CDC
CENTRE FOR DISEASE CONTROL
NORTHERN TERRITORY

THE NORTHERN TERRITORY
DISEASE CONTROL
BULLETIN

Vol. 14, No. 3, September 2007 ISSN 1440-883X

Immunisation coverage rates in the 10-49 year age group in a remote Indigenous community in the Northern Territory experiencing a mumps outbreak–a clinical audit.

James C. Walcott[1] & Emily Fearnley[2], CDC Darwin
[1]Medical Student, Flinders University, CDC placement, [2]Masters of Applied Epidemiology Student

Introduction

Mumps is an acute viral illness characterised by low-grade fever, malaise and inflammation of one or more salivary glands, most commonly the parotid gland. It is caused by a paramyxovirus, having a single stranded RNA genome. Typical mumps infection with acute parotitis occurs in approximately 30-40% of infections. Up to 50% of infections have non-specific symptoms such as fever, myalgias or respiratory symptoms, and as many as 20% of infections are subclinical.[1,2]

Complications of mumps can be serious, and may occur in the absence of the classical parotitis, making clinical diagnosis in this setting challenging. Such complications include mumps orchitis in postpubertal males (up to 38%, although sterility is rare), oophoritis in postpubertal females (5%), pancreatitis, aseptic meningitis (4-6%), meningoencephalitis and sensorineural deafness.[1,2]

Immunisation is the main method of control of mumps. The mumps vaccine contains live attenuated virus prepared in chick-embryo cell culture, and is currently combined with measles and rubella vaccines to form a single measles-mumps-rubella (MMR) vaccine. The vaccine produces a subclinical and non-communicable infection. Side effects include malaise, fever and

Contents

Immunisation coverage rates in the 10-49 year age group in a remote Indigenous community in the Northern Territory experiencing a mumps outbreak–a clinical audit..... 1
HTLV-1 infection and tuberculosis (TB) in Central Australian Aboriginal people 5
Fireworks-Related Injury Community Survey Report 2007..... 8
"Fireworks spark debate" An analysis of letter and text message discussion in the NT News of the personal use of fireworks surrounding Territory Day..... 12
An investigation of a cluster of *Salmonella* Oslo cases.... 16
Salmonella species in Fresh Produce – an emerging food safety issue for the NT. 20
Gastroenteritis in Aged Care Facilities 22
Salmonella Paratyphi B var Java in a child and their pet turtle 24
Campylobacteriosis factsheet 28
Influenza report..... 29
Dengue mosquito incursion and the eradication program on Groote Eylandt NT. 30
Timor-Leste AusAID Mosquito Project – an update..... 35
Detection and elimination of *Aedes albopictus* on cable drums at Perkins Shipping, Darwin, NT - April 3rd 2007 . 39
Disposal of used injecting equipment in the Northern Territory..... 42
NT notifications of diseases by onset and & district 2007 and 2006 44
Immunisation coverage for children 47
Immunisation Coverage 48
NT Malaria notifications April—June 2007 48
Disease Control staff updates 49

Editor: Vicki Krause
Assistant Editors: Lesley Scott, Steven Skov, Natalie Gray, Julie Graham, Peter Markey, Chris Nagy
Production Design: Lesley Scott
Website: http://www.nt.gov.au/health/cdc/bulletin/index.shtml

Email: vicki.krause@nt.gov.au

Centre for Disease Control
PO Box 40596
Casuarina
Northern Territory 0811

Northern Territory Government
Department of Health and Community Services

rash commonly 7-10 days post vaccination and lasting up to 3 weeks. Parotid swelling occurs in 1% of children up to 4 years. Febrile convulsions are reported to occur in 0.1% of children which is the same as the background rate in children this age.[3] Vaccine-induced encephalitis is said to occur in about 1 in 1,000,000 doses and anaphylaxis is reported to occur in less than 1 in 1,000,000 doses.[3]

Vaccination with a single dose of MMR vaccine results in sero-conversion to each virus in over 95% of recipients, however studies have documented mumps vaccine efficacies in the order of 75-95% following a single dose. A second dose achieves an efficacy in the order of 99% against mumps infection.[2,3]

Prior to immunisation, mumps was endemic in Australia with epidemic peaks every 2-5 years.[1] Mumps vaccination was first introduced into the Northern Territory (NT) immunisation schedule in 1983 as part of a measles-mumps (MM) vaccine. In 1989 this was replaced by the MMR vaccine and in 1993 a second MMR was added to the schedule.[3] The national campaign "Let's work together to beat measles" which began in August of 1998 brought forward the second dose of MMR from 10-16 years to 4-5 years.[3] Under this program a one-off booster MMR vaccination was offered to children aged 5-12 years. A central electronic database of immunisation records was commenced as part of this campaign, but did not incorporate all prior vaccination records. This means that prior immunisation records in this 5-12 year age-group are difficult to access and are not necessarily available from a central electronic database.

In 2001 the Commonwealth Department of Health and Ageing, having recognised low coverage rates of the MMR in those aged 18-30, instigated the "Young Adult MMR Program" to encourage MMR vaccination in that age group. In the NT, funding for the program was limited and resources were targeted at groups most at risk of coming into contact with measles. The program resulted in only 210 additional MMR vaccines administered in the NT, given at 10 locations, mainly in urban areas.[4] Remote locations were informed of the program and encouraged to offer opportunistic vaccinations in this age group. They however received no additional support in terms of promotional activities or supplementary funding. Although the coverage rates are unknown, it is likely that they would be low.

