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Rheumatic Fever: Licks the joints, bites the heart (and nibbles the brain...)

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Referring to the fleeting arthritis and damaging carditis characteristic of Acute Rheumatic Fever (ARF), French physician Ernst-Charles Lasègue famously said in 1884 “*Pathologists have long known that rheumatic fever licks at the joints, but bites at the heart*”. True as this is, there are a number of other manifestations of ARF which must be recognised to ensure timely diagnosis, and therefore effective treatment and secondary prophylaxis of this debilitating but treatable condition.

A recent article published by the Tropical Population Health Unit in Cairns¹ suggested that medical practitioners in North Queensland may be failing to recognise ARF, indicating a need to review the diagnostic criteria and the range of clinical scenarios which may comprise a first presentation of ARF. This is particularly timely in the context of the current Government Intervention which has resulted in the arrival of a number of health professionals from the southern states who may not be familiar with the diagnosis and treatment of ARF, or the resources available. This article will therefore summarise the diagnostic criteria for the Indigenous population in the Northern Territory (NT) and present 3 recent cases for consideration.

It is well known that Indigenous Australians have the highest rate of ARF and Rheumatic Heart

Disease (RHD) in the world.² In the past 5 years, the Top End has recorded 223 notifications of ARF, of which 163 were new cases (73%). In 2007 (to end of

Contents

Rheumatic Fever: Licks the joints, bites the heart (and nibbles the brain...)	1
Increasing Notifications of Infectious Syphilis among Men Who Have Sex with Men in Darwin Urban Area – An Alarming Recent Trend	7
Influenza immunisation of doctors at the Royal Darwin Hospital, 2007: immunisation rate and factors contributing to uptake	9
Influenza season 2007; bad, but not that bad	14
Editorial	18
The 2008 revised antibiotic protocol for adult community-acquired pneumonia in the Top End of the Northern Territory	19
Treatment of trachoma in small babies	22
Trachoma: new advances in treatment	24
Treatment completion for latent TB infection in Darwin 2005 – 2007	25
Fact sheet: <i>Chironex fleckeri</i> (Box Jellyfish)	29
Needs Analysis - Youth Access to Sexual and Reproductive health services. A Snapshot	31
Palmerston Safety Survey 2006: home safety, perceptions of community safety and experiences of injury	33
Public Health Group – Region 1: Counter Disaster Plan (2007)	40
Viral meningitis outbreak	41
NT notifications of diseases by onset date & districts	42
Exotic mosquito incursions and the risk of vector-borne disease in Block 4, Royal Darwin Hospital campus, Darwin, Australia, 2005-07	44
Vaccination coverage for children	47
NT Malaria notifications July - September 2007	48
Disease Control staff updates	49

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Table 1. Disease burden of ARF and RHD in Indigenous Australians in the Northern Territory 2004

	Rates	
	Annual Incidence ARF in children aged 5-14 years (per 100,000 population)	All age Prevalence RHD (per 1000 population)
Top End	208	3
Central Australia	320	13
NHFA defined High Risk Group	30	2

Table modified from *From Infancy to Young Adulthood* report³

October) there have been 43 notifications, of which 34 have been new cases, and 14 of these have had carditis.

A summary of the data on the disease burden of ARF and RHD in Indigenous Australians in the Top End and Central Australia 2004 is presented in Table 1. The rate the National Heart Foundation of Australia (NHFA) uses to define High Risk Group for ARF is presented for comparison.

It can be seen that Central Australia bears a greater burden of disease than the Top End, but that both populations far exceed the NHFA's definitions of a High Risk Group. The significance of these figures is that all Indigenous Australians in the NT can be considered as High Risk; a group for whom *different* diagnostic criteria now apply.

In 2006, NHFA published a comprehensive evidence-based review of the diagnosis and management of ARF and RHD in Australia,⁴ which now comprises the mainstay of treatment in the NT. It is a comprehensive document, available free online at <http://www.heartfoundation.org.au> or in hard copy by calling the NHFA on 1300 36 26 87. It has clear diagnostic criteria (see Figure 1) and management strategies, and allows a uniform approach to ARF and RHD which has hitherto been inconsistent. An abridged outline was also published by Carapetis *et al* in the *Medical Journal of Australia* earlier this year.²

Accurate diagnosis of ARF is important. Over-diagnosis results in unnecessary treatment for many years, and under-diagnosis leads to recurrences of ARF, cardiac damage and

premature death. Yet the diagnosis of ARF remains challenging as there is no single diagnostic test. It requires a combination of clinical and laboratory criteria which are often confusing for clinicians, particularly if they are not familiar with the condition.

The NHFA document describes the clinical features in detail, and in addition presents an important list of differential diagnoses to consider. It is not the intention of this article to re-iterate the NHFA review, but rather to summarise the diagnostic criteria for ARF as they now apply to Indigenous Australians in the NT. The revised criteria (modified from the Jones criteria and the WHO criteria) are presented below. It should be noted that only High-Risk Groups are considered here.

Figure 1.

Diagnostic criteria for initial episode of ARF
2 major criteria OR 1 major and 2 minor PLUS Evidence of preceding Group A Streptococcal infection
Diagnostic criteria for recurrent episode of ARF (patient with known past history of ARF or RHD)
2 major criteria OR 1 major and 2 minor OR 3 minor PLUS Evidence of preceding Group A Streptococcal infection

Table 2. Australian Guidelines for the Diagnosis of Acute Rheumatic Fever in High Risk Groups (2005)

Major criteria	<ul style="list-style-type: none"> • Carditis* • Polyarthrititis OR • Monoarthrititis OR • Polyarthralgia • Chorea[#] • Erythema marginatum • Subcutaneous nodules
Minor criteria	<ul style="list-style-type: none"> • Fever (=38°C) • ESR =30mm/hr OR • CRP =20 mg/L • Prolonged PR interval on ECG[§]
Evidence of Group A Streptococcal (GAS) infection	<ul style="list-style-type: none"> • GAS cultured from throat swab • Raised ASOT OR • Raised Anti-DNaseB[†]
<p>* Including subclinical evidence of RHD on echocardiogram. [#] Rheumatic (Sydenham's) chorea is diagnostic of ARF if other causes have been excluded. It does not require any other criteria or evidence of GAS infection. [§] If carditis is present as a major manifestation, prolonged PR interval cannot be considered as an additional minor manifestation in the same person. [†] See table below.</p>	

Table modified from *Diagnosis and management of acute rheumatic fever and rheumatic heart disease in Australia*⁴

Given that GAS is isolated from throat swabs in less than 5% of cases, streptococcal antibody titres are critical to fulfil the diagnostic criteria. Due to a the lack of available data in Indigenous children, the NHFA proposes the upper limits of normal as shown in Table 3 and defined by a recent study in non-Indigenous children in Melbourne.⁵

†Table 3. Upper Limits of normal for serum Streptococcal Antibody Titres

Age group (years)	ASOT (IU/mL)	Anti-DNaseB (IU/mL)
4-5	120	100
6-9	480	400
10-14	320	380

Three cases recently managed by the paediatric department at the Royal Darwin Hospital (RDH) are outlined below, providing an illustration of

three ‘typical’ yet very different clinical presentations with ARF.

Case 1: The “Classic” Story

CK is a 7 year old previously well Aboriginal girl from Oenpelli. She presented to the local clinic with a 2-day history of difficulty walking due to ‘painful feet’. Further questioning revealed that CK had complained of painful ankles and knees over the preceding days, as well as a mild fever, coryza, and some vomiting. She did not remember a recent sore throat. Her brother is known to have RHD. On examination at the clinic, she did not look unwell, but was febrile (38.2°C) and unable to weight-bear. Her left ankle was swollen and tender to touch, but she had full range of movement. Auscultation revealed 2 normal heart sounds and no cardiac murmur, and she did not have pharyngitis. She was evacuated to Darwin for further investigation.

On arrival in Darwin, she was febrile at 39.1°C and complaining of significant pain. The same examination findings were noted. She had a normal ECG, and bloods and a throat swab were taken. She was diagnosed with ARF based on the diagnostic criteria shown in Table 4.

Table 4.

Diagnostic criteria for ARF fulfilled	
1 Major criteria	<ul style="list-style-type: none"> • Monoarthrititis (ankle) • Polyarthralgia (knees)
2 Minor criteria	<ul style="list-style-type: none"> • Fever 39.1°C • ESR 45 mm/hr • CRP 182 mg/L
Evidence of GAS infection	<ul style="list-style-type: none"> • ASOT 750 IU/ml • Anti-DNaseB 440 IU/ml

Culture of a throat swab was negative for Group A Streptococcus.

She was treated with high dose aspirin (80mg/kg/day in 4 divided doses) and commenced on oral penicillin V 250mg BD. She continued to have significant pain and fever for 48 hours before her symptoms started to settle. Echocardiography on day 2 of admission revealed a mildly thickened mitral valve with mild mitral incompetence, consistent with Mild RHD. She was registered with the ARF registry and received education the following day. By

day 3, her CRP had fallen (182 to 102 mg/L) but her ESR had risen (45 to 110 mm/hr). Given that she had symptomatically improved, she was given a single dose of IM pan benzathine penicillin 900mg and was discharged with 1 further week of aspirin.

She was reviewed in the community 4 weeks post-discharge by the visiting paediatrician. Her CRP had returned to baseline and her ESR was decreasing (62 mm/hr), but it was noted that she still had some residual arthralgia. She was thus prescribed another 2 weeks of aspirin after which her symptoms completely resolved. She is now receiving monthly IM pan benzathine penicillin at her community health centre.

Case 2: The Nibble (*aka St Vitus' Dance**)

JT is a 12 year old previously well Aboriginal girl from Palumpa. She presented to her local clinic with a 5-day history of abnormal 'jerking' movements of her arms and face, and significant slurring of her speech. Further questioning revealed that she had also had a painful right ankle a few days previously. She had a cousin and an aunt with RHD. An astute nurse at the health centre recognised that the unusual movements were characteristic of Sydenham's chorea and recommended transfer to RDH for further investigation. The patient was unable to travel immediately for family reasons, so in consultation with RDH doctors, the patient was given a single dose of IM pan benzathine penicillin 900mg (Sydenham's chorea alone fulfils the diagnostic criteria for ARF) and was commenced on carbamazepine 50mg BD (2.4mg/kg/day; recommended dose 7-20mg/kg/day).

She arrived at RDH 5 days later. On examination she was well and afebrile. Cardiac, ENT and joint examinations were normal. It was noted that JT had frequent facial grimacing and uncontrolled writhing movements of her arms throughout the examination.

* *Saint Vitus is said to be a 4th century Sicilian martyr, and is traditionally the patron of dancers but also young people. For obscure reasons, some 16th century Germans believed they could obtain a year's good health by dancing before the statue of Saint Vitus on his feast day. This dancing developed almost into a mania, and was confused with chorea, later known as Saint Vitus' dance, the saint being invoked against it.*

JT demonstrated the following classic signs of Sydenham's Chorea:

- The "milkmaid's grip" (rhythmic squeezing when the patient grasps the examiner's hand).
- The "pronator sign" (turning outwards of the palms when hands held above the head).
- Inability to maintain protrusion of the tongue.

She was also noted to demonstrate emotional lability, with frequent laughing alternating with crying. She had significant dysarthria and mild ataxia. An ECG was normal, and bloods were taken.

Table 5.

Diagnostic criteria for ARF fulfilled for Case 2	
1 Major criteria	• Chorea
0 Minor criteria*	• None
Evidence of GAS infection*	• ASOT 380 IU/ml • Anti-DNaseB 550 IU/ml

*Not required for diagnosis if chorea present

Her inflammatory markers were not raised and throat swab culture was negative. Her streptococcal titres reported in Table 5 were taken 5 days post-presentation; her initial titres were normal. She also had a number of additional investigations to exclude other causes of chorea including serum copper studies Wilson's disease and an ENA antibody screen for systemic lupus erythematosus, which were normal.

Given that JT was on a sub-therapeutic dose of carbamazepine and had ongoing prominent symptoms, her dose was increased. She was not treated with aspirin as she did not have arthritis. She had an echocardiogram on day 3 of her admission which revealed a mildly thickened mitral valve with mild mitral incompetence, consistent with mild RHD.

She and her mother were educated regarding the condition while on the ward. By day 5 of her admission, her dysarthria and choreiform movements were still present but much improved, and she was able to walk without difficulty. She was discharged back to the community with a prescription for 2 further weeks of treatment with carbamazepine.

She was reviewed in the community clinic 2 weeks after discharge. All symptoms had completely resolved, and the carbamazepine was stopped. She has since been regularly attending for monthly IM pan benzathine penicillin, and has remained asymptomatic.

Case 3: The Bite

JJ is a 7 year old Aboriginal boy from Kalkaringi with a past history of recurrent chest infections. He presented to Katherine Hospital with a 2-day history of cough, fever and dyspnoea. On presentation, he was described to be ill with a temperature of 38°C, significant respiratory distress, bilateral crepitations and wheezes. There was no mention of a cardiac murmur and no hepatomegaly. Chest X-ray showed a 'globular' heart. He failed to respond to treatment with nebulised then IV salbutamol, IV hydrocortisone and IV ceftriaxone, and was evacuated to RDH the following day.

On arrival in Darwin, he was noted to be distressed and dyspnoeic, with a loud pansystolic murmur, bilateral crepitations and wheezes, hepatomegaly and peripheral oedema. Echocardiogram revealed severe mitral regurgitation and mild aortic regurgitation with a mildly dilated left atrium and ventricle, but normal ventricular function. His right heart was of normal size but had severe tricuspid regurgitation and severe pulmonary hypertension (Pulmonary Artery Systolic (PAS) pressure 64mmHg; indication for mitral valve repair: PAS >55mmHg.)

His cardiac failure was treated with diuretics and an ACE inhibitor, and he was commenced on IM Pan Benzathine Penicillin 450mg (recommended dose for weight <20kg). He was not treated with aspirin as he did not have arthritis.

Table 6.

Diagnostic criteria for ARF fulfilled for Case 3	
1 Major criteria	<ul style="list-style-type: none"> • Carditis
2 Minor criteria	<ul style="list-style-type: none"> • Fever 38°C • ESR 55mm/hr • CRP 33mg/L
✓Evidence of GAS infection	<ul style="list-style-type: none"> • Anti-DNaseB 1600 IU/ml

His cardiac failure was controlled and he was discharged 12 days after admission with a diagnosis of ARF (see Table 6) with severe RHD. He was discharged on anti-failure medication and monthly pan benzathine penicillin with a plan to be referred to Melbourne for cardiac surgery in the coming months.

Two months later, he re-presented to Katherine Hospital in florid cardiac failure and was transferred back to RDH. There were significant concerns about compliance with medications and follow-up since his last discharge, and ongoing difficulties explaining the severity of JJ's condition to his grandmother and himself. He stabilised on the ward after re-instigation of his anti-failure therapy, and it was decided that he should remain an inpatient until the time of his surgery, to ensure that his cardiac status was optimised. He remained an inpatient for 10 weeks before transfer to Melbourne for a mitral valve repair.

At surgery, it was noted that he had a typical rheumatic mitral valve with prolapse. A successful valve repair was performed, although post-operative echocardiography confirmed he had persistent left ventricular dysfunction. He was transferred back to Darwin 11 days after his surgery, and was discharged back to his community 3 weeks later. He was discharged on 4 medications to keep his cardiac failure under control, which is of concern to his health care providers. JJ is an extremely high-risk patient and will require close ongoing paediatric follow up.

Conclusion

These 3 cases highlight the range of presentations which may be encountered in clinical practice. While the rare skin manifestations of ARF have not been presented here, the 3 scenarios above represent the most common presentations seen in the paediatric unit at RDH.

Certain points regarding diagnosis may be gleaned from these cases. In the first 2 cases, neither had clinically discernable heart disease, yet both had typical mitral valve involvement on echocardiogram, highlighting the importance of fully investigating all suspected cases of ARF.

Both cases also had a family history of RHD; an anecdotally common observation in our unit.

In Case 2 (although evidence of a recent GAS infection is *not* required in the presence of chorea) initial streptococcal titres were normal, but subsequently rose, highlighting the importance of repeating serology if clinical suspicion is high.

Case 3 illustrates perhaps the most frightening presentation of ARF, and one which may pose a diagnostic dilemma to the clinician in the community. Given the high prevalence of respiratory disease in Indigenous children, a child presenting with severe respiratory distress and fever is frequently, and justifiably, treated as for a lower respiratory tract infection in the first instance. Should they fail to respond to treatment as expected, however, the possibility of cardiac failure secondary to ARF should always be considered and managed accordingly.

Finally, it can be appreciated from these 3 cases that the morbidity is high. In Case 1, the joint symptoms were severe, and it took 6 weeks of treatment with high-dose aspirin before her pain resolved. In Case 2, although her gross motor symptoms settled more quickly than most, it is unclear for how long the subtle personality changes and emotional lability endure. In Case 3, clearly the morbidity is profound, and sadly this child is likely to have a reduced life expectancy as a result of his severe heart disease.

In addition, the personal, social and financial costs incurred in such a case are immense.

So it can be seen that Lasègue was right all those years ago in proclaiming that rheumatic fever licks the joints and bites the heart. But maybe we should add that it also nibbles the brain— not only of the patients with chorea, but also of the clinicians trying to diagnose and manage this elusive disease!

