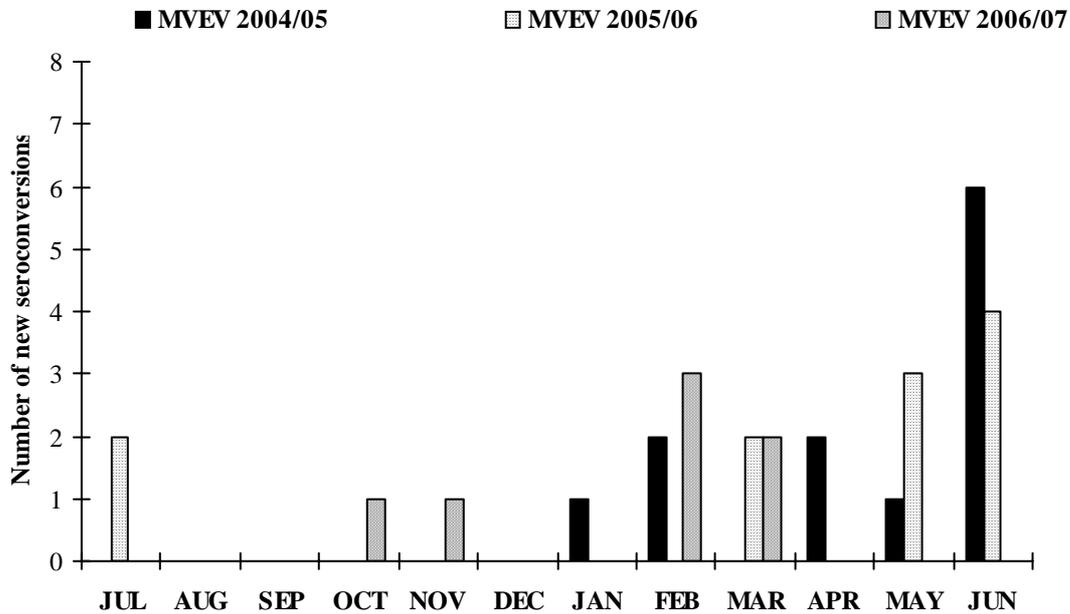
A media alert was issued in early March for the Top End of the NT. This was reissued in May 2007 following the new positive results for Jabiru and the seroconversions in the north west of WA in May.

Reference

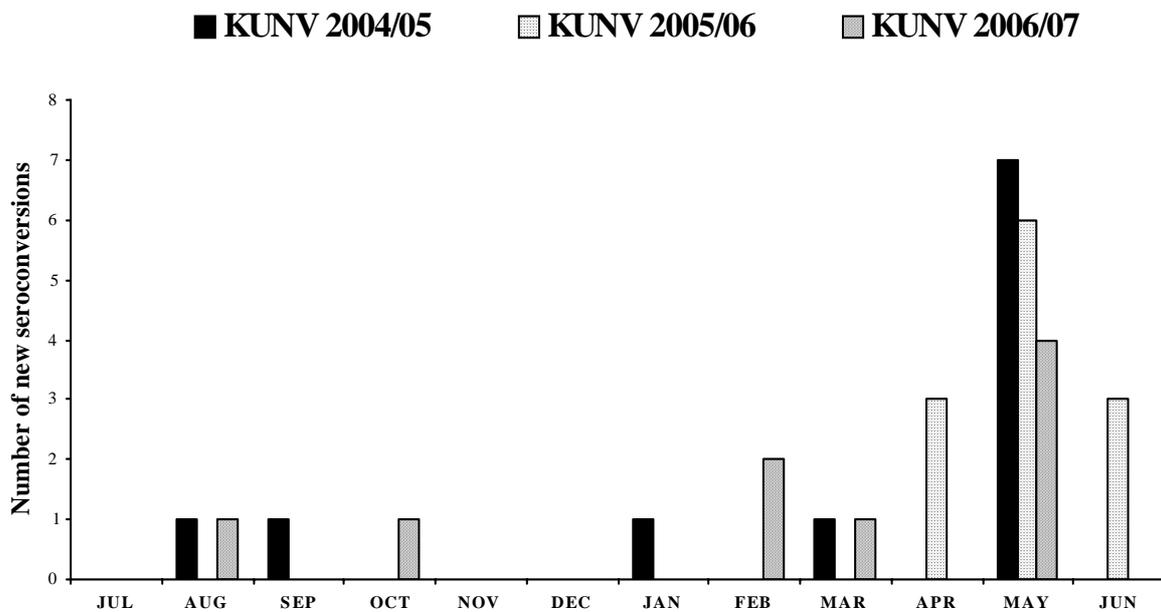
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Figure 1. Seroconversion for MVEV

(NB: Months are dates of blood sample - seroconversions occurred at some time between the previous blood sample and the date of blood sample)

**Figure 2. Seroconversions for KUNV**

(NB: Months are dates of blood sample - seroconversions occurred at some time between the previous blood sample and the date of blood sample)



Note: sentinel chicken flocks included are: Howard Springs, Leanyer, Coastal Plains Research St, Nhulunbuy, Jabiru, Katherine

Data displayed for 2006/07 does not include May to June.

Jabiru flock commenced in Nov 04. Bleeding has only occurred sporadically and in 0506 only in Dec, May and June

The NT Sexual Health Advisory Group

Wendy Armstrong, CDC Darwin

The NT Sexual Health Advisory Group (SHAG) was convened in October 2006. The aim of the SHAG is to *actively support the implementation of quality and comprehensive Sexual Health and Blood Borne Virus program within the Primary Health Care sector throughout the Territory.*

The group was formed following a period of review of the activities of the NT government's Sexual Health and Blood Borne Virus (SHBBV) Program and consultations with key stakeholders. The overall conclusions from these activities was that around 75% of sexually transmitted infections (STIs) occurred in the primary health care (PHC) sector, yet there was limited representation of the PHC sector within the Program and that additional resources were required if the government and non government services across the NT were to have an impact on the high rates of STIs across the Territory.