NT mumps notifications from 1994 to 2006 have averaged 4.2 cases per year with the highest being 10 notifications in 1997 (Figure 1). This year a total of 23 cases have been notified to the end of July 2007. This represents more cases than the total of 2006, and fits the definition of an outbreak of mumps.[5] Of these 23 cases in the NT the age range was 6-57 years with a median age of 25 years (Figure 2). Of the 23 confirmed cases, 16 have occurred within 2 remote communities in the NT located less than 50 kilometres apart. A further 28 clinical cases have presented to the health clinics at those communities, with an age range of 5-51 years and a median age of 21 years. The concentration of clinical and confirmed cases in the communities mentioned makes them a focus for this outbreak investigation. The vaccination status of all confirmed and possible cases are given in Table 1.

Figure 1. Confirmed mumps cases notified in the NT from 1994 to end July 2007*

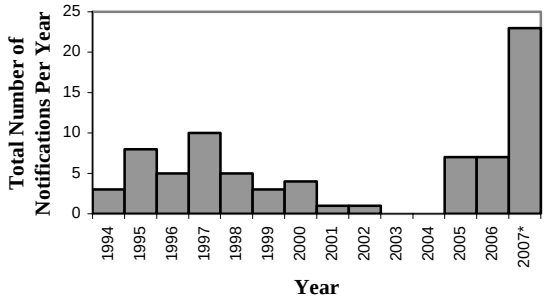


Figure 2. Confirmed mumps cases by age group in the NT from January to end July 2007

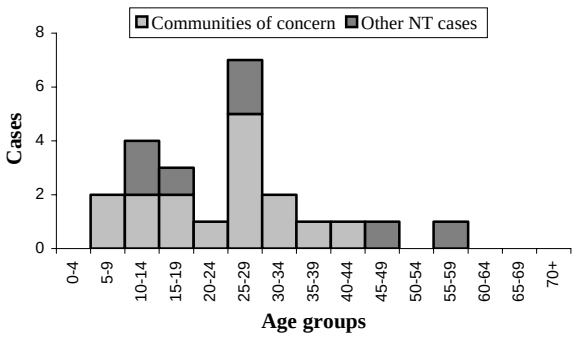


Table 1. Vaccination status for mumps containing vaccine, including confirmed and possible mumps cases in the NT, 2007

Vaccination status	Full	Partial	Not immunised	Unknown	TOTAL
Confirmed cases	8 (35%)	1 (4%)	13 (57%)	1 (4%)	23
Possible cases	15 (54%)	2 (7%)	7 (25%)	4 (14%)	28
TOTAL	**23 (45%)**	**3 (6%)**	**20 (39%)**	**5 (10%)**	**51**

Given the nature of the current mumps outbreak affecting young adults in remote communities in the NT, and the uncertainty of immunisation coverage in this group, a decision was made to undertake an audit of vaccination coverage for mumps containing vaccines in one of the affected communities. This information would be useful in determining an appropriate public health response to control the current outbreak and to prevent future outbreaks. This data may also serve as an indication of immunisation coverage in other remote communities in the NT.

Aims

To investigate the coverage of mumps immunisation in a cohort of people aged 10-49 in a remote community experiencing a mumps outbreak.

Methods

A current community list (last updated June 2007) was obtained from a central record with permission from the Director of Remote Health NT, listing all residents in the community under investigation. Patients were excluded if they were aged 50 years or greater, or 9 years or younger on the date of audit, July 4, 2007.

The case files of those included in the study were audited to determine how many mumps containing vaccines the patient had received. A 'mumps containing vaccine' was defined as an immunisation date recorded in a MMR column, or an immunisation date recorded in any column or note space in the immunisation record forms, notated as MM or MMR. This data was retrieved from the immunisation record forms at the front of the file. Where more than one immunisation record form was present, all forms were examined and dates were cross-referenced such that immunisation records were not duplicated. Individuals were considered to have not been immunised against mumps if there were no mumps containing vaccines recorded on the immunisation record forms. The progress notes were not examined for immunisation entries.

Data was entered into Microsoft Excel according to the number of mumps containing vaccines received. Immunisation status was defined as 'full' if 2 or more mumps containing vaccines were received, 'partial' if only 1 was received and 'not immunised' if none were recorded. The data was then separated into age cohorts of 5 years, starting from age 10 until age 49, and examined for vaccination coverage. Age was calculated from the date of the audit.

Results

There were 440 residents listed for the community being investigated. Of these 175 case files were excluded on the basis of age, and 16 case files were unable to be located. This resulted in a total of 249 case files included in this study, of which 113 (45.4%) were male. The overall coverage rate in the 10-49 year age group identified as being fully immunised was 34.9%. A further 14.5% were partially immunised and the remaining 50.6% unimmunised. Coverage was not significantly different between males and females (χ^2=1.47, p=0.48). The vaccination coverage was then separated into age cohorts. There was approximately 80% fully vaccinated in 10-14 and 15-19 age groups, but less than 40% vaccinated in 20-24 age group, and less than 20% vaccinated in those over 25. This was significantly different between age groups (χ^2=201.84., p<0.0001). The results are shown in Figure 3.