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Increasing notifications of infectious syphilis among men who have sex with men in Darwin urban area – An alarming recent trend and alert to GPs

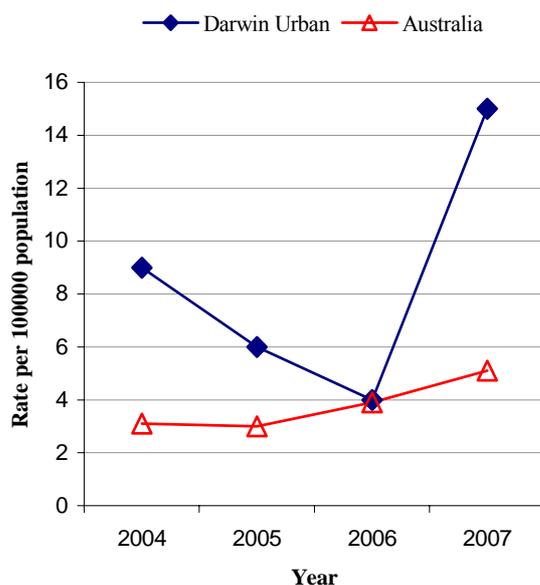
Peter Knibbs, Jiunn-yih Su & Jan Holt, CDC Darwin

Introduction

Syphilis is a serious sexually transmitted infection (STI), which, if not treated, can cause debilitating neurological and cardiovascular complications and congenital syphilis. Like other bacterial STIs, it also increases the risk of HIV transmission.¹ In addition, HIV is believed to increase the risk of infection with other STIs and increase the severity and complications of syphilis.²

There have been reports about a resurgence of infectious syphilis among men who have sex with men (MSM) in Australia^{3,4} and other developed countries⁵ in the past few years. A high proportion of these men are HIV-positive^{4,6} and many admit to engaging in high risk sexual behaviour. A case control study conducted in Victoria found that unprotected anal intercourse with a casual partner remains the most important risk factor for HIV infection.⁷

Figure. Population rate of infectious syphilis, Darwin Urban Area and Australia, 2004-2006 & 2007 (year-to-date as of 20 Nov)



The increase in Darwin

In contrast to the increasing trend seen in other jurisdictions,⁸ the rate of infectious syphilis in Darwin had been on the decrease in the past few years (see Figure 1). However, up to 20 November 2007, there have been 15 new notifications recorded this year, which represents a four-fold increase over 2006.

Of these new notifications, 11 of the 15 were diagnosed at the Darwin Clinic 34 in MSM. This compares with just 4 cases of syphilis in MSM diagnosed at the Darwin Clinic 34 in the previous 5 years. Initially, 3 of the men were seen by general practitioners (GPs) and referred on to Clinic 34 for testing, review or treatment. Additionally, 5 cases were in HIV infected men, including 3 with pre-existing HIV and 2 in whom syphilis and HIV were diagnosed at the same time. These infections are occurring in older men with the average age of the 11 men seen at Clinic 34 being 38 years (Range 24-58 years). This pattern of infection reflects what has been reported in MSM in metropolitan cities of eastern States.^{3,4}

All but 1 man presented with symptoms. They included penile chancres, oropharyngeal lesions (probably chancres), a nipple lesion (possibly a chancre or secondary lesion) and rashes. Jarisch-Herxheimer reactions were common following treatment and 1 man presented to Royal Darwin Hospital with a severe reaction.

Oral sex was the only form of sexual behaviour in 5 of the cases and the men involved were unaware that syphilis could be transmitted this way. In 3 men the infection was contracted interstate (2 from Sydney and 1 from the Gold Coast) while the remainder were probably infected in Darwin. The majority of infections occurred with casual, anonymous partners making contact tracing impossible.

Despite an awareness campaign within the local gay community earlier in 2007, largely driven by

the Northern Territory AIDS and Hepatitis Council (NTHAC), men are not presenting to Clinic 34 requesting syphilis screening. Year to date figures show exactly the same number of MSM (181) attending Clinic 34 as in 2006. Of concern is the low number of young MSM attending. There were only 31 clients (17.1% MSM) under 25 years of age in 2006 and 2007 and 41 (22.7%) and 40 (22.1%) in the 25-34 year age group in 2007 and 2006.

Discussion

This cohort of cases represents a significant increase in cases of syphilis diagnosed in MSM in Darwin. The pattern of infection is similar to what has been reported in eastern States for the past few years. The high number of HIV infected men in the cohort raises concerns over the risk of HIV transmission.

It is worth noting that 1 of the cohort initially identified himself as heterosexual but, after his diagnosis, admitted to having oral sex with men at beats[#]. Anecdotally this is not an uncommon scenario and the female partners of these men are generally unaware of their behaviour, and therefore unaware of their risk for infections such as syphilis or HIV.

A range of health promotion strategies are being implemented by the Sexual Health and Blood Borne Virus Unit in partnership with the NTHAC in response to this increase in syphilis in MSM. Relevant syphilis information has been posted on a gay chat room site on the Internet, which encourages people to seek out testing and informs them of the risk of syphilis being transmitted through oral sex. A media release in regard to the increase in syphilis in MSM has been distributed and a radio interview with a senior health official targeting this issue has been broadcast. Posters and a small information sheet have also been placed in venues where gay and bisexual men socialise and visit. A discreet condom wallet is being developed for distribution and this will include information about syphilis, testing and safe sex.

Through the Top End Division of General Practice's 'Wednesday's Word' an alert has been issued informing GPs of this increase in syphilis and urging GPs to refer patients to Clinic 34 or,

alternatively, contact the Darwin Syphilis Register for information on case management (please see below for contact telephone numbers). Clinicians need to maintain a high awareness for symptoms of syphilis; nearly one third of this cohort attended a GP with their initial symptoms.

It is hoped that through these strategies those at risk will seek regular sexual health screening as a part of their general health care and commit to safer sex behaviour to prevent further transmission of STIs.

Telephone

Darwin Clinic 34	89992678
Darwin Syphilis Register	89227818

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[#] Beats are locations where MSM meet for anonymous sex

Influenza immunisation of doctors at the Royal Darwin Hospital, 2007: immunisation rate and factors contributing to uptake.

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Background

Influenza is a common seasonal infection in Australia, and is usually more severe than other viral colds (which are often erroneously referred to as 'the flu'). Typically there is abrupt onset of fever and coryza with fatigue, malaise, myalgia, headache, chills and anorexia. Healthy adults will usually recover within 10 days, with no lasting effects. Influenza can however cause a spectrum of disease, ranging from asymptomatic infection to death from primary viral pneumonia. Around 1500 Australians die each year from influenza related complications.¹

Influenza is transmitted by respiratory droplets spread from person to person, such as from coughing and sneezing. Health Care Workers (HCWs) are often exposed during the course of their work, and have substantial rates of clinical and subclinical infection during influenza season.² They may then act as vectors, spreading influenza to patients, staff, family and friends. Influenza infection is also associated with significant loss of productivity among HCWs.³

Both influenza A and B (clinically important in human disease) undergo frequent antigenic drift requiring annual updating of influenza vaccines. Immunisation is the single most important measure in reducing influenza morbidity and mortality, and in healthy adults under 65 years of age, influenza vaccine is 70-90% effective when the antigenic match between vaccine and circulating virus is close.⁴ Australian guidelines thus recommend annual influenza immunisation for all HCWs.⁴ Effective immunisation programs are a vital part of hospital infection control and have been shown to be cost-effective in protecting HCWs, reducing absenteeism, and indirectly reducing morbidity and mortality in high-risk patients.³

There are very few absolute contra-indications to receiving influenza vaccine. Common side effects are minor and should not be barriers to immunisation. The vaccine does not contain live virus so cannot cause influenza.

Historically, rates of immunisation of HCWs have been variable. A review of the literature provided a range of rates of influenza immunisation from previous studies, ranging from 11 - 82%.^{5,6} There are no studies examining the rate of influenza immunisation of doctors specifically in Australia, with most studies focusing on HCWs in general or are conducted overseas.

Royal Darwin Hospital (RDH) staff clinic statistics were available for influenza immunisation in 2004 and 2006 only, with 15% and 32% of all doctors vaccinated in those years, respectively. The accuracy of these statistics is uncertain however as the 2006 records state 125% of the administration staff were immunised that year. These overall low rates may indicate that some doctors received immunisation outside RDH, a possibility demonstrated in a US study⁷ where 64% of medical residents not immunised by the hospital received immunisation elsewhere.

Criteria and standards

The criteria regarding recommendations for influenza immunisation for doctors is unambiguous: the gold standard is that **annual influenza immunisation is recommended for all contacts of high risk patients such as HCWs**. This is stated in the national guidelines such as *The Australian Immunisation Handbook*⁴ and *Infection control guidelines for the prevention of transmission of infectious diseases in the health care setting*.⁸ These criteria are also supported at a local level with influenza vaccine being recommended in the RDH *Infection Control Manual* and offered annually to all RDH staff free of charge.

So what is a reasonable standard? The gold standard of 100% is unlikely to ever be achieved by even the most efficient hospital immunisation service. It is reasonable to expect a small number of doctors may not wish to receive immunisation on the basis of a medical contraindication, or allergy. Taking into account staff leave and the

busy nature of medical work, some others will be missed by even the most thorough immunisation campaign. For the purpose of this audit an immunisation rate of 80% was decided upon as a realistic standard: the gold standard modified by the experience of reality. This rate has been shown to be achievable, with a rate of 82% for doctors specifically being achieved in an Israeli study.⁵

Setting

2007 RDH staff influenza immunisation program

Influenza is a recommended (but not mandatory) immunisation for all HCWs in the RDH *Infection Control Manual*. The current protocol was due for review in 2007. Annually updated Vaxigrip® influenza vaccine is released in February, and offered to all RDH staff free of charge throughout March and April. Occasionally catch-up clinics are offered in early May. The immunisation campaign is publicised with flyers in common areas and loudspeaker announcements.

Immunisation takes approximately 15 minutes (as injection observation time is recommended) plus up to 15 minutes waiting time, and is delivered by infection control nursing staff between 1-3pm most days from a drop-in staff clinic. Mobile clinics are also conducted for 1-2 days on each ward, and it is possible to make appointments for the Friday afternoon staff immunisation clinic. Immunisation is not available outside of business hours.

Methods

Data Collection

An anonymous and confidential written survey was given to RDH doctors for self-completion, following the RDH influenza immunisation campaign and clinics in May 2007. The main information being sought was:

- had they received influenza immunisation in 2007, or in the past?
- if they had (in 2007), what reasons motivated them?
- if they had not, what were the perceived barriers?

- to obtain a knowledge score about influenza immunisation (as below)
- what might facilitate more doctors to get immunised?
- what level of doctor (intern, RMO, registrar, consultant), speciality and age were they?

A knowledge score was obtained from 5 true/false questions derived from information in *The Australian Immunisation Handbook*.⁴ The survey was delivered and information collated by a single assessor, and results analysed using Microsoft Excel.

Bias Minimisation & Representative Sampling

Surveying was carried out face-to-face to maximise the response rate. The survey was delivered at a major meeting or grand-round for each department as well as weekly junior doctor teaching sessions.

We have assumed that this convenience sampling will give us a representative sample of the doctor cohort at RDH. It is possible however that doctors who are 'not good' at attending meetings are also doctors who are 'not good' at getting their influenza immunisation, and we might subsequently overestimate the percentage of total RDH doctors who we believe were immunised. The benefit of this methodology is its reproducibility, allowing for re-evaluation of the outcome measurements in subsequent years. The written survey format is consistent with the methodology used in the literature by previous overseas studies investigating influenza immunisation of doctors specifically.

Results

Of 243 registered medical practitioners at RDH in May 2007, 150 completed the influenza immunisation survey giving a response rate of 62%. See Table 1.

Table 1. Survey respondents by level of doctor

	total number	number surveyed	% surveyed
interns & RMOs	68	48	71%
registrars	94	56	60%
consultants	81	46	57%
total	243	150	62%

2007 and prior immunisation status of RDH doctors

Of 150 doctors surveyed, 42(28%) received influenza immunisation in 2007.

Of the 108 doctors (72%) not immunised in 2007, 66(44%) had received influenza immunisation in a year prior to 2007, and 42 (28%) had never been immunised.

Factors facilitating influenza immunisation uptake in 2007

Table 2. Reasons given for receiving influenza immunisation in 2007

Reason immunised	Number citing reason	Percentage citing reason
protect self	38	90%
protect patients	30	71%
protect family/friends	24	57%
offered conveniently	24	57%
reduce sick-leave	18	43%
encouraged by peers	11	26%
recommended in guidelines	7	17%

Of the 42 RDH doctors immunised in 2007 (see Table 2), the most common reason for being immunised, cited by 38(90%), was to protect themselves from influenza. The next most common reasons for receiving immunisation were to protect patients (71%) and friends or family (57%), or it was offered conveniently (57%).

All respondents, regardless of whether they had received immunisation or not, were also asked an open-ended question: what they thought might facilitate/encourage more doctors to receive influenza immunisation at RDH. Of the 112 respondents who answered this question, 50 (45%) suggested that the immunisation service needed to be more convenient, and 25(22%) suggested there needed to be more reminders about when immunisation was available. Additionally, 15(13%) suggested more education was required, 10(9%) suggested bribery, 9(8%) suggested making immunisation compulsory and 3(3%) suggested peer pressure.

Impediments to immunisation uptake in 2007

Table 3. Reasons given by 108 doctors for not receiving influenza immunisation in 2007

Reason Not Immunised	Number citing reason	Percentage citing reason
too busy	32	30%
not offered conveniently	31	29%
unaware how to access vaccine	28	26%
concern re: flu-like illness	16	15%
forgot	15	14%
other	15	14%
concern re: adverse reaction	12	11%
unlikely to catch flu	10	9%
don't believe evidence/guidelines	8	7%
unlikely to spread to patients	3	4%
unlikely to spread to family/friends	3	3%

Of the 108 doctors who did not receive influenza immunisation in 2007, the most common reasons given related to accessing the immunisation service (see Table 3) with 30% being too busy, 29% saying immunisation was not offered conveniently and 26% being unaware of how to access the vaccine. Reasons relating to the actual vaccine were far less significant. No respondents reported not receiving the vaccine due to a contra-indication.

Knowledge of influenza immunisation and its benefits

Overall knowledge about influenza immunisation was good (see Table 4) with 84% of all respondents having knowledge score of 4/5 or 5/5 from the true/false questions asked. Doctors immunised in 2007 were more likely to have a knowledge score of 4/5 or 5/5(93%) than doctors who were not immunised in 2007 (81%). Doctors never immunised were most likely to have a knowledge score of 3/5 or less (28%).

Where was influenza immunisation received?

Of the 42 doctors who received influenza immunisation in 2007, 38(91%) did so through RDH staff immunisation service (65% in the

Table 4. Knowledge score vs immunisation status

knowledge score /5	% of all respondents	% of those immunised 2007	% of those not immunised 2007	% of those ever immunised	% of those never immunised
5	60%	71%	56%	69%	37%
4	24%	22%	25%	20%	35%
3	13%	7%	15%	10%	21%
2	1%	0%	2%	0%	5%
1	0%	0%	0%	0%	0%
0	1%	0%	2%	1%	2%

staff clinic, 26% on the wards). Only 3(7%) received their vaccine elsewhere and one respondent had self-administered it.

Immunisation according to speciality, age and seniority

There were no significant correlations between immunisation status (in 2007 or prior) and level of seniority, age or speciality of respondents.

Previous adverse reactions to influenza immunisation

The majority of respondents (87%) had never had a previous adverse reaction to influenza immunisation. 15(10%) reported experiencing a mild flu-like illness and 4(3%) reported local soreness after a previous immunisation, consistent with the expected rate of adverse reactions suggested by *The Australian Immunisation Handbook*.⁴

Discussion

2007 RDH influenza immunisation coverage

The rate of influenza immunisation among RDH doctors in 2007 (28%) was well below the desired standard (80%). Past studies that surveyed doctors specifically, as opposed to HCWs in general, reported response rates which varied widely but tended to cluster around 60%. Given the response rate of 62% here, it is unlikely that the RDH immunisation rate was substantially underestimated. The 28% uptake was well below other reported immunisation rates in doctor specific studies which ranged from 38-82%.^{6,9,10} Given that annual immunisation is recommended for all doctors, it was surprising to also find that 28% had never before been immunised.

Overall, the poor uptake of influenza immunisation by RDH doctors leaves both the medical workforce and vulnerable patients at risk of influenza infection and its complications.

Convenience, access and barriers

The busy nature of medical work is self-evident, and doctors who did not get immunised in 2007 mostly reported not doing so due to inconvenience of the immunisation service rather than not wanting or feeling a need for the vaccine. It appears that doctors who did not get immunised may not find the existing service sympathetic to the demands of their work.

In contrast, doctors who did get immunised in 2007 mostly found the immunisation service convenient (57%). This suggests that despite the low immunisation uptake (28%), the immunisation service offered is convenient for at least some doctors and could be built upon to increase its effectiveness.

Some existing strategies for convenience, such as mobile ward-based clinics at limited times, may not be as effective for doctors as for staff who have more reliable breaks such as allied health and nurses. Strategies are needed to offer immunisation at times and places convenient for doctors specifically, such as at major meetings and education sessions. Such strategies have been shown to improve immunisation compliance.¹¹ Increasing the availability of drop-in clinics and extending the service to out-of-hours would also be beneficial.

The respondents who were not immunised in 2007 (26%) were not aware of how to access the immunisation service, and 14% just forgot. Effective publicity thus appears important to ensure doctors are aware of the immunisation

program and how to access it. Several reminders may be needed, such as sending targeted messages to doctors who have not yet received immunisation.

When all doctors (not just those immunised in 2007) were asked what might facilitate more doctors receiving influenza immunisation, their responses that greater convenience (45%) and more reminders (22%) were needed which further reinforced this study's findings.

Motivation and education

Prominent reasons given for receiving immunisation in 2007 were to protect self (90%), to protect patients (71%), to protect family/friends (57%) and to reduce sick-leave (43%). Knowledge about influenza immunisation was good overall with 84% of all respondents having a knowledge score of 4/5 or 5/5. There was a modest association between positive immunisation status and higher knowledge scores and these results are consistent with other studies. Wodi et al found that 93% of the 205 doctors surveyed in their study cited self-protection as a reason for receiving immunisation, and that doctors ever-immunised had higher knowledge scores than doctors never-immunised.¹⁰ Rates of adverse reactions were consistent with rates suggested in *The Australian Immunisation Handbook*⁴ and elsewhere in the literature and all were minor in nature, and did not appear to be an impediment to immunisation.