The SHAG is chaired by Jenny Cleary, Assistant Secretary, Health Services Division, DHCS and is made up of representatives from the:

- DHCS Centre for Disease Control/Sexual Health BBV Program (3)
- Tri State STI/HIV Project, Central Australia (1)
- Office of Aboriginal and Torres Strait Islander Health (1)
- Aboriginal Medical Services Alliance NT (4)
- Northern Territory AIDS and Hepatitis Council (1)
- Top End Division of General Practice (1)
- Central Australian Division of Primary Health Care (1)
- NT Family Planning and Welfare Association (1)
- DHCS Remote Health, Top and Central Australia (1 each)

Face to Face meetings are held bi-annually with teleconferences in between times. To date the SHAG has met face to face twice with the next meeting planned for the end of July in Alice Springs.

The key functions of the Advisory Group are to:

1. Have a key coordination role in promoting and supporting sexual health and BBV activities within the government and non government sectors throughout the NT.
2. Contribute to the planning and monitoring of sexual health and BBV activities throughout the Territory with oversight for:
 - Priority setting
 - Program direction
 - Research
 - Resource allocation
3. Contribute to the development of new policy and program initiatives where relevant and appropriate.
4. Engage with Commonwealth and State funding bodies to advocate for appropriate and adequate resourcing of sexual health and blood borne virus programs throughout the government and non-government sector.

Summary of progress to date

Following the first meeting of the SHAG a presentation was made to the then Chief Executive Officer (CEO) of the DHCS detailing the framework for future directions of sexual health and blood borne virus activities across the sector over the next 3 years. The CEO endorsed the framework and agreed to release additional funds to support the roll out of the program.

The framework will be implemented under the following headings:

- Governance, via an Advisory Group
- Investment in a new PHC approach
- Re-focus of existing services
- Responding to increasing Hepatitis C/HIV clinical demand
- Health Promotion informed by research
- Partnerships with non government organisations
- Staged Approach

PHC Support

The new Territory wide approach will support comprehensive and collaborative STI/HIV/BBV programs through providing grant funding for PHC services to develop comprehensive, whole of health service, sexual health programs managed by dedicated Sexual Health Coordinators. This approach is to be supported by ensuring a close partnership with the CDC SHBBV program and by providing new resources and re-allocation and re-focus of existing resources where appropriate.

The first of these grants has been provided to the Central Australia Aboriginal Congress (CAAC) and for the first time CAAC is working in partnership with the Alice Springs Sexual Health Unit (SHU) and Tri State project to undertake the annual STI/HIV screen.

Negotiations are underway with representatives from the Katherine non-government organisations to provide similar support for the Katherine region. Similar programs will be rolled out across the region in the coming years.

Re-focus of existing services

In January 2007, a Nurse Manager was appointed to Clinic 34 Darwin in order to expand and integrate Darwin urban services. Over the next 12 months, the Clinic 34 team will be engaging in an expanded program which will include providing outreach services to the urban community with a particular focus on meeting the needs of young people and strengthening partnerships with other PHC service providers.

The Alice Springs Sexual Health Unit remote team will be offering a comprehensive 'zonal' approach to communities based on the '8-ways' sexual health service provision model.

A policy group will guide all Clinic 34s through a process of policy and procedures review with the long term aim of accreditation for the larger clinics.

Research

In recognition of the paucity of research to inform service delivery, the SHAG members

identified 3 key research areas to be commissioned over the coming year. The first was in response to a request from the NT AIDS and Hepatitis Council (NTAHC) for funds to support research into the peer support needs for sex workers throughout the Territory. This small needs analysis was undertaken in late 2006 and will inform the ongoing work of the NTAHC's Sex Worker Outreach Project (SWOP).

Another small research project supported by SHAG was for a project officer to be employed to undertake a needs analysis for young people accessing sexual and reproductive health services in the Alice Springs and Darwin urban areas. Terms of reference for this project have been developed and the project will be implemented over the coming weeks.

Terms of reference are also being developed to employ a Project Officer to scope and develop a submission for funding to undertake research into sexual behaviour in Indigenous communities. This is a research area that has never been undertaken and by far the most significant research activity being supported through the SHAG. If funding is successful, it will hopefully provide the evidence base to guide the work of the program over the coming years.

Other Strategies

- A Territory wide approach to health promotion and prevention
- A plan is underway so as to respond proactively to media issues

The SHAG is the ideal forum to advise to government around policy matters and new initiatives.

To date the new program is progressing well. Members of the SHAG recently endorsed a Business Plan for the coming 3 years. While it will be some time before the results of this coordinated approach will have an impact of the rates of STIs and Blood Borne Virus infections across the Territory, the beginnings are positive. Regular updates will be provided as the program expands across the NT.

Trachoma update and an invitation to become a Trachoma Volunteer

Cate Coffey, CDC Alice Springs

Background

Trachoma is a chronic eye condition resulting from untreated infection with *Chlamydia trachomatis*. In the Northern Territory (NT), it is estimated that, 50% of Aboriginal children in remote communities have trachoma.¹ Untreated, this infection, may lead to blindness in later life.

The Australian Government are committed to taking part in the WHO GET 2020 program to eradicate trachoma by 2020 and have provided funding for an NT Trachoma Project Coordinator.

The NT Trachoma Working Group recommended the employment of a Public Health Nurse based in the Centre for Disease Control Alice Springs to work as this coordinator to:

1. assist in the training of health staff to better diagnose trachoma and establish the prevalence of trachoma at the community level;
2. assist with the co ordination of screening and control measures;
3. facilitate data collection.

I commenced as the Trachoma Coordinator on May 14 2007.

Initial Priorities.

I will work in my role as Trachoma Coordinator to:

1. Review NT Trachoma Guidelines and Protocols in line with Communicable Diseases Network Australia Guidelines.

2. Implement guidelines through public health and primary health care providers.
3. Develop training packages for health service providers
4. Review data collection procedures and support data collection.
5. Establish which communities have been screened and those requiring screening in 2007.
6. Coordinate the public health response and treatment for communities as required.

The Trachoma Project will work closely with the Maternal and Child Health Team and Environmental Health staff to assist communities to build sustainable capacity to provide a public health response to trachoma and ultimately eradicate this preventable disease.

Training sessions with Aboriginal Health Workers, Environmental Health Workers, Child Care Workers, Liaison officers, and other community based health service providers will be held twice yearly in Central Australia and the Top End.