During the audit process, it was noted that there were many immunisations entered in the records as dates in a 'morbilli' column (implying a measles-only containing vaccine) even after 1982 when the measles-only vaccine had been replaced by Measles-Mumps vaccine. Although notated as measles-only, it is likely that these

Figure 3. Mumps vaccination coverage by age cohort

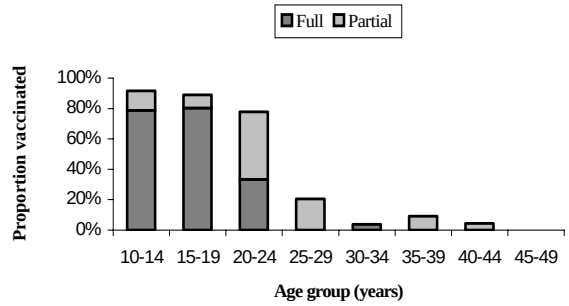
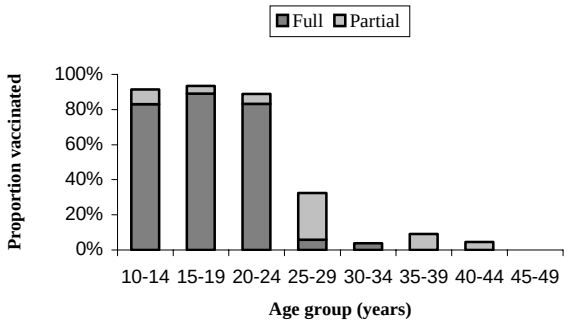


Figure 4. Mumps vaccination coverage by age cohort – a best-case analysis



vaccines also contained the mumps component. Therefore a similar graph was prepared for comparison as a best-case analysis with all measles containing vaccines administered from 1983 considered to also contain mumps (Figure 4). The results are similar, with the majority of the difference concentrated in the 20-24 age group, and slightly better coverage in those aged under 20 in Figure 4 compared to Figure 3.

Discussion

The immunisation coverage rates in the 10-49 age-groups were low, with more than 50% of cases showing no record of vaccination. This is most obvious in the age cohorts over 20 years where coverage is significantly lower. The low coverage rates for mumps correspond chronologically to the age cohort that were too old to be included in the "Let's work together to beat measles" campaign of 1998 and were not targeted effectively in the "Young Adult MMR Program" of 2001. Given the remote location of the cohort, it is conceivable that these unvaccinated people may not have previously come in contact with the mumps virus and therefore this represents a mumps susceptible population. This is further reinforced by the fact that during the current outbreak, disease activity is concentrated in this age group. A MMR catch-up program targeting the affected communities and age groups is warranted to help control the current outbreak and prevent future outbreaks.

There are some limitations when interpreting these results. Firstly, the data here represent the immunisation record in the patient's case notes. Given that this data is not recorded on some central record, it does not include immunisations received at other health clinics.

In addition, as mentioned earlier there was some disparity between certain vaccines being recorded as given at a particular date, and when they were available. A decision was made that the immunisation status was interpreted on the basis of the data that was recorded, with a best-case analysis for comparison with the assumption that the true vaccination coverage rate would fall in between these results. Since we could not exclude that measles-only vaccines were being administered after 1983, we accepted the data as recorded, but also included a best-case analysis, where the majority of the difference was observed in the 20-24 age group and corresponds better with those that would have been targeted in the 1998 campaign.

The quality of the record keeping deserves mention. During the audit, we were able to investigate 249 case files within 1 day, which was more than anticipated. Nonetheless there were some difficulties encountered in accessing the data efficiently. The immunisation data was filed in the front of the case notes in each case, however the immunisations were recorded on several different types of forms over the years. Often the latest immunisation forms were filed, with all, some or nil transfer of information from previous records. This was confusing when the same immunisation was recorded on multiple forms, and needed to be cross-referenced to ensure data was not incorrectly duplicated. It was also time consuming to investigate multiple records, where a single record should suffice.

Recommendations

1. MMR catch-up program:

Given these results it would be prudent to increase the coverage of the MMR immunisation in order to reduce the impact of the current outbreak and prevent future transmission of the disease. This could be achieved through a community MMR vaccination day or opportunistic vaccination of patients as they present at the clinic. A list of individuals with incomplete immunisation status has been forwarded to the health clinic of the community we investigated.

2. Update of immunisation records:

Current immunisation records would be easier to interpret if all immunisation data over multiple forms were transferred onto the latest immunisation record. Outdated records could then be archived once their information is transferred across to avoid confusion. Upgrading to a central electronic record should be considered when the technology and resources become available.

Acknowledgements

We would like to thank Dr Vicki Krause, Dr Peter Markey, Dr Julie Graham and Chris Nagy, RN for their assistance and expertise in preparing this audit. We would also like to thank Barry Oliver and Michelle Oliver from the community health clinic for their assistance on the audit day.

References

1. Heymann DL. 2004 Control of Communicable Diseases Manual, 18th Edition. Washington: American Public Health Association.
2. Centers for Disease Control and Prevention. Measles, Mumps, and Rubella – Vaccine Use and Strategies for Elimination of Measles, Rubella, and Congenital Rubella Syndrome and Control of Mumps: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 1998;47(No. RR-8).
3. National Health and Medical Research Council. 2003 The Australian Immunisation Handbook 8th Edition; Commonwealth of Australia.
4. Unpublished report on "Young Adult MMR Program–NT" 2001, accessed from CDC Darwin, June 2007.
5. Gregg M. 2002 Field Epidemiology, 2nd Edition. New York: Oxford University Press.

****

HTLV-1 infection and tuberculosis (TB) in Central Australian Aboriginal people

Rosalie Schultz, CDC, Alice Springs

Background

HTLV-1 is a retrovirus that infects and transforms human lymphocytes. Infection is lifelong and associated with a number of life-threatening diseases. The full range of diseases that may be associated with HTLV-1 infection is not known, but may include tuberculosis (TB) has been considered.[1]

Transmission of HTLV-1 is usually vertically and specifically by breast milk. Transmission can occur sexually and also through blood products. Transmission can be prevented by avoiding certain practices including breast-feeding, unsafe sexual activity and blood donation.[1]

A survey of Australian Aboriginals done in the 1992-1993 found that 13.9% of Central Australian Aborigines were infected with HTLV-1.[2]

HTLV-1 is associated with tropical spastic paraparesis and T-cell lymphoma, but these conditions are rarely diagnosed in Aboriginal people. Theoretical evidence of its activity and clinical evidence of high rates of infectious diseases among Aboriginal people in Central Australia suggest that HTLV-1 may also be associated with immune compromise among this group.