While it stands to reason that education would help to improve immunisation uptake, a previous study⁶ found knowledge influences immunisation uptake for nurses but not for doctors. The results of this audit however suggest that some targeted education may be beneficial. Given that any hospital-wide promotion is likely to be viewed by all staff, and that many studies recommend education as a vital strategy for improving vaccine uptake of other HCWs, strategies to improve education would be a sensible overall approach to improving immunisation uptake whether or not doctors are specifically influenced.

Suggestions for change

The disappointing immunisation rate of RDH doctors suggests that specific interventions and strategies, targeting doctors in addition to an overall approach, and taking into account the

nature of their work, must be implemented in subsequent immunisation campaigns. Effective interventions in Australia can significantly improve immunisation uptake as demonstrated clearly by Cooper and O'Reilly¹² where staff in contact with patients showed a dramatic improvement in immunisation coverage, from a baseline of 8% to an impressive 81%. Building on existing strategies and new innovation is required, and suggestions for change include to:

- expand the successful mobile immunisation carts and ward-based clinics
- increase availability of drop-in clinics and offer some clinics outside business hours
- target congregations of doctors at grand rounds and teaching sessions and offer immunisation 'on the spot'
- consider a "vaccinate a mate" campaign: supply the vaccines for doctors to immunise each other in pairs
- implement pager message reminders: "protect yourself and your patients: influenza immunisations available 1-6 pm ward X"
- send directed reminder letters to staff not yet immunised through staff clinics
- emphasise the protective benefits to self and others of immunisation through flyers and in hospital publications (eg. *RDH Bulletin*)

Adequate staffing would be required for implementation of some of these suggestions. As it appears most doctors receive their immunisation through staff immunisation clinics, there is an ideal opportunity for the Infection Control Department to keep accurate records of doctors' influenza immunisation status (as they do for other immunisations).

There are however inherent difficulties in meeting standards for influenza immunisation in hospitals, partly associated with the repeated turnover of junior staff, further emphasising the need for effective annual campaigns. If these strategies are unsuccessful in raising the immunisation rate, it may be worth considering mandatory influenza immunisation or on an opt-out basis in subsequent reviews of RDH Infection Control Protocols.

Thanks

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Influenza season 2007; bad, but not that bad

Peter Markey, CDC Darwin

Introduction

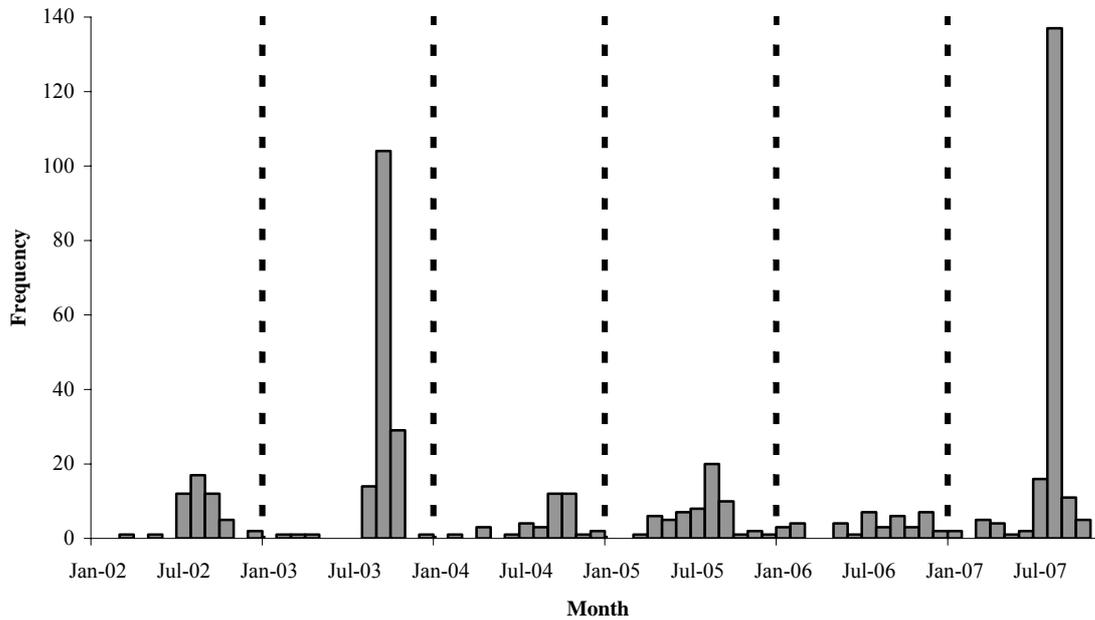
The 2007 year was a big year for seasonal influenza both nationally and in the Northern Territory (NT). Until the beginning of December there were 183 laboratory confirmed cases of influenza notified in the NT which is 2.7 times the 5 year mean and higher than the 2003 total (151), which was the previous highest annual figure (Figure 1). Nationally, there were 3.2 times the expected number (5 year mean) of reported notifications for 2007.

However, in 2007 the demographic pattern of laboratory cases was much different from that of 2003, raising questions about the comparability of the data. This report summarises the 2007 outbreak and attempts to compare this year with previous years.

Influenza surveillance in the NT

In the NT, surveillance for seasonal influenza has traditionally been carried out using both the notifiable disease system, which collects laboratory confirmed cases, and GP sentinel surveillance, which relies on a small proportion of community GPs systematically reporting cases with a defined clinical syndrome of 'influenza-like illness' (ILI - a history of fever, cough and fatigue). The 2007 influenza season was the first year, the Emergency Department Syndromic Surveillance System (EDSSS) was implemented, allowing surveillance of ILI, as defined by a pre-determined group of symptoms (cough, viral illness, febrile illness and respiratory infection)¹ in cases presenting to Departmental Emergency Departments (EDs). This added an useful extra dimension to influenza surveillance.

Figure 1. Cases of laboratory-confirmed influenza, by month, 2002-2007



In addition, in 2007 during the period of increased activity (July to October), hospitalisation status was routinely collected on laboratory confirmed cases throughout the NT. Influenza patients were also contacted to ascertain their vaccination details.

Timing

As is often the case, the NT had a slight rise in cases in March and April in 2007 (Figure 1). Some of these cases were sporadic but of note was an influenza outbreak in April on Bathurst Island which affected a large proportion of the

community and was associated with several adult admissions to hospital.

Looking at laboratory data, the seasonal epidemic started earlier than usual this year, with an increase in laboratory confirmed cases noted in the third week of July (Figure 2). There were cases in all regions apart from East Arnhem during this week.

However, ED syndromic surveillance, using CuSum techniques,² detected an increase in ILI cases presenting to the ED at Alice Springs Hospital as early as the second week in June.

Figure2. Cases of laboratory confirmed influenza by week and region, July to October, 2007

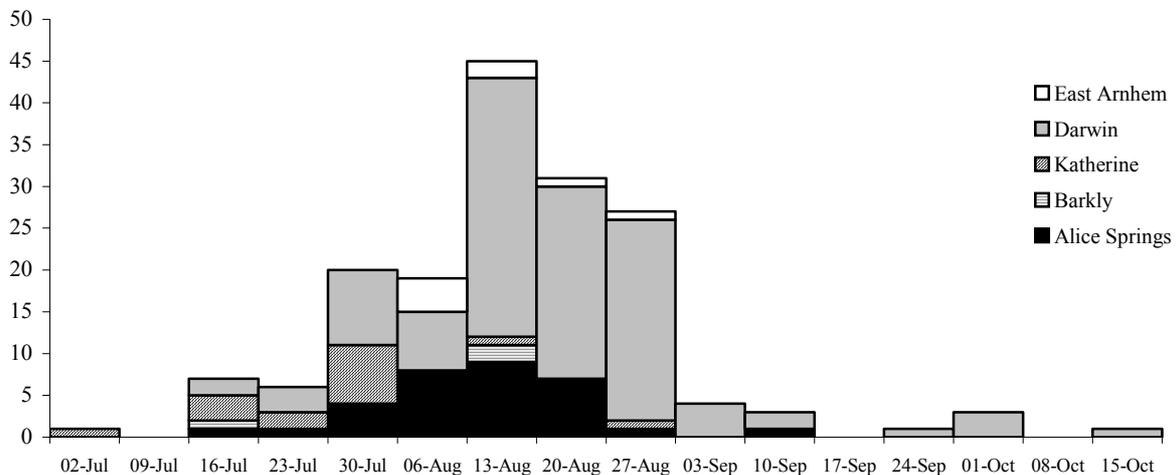


Table 1. Dates of ED ILI increases and peaks, together with regional lab confirmed cases and incidence.

	Date of increase in ED ILI*	Date of peak ED ILI*	Date of first lab confirmed case	Lab confirmed cases 2007	Incidence (lab confirmed cases)
ASH / Alice Springs	14/6	19/8	21/7	32	79.3
TCH / Barkly	28/6	24/7	18/7	3	52.8
KDH / Katherine	16/7	28/8	5/7	15	77.5
RDH / Darwin	24/7	28/8	20/7	127	100.0
GDH / East Arnhem	14/8	18/8	10/8	8	56.2

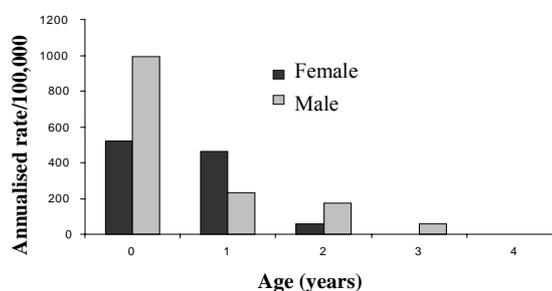
Whether this was true influenza activity is uncertain as the first laboratory confirmed case from Alice Springs Hospital was not until 21 July. It was interesting nevertheless that there were increases in ILI noted at all ED departments between the second week in June and the third week in July with the hospitals further north showing the increase later (Table 1).

The GP sentinel system, in Darwin also detected an increase in activity in the middle of June with a larger peak in mid July coinciding with the ED data and laboratory confirmed cases.

Morbidity

The pattern of laboratory confirmed cases compared to previous years is illustrated in Figure 1. The 2007 epidemic is illustrated by week and region in Figure 2. Incidence for the year varied between 100/100,000 in the Darwin region to 52.8/100,000 in the Barkly (Table 1).

Analysis by age-group revealed that the highest rates were in infants under one year, and were greater among males in the under age 40 year age groups (Figures 3 and 4). Males under one

Figure 4. Annualised age and sex specific rates of laboratory confirmed influenza in the under 5 age group, 2007

year had a rate almost twice that of females (940 vs 519 per 100,000). The proportion of laboratory confirmed cases that were infants under 5 years was considerably less than previous years and the increase in the year's influenza cases appeared to be mainly confined to adults (Figure 5). There were 42 laboratory confirmed cases under 5 years of age compared to a 5 year mean of 43.4 and 118 cases in 2003.

There were also marked variations in the age distribution across NT regions. In Alice Springs 56% (11/32) of laboratory confirmed cases were under 1 and a further 28% (9) were 1-4 years of

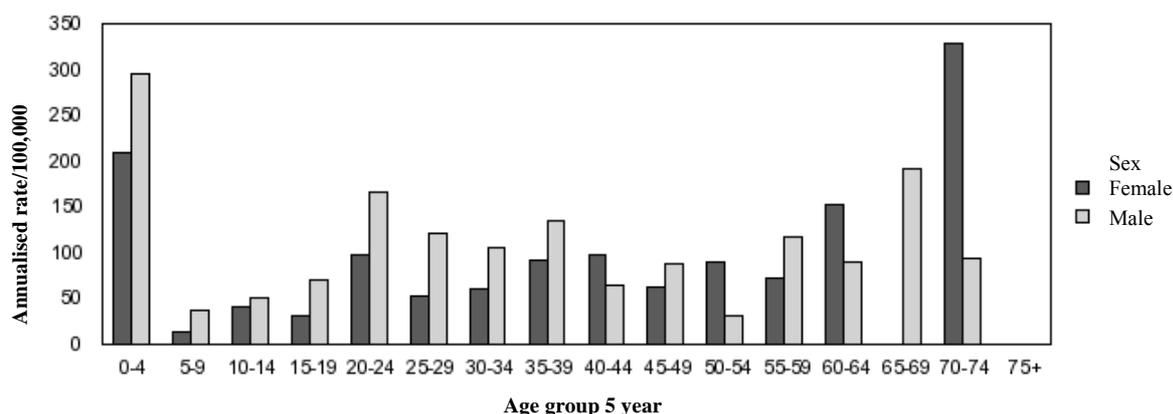
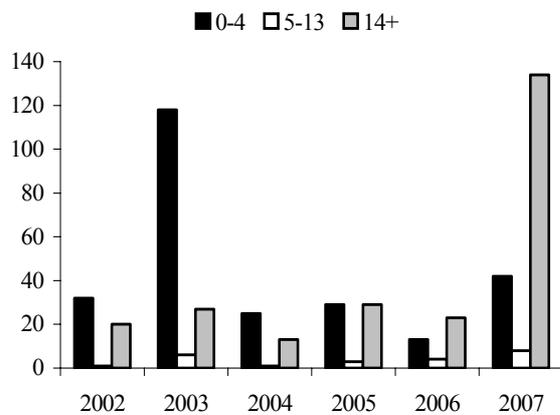
Figure 3. Annualised age and sex specific rates of laboratory confirmed influenza, NT 2007

Figure 5. Laboratory confirmed cases by year and age-group 2002-2007

age (median age; 8.5 months) while in the Darwin region only 4% (5/126) were under 1 year of age and 89% were over 13 years of age (median age; 32 years; Figure 6).

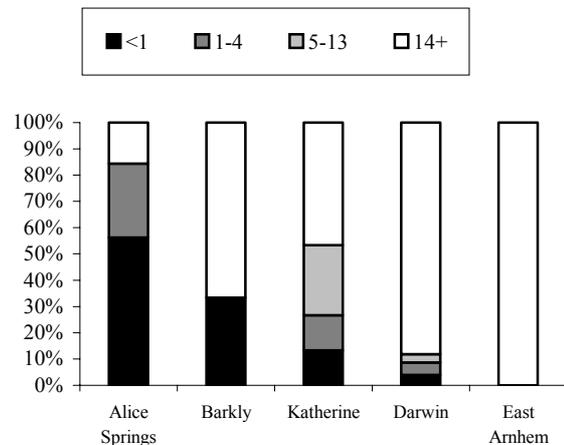
Hospitalisation status was ascertained in 79% of cases. As might be expected the hospitalisation rate varied with age, with 91% of infants under 1 year with known hospitalisation status having been hospitalised compared with 43% of cases in the over 13 years age category. There were no deaths among the laboratory confirmed cases.

The peak in the GP sentinel surveillance rates was 78 cases of ILI per 1000 consultations, which was about twice the mean of the previous 3 years. The ED surveillance data was not stable enough to draw comparisons between recent years.

Strain data

All but 2 of the 183 cases were of influenza A. Interestingly both cases of B may have acquired their illness from interstate or from interstate contacts. The only other year in which there was a similar dominance of type A was 2003, whereas usually between 7 and 40% of laboratory confirmed cases are Type B.

Specimens collected through the GP sentinel surveillance system are referred to the World Health Organisation Influenza Reference Laboratory in Victoria for strain identification. In 2007, 21 out of 84 specimens sent to the reference laboratory tested positive; 4 were H1N1 Solomon Islands strain while 17 were H3N2, 12 being the Wisconsin strain and 5 the Brisbane strain.

Figure 6. Distribution of age-group by region, laboratory confirmed cases, 2007.

Discussion

A big challenge for disease surveillance systems is to remain representative so that comparisons over time and between demographic groups can be meaningful. On the face of it, 2007 was a bad or more severe year for influenza in the NT; however, there are several features of the analysis which suggest that part of the increase might be explainable in terms of testing patterns. It is interesting to note that there were fewer laboratory confirmed cases under 1 year of age in 2007 than in 2003 and in particular much less in Darwin (Darwin; 5 in 2007 versus 28 in 2003 and for Alice Springs 18 in 2007 vs 35 in 2003; Table 2). Indeed looking at the breakdown of cases by district and age-group in Table 2, it can be seen that apart from Darwin adults the only group that had more cases than in 2003 was cases from Katherine (13 in 2007 vs 1 in 2003). Even so, comparison with the mean number of cases in the years 2004-06 in each age-group and region reveals that apart from the Darwin adults there were about twice the number of laboratory notifications than expected based on the years since the big outbreak of 2003.

Data on the number of tests requested for influenza are not easily available but at least part of the sudden rise in adult cases in Darwin might be due to the recruitment of several defence force GPs into the Tropical Sentinel Surveillance System and their interest in the pattern of influenza in the defence forces. Even though they might not have contributed regularly to the sentinel system, they did implement strict testing regimens, with over a third of the Darwin adult cases being from the defence force. Whether the

Table 2. Laboratory cases of influenza by region and age-group, 2003, mean 2004-06 and 2007.

Age group	CDC Unit	2003	2004-06 mean	2007
<1	Alice Springs	35	9.3	18
	Barkly	0	0.3	1
	Darwin	28	3.7	5
	East Arnhem	1	0.3	0
	Katherine	0	0.7	2
1-4	Alice Springs	20	4.0	9
	Barkly	0	0	0
	Darwin	32	1.7	6
	East Arnhem	2	1.3	0
	Katherine	0	1.0	2
5-13	Alice Springs	1	1.0	0
	Barkly	0	0	0
	Darwin	5	1.3	4
	East Arnhem	0	0	0
	Katherine	0	0.3	4
14+	Alice Springs	5	3.3	5
	Barkly	0	0.3	2
	Darwin	13	13.0	112
	East Arnhem	8	2.3	8
	Katherine	1	2.3	7

rest of the measured increase in cases in Darwin adults was due to increased testing by Darwin GPs or was in fact a true increase is unclear.

In summary, it appears that rates of influenza infection in the NT in 2007 were about twice what might have been expected from the previous 3 years but not as high as 2003. In Darwin the incidence in the adult population was much greater than in 2003; at least part of this was due to increased testing.