A database of health service volunteers, to assist with trachoma screening and community treatment will be established to enhance existing services. Anyone who is interested in attending training to become a Trachoma Volunteer please contact Cate Coffey at cate.coffey@nt.gov.au.

Reference

1. Lansingh VC, Weih LM, Keeffe JE, Taylor HR. Assessment of trachoma prevalence in a mobile population in Central Australia. *Ophthalmic Epidemiol* 2001; 8(2 & 3): 97-108.

The Acute Rheumatic Fever/Rheumatic Heart Disease Program - an update

Keith Edwards, CDC Darwin

Background

The objectives of the Acute Rheumatic Fever (ARF)/Rheumatic Heart Disease (RHD) Program are in order of priority

- To prevent clients who have had one attack of ARF from having another by giving them a 4 weekly injection of Benzathine Penicillin (Secondary Prophylaxis). This includes the timely monitoring of adherence by reviewing Community Clinic Benzathine Charts each month.
- To diagnose every case of ARF, record them on the register with their consent and to educate them about ARF, RHD and the need for prophylaxis.
- To educate health staff about the diagnosis and management of clients with ARF / RHD.
- To educate the community about ARF/RHD and the importance of secondary prophylaxis and also the contribution of living conditions and hygiene to causation.
- To classify clients according to severity of disease and recall them in a timely fashion for review echocardiography, DMO/GP review, physician/paediatrician review and cardiologist review as appropriate. Dental assessment and therapy are also included in the recall capacity.

Funding

The register based program has been funded largely by the Department of Health and Aging although the amount and timing has varied from year to year. Most recently in 2005, funds were provided through the Australian Government Sharing Health Care Initiative that allowed the employment of a full time nurse educator/coordinator in both Darwin and Alice Springs. This initiative has helped break down barriers in rural communities, and combined with education and the recall systems of the ARF/RHD Register, help to give a better client service. The quality of education and the number of clients, health staff and communities has improved. We are fortunate to have been recently awarded funds at the same level for 2006-2007 and 2007-

2008. This will support the ongoing development of the register as well as maintain the existing staffing.

Staffing issues

Staffing since Jan 2007 has undergone some changes. Although all staff members working in the RHD program remain enthusiastic and wholeheartedly supportive of the program objectives, the completion of contract for the Administrative Officer and the uptake of an alternative position of one part-time RHD Public Health Nurse in Central Australia has provided challenges. The coordinator in Darwin for the Top End Program has been unwell, which has necessitated her absence for some time, and we have been relying on temporary staff to continue the program.

A submission to the federal government for Aboriginal Health Worker positions with the intent to expand the effectiveness of the program was not successful. At a recent TB/Leprosy workshop the TB/Leprosy Public Health Nurses were given a refresher course on ARF and RHD to enable them to assist with the program when needed.

Policy Development

A National Working Group has been formed by the federal government to review the need for a National ARF/RHD Program. It met for the first time in May 2007 and has a 6 month time frame to reach a conclusion. Ms Jenny Cleary is the NT representative for the Department of Health and Community Services (DHCS) and Professor Jonathan Carapetis of the Menzies School of Health Research is also a member. This group will provide feed back to the federal government and with the hope of a positive response to further support the ARF/RHD nationally including the NT program.

The Register

The ARF/RHD register is still in the process of being upgraded. Despite a lengthy interaction with the IT company Dialogue, the register

remains largely in its former state with the 2 registers not yet combined into one functional unit. Thanks to assistance being provided by the IT Division of the DHCS (Data warehouse section), work on the register has progressed and an initial merge of the registers is expected to be achieved by the end of July 2007, becoming fully operational by the end of August 2007. This upgrade will allow a web based portal so that clinics with internet connections will be able to view their clients on this window and to enter their benzathine penicillin injection dates. This will assist with mobility issues as other clinics will be able to obtain relevant data when needed. Information will be 'up-to-date' and make the paper based recall lists less necessary. NT Cardiac, who look after all the priority (1) clients will also be connected to the new system by way of a daily download of information.

Epidemiology

Currently there are a total of 1694 clients on the Top-end register and 598 on the Central Australian register. Figure 1 is a bar chart showing the apparent decline in ARF cases and the number of recurrences over the past 5 years in the Top End. Similarly, Figure 2 shows an apparent decline in RHD over the same period. This may reflect a true reduction, but more likely reflects annual variation or even a recent reduced ability to record case numbers.

Recent analysis of data on adherence to secondary prophylaxis does not show the high levels of adherence which might be expected to bring about such a reduction in recurrences. Many clinics report a coverage of less than 50%.

Figure 1. ARF by year Top-End Register showing proportion of recurrences

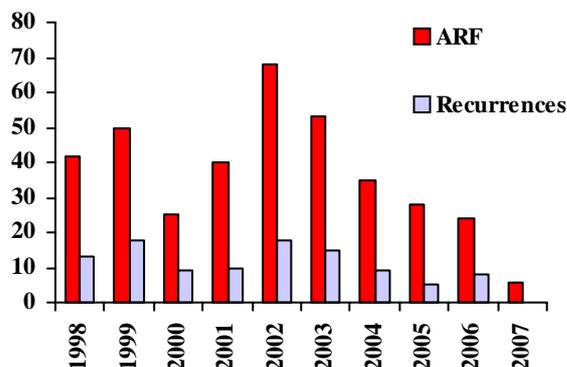
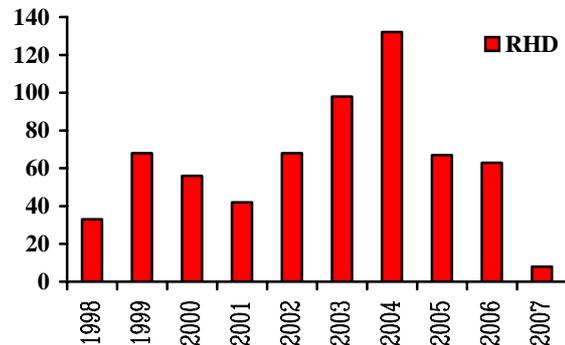


Figure 2. RHD by year Top-End Register



Currently, due to the registers lack of IT functionality, there is a back log of data entry and an inability to produce accurate reports. This problem should be resolved by the next quarterly report.