This project was developed to examine the prevalence of HTLV-1 among Central

Australian Aboriginal people with a diagnosis of TB. Review of these cases may suggest an influence of HTLV-1 infection on TB infection in this population.

Methods

An audit of those Indigenous TB cases to determine risk for co-infection with HTLV-1 and complications of this infection was recently undertaken.

The names of all Indigenous TB cases in Alice and Barkly regions from 1991 were extracted from the Northern Territory Notifiable Diseases System.

Non-Aboriginal cases of TB were excluded.

Where identifiable data were available for TB notifications of Aboriginal people, electronic hospital laboratory records were examined to find out if the person had been tested for HTLV-1, and whether the person had antibody to HTLV-1. HIV testing was also sought.

If these test results were available, their timing in relation to the TB diagnoses was examined, noting the possibility that people may have been infected with HTLV-1 after diagnosis of TB.

TB case records for people with HTLV-1 at the time of TB treatment were examined, noting source of infection, timing of disease in relation to infection, complications of the disease and treatment.

Results

There were 89 identifiable cases of TB in Alice Springs and Barkly region downloaded from electronic databases kept in Darwin and Alice Springs for the period from 1991 to March 2007. This included 2 people who had been diagnosed a second time, after documentation of cure after treatment, ie. relapse.

Ethnicity was identified as Aboriginal for 79 cases.

There were 21 of 79 (27%) tested for HTLV-1. All had been tested for HIV, and all were negative.

Of the 21 cases, 12 had tested HTLV-1 positive (52%). This includes the 2 people, who had relapse of cured TB.

There were 5 of the TB patients who had HTLV-1 who were not tested for HTLV-1 until after their TB work up, leaving the possibility that they were infected with HTLV-1 after TB. This included one of the pair who had 2 TB diagnoses, who was tested for HTLV-1 as part of the work-up for the second episode of TB.

Chest clinic charts for each of the 12 clients with HTLV-1 and TB were examined. Charts were available for 11 of the clients.

The age at diagnosis of TB ranged from 10 to 63 years. There were 4 females and 6 males with TB and HTLV-1.

There were 2 patients under age 15 years diagnosed with TB and HTLV-1 in 1996. Both had been contacts of the same TB case who had not been tested for HTLV-1. One of these cases was smear and culture positive for TB, while the other was diagnosed and treated on clinical grounds, with negative cultures. Interestingly, the first of these cases had relapse of TB 10 years later at age 21 years.

Apart from the 2 above, there was no clustering of cases.

Pulmonary TB was the clinical presentation for 8 of the 11 cases, for which charts were available, with the others having paravertebral abscess, liver and pleural disease with no infiltrates on chest x-ray. No sputum had been collected from the clients with paravertebral abscess or liver disease, while the client with pleural TB had negative sputum smears and cultures. Of the 8 clients with pulmonary TB, 6 were smear positive and 7 culture positive. One had miliary TB including smear positive pulmonary disease.

Of the pair who had relapsed, one had been unable to tolerate full doses of medication, due to hepatitis and thrombocytopaenia and the treatment completion was questionable. The other had documentation of completion of 6 months of treatment and disease cure.

Discussion

No specific recommendation has been made to test patients with TB for HTLV-1.[3] Rates of testing are low and this is understandable in the absence of a recommendation.

No different management strategy for TB is recommended for clients co-infected with HTLV-1.

It is possible that the testing for HTLV-1 is performed on a particular sub-group of clients, particularly clients who may have poor outcomes for a variety of reasons.

Alternatively selection for HTLV-1 testing may be biased by the clinician managing the case.

Of the clients reviewed above, a high proportion (over 50%) of HTLV-1 positive status is noted. However, clinical and epidemiological characteristics (of this group) in relation to TB are not outstanding.

Conclusion

This audit would indicate that Aboriginal patients in Central Australia who have active TB should be tested for HTLV-1. Prospective universal testing would remove selection bias in the testing, and enable estimate of any increased risk of TB associated with HTLV-1 in this population. Assessment of any impact of HTLV-1 on TB disease outcome could also be estimated. After such assessments, the recommendation for HTLV-1 testing should be reviewed for usefulness in diagnosis or prognosis.

References

1. Centres for Disease Control and Prevention. Recommendations for Counselling persons infected with human lymphotrophic virus, types 1 and 2. *MMWR*. 1993;42.
2. Bastian I, Hinuma Y, Doherty RR. HTLV-1 among Northern Territory Aborigines. *MJA*. 1993;159:12-16.
3. Centre for Disease Control, Department of Health and Community Services. Guidelines for Control of Tuberculosis in NT. Centre for Disease Control, Darwin 2003. http://www.nt.gov.au/health/cdc/protocols.shtml; accessed 30/09/2007.

****

Annual CDC Conference Darwin
October 23-25

This annual conference with staff from the Centre for Disease Control Units from around the Territory is being held in Darwin for 2007.

Topics for the conference include:

- Trachoma, Professor Hugh Taylor and Dr Katrina Roper
- Predictions for infectious disease in tropical Australia, Professor Bart Currie
- Alcohol problems in Aboriginal Communities: solutions that work? Dr Steven Skov
- Public Health Counter Disaster Sub-plan, Xavier Schobben
- Dengue mosquitoes and response to the Groote incursion, Peter Whelan
- Fireworks related injuries; Justine Glover
- Refugee health, Dr Natalie Gray
- Hepatitis C, Dr Josh Davis

There are a limited number of places available. If you are interested in the program please contact Tracy Ward on 89227776.