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Editorial Note

As noted in this report, it is a challenge, and indeed an essential challenge, that disease surveillance systems jurisdictionally and nationally remain representative year to year so that comparisons over time and among various groups are possible. It is also important that agreed critical information be collected to best inform public health action decisions and policy formation. The 2007 influenza season provided an opportunity to nationally test what can be collected and analysed regarding influenza and

to identify where gaps in national data gathering and surveillance might be. Using this recent information, the Office of Health Protection (OHP) and the Communicable Disease Network Australia (CDNA) are developing a strategy to improve national seasonal influenza surveillance. A CDNA working group, the Seasonal Influenza Surveillance Strategy Working Group (SISSWG) has been formed to guide this process and Dr Peter Markey, Head of Surveillance, CDC NT, is chairing this group.

The 2008 revised antibiotic protocol for adult community-acquired pneumonia in the Top End of the Northern Territory

*Bart Currie, Nick Anstey, Ric Price, Josh Davis, Didier Palmer and Dianne Stephens
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The prime aim of treating community-acquired pneumonia (CAP) is to prevent death. We present the 2008 revised antibiotic protocol for adult CAP for use in all Top End communities and hospitals.

Table 1 shows the 4 commonest organisms isolated in 255 cases of adult community-acquired bacteremic pneumonia treated at Royal Darwin Hospital (RDH) from a past study.¹ As elsewhere in the world, *Streptococcus pneumoniae* is the commonest organism overall. However, *Burkholderia pseudomallei*, the organism causing melioidosis, accounted for over one third of the deaths from severe CAP at RDH.^{2,3}

Acinetobacter baumannii was the second most important gram-negative organism, causing almost as many deaths as *S pneumoniae*. *A baumannii* has been increasingly recognised as an important cause of severe CAP in tropical regions.⁴ This is in contrast to the situation in temperate city hospitals where *A baumannii* is being increasingly recognised as a nosocomial pathogen causing secondary infection in patients in intensive care units. Community-acquired *A baumannii* pneumonia in the tropics occurs usually in the wet season and usually following heavy alcohol consumption.⁴ Presentations are with fulminant lobar/total unilateral lung pneumonia and mortality rates are very high.

Staphylococcus aureus was the third commonest cause of bacteremic CAP and the fourth commonest cause of death. Of concern is the steady increase in community-acquired methicillin resistant *S aureus* (CA-MRSA) seen in the Northern Territory (NT) as well as elsewhere in Australia and globally. This includes occasional patients with severe CAP from CA-MRSA.

There is a general impression that there are fewer cases of 'atypical' pneumonia in patients admitted to RDH in comparison to southern hospitals.¹ However formal assessment of this has not been done and occasional cases of severe CAP from *Mycoplasma pneumoniae*, *Legionella pneumophila* or *L longbeachae* are diagnosed in patients admitted to RDH intensive care unit (ICU), with some requiring ventilation.

Treatment Protocols

People with risk factors such as diabetes, alcohol excess, chronic lung disease, chronic renal failure and steroid or other immunosuppressive therapy are at particular risk for melioidosis and *A baumannii* pneumonia.¹⁻⁴ However, melioidosis will sometimes occur in an immunocompetent person and therefore needs to be covered by antibiotics for any presentation with severe CAP in the Top End.

Table 1. Adult community-acquired bacteremic pneumonia: RDH 1986 - 1998

255 cases 84 deaths (33%)	Admissions		Deaths		Mortality by organism
	Number of cases	Percentage of total admissions	Number of total deaths	Percentage of total deaths	Percentage
<i>Streptococcus pneumoniae</i>	100	39%	17	20%	17%
<i>Burkholderia pseudomallei</i>	60	24%	30	36%	50%
<i>Staphylococcus aureus</i>	29	11%	11	13%	38%
<i>Acinetobacter baumannii</i>	26	10%	14	17%	54%

Table 2 outlines the initial therapy of adult CAP recommended in the Top End. There are ongoing studies to develop and assess severity scores for CAP. At present the Pneumonia Severity Index (PSI) is recommended in the national Antibiotic Guidelines.⁵ While in some Australian hospitals the PSI has been successfully implemented, its use is not universal and a variety of other severity scores are used or doctors just rely on clinical judgement for assessment of CAP. At RDH the PSI has generally not been used and, as elsewhere in the Top End, CAP severity has traditionally been categorised as mild, moderate or severe based on clinical judgement. However concern that the severity of CAP is sometimes underestimated in young adults has led to ongoing assessment of simple severity scores modified for use in tropical northern Australia. It is hoped that by the end of 2008 we will have a validated severity score to link to our CAP treatment protocols.

Irrespective of risk factors, penicillin is recommended for mild CAP and *S pneumoniae* remains the commonest organism. Penicillin can also be used initially in those without risk factors presenting with moderate pneumonia. Penicillin regimens include oral amoxicillin 1g 8-hourly,

IM procaine penicillin 1.5g daily and IV benzyl penicillin 1.2g 6-hourly.^{5,6}

If risk factors are present and the CAP is moderate, then it is important to cover both *A baumannii* and *B pseudomallei*. Therefore an initial dose of gentamicin 4-6 mg/kg IV (or IM) (to cover *A baumannii*) is used with ceftriaxone 2g IV (or IM). It is usually evident within 24 hours that the patient does not have *A baumannii* CAP and the gentamicin is therefore ceased after 1 or 2 doses and the ceftriaxone 2g daily IV is continued as an inpatient, unless culture results can direct an alternative therapy. Continuing gentamicin beyond 2 doses is rarely required. Because of potential renal and ototoxicity, gentamicin beyond 2 doses requires Infectious Diseases Unit approval.

In moderate CAP ceftriaxone is considered to be adequate initial empirical therapy to cover the possibility of melioidosis if used in a dose of 2g per day, although it has been shown to be inferior to the specific melioidosis regimens (see below). The minimum inhibitory concentrations (MICs) of ceftriaxone are around 2 - 4 times those of ceftazidime and meropenem, so if *B pseudomallei* is isolated then ceftazidime or

Table 2 Initial therapy of Top End adult community-acquired pneumonia

	Mild Pneumonia#	Moderate Pneumonia#	Severe Pneumonia (ICU and HDU)
No risk factors present*	amoxicillin 1g orally 8-hourly OR procaine penicillin 1.5g IM daily OR benzyl penicillin 1.2g IV 6-hourly	benzyl penicillin 1.2g IV 6-hourly	meropenem (wet season) 1g IV 8-hourly OR piperacillin/tazobactam (dry season) 4g/0.5g IV 8-hourly PLUS azithromycin 500mg IV daily
Risk factors*	amoxicillin 1g orally 8-hourly OR procaine penicillin 1.5g IM daily OR benzyl penicillin 1.2g IV 6-hourly	ceftriaxone 2g IV daily PLUS gentamicin 4-6mg/kg initial dose IV then review	meropenem (wet season) 1g IV 8-hourly OR piperacillin/tazobactam (dry season) 4g/0.5g IV 8-hourly PLUS azithromycin 500mg IV daily

'Atypical' cover is optional – roxithromycin 300mg orally daily OR doxycycline 200mg stat then 100mg daily

*Risk factors include - alcohol, diabetes, chronic lung disease, chronic renal failure, steroid and other immunosuppressive therapy and kava excess.

meropenem should be commenced as per the melioidosis guidelines. When used with gentamicin, ceftriaxone 2g will generally hold non-MRSA *S aureus* infection initially, although this is not the definitive therapy for *S aureus*. Once *S aureus* is isolated then the appropriate treatment for non-MRSA *S aureus* pneumonia is usually IV flucloxacillin. CA-MRSA CAP requires IV vancomycin therapy initially. Ceftriaxone will also provide excellent coverage for *S pneumoniae*. However, once *S pneumoniae* is isolated, IV penicillin becomes the drug of choice. While average MICs of penicillin for *S pneumoniae* have been increasing, the level of resistance is usually intermediate and therefore high dose penicillin is quite adequate for respiratory (but not CNS) infections with these organisms.

For both mild and moderate CAP in the Top End the addition of macrolide or doxycycline cover for 'atypical' organisms is optional and the decision is made by the treating doctors. Roxithromycin 300mg daily orally is the preferred macrolide for these circumstances.

Patients with severe CAP are admitted to the RDH ICU or High Dependency Unit and treated with meropenem 1g IV 8-hourly (wet season for maximum melioidosis cover) OR piperacillin/tazobactam 4g/0.5g IV 8-hourly (dry season) PLUS azithromycin 500mg IV daily (to cover the 'atypical' pathogens). If CA-MRSA CAP is suspected or confirmed, IV vancomycin is added.

In addition to 2 sets of blood cultures, an urgent Gram stain of initial sputum may occasionally be

helpful in directing therapy. However the results of sputum culture are often unreliable as they may just indicate throat and upper respiratory tract flora, especially if *Haemophilus influenzae* or *S pneumoniae* is cultured. In all patients presenting with CAP in the Top End it is recommended that melioidosis screening is performed; throat and rectal swabs each placed in Ashdown's selective broth for culture, sputum culture and melioidosis serology.

A recent change to evacuation policy for the Top End is that any patient considered sick enough by the DMO/flight doctors to require admission to ICU or HDU is given IV meropenem (after blood cultures) by the retrieval team.

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Treatment of trachoma in small babies

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Trachoma and other chlamydia infections

“Trachoma” is the eye infection with chronic inflammation and scarring that results from repeated infection with *Chlamydia trachomatis*. This is the same organism that causes genital infection, but different strains infect eyes. Genital infections include chlamydial urethritis/cervicitis and Lymphogranuloma Venereum (LGV); each with different chlamydia strains. These chlamydial infections are usually low grade and often asymptomatic. They may remain unnoticed and untreated when not looked for specifically. Without treatment, these chlamydial infections can lead to scarring, distortion of normal architecture and devastating complications, including blindness or infertility.¹

C trachomatis is a bacteria that lacks peptidoglycan in its cell wall. As a result the antibiotics that act on the cell wall have no effect – this includes penicillins and cephalosporins. Antibiotics with activity against bacterial protein or nucleic acid synthesis are effective and these include macrolides (erythromycin, azithromycin), tetracyclines (doxycycline, minocycline), aminoglycosides (gentamicin), fluoroquinolones (ciprofloxacin), chloramphenicol and rifampicin.^{1,2}

Without azithromycin the treatment of both genital and ocular chlamydia is troublesome. Genital chlamydia requires 7 days of doxycycline twice daily, while trachoma requires 6 weeks of tetracycline eye ointment twice daily.^{1,3}

Interventions for trachoma

Prior to the mid 1990s attempts to control trachoma in Aboriginal communities focused on environmental determinants and the sporadic use of antibiotics. Improvements in living conditions were responsible for the disappearance of trachoma from mainstream Australia by the 1930s. Professor Ida Mann’s recommendation for trachoma control was:

“Drugs? I’d prescribe water. If governments were to put water on, nobody would have trachoma!”

These comments remain pertinent, but medical intervention has dramatically hastened the eradication of trachoma from much of the world, and has a role to play in Aboriginal communities.^{1,4}

With the availability of azithromycin, medical intervention is now much more feasible.^{1,3,4} However, as for most medications, babies and pregnant women were excluded from the explicit approved recommendations for use.¹ This is problematic as infants have the highest carriage of infectious trachoma.^{5,6,7,8}

Since 2000 prescription of azithromycin to pregnant women with genital chlamydia and other indications has become accepted. Azithromycin is now category B1, meaning that no adverse effects have been attributed but experience is still limited.^{1,9,10}

Prescription of azithromycin for small babies is also recognised as safe. Use for treatment and prevention of pertussis (whooping cough which can be a dramatically life-threatening illness in small babies) was approved only in 2005.¹¹ Use for trachoma was specifically excluded in the 2006 CDNA guidelines for trachoma control.¹²

Our proposal

Following discussions with local and national paediatric, infectious diseases and immunology experts, approval for use of azithromycin in small babies for trachoma control has now been granted in NT (see Box for dosing). In the setting of not having specific approval for this use from the manufacturer we are undertaking enhanced surveillance for side effects. We will be actively seeking for side effects at 1 and 4 weeks after administration, in order to be able to confidently document the occurrence, frequency and type of side effects that may occur. These may include diarrhoea, ‘tummy aches’ and thrush.⁹ We do not anticipate serious side

Box. Dose recommendations

Weight	Single dose of azithromycin	
Under 6kg	80mg	2mL syrup
6 to 9.9kg	120mg	3mL syrup
10 to 14.9kg	240mg	6mL syrup
15 to 19.9kg	400mg	10mL syrup
20 to 29.9kg	500mg	1 tablet
30 to 39.9 kg	750mg	1½ tablet
40kg and over	1000mg	2 tablets

effects. In particular we do not anticipate hypertrophic pyloric stenosis. This can occur as a side effect of erythromycin given to neonates, but has not been associated with azithromycin.^{9,11}

With the addition of azithromycin to our armamentarium for fighting trachoma, and this new weapon now being available for use in all age groups, we are more confident in our capacity to control trachoma. We heed Ida Mann's words and are actively working with environmental health, schools and councils for improved environments which will also contribute to making trachoma control possible. We additionally wish to emphasise the importance of promoting clean faces as a key message in trachoma control.

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Trachoma: new advances in treatment

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Trachoma is an eye disease caused by repeated infections with the bacteria *Chlamydia trachomatis*. It is usually associated with poor personal and community hygiene and poverty.¹ It is a preventable cause of blindness.^{2,3}

Trachoma has been endemic in Aboriginal communities for a long time. Up until the 1930s, it was endemic in Non-Indigenous Australia, but improvements in living conditions eliminated the disease.⁴ However, it persists in Aboriginal communities. Of the 54 countries in the world with endemic trachoma, Australia is the only developed nation, with the burden of disease falling almost exclusively on the Aboriginal population.⁵ In terms of eye health, trachoma may be responsible for up to 45% of blindness in Aboriginal people in Central Australia.⁶

Data on the current prevalence of active trachoma in Australia is patchy at best, but in a recent survey conducted in the Katherine region, rates of follicular trachoma and trichiasis were found to be several times higher than the World Health Organisation threshold for a public health problem. In 2 of the 5 communities surveyed trachoma was hyperendemic, being present at levels greater than 20% of children aged 10 years and under. In a further 2 communities, trachoma was at endemic levels; that is, greater than 10% of the children aged under 10 years presented with follicles during clinical presentation (unpublished data, Roper).

Trachoma responds readily to treatment with antibiotics, in particular, azithromycin given as a one-off dose by mouth either as a tablet or suspension. In endemic and hyperendemic conditions, a community-based treatment should be considered. That is, the treatment of all school-aged children and all household contacts.^{7,8} However, as a general recommendation azithromycin is only approved for those aged 6 months and over or for those weighing more than 6kg in body weight. For the young babies, who are often a reservoir for *C trachomatis*. Erythromycin twice a day for 14 days has been the recommended treatment and difficulties in achieving compliance with such a regimen in young babies are well known. Azithromycin is now approved, however, for the treatment and postexposure prophylaxis of pertussis for babies aged less than 6 months⁹ and

this step suggests a more achievable treatment and prophylaxis for trachoma for babies may also be considered.

The Centre for Disease Control is taking steps to improve and simplify the treatment of young babies. The new recommendation to use azithromycin for trachoma in those aged under 6 months or under 6 kg will assist community-based clinicians to provide rapid and effective treatment for trachoma, with reduced issues of non-compliance. The instigation of enhanced surveillance will provide reassurance that any adverse events will be monitored. Data collected will provide stronger evidence to include a consistent recommendation of the new regimen in other standard treatment guidelines such as the CARPA Standard Treatment Manual.

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Treatment completion for latent TB infection in Darwin 2005 – 2007

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Introduction

Australia has one of the lowest rates of tuberculosis (TB) in the world, with an annual notification rate of between 5 and 6 cases per 100 000 population. In 2005, 86% of notified TB cases occurred in people who were born overseas, a figure that has been increasing steadily since the early 1990s.¹ This suggests that the majority of cases of TB in Australia result from reactivation of latent TB infection (LTBI) rather than recent community transmission, a finding consistent with the experiences of other developed countries with long-established TB control programs.²

The identification of people with LTBI, and their appropriate treatment, is therefore a priority for TB control in Australia. To this end, screening programs targeted at 'high-risk' groups operate throughout the country. In the Northern Territory (NT), these screening programs focus on contacts of TB cases, healthcare workers, newly-arrived refugee and humanitarian entrants, immunosuppressed patients, school children in communities that have had an active TB case in the last 3 years, personnel of agencies involved in the apprehension and detention of illegal foreign fishermen, and prisoners.³

The NT screens for LTBI using Mantoux tests, with a chest x-ray and clinical review arranged for anyone with a positive result (defined as a Mantoux of more than 10mm).³ Once active TB has been excluded, a lifetime risk of reactivation is calculated using guidelines published in the *New England Journal of Medicine*.⁴ Any patient with a lifetime risk of 10% or more should be offered LTBI treatment unless s/he has a clear medical contraindication.

The current recommendation for LTBI treatment in the NT is 9 months of daily isoniazid (INH). Pyridoxine is given in conjunction with INH to reduce the risk of peripheral neuropathy.³ This regimen is consistent with the most recent Cochrane systematic review on LTBI treatment that found that treatment with INH resulted in a relative risk of developing active TB of 0.4 (95% confidence interval 0.31 to 0.52) over 2 or more

years. This review also found no significant difference between treatment duration of 6 or 12 months.⁵

However, the efficacy of INH in preventing active TB is dependent upon treatment completion and trials performed under program conditions have shown widely varying completion rates.⁶ Of concern, 2 recent large studies conducted in the US revealed that less than 55% of patients completed INH therapy.^{7,8} This has significant implications for both the structure of TB control programs, and the response to recent calls in the literature⁶⁻⁹ for adoption of alternative regimens such as 4 months of rifampicin. It is on this basis that a retrospective audit was conducted of treatment completion for patients commenced on LTBI treatment in Darwin from 1 July 2005 – 30 June 2007.