Health Education

While there has been an increase in the number of clients receiving education on a one-to-one basis, there is still only a small proportion of the clients on the register educated. A need to move towards a 'training of trainers' approach is needed so that each clinic has a person knowledgeable about ARF/RHD and confident to educate clients, staff and the community.

Some innovative exercises in client education have included 'Kids Camps' in Central Australia and 'Telling True Stories' type radio programs produced by Aboriginal Resource Development Services (ARDS) in the Top-End. A new educational DVD in simple English is planned.

The *Australian Evidence Based Guidelines for the Management of ARF/RHD* which were published in 2006 by the National Heart Foundation have been distributed to all community health clinics and hospitals and are also on the internet. Even so, individual health staff require education regarding these Guidelines and the use of the shortened protocol versions to improve diagnosis and management.

Secondary prophylaxis

Individual client adherence to 4 weekly injections has been challenged over the past 12 months with the non-availability of LA Bicillin.

This has resulted in the use of a larger injection volume (double that of LA Bicillin at 4.6ml) of Pan Benzathine Penicillin and significant difficulties in administering the injection without needle blockage. Staff have reported needing to reinject up to 4 times in an individual patient. Guidelines have been distributed outlining how this problem can be minimised. Interestingly, there are many clients and staff who maintain that this larger injection is less painful, perhaps because of the optional dilution with local anaesthetic. There is an urgent need to review this issue so that an informed judgement on choosing the best preparation is made when LA Bicillin becomes available once more.

The other recent innovation in secondary prophylaxis is the promotion of the 'Full Moon Calendar'. This aims to remind clients when their injection is due by the 'natural' appearance of the moon. Drawbacks include everyone wanting their injection on the same day and the fact that the full moon is not every 28 days (28-31 days). Advantages include being able to review the clinic master chart a few days later to see what adherence rates are like and to send help if needed.

The 'Hand Held Patient Record' is an ID card which identifies the client as having had ARF/RHD and being on 4 weekly Benzathine penicillin. Previous analysis of the register data has revealed that the commonest reason for the client not receiving their 4 weekly injection is travel to town or another community. 'Hand Held Patient Record' Cards have been issued in Central Australia and are planned to be distributed in the Top-End when the register becomes functional. It is planned that the clinics will be able to print cards for individual clients when needed. The hope is that these cards will facilitate the client being able to access their injection at another location.

Research

Innovative approaches to improving adherence to secondary prophylaxis have included the ABCD local audit process. This was trialled

successfully in one Top-End Community in 2006 by staff of the Menzies School of Health Research (MSHR). The aim is to continue to develop this approach in other selected communities. The MSHR is also planning research in the area of 'echo' screening of all school children for RHD.

Conclusion

Much work has been undertaken over the past years in regards to improving the care of clients with ARF and RHD living in NT urban and remote communities. High staff turnover and competition with other chronic disease demands have resulted in variable success in achieving 4 weekly secondary prophylaxis regimens in communities. Clients have expressed their needs in regards to facilitating receiving their injection on time as described in the work by Dr Zinta Harrington. Transport to the clinic, receiving the injection from a preferred person and reduced waiting times were as important as whether the injection is painful or not. Adequate staffing ratios are needed in the Community Health Clinics in regards to the workload present. ARF/RHD needs to be integrated into other chronic disease strategies. Importantly the underlying determinants of ARF/RHD need to be addressed urgently, namely the high levels of overcrowding in houses and the low levels of hygiene.

Bibliography

1. Harrington Z, Thomas DP, Currie BJ and Bulkanhawuy J. Challenging perceptions of non-compliance with rheumatic fever prophylaxis in a remote Aboriginal community. *MJA* 2006; 184 (10): 514-517.
2. Menzies School of Health Research. The Audit and Best Practice for Chronic Disease Project (ABCD Project) <http://www.health.gov.au/internet/h4l/publishing.nsf/Content/respack-abcd> accessed
3. National Heart Foundation of Australia (RF/RHD guideline development group) and the Cardiac Society of Australia and New Zealand. Diagnosis and management of acute rheumatic fever and rheumatic heart disease in Australia - an evidence based review. 2006.

Legionella Fact sheet

What is Legionella/ Legionnaires disease?

Legionella bacteria can cause two illnesses *Legionella* pneumonia (Legionnaires' disease) and a mild flu-like illness (Pontiac fever)

Legionnaires' disease (Legionellosis) is an infection of the lung caused by the *Legionella* bacteria. Exposure to the *Legionella* bacteria will not necessarily lead to the disease, but the bacteria can cause a type of pneumonia that can be fatal. It can take 2 to 10 days for the symptoms to develop after inhaling the bacteria however, symptoms usually appear within 5 to 6 days.

Pontiac fever is not associated with pneumonia or death. Symptoms may appear 5 to 66 hours after exposure to the *Legionella* bacteria, most often between 24 and 48 hours.

Where does Legionella come from?

Legionella bacteria are found naturally in low levels in the environment. There are several species of *Legionella*, but the ones associated with human disease are *Legionella pneumophila* and *Legionella longbeachae*.

Legionella pneumophila may be found in environments such as water cooling systems (cooling towers), warm water systems or water heaters, shower heads and spa pools. In the absence of effective maintenance and cleaning, high numbers of the bacteria may be found.

Legionella longbeachae occur in potting mix or soils.

The most common way *Legionella* infection is contracted is by breathing air contaminated with *Legionella* bacteria. Air is contaminated when aerosols (very fine droplets of water) containing *Legionella* bacteria are released. The aerosol needs to be very small so that it can penetrate deeply into the lung. Evaporative cooling units sometimes used in home air conditioning units **have not** been known to cause Legionnaires' disease. **Legionnaires' disease is not transmitted from person to person.**

What are the symptoms of Legionella infection?

A general feeling of being unwell usually occurs in the first 24 to 48 hours.

Common symptoms of Legionnaires' disease include

- high temperature (fever)
- stomach cramps and diarrhoea
- dry cough or a cough that may produce sputum
- shortness of breath
- aches and pains in the muscles
- chills
- feeling confused
- headache
- feeling tired and loss of appetite

Not all of the symptoms need to be present for diagnosis. People with these symptoms should see their doctor immediately.