Fireworks-Related Injury Community Survey Report 2007

Justine Glover, Injury Prevention Officer & Steven Skov, Community Physician, CDC, Darwin

Introduction

Territory Day has traditionally been celebrated with fireworks since self-government was conferred on the NT on 1 July 1978. Members of the public aged over 16 years can buy approved fireworks for their private use from licensed retailers between 9AM and 9 PM on 30 June and 1 July. Fireworks may only be used between the hours of 6 PM and 11 PM on 1 July (Territory Day).

The Northern Territory (NT) and the Australian Capital Territory (ACT) are the only jurisdictions in Australia where the public can buy and use fireworks without a permit. In the ACT, the Queen's Birthday long weekend is the only time of the year when members of the public are legally allowed to use fireworks.[1]

This report is the ninth in a series of annual fireworks injury surveillance reports conducted since 1998 by Centre for Disease Control (CDC).[2] No survey was conducted in 1999. Initially the survey focused on Darwin and Palmerston, but from 2002 it was broadened to encompass all 5 major regional centres. The aim of the surveys is to monitor the level of fireworks-related injury on and around Territory Day.

Methods

Surveillance was targeted at persons seeking medical care for fireworks-related injuries during the period midnight Friday 29 June – midnight Sunday 8 July from NT Emergency Departments or General Practitioners (GPs).

A survey pack was sent out to 180 GPs via the Top End Division of General Practice and to the 5 NT public hospital's Emergency Departments (EDs).

The pack contained:

- a letter to clinicians requesting participation in the survey
- patient information sheets
- consent forms for people presenting to EDs
- survey forms.

Patient consent was sought for information to be forwarded to NT WorkSafe and for an officer from NT WorkSafe to contact the patient (if deemed appropriate) to discuss the circumstances of the injury in order to explore whether there may have been a fault with the fireworks.

Clinicians were asked to briefly describe the nature and cause of injuries and rate them according to the following severity scale:

- Severe - requiring admission to hospital
- Moderate - requiring 2 or more reviews by a health practitioner
- Minor - requiring only 1 visit to a health practitioner.

Results

A total of 32 firework-related injuries were recorded over the 2007 survey period. There was 1 client who declined to participate in the survey, leaving information on 31 injuries for this analysis.

Hospitals provided information on 27 clients; GPs provided information on 4 and 1 had presented to a community care centre (Table 1). Of the clients presenting to hospital EDs, 17 gave consent for their information to be forwarded to NT WorkSafe. To date, NT Worksafe has commenced 2 investigations and is waiting on further information.

Demographic profile

Of the people presenting with fireworks-related injuries:

- 27 were male, 3 were female and for 1 person the sex was not identified
- 21 were over 15 years of age, 9 were 15 years or younger and 1 did not have their age specified

Table 1. 2007 Fireworks related injuries: places of presentation and severity of injuries.

	Severe	Moderate	Minor	Eligible for analysis	Not eligible	Total
Royal Darwin Hospital	7	13	3	23	0	23
Alice Springs Hospital	1	0	2	3	0	3
Katherine District Hospital	0	0	1	0	1	1
Tennant Creek District Hospital	0	0	0	0	0	0
Gove District Hospital	0	0	0	0	0	0
GP	0	4	0	4	0	4
Community Care Centre	0	1	0	1	0	1
Total	**8**	**18**	**6**	**31**	**1**	**32**

- 28 of the cases were reported from the Darwin region and 3 from the Alice Springs region.

Cause of injury*

The cause of injury was attributed to an explosive force in 10 cases, sparklers in 10 cases, a direct hit by a flying device in 6 cases and clothing igniting in 5 cases. More specifically:

- 2 were caused by home made devices
- 2 occurred when the person approached an apparently unexploded device
- 4 were attributed to a device identified as a 'Bumble Bee'[#]
- 2 injuries resulted from a device exploding in the hand
- 5 of the injuries occurred when lighting more than one sparkler at a time
- 8 of the injuries were attributed to errant flying or spinning devices
- 13 of the injuries occurred to bystanders (not directly involved in igniting devices).

Nature of injuries*

Burns were the most common injury:

- 30 of the injuries involved burns (Figure 1)
- 6 of the injuries involved impact trauma (Figure 2)
- 2 of the injuries resulted in impaired vision or vision loss.

Figure 1. Sparkler Burn

Figure 2. Injury from direct hit, person went to pick up unexploded device known as a spinner

Body site*

Multiple body sites were involved in the injuries:

- 11 injuries affected the hand (8 were caused by sparklers)
- 8 injuries affected the lower extremities (includes feet)
- 3 injuries affected the head (not the eyes)
- 3 injuries affected multiple sites
- 3 injuries affected the head and eyes
- 1 injury affected the upper extremities (not hand)
- 2 injuries affected the neck and trunk.

* Note several of the cases involved multiple types of injury.

[#] A 'Bumble Bee' is a small firework that looks like a bee and when lit shoots in the air and whistles.

Management of injuries*

Serious injuries occurred this year, requiring complex and intensive inpatient management:

- 1 person received life-threatening injuries and required prolonged admission to the Intensive Care Unit. He was transferred to Adelaide for higher-level care and was still in hospital on the 3rd of August
- 7 people required hospital admission for surgical interventions
  - 5 persons required skin grafts
  - 1 person required 2 surgical procedures to repair his hand
  - 1 person underwent surgical debridement of his hand
- 11 bed days in ICU, 44 bed days in NT hospitals, and 20 bed days in an interstate hospital over the month of July.