Methods

Since 1 July 2005, all patients commenced on LTBI treatment at the TB Unit in Darwin have been entered onto an Access database. The data recorded include basic demographic information (including age and ethnicity), size of Mantoux reading, calculated lifetime risk of reactivation,⁴ regimen used (9 months of INH or, in rare cases, 4 months of rifampicin), whether treatment was completed (defined as taking more than 80% of prescribed tablets) and, if not, the reason for ceasing treatment. At the commencement of the audit, patients were also cross-referenced with their Community Care Information System (CCIS) data to ascertain the risk factor leading to their initial Mantoux screening.

All patients commenced on treatment between 1 July 2005 and 30 June 2007 who were not currently taking LTBI treatment were included in the audit. Treatment completion was calculated and further stratified according to age, ethnicity, risk factor and treatment regimen. Bivariate analysis was undertaken using a χ^2 test to determine predictors of treatment completion. Logistic regression was then utilized to generate odds ratios. All statistical analysis was completed using Stata version 9.0. For those

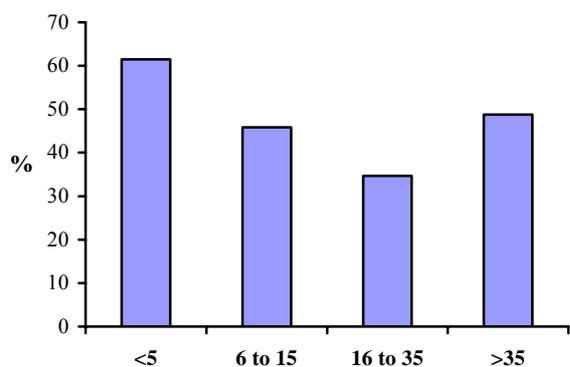
patients who failed to complete treatment, the reasons for cessation were also analysed.

Results

There were 258 people commenced on LTBI treatment in Darwin between 1 July 2005 and 30 June 2007. At the time the audit was undertaken (November 2007), 21 patients were still taking their LTBI treatment. Analysis was therefore limited to the 237 people who had completed or ceased treatment.

Overall, 100 patients (42.8%) completed their LTBI treatment. Treatment completion was highest in the under 5 age group (61.5%) and lowest in the 16-35 age group (34.7%), with age between 16 and 35 being negatively associated with treatment completion (OR 0.54; 95% confidence interval (CI) 0.32 to 0.91, $p=0.0211$). Treatment completion by age is shown in Figure 1.

Figure 1. LTBI treatment completion (%) by age



Ethnicity was also associated to treatment completion, with overseas-born patients being less likely to complete treatment (37.9%) than either Indigenous (53.5%) or non-Indigenous Australians (46.3%). However, these differences were not statistically significant.

Risk category was also associated with LTBI treatment completion. As demonstrated in Table 1, healthcare workers (27.6%) and refugees (29.3%) were least likely to complete treatment while immunosuppressed patients (73.7%), prisoners (54.1%) and contacts of TB cases (53.3%) were most likely. When treatment completion risk categories were compared, the

Table 1. LTBI treatment completion by risk category

Risk Category	Commenced treatment (n)	Completed treatment (n)	Completed treatment (%)
Contact of TB case	15	8	53.3
Health care worker	29	8	27.6
Other occupational	22	8	36.4
School screening	10	5	50.0
Refugee	75	22	29.3
Other migrant	23	12	52.2
Immunosuppressed	19	14	73.7
Prisoner	37	20	54.1
Referred with symptoms	7	3	42.9

only categories significantly associated with treatment completion were refugees, who were significantly less likely to complete treatment (OR 0.45; 95% CI 0.25 to 0.80, $p = 0.0065$), and immunosuppressed patients who were significantly more likely to complete treatment (OR 4.3; 95% CI 1.5 to 12.4, $p=0.0038$). All other associations were non-significant.

INH was the prescribed regimen for 227 (95.8%) patients and 10 (4.2%) were prescribed 4 months of rifampicin. Rifampicin was used in 2 patients who were already receiving the drug as leprosy treatment and 8 prisoners who had a high lifetime risk of reactivation but did not have a sufficient prison sentence to allow completion of 9 months of INH. Rifampicin was positively associated with treatment completion, with 80% of these patients completing treatment compared with only 40.5% who were prescribed INH (OR 5.9; 95% CI 1.2 to 28.3, $p = 0.0136$). However, the small numbers and wide confidence intervals mean that this result should be interpreted with caution.

There were 135 patients who failed to complete INH treatment. The most common reasons recorded for cessation of treatment were default (48.2%), elevated liver function tests (12.4%), rash (7.3%) and GIT side effects (7.3%). Other reported side effects included tiredness and lethargy (6 cases), mood alteration (6 cases including 1 attempted suicide using INH) and peripheral neuropathy (3 cases). There were 2 patients who ceased INH upon becoming

pregnant and 17 patients left the NT and were lost to follow up. Of the 2 patients to cease rifampicin, 1 defaulted and the other had elevated liver function tests.

Discussion

This audit demonstrates that achieving completion of LTBI treatment is a significant challenge for Darwin's TB control program. While it is reassuring that immunosuppressed patients, who are among the highest risk groups for reactivation, are positively associated with treatment completion, other 'at risk' groups are not currently receiving adequate preventive therapy. Of particular concern is the finding that being a newly-arrived refugee is a significant predictor of failing to complete LTBI treatment, especially in light of the growing body of literature suggesting that refugees are at increased risk of reactivation of LTBI for up to 5 years after resettlement.²

There are a number of plausible reasons why refugees have such a low rate of treatment completion. Refugee screening in the NT, and therefore diagnosis of LTBI, occurs in the first 1-2 months following their arrival in Australia. This is a highly stressful time for refugees who are likely to be preoccupied with immediate settlement needs such as accommodation, schooling, learning a new language and finances. In addition, many newly arrived refugees are unfamiliar with the notion of preventive health care. Often their experience to date is that health care is only required when there is a problem. Preventive health care in Australia is an essential part of primary health care services and accessing comprehensive primary health care and, in turn, health education, on arrival in Darwin is difficult for refugees. It is therefore hardly surprising that a long prophylactic treatment course is unlikely to be a priority for the majority.

An additional barrier to refugees completing LTBI treatment has been confusion among health care providers about perceived interactions between INH and antidepressants. As many refugees arrive with a past history of torture and trauma, mental health issues and consequent treatment are not uncommon. This has led to a number of refugees having their INH ceased by their mental health care provider.

Although INH can cause mood alterations in a small number of patients and consideration needs to be given in individuals with major depression, consultation case by case is advised. While there is a theoretical basis for concern about a potential interaction between INH and selective serotonin reuptake inhibitors (SSRIs), there is currently no clinical evidence of any adverse interactions.¹⁰ Education may be useful for both mental health providers and refugees to overcome these misconceptions and there is a need to enhance communication between mental health and TB services.

Culturally appropriate community-based education and service delivery programs may also help address the reluctance of refugees and other high-risk groups to persevere with LTBI treatment. A starting point for such programs would be to attempt to increase the acceptability of therapy by ensuring that only those people for whom there is evidence of benefit from LTBI treatment (those with a lifetime risk of 10% or more) have it offered to them. Research will also be needed to create an evidence-base for the development of targeted interventions such as education, directly observed therapy (DOT) and incentives, all of which require identification and understanding of the determinants of failure to complete treatment. Given that over 48% of treatment cessation across all risk groups is due to default, a greater understanding of the reasons for this in various risk groups would also be useful. Systematic data collection and analysis in all States and Territories should be encouraged for this purpose.

Healthcare workers should particularly be targeted for research and efforts to increase treatment completion. Although being a healthcare worker was not itself a statistically significant predictor of failure to complete treatment, they have disturbingly low rates of treatment completion. Obtaining greater insight into the reasons for this, and addressing them, is important both for the protection of individual and public health, and because of the potential influence of healthcare workers on the decision-making of their patients.

There are a number of limitations to the conclusions that can be drawn from this audit, which had relatively small numbers in each risk category. It is likely that the true reasons for

treatment outcome in some groups were too complex to be captured by this study. Examples include the effect of DOT on the under 5 year olds and prisoners, the effect of the ethnic composition of prisoners and healthcare workers and the relationship between age and risk category. Another limitation is that adherence to treatment was assessed clinically and by the patient returning each month to have his/her script filled, rather than by counting tablets. It is therefore not possible to be sure that all patients listed as having completed treatment actually took 80% of their medications. Finally, it is possible that treatment completion for this time period has been underestimated by excluding the 21 patients currently taking LTBI treatment. However, even if all of them complete (which is highly unlikely), the overall treatment completion would still only be 46.9%.

This audit also raises the issue of using rifampicin rather than INH as treatment for LTBI. Although the small numbers make the comparison in this audit inconclusive, and there is likely to have been confounding by the fact that most people receiving rifampicin were prisoners and therefore subject to DOT, it does raise the issue of whether further research is warranted. It is certainly intuitive that a shorter course would be easier to take, but without either a randomised trial or, at least, a greater understanding of the reasons behind the failure to complete INH treatment, this is currently little more than guesswork in the Australian context. However, investigating a change in regimen, including an evaluation of the risk of drug resistance, should certainly remain an option while LTBI completion rates are so poor.⁹

Conclusion

Only 42.8% of patients who commenced LTBI treatment during the audit period completed it. Given that the efficacy of INH in preventing reactivation of TB is dependent on treatment completion⁷, this finding calls into question the effectiveness of Darwin's current LTBI treatment program. Despite the limitations of the audit, it has usefully identified predictors of treatment completion and non-completion under program conditions. It has also provided

guidance for future research and the potential development of interventions, especially for high-risk groups such as newly arrived refugees and healthcare workers. With more extensive evidence about the reasons for non-completion in different risk groups, targeted community-based education and service delivery programs may be developed to improve treatment completion, irrespective of whether INH or rifampicin is used.

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DEPARTMENT OF HEALTH AND COMMUNITY SERVICES

CENTRE FOR DISEASE CONTROL

Chironex fleckeri (Box Jellyfish)

'*Chironex fleckeri*', also known as the major Box Jellyfish has the most rapidly acting venom known to science and is capable of killing a person in under 5 minutes. Although it is only one of many species of box jellyfish, it has become infamous causing more than 60 deaths in Australia over the last 100 years.

Season

The official "stinger" season for the Northern Territory is from 1 October until 1 June. However stings have been recorded in all months of the year.

Distribution

Chironex fleckeri inhabit the shallow waters of the northern Australian coast, and are more numerous after local rain and in calm seas, especially near river and creek outlets.

Appearance

The bell of *Chironex fleckeri* is a rounded box shape with the bottom missing, with four fleshy appendages, one at each corner, from which tentacles trail.

The jellyfish is difficult to see in the water because the bell is colourless, and although the outermost tentacles are sometimes purple near their base the others are white or dull yellow.

An adult jellyfish may have 40 or more tentacles, each of which may be up to 2 meters long. Body size varies according to the level of maturity. Visible baby Box Jellyfish have bodies

DO NOT ENTER THE SEA AND MOST IMPORTANTLY DO NOT LET CHILDREN ENTER THE SEA DURING THE STINGER SEASON - OCTOBER TO MAY

2-5cm in diameter, while the larger mature specimens are up to 20 cm across.

Envenomation

A sting occurs when the tentacles contact the bare skin causing stinging cells called nematocysts to fire into the body. Millions of these nematocysts are present in the tentacles of the jellyfish. Thus the amount of venom injected is divided into millions of little doses deposited over a large area of tissue, allowing very rapid absorption. The stinging cells of a *Chironex fleckeri* fire venom into the skin within 3 milliseconds of being triggered – 10 times faster than the inflation of an airbag in a car crash.

Signs and Symptoms

The venom has cardiotoxic (attacks the heart) and highly dermatonecrotic (destroys skin) components.

On being stung the victim will experience immediate severe localized pain often associated with vigorous attempts to remove the tentacles (this may make it worse as more nematocysts will be discharged).

Within minutes white welts appear where the tentacle contact occurred, followed by red whip-like lines which may later blister. Subsequent skin death may lead to permanent scarring.

A massive dose of venom can cause cardiac dysfunction, resulting in loss of consciousness and cardiac arrest and death within 5 minutes of being stung.

Injury and deaths

Around 40 people present to Top End hospitals or health clinics each stinger season with an injury attributed to a jellyfish sting.

Chironex fleckeri has been responsible for at least 63 deaths since first reported in 1883. The last recorded *Chironex fleckeri* death in Australia was in January 2006 when a 7-year-old girl in Far North Queensland died soon after a presumed *Chironex fleckeri* sting. The last recorded death in the NT in February 1996 was a 3-year-old girl from a remote NT Aboriginal community with confirmed *Chironex fleckeri* envenomation.

The last 10 stinger deaths in the NT have all been children.

Children are at greater risk of severe, life threatening envenomation because of their smaller body mass.

Treatment

1. Immediate first aid is vital and cardiopulmonary resuscitation may be needed.
2. Remove the patient from the water and restrain if necessary.

3. Call for help (dial 000 or get a surf life saver or life guard to help you).
4. Assess the patient and commence CPR as necessary.
5. Liberally douse the stung area with vinegar to neutralize invisible stinging cells – do not wash with fresh water.
6. If vinegar is unavailable, pick off any remnants of the tentacles (this is not harmful to the rescuer as the pads of the fingers and palm are usually too thick for the stinging cells to penetrate) and rinse sting well with salt water (not freshwater).
7. Seek urgent medical assistance with rapid transport to hospital. Antivenom may be required in severe stings.

For more information contact your nearest Centre for Disease Control.

Darwin	8922 8044
Katherine	8973 9049
Nhulunbuy	8987 0359
Tennant Creek	8962 4259
Alice Springs	8951 7549

Further CDC fact sheets available at: http://www.nt.gov.au/health/cdc/fact_sheets/fact.shtml

Needs Analysis - Youth Access to Sexual and Reproductive health services A Snapshot

Astrid Stark, Sexual Health and BBV Program, CDC Darwin

Background

At the January 2007 meeting of the Northern Territory Sexual Health Advisory Group (SHAG), the issues of high rates of STIs among youth and youth access to sexual and reproductive health (SRH) services were discussed.

In response to the Northern Territory's (NTs) persistently high rates of sexually transmitted infections (STIs) in the younger age group (15-24 years) a decision was made to appoint a project officer to undertake a needs analysis investigating youth access to existing SRH services in urban NT.

The aim was to examine existing sexual health, reproductive health and blood borne virus (SHRHBBV) services in urban Darwin, Palmerston and Alice Springs and highlight issues regarding Indigenous and non-Indigenous youth access to these services. Gaps and weaknesses will be identified and suggestions forwarded to improve younger people's access to these existing services.

STI statistics in young people of the NT

The National Sexually Transmitted Infections Strategy of 2005-2008 has identified young people under 25 years as a future priority population in tackling the high rates of STIs.¹ Given the persistently high rates of adolescent STIs and teenage pregnancy in the NT² and Australia, particularly among Indigenous youth,

Figure 1. Average notification rates of STIs by age group, Darwin urban Area, 2002-2007

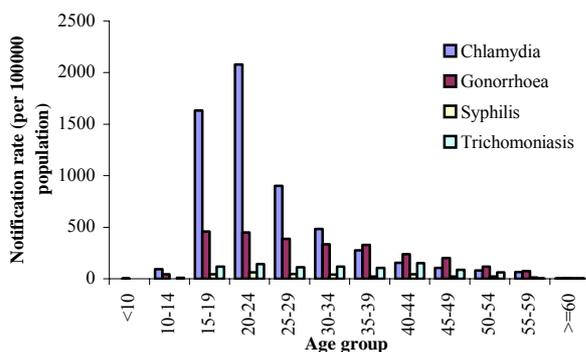
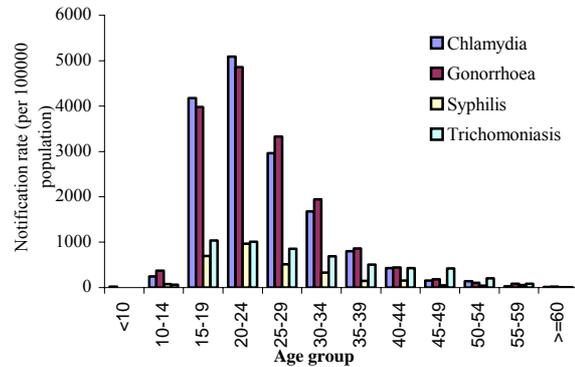


Figure 2. Average notification rates of STIs by age group, Alice Springs urban area, 2002-2007.



[Data provided from the Northern Territory Notifiable Diseases System (NTNDS), November 2007]

it is timely to address young people's sexual and reproductive health.

Methods

Following a comprehensive literature review, the project officer developed an interview schedule with contributions from the Youth Access Advisory Group (YAAG): Wendy Armstrong, Kirsty Smith and Jan Holt (Sexual Health and Blood Borne Viruses Program).

A number of relevant models of interstate SRH organisations and agencies were selected for a review of their services and issues related to how young people accessed their service. Consultations then began with service providers of urban government, non-government and community based organisations in the NT in Darwin, Palmerston and Alice Springs. A focus group was also conducted with the Youth Minister's Round Table of Young Territorians, here after called the Round Table.

Consultations were conducted to establish the:

- Range of services provided
- Physical access to services (eg. opening hours, days, transport availability)
- Cost of services

- Barriers to service delivery (ie. physical, clinical, social, cultural)
- Client profiles (numbers, age, gender, cultural background)

Consultations took place either at the service locations or by telephone interview.

Progress to date

The data is currently being analysed to identify common themes among stakeholders, strategies that work as well as gaps and weaknesses in the accessibility of existing SRH services.

Range of services available

In Darwin and Palmerston as well as Alice Springs, there are extremely limited SRH clinical services available, particularly in Palmerston and Alice Springs. The only youth specific SRH clinic in the NT is held once a week at Family Planning in Darwin. It is usually fully booked with long waiting times. There are no youth specific SRH services in Alice Springs. There are currently no strategies at the other existing SRH services to attract young people.