The symptoms of Pontiac fever include

- feeling tired and loss of appetite
- high temperature (fever)
- chills
- headache
- aches and pains in the muscles

Pontiac fever does **not** present as pneumonia and has **not** been associated with death.

How is Legionella infection diagnosed?

Specialised laboratory tests using blood, urine or lung secretions (sputum) are necessary to establish a definite diagnosis of *Legionella* infection.

Note: Legionnaires' disease is a notifiable disease under the *Notifiable Diseases Act* so all cases are reported to the Centre for Disease Control.

Who is most at risk?

- older people, with existing health problems such as a respiratory disease or diabetes
- people who are taking drugs which suppress the immune system, e.g. liver or kidney transplant patients and cancer patients
- smokers and people who drink alcohol

What is the treatment?

Treatment for Legionnaires' disease is with an antibiotic. For those people with serious symptoms such as severe difficulty in breathing admission to hospital may be required.

Time of treatment can vary, but normal expected time is 10 to 14 days.

People with Pontiac fever generally recover spontaneously within 2 to 5 days without treatment.

What is being done about Legionella?

Best practice guidelines include regular treatment, cleaning and maintenance of water-cooling systems, warm water systems and water storage units performed by the proprietor of a building. The proprietor is encouraged to hire people for the installation and maintenance of water-cooling systems.

An operation and maintenance manual should be kept by the building proprietor and be readily accessible at all times.

In addition, inspections of appropriate facilities are carried out by Environmental Health Officers. The Environmental Health Program keeps a register of cooling towers and evaporative condensers in the Northern Territory.

People are encouraged to avoid direct inhalation of potting soil or to wear protective coverings over their nose and mouth. People are also encouraged to wash their hands thoroughly after handling potting mix or soil, especially before eating or drinking.

Further information

For further information and advice contact your local Environmental Health Program

Darwin 8922 7152

Alice Springs 8955 6122

or

Centre for Disease Control.