The requirement for outpatient management was also extensive with:

- 25 ED consultations
- 18 people requiring 2 or more follow up treatments
- 54 burns consults by RDH Burns outpatient's clinician conducted on 20 patients in July
- 6 eye clinic consults for 1 patient in July
- 22 consults by the Occupational Therapy Unit conducted in July
- 6 people needing to wear pressure garments for up to 12 months
- 11 people requiring ongoing rehabilitation
- 4 people managed by health professionals in the community
- 5 minor injuries with no follow-up required.

Discussion

Territorians have traditionally embraced Territory Day as a day of fun, celebration and fireworks. However, over the years serious injuries from fireworks have dampened the experience for many. Over the past 5 years, these surveys have documented that 127 people have been injured by fireworks in the NT, 18 of whom required hospital admission (Table 2). While it is not possible to ascribe a trend to the total number of injuries, it would appear from the number of hospitalisations that the severity of injuries may be increasing.

Table 2. Firework injuries and hospitalisation by year.

	2003	2004	2005	2006	2007	Total
Injured persons	31	11	18	35	32	127
Hospital admissions	1	2	0	7	8	18

For the first time since the survey began in 1998, a firework caused life-threatening injuries to a person. A second person came within a centimetre of a similar event (see Figure 2). Many more people required hospitalisation for their injuries and will now require months of intensive rehabilitation. One child sustained injuries resulting in a sustained poor vision prognosis.

In recent years, 2 particular causes of easily preventable injury have emerged. One is holding several sparklers at a time while lighting them causing severe hand burns. A "super ignition" occurs and showers the hand with flame and embers. Sparklers burn at 1000^{o} C, hot enough to melt gold, and this results in rapid, severe and deep burns. The other frequent event is clothing (often synthetic) catching on fire when a device explodes nearby. The wearing of non-synthetic clothing when near to fireworks (many injuries occur in bystanders) and distancing bystanders from those igniting fireworks would greatly reduce these injuries.

The growing number of Territorians who are permanently maimed and disfigured is causing increasing concern about the private use of fireworks in the NT. In the past 2 years there has been considerable public debate on the subject in letters to the editors of NT newspapers. Analysis of this discussion published in this journal reveals that about one quarter of correspondents favour a continuation of the status quo, but two thirds are in favour of either a ban or further restrictions on the private use of fireworks, or express clear dissatisfaction with the way fireworks are often used and the remainder undecided.[4,5] Concerns were expressed about injuries, noise, distress to children and animals as well as fires and environmental pollution.

Each year the personal use of fireworks results in considerable work and expense for several government and non-government agencies. The cost to the health system in 2002 for acute care was estimated to be $33,000. However, there has yet to be a comprehensive analysis of the costs across all agencies which would allow a more fully informed consideration of the impact of fireworks. The police receive many complaints about irresponsible behaviour, the town councils have a major clean up task and the RSPCA report a surge in lost animals. Every year a large number of grass fires occur and this year the NT Fire Service took the unusual and bold step of publicly calling for a ban of personal use of fireworks.

Permitting the private use of fireworks remains NT Government policy with the Chief Minister vowing to continue to allow fireworks, but to make them "as safe as possible". This is a challenge as fireworks by their very nature are explosively dangerous. The risk of firework injury is elevated when factors such as youth, inexperience, irresponsible behaviour, crowded places, poor lighting and limited parental supervision are considered. Segregated areas at public fireworks displays where personal use of fireworks is not permitted have been implemented in recent years. There have been extensive efforts to educate the public on the safe use of fireworks and WorkSafe continues to monitor and regulate the industry.

Fireworks related injuries are however not reducing in number or severity. Local and international reports consistently agree that the safest way to prevent fireworks-related injuries is to leave fireworks to trained professionals.[6,7] Other options include further reducing the amount of time when fireworks may be sold, restricting the places where private fireworks may be used and only allowing adults to purchase fireworks.

The private use of fireworks in the NT leads to substantial harm and considerable cost and annoyance to the community. This must be balanced against the enjoyment that some people derive from them. There are means by which these harms could be reduced. However, most of the rest of Australia has made the judgement that the harms are such that only professionals should have access to fireworks. This is a view shared by many health care providers and others in the NT. The 30th Territory Day celebration next year provides an opportunity for the community to consider these issues and celebrate our history and hopes for the future in safety.

Recommendations

- That a comprehensive analysis of overall costs incurred as a result of fireworks in 2007 be conducted.
- That the private use of fireworks be banned at public fireworks displays where crowds gather.
- That the legal age to purchase fireworks be increased to 18 years of age.
- That the sale of fireworks be limited to Territory Day.
- That public safety campaigns be funded.

References

1. ACT WorkCover Notice 06.02. Rules for the purchase and use of consumer fireworks. Date Issued: 6 May 2005
2. Mein J. Territory Day celebration 1998 in the Top End of the NT – outbreak of firework related injuries. *NT Dis Control Bull.* 1998;5(8):12.
3. Abdulwadud O, Ozanne-Smith J. Injuries associated with fireworks in Victoria: an epidemiological overview. *Injury Prevention. 1998;4:272-275.*
4. Skov S, Glover J. "Cracking up about crackers" An analysis of letter and text message discussion in the NT News of the personal use of fireworks surrounding Territory day. *NT Dis Control Bull* 2006; 13(3):12-4.
5. Walcott J, Skov S. Fireworks spark debate: An analysis of letter and text message discussion in the NT News of the personal use of fireworks surrounding Territory Day. *NT Dis Contr Bull. 2007;14(3):13.*
6. American Academy Of Ophthalmology Warns Parents To Leave Fireworks To The Professionals. Article Date: 21 Jun 2007 - 1:00 PDT http://www.medicalnewstoday.com/articles/74742.php.
7. Centers for Disease Control & Prevention. Spotlight on Injuries from Fireworks http://www.cdc.gov/ncipc/duip/spotlite/firework_spot.htm (Accessed 2 August 2007).