There are 2 specific SRH services in the NT: Clinics 34 and Family Planning Welfare of the NT (FPWNT). The only comprehensive 'one stop shop' providing SRH services for both women and men of all ages in the NT is at FPWNT. Until July 2006, this service was also operating in Alice Springs. However it is now closed and although negotiations have taken place, the future of the service is uncertain.

Clinics 34 in Darwin and Alice Springs focus primarily on STIs and blood borne virus (BBV) screening, treatment and management. The Northern Territory AIDS and Hepatitis Council (NTAHC) in both regions provides education, support to the affected community, the general community and a needle and syringe program (NSP). These 2 organisations collaborate on a number of health campaigns as well as co-manage HIV and hepatitis C patients.

Danila Dilba Aboriginal Medical Service, provides a separate comprehensive SRH service for Aboriginal women and a separate men's clinic in Darwin city. General medical services throughout Darwin and Palmerston such as GP

practices, staff at Royal Darwin Hospital and regional Community Care Centres may offer some SRH services as part of their client care.

Alice Springs has 2 medical services with a specific sexual health focus: Congress Alukura and Congress men's clinic. Several general health services such as GP practices, Alice Springs Hospital and Congress Medical Centre also deliver SRH services as part of their general health services. Congress Alukura provides a free comprehensive SRH service for Indigenous women.

Many government and non-government organisations offer some form of sexual health education. Most is offered ad hoc and at various locations such as schools, community groups and at events as needed. All services are engaged in cross-referrals to various other related services.

Access

The majority of SRH services are open weekdays during business hours apart from FPWNT, which opens on Saturday mornings, and Clinic 34, Darwin which opens until 6pm on Tuesdays. Most services are provided free of charge however FPWNT charges a small annual membership fee. Medications are provided free at all services except FPWNT who offer prescription medication at a lower cost.

Most services offer a drop-in service with minimal waiting times, however, the Saturday youth clinic at FPWNT is in high demand and young clients may have to wait up to 1 hour and 20 minutes to see a doctor or a nurse.

While none of the Top End services offer assistance with transport for able youth, all are on local bus routes. The location of SRH services in Alice Springs is convenient for young people. Assistance with transport is offered to all Indigenous clients by all services in Alice Springs.

Common themes emerging

Barriers identified

Several barriers were identified facing young people in their access to SRH services. Many service providers believed that the majority of

young people **lack awareness of SRH services** and their need to use them. **Cost** of services was also a barrier at FPWNT and GP practices. Service providers felt that young people may have a **low perception of risk** to any danger involved in their sexual activities possibly due to a lack of SRH education in their homes or whilst at school. **Fear of the unknown** was also an identified barrier with many young people unaware of what is involved in STI testing. The perceived feelings of **stigma and embarrassment** when accessing a SRH service were also identified as barriers for young people.

While physical accessibility to the Alice Springs services is easy for most young people, there are a number of barriers that influence access to these services. Almost all service providers in Alice Springs identified that feelings of 'shame' may be a barrier for young people, particularly Indigenous youth. This was a particularly strong theme throughout the consultations. They also identified lack of sexual health education and information and **sexual health being a low priority** for young Aboriginal people. In a small rural town, **familiar staff** working at the SRH services, such as family members, may magnify feelings of **shame or fears about confidentiality** when accessing the service.

Increasing access to services

Most service providers agreed that there is a need for **more consistent sexual and reproductive health education** at schools. The majority of service providers highlighted the need for young people to **participate** in the planning of SRH education, interventions and activities. They also recommended **outreach** education and clinical services held at youth based venues and organisations. Linking SRH clinical services or education with **recreational based activities** was described as an effective strategy for engaging the youth, as well as **incorporating SRH into general youth health** to reduce stigma. Strong **partnerships** between SRH services and youth services were also highlighted.

Preliminary recommendations

Top End and Alice Springs service providers recommended similar strategies to increase

access to sexual and reproductive health services.

They included to:

- promote existing services,
- expand youth services of existing services,
- make SRH services part of general youth health initiatives,
- link recreational activities with SRH clinical services and education,
- provide outreach services at schools and other youth-based organisations,
- strengthen partnerships between SRH services and youth organisations, and
- increase SRH education for youth in schools.

Discussions from the Youth Minister's Round Table of Young Territorians

A focus group was held with 7 young people from the Round Table in Darwin.

Participants identified many **barriers** affecting young people's access to SRH services including lack of education and awareness of sexual health, stigma and fear around STIs and adolescent pregnancy and fear of the unknown, such as what is involved in a STI test. Gender issues and stigma also arose regarding male and female access to SRH services. Privacy and confidentiality were mentioned as important factors in young people's access to SRH services, particularly in small towns. They expressed a lack of anonymity and possibly confidentiality, especially in the waiting rooms and among their own social networks.

Enablers identified by the focus group that may increase youth's access to services included a drop-in service with short waiting times, free or bulk-billed services, extended clinic hours in the evenings and staff with good rapport and communication skills with young people. They suggested early evening clinic hours, specifically Thursday evenings. One person suggested that extended clinic times should differ between Palmerston and Darwin and access to SRH services in both Darwin and Casuarina (northern suburbs of Darwin). Currently there are no specific SRH clinical services available in the Casuarina area.

Where to from here

Following consultation with the Youth Access Advisory Group, analysis of all the data from the government, non-government organisations and Round Table consultations has taken place and a comprehensive report for the NT Sexual Health Advisory Group (SHAG) is underway. This project will be completed in January 2008. With the report and recommendations available SHAG will be in a position to consult and plan the next stage in improving young people's access to SRH services.

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Palmerston Safety Survey 2006: home safety, perceptions of community safety and experiences of injury

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Introduction

Injury is a significant cause of mortality and morbidity, both worldwide and in Australia, where it is the leading cause of death in people under 45 years of age.¹ In the Northern Territory (NT), injury accounts for over 17% of all deaths, compared to 6% nationally, and the crude death rate from injury is almost twice that of the national rate.² The average cost due to injury to the NT Department of Health and Community Services (DHCS) for the 4-year period to 2001 was estimated at \$19.7 million annually.¹

The Safe Communities model, initiated and developed in collaboration between Sweden's Karolinska Institute and the World Health Organisation (WHO), is a community-based approach to injury prevention and safety promotion.³ It evolved from a successful community-based injury prevention project conducted in Falkoping, Sweden in 1974. Since then, the WHO Safe Communities model has been adopted in more than 127 communities worldwide, with populations ranging from two thousand to two million.⁴ Currently, Australia has 10 designated Safe Communities, including Mackay in North Queensland and the Hume City

in Victoria, with many more preparing for accreditation.^{4,5,6,7} Several studies provide evidence that the model can be effective in reducing injuries and enhancing safety in whole populations.⁸

The city of Palmerston, with a population of 25,000, is located 21km south of Darwin in the NT. The population of Palmerston is primarily made up of families, with around 30% of the population being aged less than 15 years.^{9,10} Although multicultural, 87% of the population was born in Australia and a further 5% were born in either England or New Zealand. Overall 11% of the population is Indigenous. English is the only language spoken at home for 82% of residents. Over 96% of the workforce is in full or part-time employment, with the most common occupation being clerical or administrative work.¹¹

In 2005 the Palmerston City Council, with support from the DHCS began work to develop a Safe Community program using the WHO model. One of the key criteria for accreditation as a WHO Safe Community is the documentation of the frequency and causes of injury.¹² To this end, and in order to establish

baseline measures for the purpose of evaluation of later interventions, a telephone-administered survey was conducted to gather data about people's perceptions and experiences of injury, safety and crime in Palmerston. It was anticipated that the exercise would also serve to raise awareness of the Safe Community program amongst the residents of Palmerston.

Methods

The sample size was calculated using the Raosoft[®] online sample size calculator.¹³ Taking into account the population size, a margin of error of 5%, a confidence interval of 95% and a distribution of responses of 50%, the sample size was calculated to be 379. This was rounded up to 380 for the survey. A random sample of telephone numbers, stratified by the 11 residential suburbs of Palmerston, was taken from the latest available version of the Electronic White Pages (EWP). The telephone numbers, with matched addresses, were updated using the MacroMatch[®] service provided by Sensis[®]. Respondents were considered ineligible if the telephone number was that of a business rather than a residence or if they were unable to speak English well enough to provide informed consent.

A questionnaire was developed following a review of the literature and several previous similarly intentioned surveys conducted in other Australian communities, for example Mackay,⁵ Adelaide¹⁴, Armadale¹⁵ and Melbourne,^{6,16} Topics and selected questions were agreed by a panel of stakeholders. The questionnaire was pilot tested to refine the sequencing and wording of questions. The resultant 10-page questionnaire contained 56 questions in 8 sections including demographic information. In pilot testing, the average time taken to interview a person was under 15 minutes.

A media campaign was launched in the weeks leading up to and during the survey to help raise awareness of and participation in the survey. The campaign included newspaper advertisements, posters on public billboards, radio segments conducted by the Mayor of Palmerston and development of a webpage. In addition, a letter signed by the Mayor was sent to each household in the sample.

The survey was conducted in the 4 weeks of November 2006 by the primary author (KR) and two research assistants. Inter-observer variability was minimised by means of internal validity tests to ensure that questions were asked in the same way by each interviewer. Each telephone number in the sampling frame was called up to 3 times before being abandoned. Calls were made at different times of the day from 9:00am through to 8:30pm, including weekends. Data were entered into an Access (1997) database then transferred via StatTransfer (version 8) to Stata (version 9). Excel (XP Professional 2000) was utilised for qualitative data analysis.

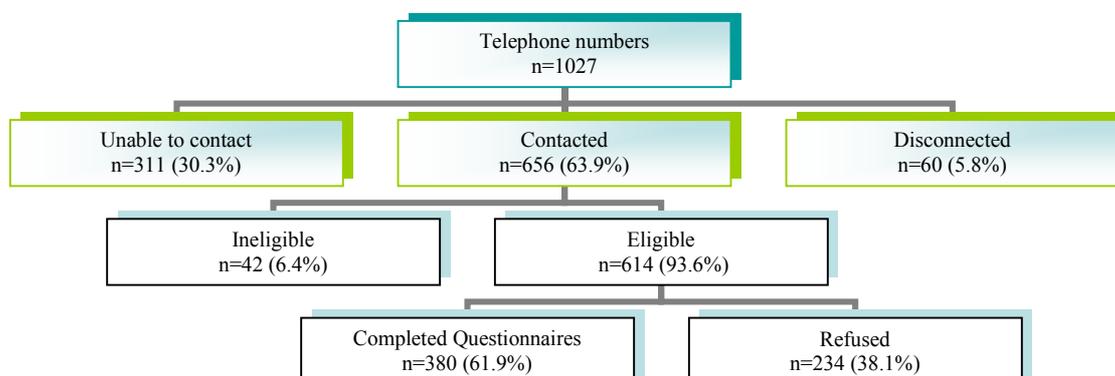
Ethical approval was obtained from the Australian National University Local Ethics Subcommittee for the National Centre for Epidemiology and Population Health and from the Human Research Ethics Committee of the Northern Territory Department of Health and Community Services and Menzies School of Health Research. After receiving an explanation of the study, all participants gave verbal consent to participate.

Results

At the end of the 4 week survey period, the required number of 380 completed questionnaires was obtained. Using the sampling frame of 1027 telephone numbers 2094 call attempts were made. The response pattern of the survey is summarised in Figure 1. Of the 614 people who were contacted, 61.9% agreed to participate.

Demographics of interviewees

Representation from all 11 suburbs of Palmerston was obtained in proportion to the sampling frame. Of the 380 interviewees, 245 (64.5%) were female, 133 were male (35.0%) and 2 questionnaires did not have the gender recorded. The age range of interviewees was from 18 through to 83 years, with a mean of 46.5 years (95% CI: 45, 48). Of the 80% living in a house, 75% lived in a house that they owned. Over 40% of interviewees had lived at their current address less than 5 years, but over 90% had lived in the Northern Territory for more than 5 years. The mean period of time at the current

Figure 1. Response pattern of survey sample

address was 7.6 years (95% CI: 7.01, 8.16) and the mean period of time in the Territory was 21.8 years (95% CI: 20.42, 23.09).

Home safety

Questions were asked about the presence in households of items that may reduce the risk of injury (see Table 1). Smoke detectors or smoke alarms were reported in 77% of homes and 52% of homes had a tempering valve fitted to their hot water system. In homes with children aged less than 5 years of age in residence, 65% had child-proof locks fitted to the cupboards containing medicines or cleaning goods. However, 94% of families with young children were pro-active in preventing poisoning of their child if those put medicines up and out of the reach of small children are included.

In Palmerston, 162(43%) of homes had a backyard swimming pool, and 161(99.4%) of these were fenced. Of the fenced pools, 86% (n=138) had exclusion fencing (i.e. a fence around the swimming pool), while 14% (n=23)

had a boundary fence (i.e. no specific pool fence, but the backyard was fenced off from other yards).

Of the 380 people interviewed, 75% (n=275) had been trained in first aid at some time in their life. Of these, 39% (n=111) had a current first aid certificate. Many of those with current first aid training were employed in an area that required a first aid certificate, for example, childcare, fire brigade and the police department.

Perceptions of community safety

Residents were asked to rate how safe they felt when alone in a variety of locations during both the day and at night. Responses were categorised as 'very safe', 'mostly safe', 'a little unsafe' or 'very unsafe'. Responses of 'very safe' and 'mostly safe' were combined to provide a 'safe' category and responses of 'a little unsafe' and 'very unsafe' were combined to produce an 'unsafe' category (see Table 2). For all locations, the perception of safety decreased from the day to the night. All decreases were all statistically

Table 1. Household safety items

Home safety item	n	%	95% CI (%)
Smoke detectors or smoke alarms	291	77	72-81
Adjustable thermostat on hot water system	199	52	47-57
Child-proof locks on medicines cupboard	62	65 *	60-70
Exclusion fence around the backyard pool	138	86 §	79-90
Trained in first aid	285	77	70-79

* As a proportion of households with children aged less than 5 years in residence

§ As a proportion of households with a backyard swimming pool

Table 2. Perceptions of safety in different locations by day and at night

Location	% Safe by day	% Safe at night
Own home	98.2 (n=372)	89.7 (n=340)
Streets of neighbourhood	95.1 (n=353)	47.6 (n=171)
At Palmerston CBD shops	90.9 (n=339)	38.4 (n=132)
At local shops in neighbourhood	90.4 (n=49.8)	40.3 (n=127)
Walking past pubs/clubs	95.1 (n=310)	40.3 (n=121)
Using ATMs	86.9 (n=312)	33.0 (n=106)
Walking in parks in Palmerston	82.4 (n=277)	15.2 (n=47)

* The denominator for the percentage may differ between locations as some persons were not able to provide a response, for example, those persons who did not use ATMs at any time.

significantly different at the $p < 0.001$ level using McNemar's test for paired data.

When asked what contributed to feelings of lack of safety, the most commonly mentioned items were groups of youths, gangs, itinerant people and drunk people.

Experiences of injuries

Interviewees were asked if they or anyone else in their home had received an injury in the previous 4 weeks, with an injury being defined as 'a bodily damage that might require medical treatment'. In 21% of households there had been an injury in the previous 4 weeks, with a total of 82 injuries. Forty-four of the injuries (55%) occurred in the home, and more than one third (n=28, 34.2%) involved a fall of some sort. Professional medical attention was sought for 33 injuries (40.2%). The hospital was the most commonly attended place (n=20), representing 60.6% of those who sought help and 24.4% of all injuries. Nearly one third (n=25, 30.5%) of injured persons required some time off work, school or their normal activities due to their injury. The period of time required off work ranged from half an hour up to 12 weeks. The median period of time off normal activities was 3 days. Alcohol was considered to be either a 'very significant' or 'somewhat significant' contributor to injury by 87.9% of interviewees.

Discussion

This paper describes the methodology and some of the major findings of a cross-sectional survey conducted with Palmerston residents to gather

baseline data about their experiences and perceptions of injury, safety and crime.

The participation rate reflects the compliance of the contacted population, with the denominator containing all eligible persons contacted. This survey had a participation rate of 61.9%, which compares favourably with other community surveys conducted in Australia when calculated by the same formula. Participation rates of between 48% and 62% were obtained for 3 other community surveys conducted in Australia.^{5,6} In addition, the sample size proportionate to population size for this survey was more than twice that used in other community surveys.^{5,6,17} However, females were over-represented in the survey, and the mean age of participants was higher than the mean age for the adult population. This has been observed for other community surveys⁵ and reflects the fact that women are more likely to be at home during the day. For this survey, nearly half the successful calls occurred during the day and more than 70% of those calls were to women. This may impact on the generalisability of some data, particularly in terms of perceptions of safety. In addition, the proportion of people interviewed living in homes that were purchased or being purchased (75%) was higher than reported at Census (48%).¹¹ This may indicate over-representation of interviewees of higher socio-economic status. The data on period of residency in the Territory is similar to that reported in another recently-conducted survey.¹⁸

A high proportion of homes in Palmerston (77%) had either smoke alarms or smoke detectors, and over half knew of having an adjustable

thermostat on the hot water system. These findings are similar to those of surveys conducted in Western Australia and Victoria,^{19,20} but are indicative that more education is needed to encourage the use of hot water tempering valves to reduce the risk of scalds for children.

The prevalence of injury in the 4 weeks prior to the survey for Palmerston was 21% of households. This was a little more than the 18% of households reported in the 2004-05 National Health Survey.²¹ A greater proportion of injured persons in Palmerston sought medical attention compared with those in the national survey (40.2% versus 16%). This could indicate that the severity of injuries is greater than observed nationally, may indicate a greater willingness on the part of injured persons in Palmerston to seek or to access medical care, or may be due to the lack of a consistent definition for injury for community surveys. For the national survey, the definition used for an injury event was 'an accident, harmful event, exposure to harmful factors or other incident which resulted in an injury and resulted in one or more of the following actions being taken: consulting a health professional; seeking medical advice; receiving medical treatment; reduced usual activities; and other treatment of injury (i.e. taking medications, using a bandage/bandaid, or heat or ice pack)'.²¹ This broader definition could be expected to capture more injuries at the minor end of the scale. Also of note was the greater proportion of persons in Palmerston who sought help from a hospital (24.4%) versus 5% nationally. This may reflect lack of 24-hour medical services or difficulties in obtaining local clinic appointments.