Darwin 8922 8044

Katherine 8973 9049

Alice Springs 8951 7540

Tennant Creek 8962 4259

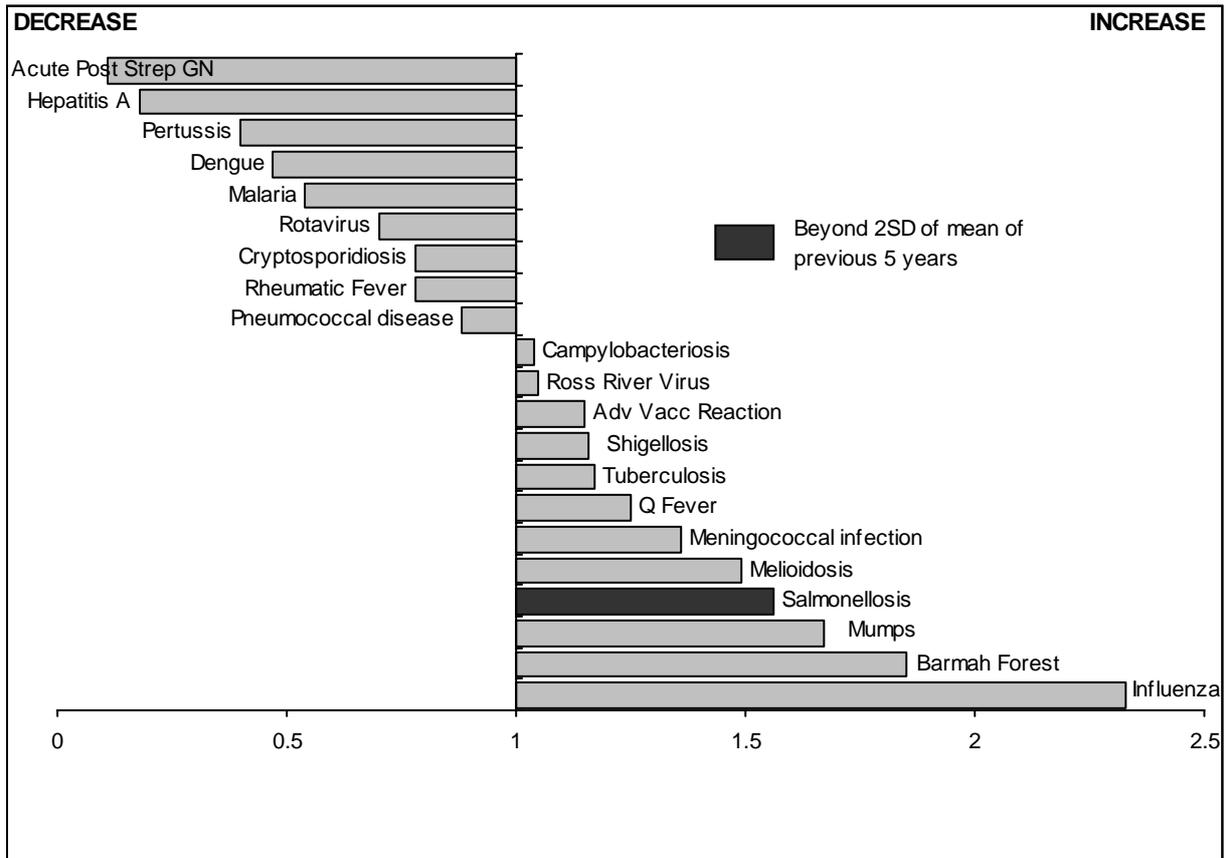
Nhulunbuy 8987 0359

NT NOTIFICATIONS OF DISEASES BY ONSET DATE & DISTRICTS
January to March,

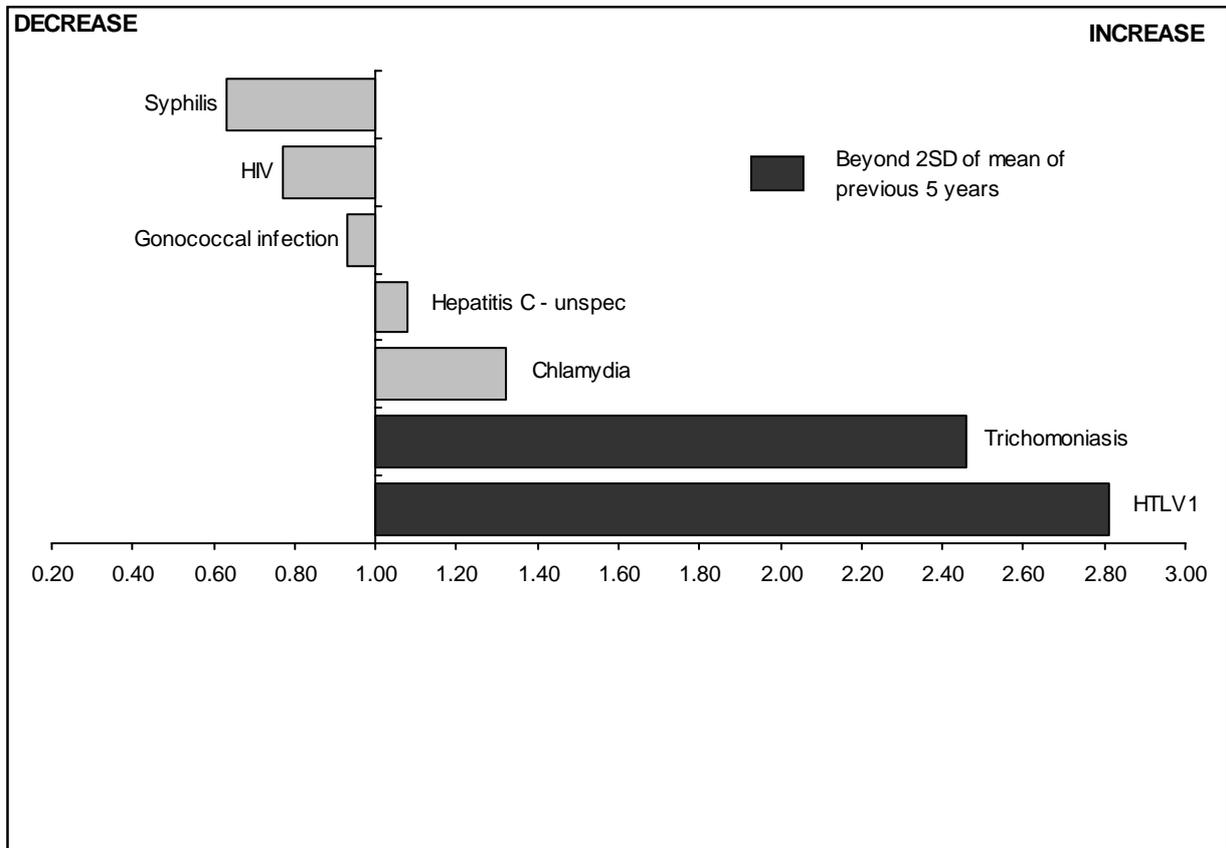
	Alice Springs		Barkly		Darwin		East Arnhem		Katherine		NT	
	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006
Acute Post Streptococcal GN	0	0	1	1	0	3	0	1	0	0	1	5
Adverse Vaccine Reaction	2	1	1	1	7	7	1	3	0	0	11	12
Barmah Forest	6	8	0	1	18	35	6	4	3	1	33	49
Campylobacteriosis	17	21	2	0	51	30	1	3	0	12	71	66
Chickenpox	4	0	1	0	13	1	3	0	0	0	21	1
Chlamydia	212	211	9	14	214	238	51	57	54	42	540	562
Chlamydial conjunctivitis	1	2	2	0	1	5	1	0	0	10	5	17
Cryptosporidiosis	21	13	2	0	13	3	2	12	6	3	44	31
Dengue	0	1	0	1	5	8	0	1	0	0	5	11
Gastroenteritis - related cases	0	0	0	0	0	0	0	1	0	0	0	1
Gonococcal conjunctivitis	2	0	0	0	0	0	0	0	1	0	3	0
Gonococcal infection	199	276	16	13	85	112	25	37	59	42	384	480
Gonococcal neon ophthalmia	0	1	0	0	1	0	0	0	0	0	1	1
Hepatitis A	0	1	0	0	2	10	0	2	0	8	2	21
Hepatitis B - chronic	14	31	0	0	11	24	23	9	5	4	53	68
Hepatitis B - new	0	1	0	0	0	0	0	1	0	0	0	2
Hepatitis B - unspec	39	23	1	0	23	7	9	11	4	1	76	42
Hepatitis C - new	1	0	0	0	1	0	0	0	0	0	2	0
Hepatitis C - unspec	13	15	1	1	44	67	2	0	3	7	63	90
<i>H. Influenzae</i> b	0	0	0	1	0	0	0	0	0	0	0	1
<i>H. Influenzae</i> non-b	3	1	0	0	0	1	0	1	0	0	3	3
HIV	0	0	0	0	2	4	0	0	0	0	2	4
HTLV1 asyptomatic/unspecified	27	19	0	1	0	1	0	0	0	0	27	21
Hydatid	1	0	0	0	0	0	0	0	0	0	1	0
Influenza	0	2	0	0	7	4	0	1	0	0	7	7
Leprosy	0	0	0	0	0	1	0	0	0	0	0	1
Leptospirosis	0	0	0	0	1	2	0	0	0	0	1	2
Malaria	1	0	0	0	5	10	0	1	0	2	6	13
Melioidosis	0	0	0	0	19	8	1	0	0	2	20	10
Meningococcal infection	1	0	0	0	1	1	0	0	1	1	3	2
Mumps	0	0	0	0	2	0	0	3	0	0	2	3
Non TB Mycobacteria	0	0	0	0	0	2	0	1	0	0	0	3
Pertussis	3	8	0	0	4	21	0	6	1	0	8	35
Pneumococcal disease	4	9	1	0	6	4	1	0	0	2	12	15
Q Fever	1	0	0	0	0	0	0	0	0	0	1	0
Rheumatic Fever	3	3	0	0	7	4	3	2	2	2	15	11
Ross River Virus	4	4	1	4	79	148	14	6	28	12	126	174
Rotavirus	15	12	1	0	10	19	0	9	3	3	29	43
Salmonellosis	44	20	4	7	110	54	14	11	12	12	184	104
Shigellosis	22	24	6	4	12	7	4	1	5	1	49	37
STEC/VTEC	2	0	0	0	0	0	0	0	0	0	2	0
Syphilis	15	38	3	2	6	11	3	8	18	9	45	68
Syphilis congenital	0	1	0	0	0	0	0	0	0	0	0	1
Trichomoniasis	160	112	21	8	139	63	81	58	72	20	473	261
Tuberculosis	1	2	0	1	8	5	1	0	1	0	11	8
Typhoid	0	0	0	0	0	1	0	0	0	0	0	1
Vibrio food poisoning	0	0	0	0	0	1	0	0	0	0	0	1
Yersiniosis	0	0	0	0	1	0	0	0	0	0	1	0
Zoster	5	0	0	0	24	0	0	0	0	0	29	0
Total	843	860	73	60	932	922	246	250	278	196	2,372	2,288