****

"Fireworks spark debate"
An analysis of letter and text message discussion in the NT News of the personal use of fireworks surrounding Territory Day

James Walcott[1], Steven Skov, Community Physician, CDC, Darwin
[1]Medical Student, Flinders University, CDC placement

Introduction

Cracker night on Territory Day, July 1, is the night when residents of the Northern Territory (NT) celebrate the acquisition of self-government. The personal use of fireworks has been permitted on this night since 1978. The NT is one of 2 remaining jurisdictions in Australia that permits the personal use of fireworks. Their use is restricted to July 1 between the hours of 1800 and 2300.

Public debate over the personal use of fireworks has been considerable in recent years. Much of the discussion has focused on whether to ban fireworks altogether, further restrict their use, or to allow their current use to continue. While many people in the NT regard fireworks to be dangerous and disturbing, others consider them to be one of the enjoyable 'freedoms' that make the NT unique. Many individuals have submitted their thoughts and opinions to the editorial pages of the *NT News*. Such discussion has been intense in the past, and in 2006 the Darwin Centre for Disease Control (CDC) performed an analysis of letters and text message discussion in the *NT News* on the subject of personal use of fireworks. That analysis showed a reasonably even distribution between messages expressing an opinion in favour of a ban or further restriction, those expressing some dissatisfaction with current firework use, and those against a ban.[1]

This year was one of the worst years for injuries related to firework use in the NT since the CDC began conducting annual surveys in 1998.[2] For the first time a person suffered life-threatening injuries and was admitted to the intensive care unit. The Government stance on personal use of fireworks remains unchanged however the Chief Minister vowed to make them "as safe as possible".

In order to help inform policy debate, this paper will analyse the public discussion in the editorial pages of the *NT News*. Opinions and themes expressed will be compared to last year's analysis, to identify any changes in public opinion.

Methods

All letters and text messages to the editor (LTE and TXT) in the *NT News* for a four-week period between Friday 29 June 2007 and Friday 20 July 2007 were scrutinised. All messages that referred to fireworks in any way were included in the analysis. The principal analysis focused on determining the author's opinion about the personal use of fireworks. Further to this classification, other themes clarifying the reasons for the author's view were documented. Recurring themes were listed according to the frequency in which they emerged. An initial classification was performed by JW and was subsequently reviewed by SS until a consensus opinion was reached for a final classification.

Results

109 messages published in the editorial pages of the *NT News* from 29 June until 20 July 2007 that addressed the personal use of fireworks were included in this study. 82 (75%) were text messages to the editor and 27 (25%) were letters to the editor.

Analysis of the ideas expressed led to a categorisation of messages into 6 groups according to their stance on the personal use of fireworks, defined as follows:

- *Outright Ban* (OB): Those that explicitly advocate a ban on the personal use of fireworks, or where such an opinion could be clearly interpreted.
- *Further Restriction* (FR): Those that suggest some further restriction on the personal use of fireworks, but do not explicitly call for a ban.
- *Accepting of Ban* (AOB): Those that express acceptance or understanding of the need for a ban, but do not explicitly call for one.
- *Annoyed* (AN): Those that express some degree of annoyance related to the personal use of fireworks, but do not explicitly call for a ban or further restriction.

- *Against Ban* (AB): Those clearly not in favour of a ban or explicitly advocating against a ban on the personal use of fireworks.
- *Unclear* (UC): Those in which a view neither 'for' nor 'against' the personal use of fireworks could be clearly interpreted.

The breakdown of messages according to their stance regarding a ban on the personal use of fireworks is shown in Table 1.

Table 1. Frequency of messages according to stance and message type

Stance	LTE	TXT	Total (%)
OB	9	11	20 (18.4)
FR	9	6	15 (13.8)
AOB	2	4	6 (5.5)
AN	1	20	21 (19.3)
AB	4	24	28 (25.7)
UC	2	17	19 (17.4)
Total	27	82	109 (100)

AB = against ban, AN = annoyed, AOB = accepting of ban, FR = further restriction, LTE = letters to the editor, OB = outright ban, TXT = text message to the editor, UC = unclear.

More broadly, 57% of the messages could be classified as either being against or at least negatively concerned about the personal use of fireworks as currently occurs (OB, AOB, FR or AN), while 26% were in favour of the status quo.

Recurring reasons amongst those expressing a negative opinion on the personal use of fireworks were:

- use outside of designated times (32),
- impact of fireworks on animals (19),
- personal disturbance created by fireworks (15),
- injuries or risk to safety caused by fireworks (10),
- use of fireworks by irresponsible people (12),
- litter or pollution created by fireworks (7),
- damage to property (7), and
- disturbance to children (4).

Among those in favour of personal fireworks use, reasons included:

- being from the NT,
- being a Territorian was different than being from other states (9),
- only whingers were against fireworks (8),
- personal enjoyment derived from fireworks (5),
- fireworks are enjoyable for children (4),
- not wanting to lose freedoms (2), and
- that fireworks were not as bad as dogs barking (2).

A breakdown of the reasons expressed 'for' and 'against' fireworks is shown in Table 2.

Outright Ban:

There were 20 messages (18.4% of total) in which a call for a ban was clearly expressed. Almost half of these messages were letters. The most common reasons expressed in messages calling for a ban were:

- disturbance to animals (9),
- use outside specified times (8),
- safety or injuries related to fireworks (4), and
- and disturbance to children (4).