The perceived lack of safety at night is a well-documented phenomenon, and the negative perception of safety can have a serious detrimental affect on society and individuals' quality of life.²² Not feeling safe can have significant impact on people's ability to participate in the community, particularly in terms of achieving adequate amounts of exercise.^{23,24} Palmerston is seeking to address some of the issues around perceptions of safety. The police are represented on the Safe Communities committee as is Neighbourhood Watch.

Alcohol was frequently referred to as contributing to the risk of injury and lack of

feeling of safety. Per capita alcohol consumption in the NT is the highest in Australia: 17.3 litres of pure alcohol per year compared to 10 litres for the whole of Australia in 2005-06.²⁵ In 2006 35% of Territorians reported alcohol consumption that risk acute harm with 16% admitting to drinking at levels risking long term harm.¹⁸ A major aspect of the Palmerston program is the Alcohol Management Plan being developed by the Palmerston Alcohol Reference Group.²⁶

The survey data are already informing the Palmerston Regional Safe Communities Committee on areas in which to improve safety and prevent injury at a community level as well as providing a baseline for evaluation. The survey has also served to raise the public's awareness of the program to develop Palmerston as a WHO-accredited Safe Community and enhance their engagement with it.

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Public Health Group – Region 1: Counter Disaster Plan (2007)

Background

The Public Health Group – Region 1: Counter Disaster Plan (2007) (see website below) supersedes the Public Health Counter Disaster Sub Plan (1999), which was originally developed in response to the 1998 Katherine Floods.

The objective of the 1999 Plan was to define the responsibilities and roles of public health professionals in order to minimise the effects of a disaster on the public. It was a prescriptive document that was developed in the expectation that a technically exact approach to disaster management was possible. Over time, it has been shown that such an approach is outdated and that a multitude of factors determine effective disaster management. The 1999 Plan was generic and did not specifically apply to the context of the DHCS Public Health Group – Region 1.

Purpose of the 2007 Counter Disaster Plan

The 2007 Plan is outcome focused and provides a framework for the management and response to disasters by the DHCS Public Health Group – Region 1. It also aims to increase the skills sets of Public Health Professionals with respect to disaster management.

What's new in the 2007 Counter Disaster Plan?

The entire document is new and reflects the changing roles of Public Health professionals towards contemporary disaster management practices rather than focusing on a reactionary approach. The 2007 Plan is multi-disciplinary and recognises the important roles of other NTG

Agencies and DHCS Response Groups. Notwithstanding, the 2007 Plan is a working document and the new layout is now more conducive to updates, particularly with the separation of technical reference documents from the main document.

The 2007 Plan details the following:

- Northern Territory Counter Disaster arrangements
- DHCS – Counter Disaster arrangements
- Public Health Group response to disasters
- Public and Environmental roles in a disaster

Furthermore, the 2007 Plan:

- Is a subplan of the parent document, Cyclone Counter Disaster Plan – Region 1.
- Includes a extensive list of reference documents in the areas of Disease Control; Water; Onsite Wastewater Management; Food, Housing and Infrastructure; and Mosquitoes. There are also numerous Public Health Fact Sheets, which can form the basis for media releases.
- Can be used as a template by other Counter Disaster Regions for the development of their respective Public Health Group plans.

Where can I obtain a copy?

The 2007 Plan was prepared by the DHCS Environmental Health Program on behalf of the Public Health Group – Region 1. The 2007 Plan can be downloaded from the DHCS Environmental Health internet site:

<http://www.nt.gov.au/health/envirohealth>

For further information about the 2007 Plan, please contact the DHCS Environmental Health Program on 8922 7152 or email: envirohealth@nt.gov.au

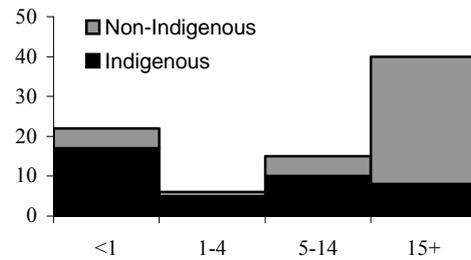
Viral meningitis outbreak

Peter Markey, CDC Darwin

Between July and December 2007 the NT experienced an outbreak of viral meningitis. The outbreak started in the East Arnhem region in early July and coincided with community outbreaks of a brief viral-like illness consisting of fever, headache and vomiting with a high attack rate in children. As it spread across the Top End from east to west it became apparent that the viral meningitis and the epidemic febrile vomiting syndrome were likely to have been caused by the same agent, with the viral meningitis cases representing the severe end of the clinical spectrum of disease. The epidemic reached Darwin in October and Alice Springs in November (Figure 1) and was continuing at the time of going to press.

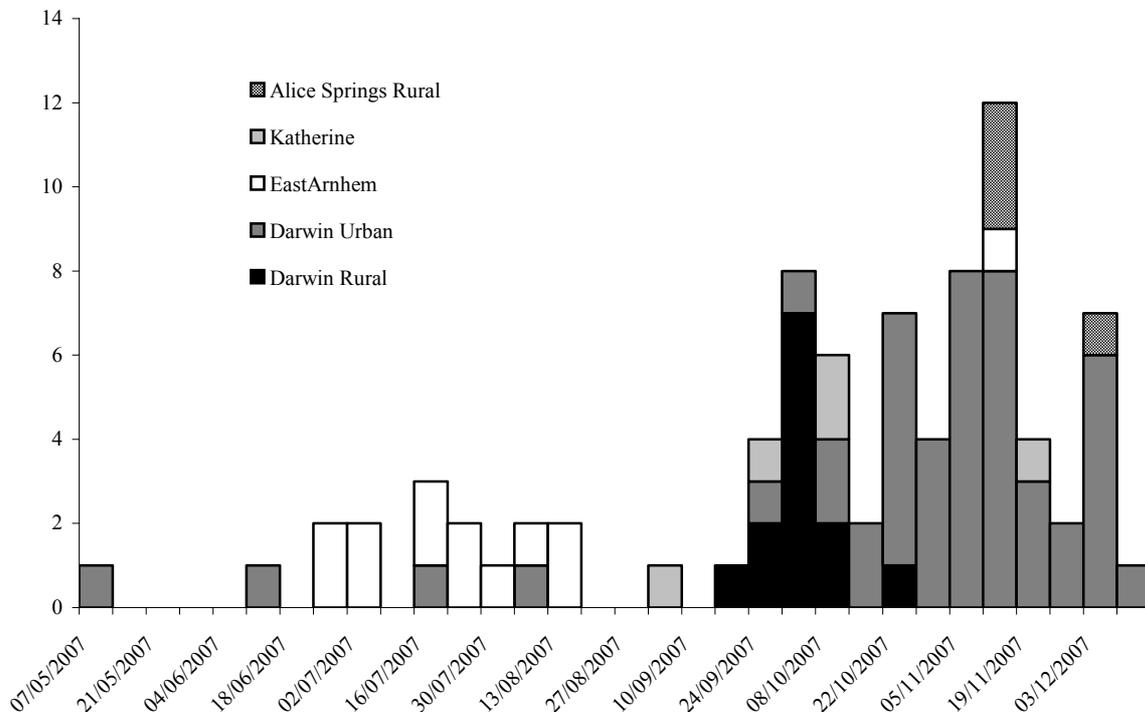
The majority of cases from remote communities were Indigenous infants while in Darwin the majority have been non-Indigenous adults (Figure 2). Cases have also been confirmed in the Kimberley.

Figure 2. Viral meningitis cases by Indigenous status and age



An enterovirus resembling Yanbian 96-83cf was isolated from the cerebro-spinal fluid from cases of viral meningitis and in some cases of the epidemic febrile vomiting syndrome. Details of the epidemic and the nature of the virus will be published elsewhere.

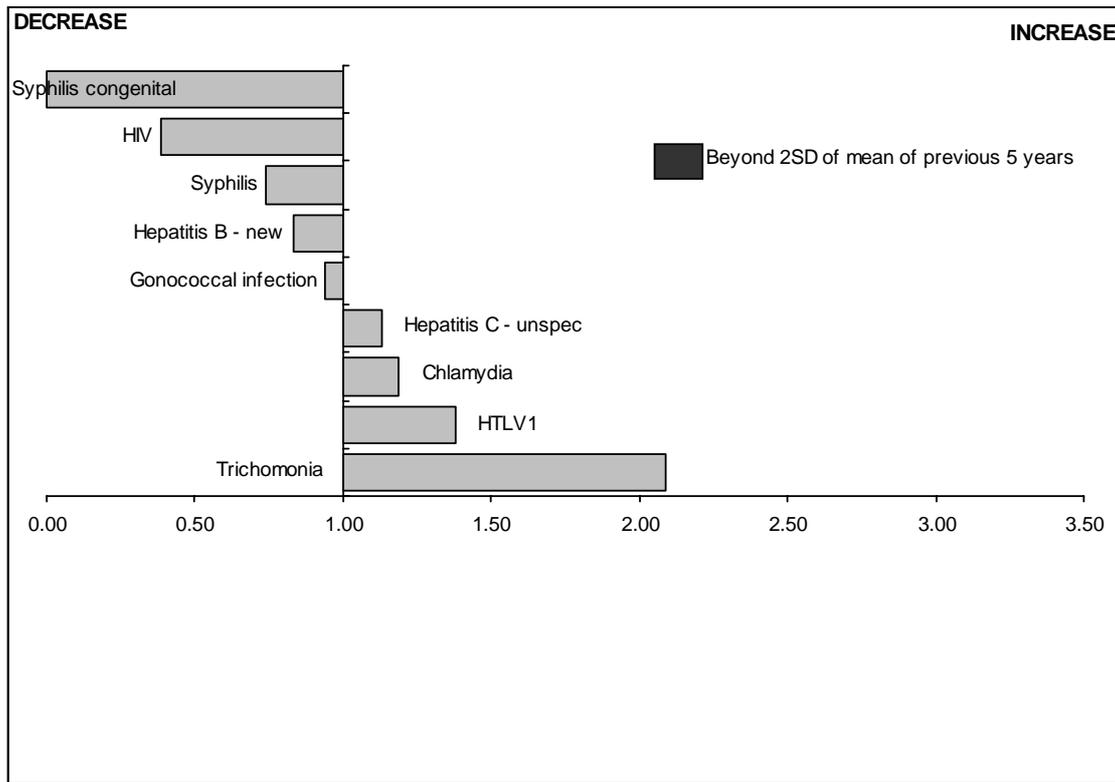
Figure 1. Epicurve of viral meningitis cases 2007



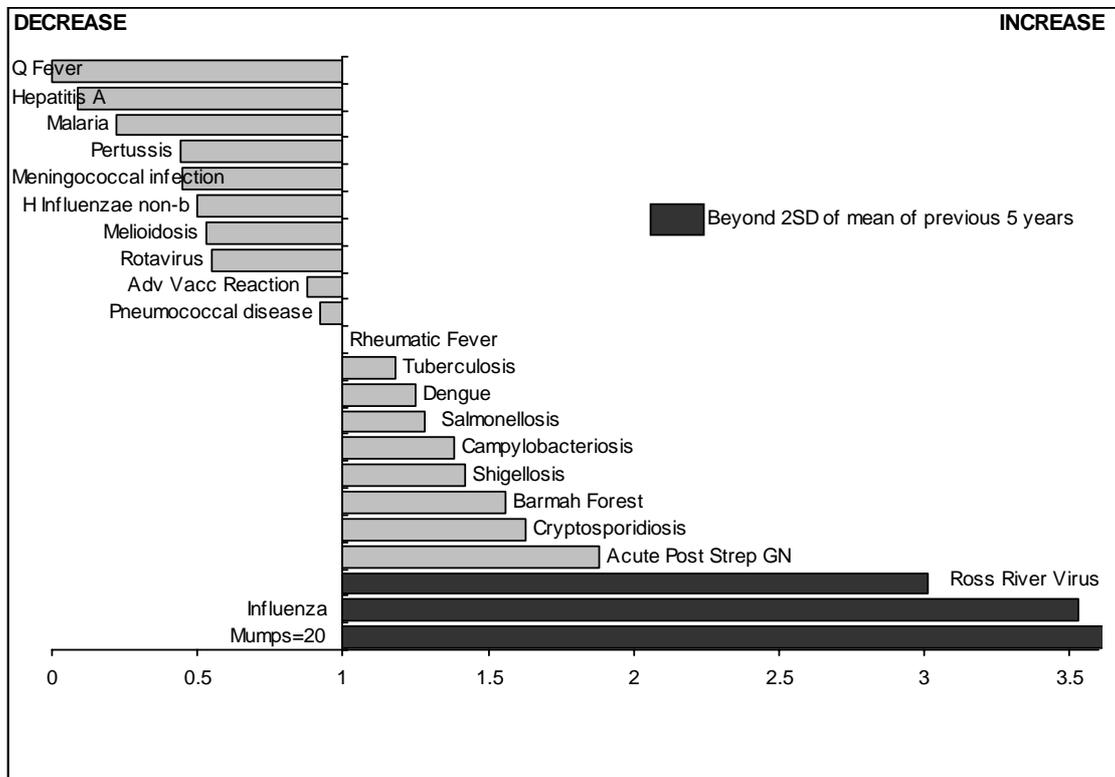
NT NOTIFICATIONS OF DISEASES BY ONSET DATE & DISTRICTS
1 July to 30 September 2007 & 2006

	Alice Springs		Barkly		Darwin		East Arnhem		Katherine		NT	
	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006
Acute Post Streptococcal GN	2	0	0	0	5	1	1	0	1	0	9	1
Adverse Vaccine Reaction	2	6	0	0	5	4	1	2	1	1	9	13
Amoebiasis	0	0	0	0	0	1	0	0	0	0	0	1
Arbovirus not otherwise Spec.	0	0	0	0	1	0	0	0	0	0	1	0
Barmah Forest	2	5	0	0	10	21	1	1	1	2	14	29
Campylobacteriosis	11	6	0	3	57	56	2	2	7	5	77	72
Chickenpox	20	3	0	0	33	49	0	7	35	37	88	96
Chlamydia	139	167	12	6	226	218	49	40	42	43	468	474
Chlamydial conjunctivitis	1	0	0	0	3	2	1	0	0	0	5	2
CJD	0	0	0	0	0	1	0	0	0	0	0	1
Cryptosporidiosis	6	0	1	1	7	1	0	0	0	0	14	2
Dengue	0	0	0	0	3	4	0	0	0	0	3	4
Donovanosis	1	0	0	0	0	0	0	0	0	0	1	0
Food/water borne disease	0	0	7	0	0	0	2	0	0	0	9	0
Gonococcal infection	147	206	21	16	101	90	26	34	59	59	354	405
Hepatitis A	0	0	0	0	0	1	0	0	1	0	1	1
Hepatitis B - chronic	21	29	3	0	23	25	44	30	0	6	91	90
Hepatitis B - new	0	0	0	0	1	1	0	0	0	1	1	2
Hepatitis B - unspecified	15	21	1	0	20	8	2	6	6	3	44	38
Hepatitis C - new	0	1	0	0	0	0	1	0	0	0	1	1
Hepatitis C - unspecified	19	15	0	2	37	34	0	2	6	7	62	60
<i>H. Influenzae</i> non-b	0	2	1	0	0	1	0	0	0	1	1	4
HIV	0	0	0	0	1	2	0	0	0	0	1	2
HTLV1 asymptomatic/ unspecified	23	35	1	0	0	0	0	0	0	0	24	35
Influenza	32	9	3	0	106	5	8	0	15	2	164	16
Legionellosis	0	1	0	0	0	0	0	0	0	0	0	1
Malaria	0	3	0	0	2	19	0	0	0	0	2	22
Melioidosis	0	1	0	0	2	4	0	0	0	0	2	5
Meningococcal infection	0	1	0	0	1	0	0	0	0	0	1	1
Mumps	0	1	0	0	14	2	0	0	2	0	16	3
Pertussis	1	18	0	0	4	8	0	1	0	0	5	27
Pneumococcal disease	11	13	0	0	11	7	0	1	1	0	23	21
Q Fever	0	1	0	0	0	0	0	0	0	0	0	1
Rheumatic Fever	2	7	5	2	7	3	3	1	1	5	18	18
Ross River Virus	2	6	1	0	37	21	2	2	2	3	44	32
Rotavirus	28	18	2	1	34	176	4	25	8	35	76	255
Salmonellosis	13	23	7	0	54	42	2	6	12	3	88	74
Shigellosis	16	7	0	1	11	7	4	6	3	1	34	22
STEC/VTEC	0	2	0	0	0	0	0	0	0	0	0	2
Syphilis	23	36	2	3	16	1	4	5	12	10	57	55
Syphilis congenital	0	1	0	0	0	1	0	0	0	0	0	2
Trichomoniasis	118	128	17	7	143	115	60	85	85	79	423	414
Tuberculosis	2	1	0	0	6	9	0	0	0	1	8	11
Typhoid	0	1	0	0	2	0	0	0	0	0	2	1
Varicella unspecified	1	0	0	0	0	0	0	0	0	0	1	0
Vibrio food poisoning	0	0	0	0	1	0	0	0	0	0	1	0
Yersiniosis	0	1	0	0	0	0	0	0	0	0	0	1
Zoster	4	3	0	0	16	20	4	0	1	5	25	28
Total	662	778	84	42	1000	960	221	256	301	309	2268	2345

Ratio of 3rd Quarter 2007 cases to the mean 2002-06: sexually transmitted diseases



Ratio of 3rd Quarter 2007 cases to the mean 2002-06: selected diseases



Comments

For further information on influenza see article p14 this issue. See the September issue for further information on the mumps outbreak (p1) and Ross River virus (p46) available at <http://www.nt.gov.au/health/cdc/bulletin/index.shtml>

Exotic mosquito incursions and the risk of vector-borne disease in Block 4, Royal Darwin Hospital campus, Darwin, Australia, 2005-07

Peter Markey and Peter Whelan, CDC Darwin

“Swamps, marshes, borrow-pits and other Areas of stagnant water serve As breeding grounds....” Now Have I found you my Anopheles!