Note: chickenpox, varicella unspecified, and zoster became notifiable on 15 March 2006

Ratio of the number of notifications (Q1 2007 to the mean of Q1 2003-2006): selected diseases



Ratio of the number of notifications (Q1 2007 to the mean of Q1 2003-2006): sexually transmitted diseases



Comments on NT Disease notification graphs p 32

Trichomoniasis

The increase in this quarter spread across all the districts, but was most significant in Alice Springs and Darwin districts. It is believed to be related to the fact that the nucleic acid test for trichomoniasis is increasingly being used for diagnosis and screening. In contrast to the same time of the last 5 years, nucleic acid tests have surpassed microscopy to become the predominant diagnostic method for trichomoniasis in the NT. Whether this increase

in notification reflects a true increase in disease incidence is unknown.

Salmonellosis

There were 184 cases of Salmonellosis in the first quarter of 2007 compared with a five-yearly mean of 118. The outbreak of *Salmonella* Oslo accounted for 32 of these and the rest of the increase was due to increased numbers in Alice Springs and Darwin of a mixture of different serotypes. Salmonellosis notifications have increased nationally this year.

Ross River virus and Barmah Forest virus disease cases in NT in 2006/2007

Peter Whelan, MEB, CDC, Darwin

Ross River virus

There has been slightly less cases of Ross River virus (RRV) disease this year (227 to May 4) compared with last year (270 to June 30). However last year was the highest number of cases in 12 years and this year is likely to be the second highest in 13 years. Cases were mostly in the Darwin region (133) but in the Katherine region there were nearly twice as many this year (36) as last year (19).

The cases were relatively low in January and relatively higher in March and April compared with other years. The higher case numbers in the Darwin region can be attributed to less rainfall in the mid wet season rain period (leading to extended *Aedes vigilax* numbers and higher *Culex annulirostris* numbers) and a much above average rainfall for March (leading to an extended wet season peak of *Cx. annulirostris*).

In the Darwin area of the Darwin region, there were relatively more cases in the Palmerston and rural Darwin suburbs compared to Darwin urban suburbs, which reflects the lack of organised larval mosquito control in the former suburbs. In

the Darwin urban suburbs there was no particular suburb with predominantly more cases, but there were relatively high numbers in 2 inner urban areas of Stuart Park and Nightcliff compared with the suburbs around Leanyer swamp, which may be due to some minor mosquito breeding in nearby tidally influenced areas adjacent to the former suburbs.

Barmah Forest virus

Barmah Forest virus (BFV) cases were relatively less in the NT this year (91 to May 7) compared with last year (101 to 30 June). Last year was the highest number of cases for 15 years and this year is the second highest number for 16 years. This may be due to environmental reasons as for RRV, but could also be due to false positives in testing. Most BFV cases were in the Darwin area of the Darwin region, with no clustering of cases in any suburb.

Most cases were in the January to April period with no defined peak month, although there was a tendency, as in previous years, for BFV cases to occur later than RRV, reflecting the different virus ecology of this disease.

Immunisation coverage for children aged 12 <15 months at 31 March 2007

Region	Number in District	% DTP	% Polio	% HIB	% Hep B	% Fully vaccinated
Darwin	243	90.95	90.53	93.00	93.83	90.12
Winnellie PO Bag	97	95.88	95.88	100.00	100.00	95.88
Palm/Rural	188	90.96	90.96	94.15	94.15	90.96
Katherine	80	97.50	97.50	93.75	97.50	93.75
Barkly	10	80.00	80.00	100.00	100.00	80.00
Alice Springs	118	88.98	88.98	94.92	94.07	88.14
Alice Springs PO Bag	43	86.05	86.05	93.02	95.35	83.72
East Arnhem	48	93.75	93.75	100.00	100.00	93.75
NT	827	91.66	91.54	94.92	95.53	90.81
Indigenous	366	90.16	91.54	95.90	95.63	89.89
Non-Indigenous	543	100.00	90.16	94.66	97.24	93.92
Australia Ind	2,748	84.10	94.66	92.61	92.90	83.19
Australia Non Ind	66,243	92.37	84.10	94.93	94.81	91.52
Aus Total	68,991	92.04	92.27	94.84	94.74	91.18

Immunisation coverage for children aged 24 <27 months at 31 March 2007

Region	Number in District	% DTP	% Polio	% HIB	% Hep B	% MMR	% Fully vaccinated
Darwin	226	96.46	96.46	94.25	98.23	94.69	94.25
Winnellie PO Bag	76	100.00	100.00	98.68	100.00	98.68	98.68
Palm/Rural	172	94.77	94.77	91.28	97.67	94.19	91.28
Katherine	66	100.00	100.00	98.48	100.00	98.48	98.48
Barkly	27	92.59	92.59	92.59	100.00	88.89	81.48
Alice Springs	95	95.79	95.79	91.58	95.79	93.68	90.53
Alice Springs PO Bag	57	100.00	98.25	96.49	100.00	96.49	96.49
East Arnhem	37	89.19	86.49	89.19	89.19	94.59	86.49
NT	756	96.43	96.16	93.92	97.88	95.11	93.25
Indigenous	338	96.75	96.45	94.97	98.22	97.63	94.67
Non-Indigenous	506	96.64	96.44	95.26	97.04	95.26	94.27
Australia Ind	3,028	95.57	95.41	93.89	98.05	94.65	91.74
Australia Non Ind	63,240	95.17	95.07	93.91	95.74	93.92	92.42
Aus Total	66,268	95.19	95.09	93.91	95.85	93.95	92.39