Ern Malley, 1943

Introduction

Building 4 at the Royal Darwin Hospital (RDH) campus (aka “Block 4”), which accommodates on its ground floor the majority of the Darwin Centre for Disease Control (CDC) staff, is most fortunate to be entirely free of endemic mosquitoes. This has been attributed to world class surveillance, ever vigilant staff and a super-effective public health response, but is more likely due to lack of breeding sites and self-closing doors.

It is due to this lack of endemic mosquitoes that there has never been, since records began,¹ a case of vector-borne disease acquired in the CDC working environment, apart from a certain member of the TB Unit who claims to have been attacked on one occasion by a small, but particularly ferocious, ant, with subsequent swelling and post-traumatic stress disorder. Nevertheless, occupational health and safety regulations stress that the worker should remain vigilant at all times to risks and hazards in the workplace, so it is part of our proletarian obligations to look at all workplace risks, and in particular those related to our area of expertise; viz, communicable disease.

Moreover, global warming has meant that the density of mosquitoes is likely to increase exponentially over the next few decades, with some of the more pessimistic modelling results suggesting that *Aedes aegypti* will be found on the Moon by 2060 and on some of the nearer planets by the end of the century.²

To monitor the possible incursion of exotic mosquitoes into Block 4, enhanced sentinel surveillance for mosquitoes was undertaken during the period 2005-2007. This is a summary of the findings.

Methods

Following rumours of exotic mosquitoes having been witnessed in a toilet on the ground floor of Block 4, an enhanced sentinel surveillance system was established in the office of the Head of Surveillance (PM). The site was chosen due to the proximity to the outside door and the convenience to the researcher. As mosquitoes were witnessed hovering in the vicinity of the personage of the researcher, with intent of inflicting at least injury and possibly disease thereupon, they were humanely, but triumphantly, euthanased using existing technology. They were then labelled with the date and stored at room temperature in a dedicated arthropod preservation and transport tube (a film canister).

At the end of the surveillance period, the species of mosquitoes were transported to the Medical Entomology Branch (MEB) and identified by MEB staff (PW) using standard microscopic techniques.

Arboviral disease patterns and malaria cases were monitored over the same time period using existing surveillance systems.

Results

Over the 24 month period July 2005 to June 2007 there were 14 mosquitoes isolated (Table 1). All were female. Given the fact that there are no endemic mosquitoes in Block 4, all were designated ‘exotic’, but as such were probably not the only exotic females at work in CDC during the period.

The timing of the mosquito capture ranged over most months of the year, commensurate with their species-specific ecology, local external climatic variability and the presence of nearby breeding grounds (Figure 1).

During the study period there were no arboviral diseases reported by CDC staff and no malaria or scrub typhus (Table 2, Figure 2).

Table 1. Mosquito species, number caught and usual breeding sites.

Mosquito	Number	Breeding site
<i>Aedes vigilax</i>	9	Tidal influenced swamps
<i>Mansonia uniformis</i>	4	Aquatic and semi aquatic plants in creeks and freshwater swamps
<i>Anopheles bancroftii</i>	1	Shaded areas fresh-water swamps

Table 2. Vector-borne diseases acquired within and without CDC, July 05 - June 07

Disease	Cases acquired in CDC	Cases acquired or diagnosed in NT
Ross River Virus	0	535
Barmah Forest Virus	0	211
Malaria	0	96
Dengue	0	31
Scrub Typhus	0	2
MVE	0	0
Arbovirus NOS	0	0
Total	0	875

Discussion

This is the first study to demonstrate and quantify the presence of exotic mosquitoes in a government building anywhere in Australia.

With respect to risk of disease transmission, *Aedes vigilax* (the salt marsh mosquito) is an efficient vector of arboviruses including Ross River and Barmah Forest viruses. This species has a relatively long flight range although there are nearby tidally influenced breeding sites. It is obvious from the months of capture that these specimens are the result of the spring tides common in the late dry season and the flooding of their tidally influenced breeding site in the early wet season. This indicates a local breeding population, which is of considerable concern.

Anopheles bancroftii is a poorly efficient vector of malaria compared with the Australian Malaria Mosquito (*Anopheles farauti*). However its capture in the post wet season indicates the presence of persistent nearby swamps, which

Figure 1. The number and species of mosquito euthanased, by month; July 05 – June 07.

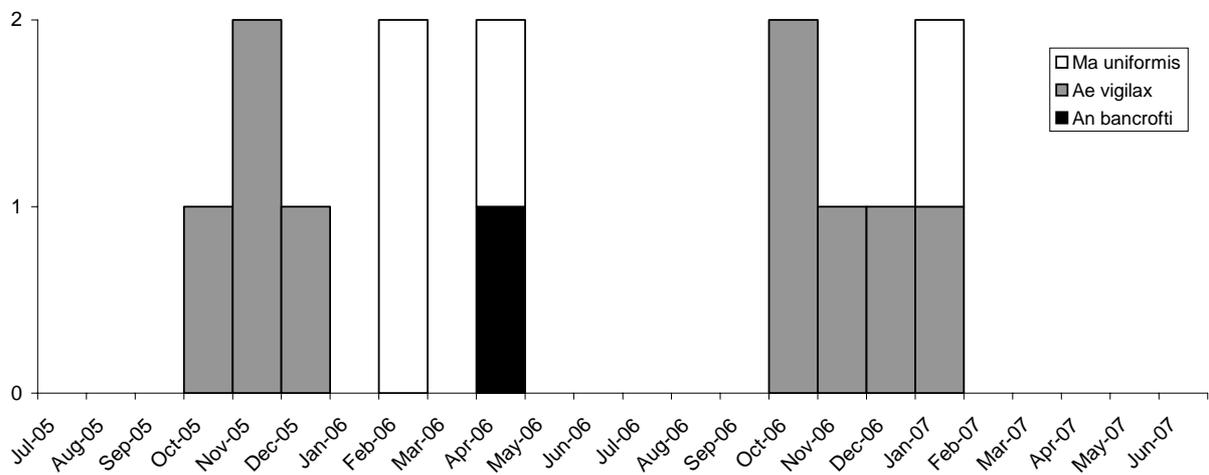
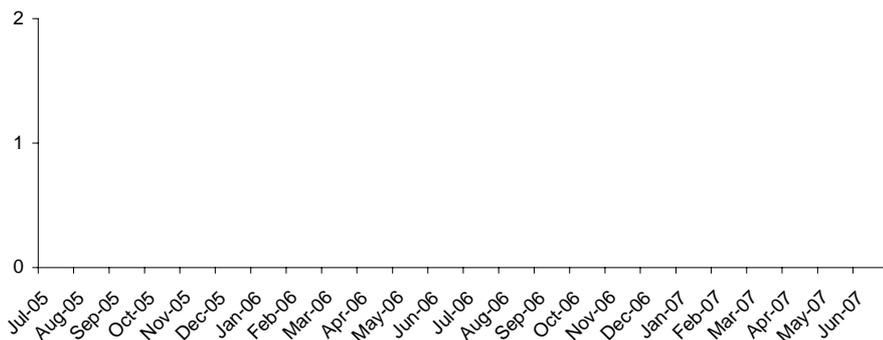


Figure 2. Cases of vector-borne disease acquired by CDC staff at work, by month July 05 – June 07



may become more productive breeding sites as changes predicted with global warming occur.

Mansonia uniformis is not known to be a vector of any human disease in Australia, although it is a vector of filariasis in other countries. The capture over 2 seasons indicates an established and persisting population. This species is known to have a relatively short flight range, so the presence of this species over a relatively long period from the early wet season to the immediate post wet season indicates the presence of an area of persistent and suitable aquatic plants nearby, possibly in the nearby creek which receives waste water run off from RDH and residential areas.

Given the occupational health and safety concerns, the results were both timely and reassuring. With global warming on the doorstep and rainfall patterns expected to rise or fall depending on what paper you read, it is important for modellers to have baseline data with which to compare future studies. The absolute numbers of mosquitoes captured was small and so it is reassuring to CDC staff that occupational exposure to communicable diseases, at least in the vector-borne diseases category, is small. The room of the Head of Surveillance is near the outside door, so it is likely that the numbers in other offices would have been smaller. On the other hand, the capture rate (mosquitoes successfully euthanased/mosquitoes witnessed circulating with intent) was below 100% so the true risk to other staff is difficult to ascertain.

The finding of an *Anopheles* mosquito is of particular interest but not that surprising given

the proximity of Block 4 to local fresh water creeks and wetlands associated with the Casuarina Coastal Reserve. Given the very low efficiency of the *An bancroftii* as a malaria vector and the otherwise malaria-free status of CDC staff, one would imagine that transmission risk would be tiny. There are however periodic cases of imported malaria hospitalised nearby in RDH that could be a source of parasites. In addition, one might also hypothesise that, with CDC staff returning from their Pacific holidays or their Medicin San Frontier sponsored safaris, it is not absolutely out of the question. The classic morphological features of the *Anopheles* genus (recognised by females having palps as long as the proboscis) can be made obvious, with a bit of training, to the naked (even presbyopic) eye of most CDC staff, so the authors are planning to recommend that the sighting of an *Anopheles* mosquito in Block 4 be scheduled as a "Notifiable Event" under the Notifiable Diseases Act 1987.

The presence of these exotic species so close to both populous administrative facilities and RDH is a cause for concern, and indicate the urgent need for intensive vector surveys and the formulation of possible control or eradication programs. More detailed surveys and research efforts are continuing in an effort to confront this emerging public health problem.

References.

1. R. V. Winkle. A sleeping problem in public health. 75:4 *RSSD*, 2001.
2. Nerk F. If you can't stand the heat.... Global warming and interplanetary species migration. *J Outrageous Modelling Predictions* 2007;23 (4);23-29.

Vaccination coverage for children aged 12 <15 months at 30 September 2007

District	Number in District	Fully	%DTP	%Polio	%HIB	%HEP	%MMR	% Fully
Darwin	270	244	91.1	91.1	93.3	94.4	0.0	90.4
Winnellie PO Bag	106	96	90.6	90.6	95.3	97.2	0.0	90.6
Palmerston/Rural	215	196	91.2	91.2	94.0	94.4	0.0	91.2
Katherine	99	94	94.9	94.9	99.0	99.0	0.0	94.9
Barkly	31	28	90.3	90.3	93.5	93.5	0.0	90.3
Alice Springs	112	98	87.5	87.5	94.6	94.6	0.0	87.5
Alice Springs PO Bag	68	62	91.2	91.2	95.6	95.6	0.0	91.2
East Arnhem	50	44	88.0	88.0	94.0	94.0	0.0	88.0
NT Indigenous	423	376	89.1	115.1	94.6	95.3	0.0	88.9
NT Non-Indigenous	528	486	92.2	92.2	94.7	95.3	0.0	92.0
NT	951	862	90.9	90.9	94.6	95.3	0.0	90.6
Australia Indigenous	3,092	2,612	85.0	85.0	92.0	92.2	0.0	84.5
Australia Non-Indigenous	65,414	59,905	92.3	92.2	94.6	94.5	0.0	91.6
Australian Total	68,506	62,517	91.9	91.9	94.5	94.4	0.0	91.3

Vaccination coverage for children aged 24 <27 months at 30 September 2007

District	Number in District	%DTP	%Polio	%HIB	%HEP	%MMR	% Fully
Darwin	257	94.2	94.2	93.4	95.7	95.7	92.2
Winnellie PO Bag	91	100.0	100.0	100.0	100.0	100.0	100.0
Palmerston/Rural	210	95.7	95.7	93.8	97.1	95.7	93.3
Katherine	82	98.8	98.8	93.9	98.8	92.7	92.7
Barkly	23	95.7	95.7	100.0	95.7	95.7	91.3
Alice Springs	142	94.4	94.4	92.3	95.1	93.7	91.5
Alice Springs PO Bag	77	98.7	98.7	100.0	100.0	98.7	97.4
East Arnhem	52	96.2	98.1	98.1	98.1	98.1	96.2
NT Indigenous	394	97.5	97.7	96.2	98.5	96.4	94.9
NT Non-Indigenous	540	95.0	95.0	94.1	96.1	95.6	93.0
NT	934	96.0	96.1	95.0	97.1	95.9	93.8
Australia Indigenous	3,032	94.5	94.4	92.9	97.2	93.4	90.6
Australia Non-Indigenous	65,704	95.0	95.0	94.4	95.7	93.9	92.5
Australia Total	68,736	95.0	94.9	94.3	95.8	93.9	92.4

Vaccination coverage for children aged 72 <75 months at 30 September 2007

District	Number in District	%DTP	%Polio	%HIB	%HEP	%MMR	% Fully
Darwin	267	85.4	84.3	0.0	0.0	85.4	83.9
Winnellie PO Bag	101	94.1	94.1	0.0	0.0	94.1	94.1
Palmerston/Rural	227	83.3	83.3	0.0	0.0	83.7	82.8
Katherine	102	97.1	96.1	0.0	0.0	96.1	96.1
Barkly	25	76.0	76.0	0.0	0.0	76.0	76.0
Alice Springs	96	89.6	89.6	0.0	0.0	89.6	89.6
Alice Springs PO Bag	58	93.1	93.1	0.0	0.0	93.1	93.1
East Arnhem	52	90.4	90.4	0.0	0.0	88.5	88.5
NT Indigenous	373	93.0	92.8	0.0	0.0	92.5	92.2
NT Non-Indigenous	555	84.7	84.1	0.0	0.0	84.9	84.0
NT	928	88.0	87.6	0.0	0.0	87.9	87.3
Australia Indigenous	2,525	88.6	88.5	0.0	0.0	88.9	87.8
Australia Non-Indigenous	63,279	89.3	89.3	0.0	0.0	89.3	88.6
Australia Total	65,804	89.3	89.3	0.0	0.0	89.3	88.6

Vaccination Coverage 30 September 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 44.

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 30 September 2007 were born between 01/07/2006 and 30/09/2006 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 3 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 30 September 2007 were born between 01/07/2005 and 30/09/2005 inclusive. To be considered fully vaccinated, these children must have received 3 valid doses of vaccines containing diphtheria, tetanus, pertussis, and

poliomyelitis antigens, either 3 doses of PRP-OMP Hib or 4 doses of another Hib vaccine, and 3 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 30 September 2007 were born between 01/07/2001 and 30/09/2001 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 was below the national in the 12-<15 months, but above the national average in the 24-<27 months cohort and approximately equal to the national average at 72-<75 months. This increase in coverage rates between the 12 and 24 months reflects in part, a lack of timeliness in vaccination for children under 12 months with these vaccines being caught up over the next year. It is a reminder that timeliness of vaccination needs to be improved.

Immunisation coverage for NT children at 72-<75 months of age (87.3%) remains lower than for the younger cohorts, and this continues to be a concern across Australia.

NT Malaria notifications July - September 2007

Merv Fairley, CDC, Darwin

There were 3 notifications of malaria received for the second 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	East Timor	Holiday	<i>P Falciparum</i>	No
1	Thailand	Refugee	<i>P vivax</i>	No
1	Guinea/Mali	Holiday	<i>P Falciparum</i>	No

Disease Control staff updates

Darwin

CDC

We wish **Veronica Barrett** an enjoyable retirement after 34 years of service in the NT government. She commenced with the Department of Health and Community Services in 1990 employed as administration officer for all of CDC which included looking after the Director of Disease Control and being a data entry officer for the surveillance unit. She has seen the development of notification data entry move from a Darwin based program to the current Web-based era and her corporate knowledge will be sorely missed. **Katrina Roper** has completed her MAE work time and we wish her well with her final projects.

Immunisation

Adrienne Chalada commenced initially as a data entry officer with the Immunisation Unit. From Oct she filled **Mary Fleming's** position as data entry officer for HPV immunisations. **Alex Fernando** has also joined the immunisation data entry team. **Jennifer Wyllie** has finished with the HPV team and has moved to Elcho Island.

Surveillance

Shellee Williams, who completed her MAE in CDC in 2005-6 was working as project officer in the Salmonella in Kids in Darwin project until mid December when she left on maternity leave. She has since had a baby boy Elliot, born 30/12/07, weight 2.9kg. Congratulations to Shellee and Brett!

SH&BBV

We said goodbye to **Maggi Richardson** who has taken a position with Maternity Services. **Mary Fleming** joins the team replacing **Anne Hanning** as Admin Officer from 7 January. **Astrid Starke** has spent 3 months with the program undertaking the youth access needs analysis.

Medical Entomology

Kevin Horig completed work on the Groote Eylandt mosquito eradication project in

December and we wish to thank him for all his efforts, particularly for assistance in new electronic methods of data recording in the field.

Myron Kulbac also left the Groote Project in December where he performed an excellent job as project manager, and particularly in organising and conducting the recent very successful dengue day in Alyangula. We all wish him well in his second retirement and for his prospecting interests. **Darren Bowbridge** has been selected as Myron's replacement from the technical level of the project to the professional level. **Melina McDowell** left the ARC link project on mosquito data analysis and research in October and we wish her all the best for her holidays in India.

Environmental Health

Kathryn Barclay's contract as EHO Darwin Urban finished in December and she has returned to SA. **Mick Kinnaird** has also completed his contract as EHO Darwin Urban. **Andrew Brown** commenced as EHO Darwin Urban in December on 6 month contract.

Alice Springs

Sonia Lyon has commenced as Clinic 34 Clinic Coordinator.

In the Alice Springs environmental health team **Kia Grieves**, (EHO) resigned in November and is currently working as Life Skills Coordinator Harts Range and **Alex Stedman** commenced as EHO in December.

Katherine

Thank you to **Joy Fordham** for providing lifestyle education services during November and December. **Carmel Whalley** will be returning to this role in February 2008. Welcome to **Amy Barton** who joins our administration team while **Maria Chandler** is on long service leave until April 2008.

Brendon Sherratt commenced as Katherine EHO in October replacing **Christopher Luthy** who resigned in August.