Immunisation coverage for children aged 72 <75 months at 31 March 2007

Region	Number in District	% DTP	% Polio	% MMR	% Fully vaccinated
Darwin	244	84.02	84.02	82.38	81.97
Winnellie PO Bag	95	92.63	91.58	92.63	90.53
Palm/Rural	185	87.57	88.65	89.73	87.03
Katherine	98	85.71	87.76	86.73	85.71
Barkly	14	57.14	78.57	85.71	57.14
Alice Springs	100	87.00	87.00	87.00	87.00
Alice Springs PO Bag	48	95.83	95.83	97.92	95.83
East Arnhem	55	96.36	94.55	96.36	94.55
NT	839	87.37	87.96	88.08	86.29
Indigenous	303	93.07	92.74	93.07	92.08
Non-Indigenous	512	86.33	86.52	86.33	85.74
Australia Ind	2,367	87.66	87.92	88.13	86.78
Australia Non Ind	65,430	88.88	88.86	88.84	88.04
Aus Total	67,797	88.84	88.83	88.82	87.99

Immunisation Coverage 31 Mar 2007

Immunisation coverage rates for Northern Territory (NT) children by regions based on Medicare address postcode as estimated by the Australian Childhood Immunisation Register are shown on page 34.

Background information to interpret coverage

Winnellie PO Bag is postcode 0822, which includes most Darwin Rural District communities, some East Arnhem District communities and some people who live in the Darwin "rural area" who collect mail from the Virginia store or Bees Creek. Alice Springs PO Bag is postcode 0872, which includes Alice Springs District, Nganampa and Ngaanyatjarra communities.

The cohort of children assessed at 12-<15 months of age on 31 March 2007 were born between 01/10/2005 and 31/12/2005 inclusive. To be considered fully vaccinated, these children must have received 3 valid doses of vaccines containing diphtheria, tetanus, pertussis, and poliomyelitis antigens, either 2 doses of PRP-OMP Hib or 3 doses of another Hib vaccine, and 2 doses of hepatitis B vaccine (not including the birth dose) (latest doses due at 6 months of age). All vaccinations must have been administered by 12 months of age.

The cohort of children assessed at 24-<27 months of age on 31 March 2007 were born between 01/10/2004 and 31/12/2004 inclusive. To be considered fully vaccinated, these children must have received 3 valid doses of vaccines containing diphtheria, tetanus, pertussis, and

poliomyelitis antigens, either 3 doses of PRP-OMP Hib or 4 doses of another Hib vaccine, and 2 doses of hepatitis B vaccine (not including the birth dose) and 1 dose of measles, mumps, rubella vaccine (latest doses due at 12 months of age). All vaccinations must have been administered by 24 months of age.

The cohort of children assessed at 72-<75 months of age on 31 March 2007 were born between 01/10/2000 and 31/12/2000 inclusive. To be considered fully vaccinated, these children must have received 5 valid doses of vaccines containing diphtheria, tetanus, pertussis antigens, 4 doses of poliomyelitis vaccine and 2 valid doses of measles, mumps, rubella vaccine (latest doses due at 4 years of age). All vaccinations must have been administered by 72 months (6 years) of age.

Interpretation

Immunisation coverage in NT children remains high and was above the national average for the 24<27 month cohort and just lower than the national average for the 12<15 and 72<75 month cohorts.

Immunisation coverage in Indigenous children was over 1% lower for the 12-<15 month cohort than the national average, but over 2% higher for the 24-<27 month cohort and over 4% higher for the 72<75 month cohort.

Immunisation coverage for non-Indigenous NT children at 72<75 months of age (85.74%) remains lower than for the younger cohorts, and this is a concern across Australia.

NT Malaria notifications January - March 2007

Merv Fairley, CDC, Darwin

Six notifications of malaria were received for the first quarter of 2007. 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
1	Indonesia	Fisher	<i>P. falciparum</i>	No
1	PNG	Holiday	<i>P. vivax</i>	No
1	Ethiopia	Working	<i>P. falciparum</i>	Yes
2	Indonesia	Student	<i>P. falciparum</i>	No
1	Indonesia	Holiday	<i>P. falciparum</i>	No

Disease Control staff updates

CDC Directorate

Tracy Ward has moved from her policy position with Environmental Health to a Senior Policy Officer position with CDC Directorate.

TB/Leprosy

The retirement of **Hartley Dentith** from Gove CDC was celebrated by all with a dinner in Darwin and an event in Gove. **Hartley** received a nomination at the NT Nurses Awards 2007 and a special mention for his years of service. **Ros Webby** and **Sajeel Samjowan** are new parents of **Rohan**, born in May. Ros has commenced leave returning at the end of November 2007. **Sarah McCarthy** has completed her contract as Administration Officer. The Tennant Creek team is joined by **Charmaine Taylor** from Maternal and Child Health to fill the Public Health Nurse/TB position vacated by **Molly Cobden**.

Immunisation

Susan McMinn from Casuarina Community Care Centre and **Jenni Wyllie** are based in Darwin for 6 months working on the HPV Vaccination Program for remote communities. **Krista McCarron** has moved from Maternity ward Alice Springs Hospital to provide HPV support in Central Australia.

Sexual health

Alison Males has moved on from the Rheumatic Heart Program to a position as Sexual Health

Co-ordinator at the Central Australian Aboriginal Congress. Alice Springs Clinic has 2 locum doctors covering one week per month each, while recruitment is in progress to the medical officer position. **Amber Price** is providing support for reception.

MEB

Peter Whelan is currently on long service leave and Geoff Cole who has been working with the Groote Eylandt team has resigned.

Environmental Health

Changes in the Darwin Office include **Leah Magee** acting as Senior Policy Officer; with **Phuong Le** backfilling Leah's Special Project Officer position. **Dagmar Schmidt** has joined the Directorate also as acting Senior Policy Officer due to **Tracy Ward's** move. **Chris Daly** has been employed as a Special Project Officer to review the public health counter disaster subplan. **Kathryn Barclay** and **Michael Dinnen** have commenced at Darwin Urban as EHOs

Aaron Clifford and **Russell Spargo** have commenced as EHOs in Alice Springs.

Surveillance

Cate Coffey has commenced as NT-wide trachoma program manager with recruitment to her Immunisation/Surveillance position in progress.