Table 2. Frequency of reasons expressed in support of an opinion either 'for' or 'against' fireworks

Reasons 'for' fireworks	Being 'Territorian' NT different to other states	Only whingers complain	Personal enjoyment	Enjoyment for children	Others
Nº of messages	9	8	5	4	18

Reasons 'against'	Used outside of designated hrs	Impact on animals	Personal disturbance created	Injuries or safety risks	Others
Nº of messages	32	19	15	10	45

Examples of such messages include:

"Isn't it about time we banned crackers for the health and safety of humans and animals alike? We could still have professional displays for special events each year. Please, enough is enough."

"RE: Mon News, pg 5, "cracker night gets everyone out". I wonder how many others spent night shut up in house with doors & windows shut with freaked out dog on lap. Lots i bet. My vote – ban private sale, public displays only!"

"Spare a thought 4 the animals on cracker nite. Glad I'll b back in Tassie where it was banned years ago. Darwin, catch up to the rest of Aust."

"Friday night & the fireworks were going off already! If you wern't so inconsiderate people like me wouldn't want them banned."

*"Territory Day, a great day 4 illegal fireworks and homemade bombs accompanied by d***eads! The powers that be need 2 wake up! Keep the nite but leave the fireworks to the pros. Easy."*

Further Restriction

There were 15 messages (13.8%) in which some further restriction on the use or provision of fireworks was advocated. Suggestions included further limiting the time available for the sale of fireworks, limiting the locations available for the personal use of fireworks, and only selling to NT residents. Other interesting possibilities advanced that might reduce firework related harm or annoyance included only selling fireworks to women, or requiring a pre-purchase IQ test.

"Fireworks. Should be on sale 12am on territory day til 6pm unfortunately there are to many idiots in the nt now to be responsible with fireworks"

"I have no problems with the fireworks, just the idiotic people letting them off days and weeks before and after the night. I think the sale of them should be from 12 noon to 6pm on the day of the event and be limited to one bag per person"

"Maybe they should ban men from using fireworks? After all, each listed incident in the NT News as a result of cracker misuse happened to males!"

"Maybe we should require people purchasing fireworks to answer 10 questions on NT self-government. After all, isn't that what they are celebrating?

"That should drop fireworks sales by 90 per cent because most of these hooligans are celebrating nothing more than the fact that our government hasn't got the courage to put a stop to their rat-baggery…"

Accepting of Ban

In 6 messages the writer expressed some empathy with introducing a ban, but did not explicitly call for a ban. The most common reasons expressed were use outside specified times (4) and use by irresponsible people (3).

"To all those freaks letting off fireworks 2 days before and during the days after fireworks nite, thanks for killing our tradition. Don't you dare blame clare when fireworks are banned, blame the freaks, once again thanks."

"2 the idiots letting fireworks of at people's dogs, get a life, u will get them banned"

Annoyed

There were 21 messages in which some degree of annoyance was expressed without a clear expression of being 'for' or 'against' the banning of fireworks or further restriction on their use. The reasons most commonly expressed in these messages were use outside of hours (12), personal disturbance (6), litter and pollution (3), use by irresponsible people (3) and disturbance to animals (3).

"To the inconsiderate people letting off fireworks, have some respect for peace & quiet."

"Crackers going off already. Doesn't seem like 12 months since last cracker night… Oh, that's right, they only stopped 6 months ago."

"2 the scum that left 100s of used firework casings littering the RAAF married qrt

patch park – poo on you – what about keeping Australia beautiful? Learn how 2 clean up your rubbish."

"My next door neighbour was setting off fire crackers at 11pm last night so I rang them at 2:30 this morning to tell them how much I enjoyed it."

Against Ban:

There were 28 messages that either advocated against a ban or were in favour of the continued personal use of fireworks. The majority of these messages were text messages (86%). The most common reasons expressed by this group were that those who complained about fireworks were 'whingers' or 'should get over it' (8), that the Territory or being a Territorian is different (7) and that fireworks were enjoyable (5) or fun for children (4).

"Fire cracker night was so much fun. I really liked the big bangs and all the colours, it made me smile lots. Cracker night is the bestest!"

"why do people have to try take all the fun away from our kids? Cracker night is great, our kids miss out on enough. Give it a rest."

"Clare, assure us that crackers are here to stay and not go the way of speed limits. Freedom please."

"Last of the territory's freedoms, fireworks, keep it that way."

"Aren't us humans here for a good time? Lets all stop winging and have some fun – that's if you know how."

Several messages categorised as AB seemed to express a certain disregard for others. Many of these suggested that those who had a problem with fireworks could leave.

"Fireworks, fireworks, let 'em stay.
I feel sorry for the bloke that lost an eye, but did he do something stupid, like trying to pick up an ignited cracker.
Try picking up a hand grenade after you've pulled the pin, your going to wear it.
People get maimed in cars every day, do we take their cars off them?

Cracker night is great. My family and I were at Berry Springs and watched a great display of people having fun. Why is it people want to ban the things we love for those who want to turn the Territory into just another state?

Why do you think we live here? I know why I live here, we're different. If people don't like it, the gate's not shut."

"To all prude's who hate crackers going off once or twice a day. Get over yourselves already. They disturb your perfect little day's for seconds, a minute when the ol 50 shots go off. get a life! Go find something better to do."

"Audrey, do us all a favour and stay in Tassie with your animals. Most of us r responsible and enjoy having a good time on cracker nite. Sounds like u r 1 of these people that has no life. 1 word 4 u, boring!"

*"On cracker night. Why don't all those whingeing idiots just shut up. P*** off back down south."*

Discussion

This year's debate in the *NT News* on the subject of fireworks was once again intense with a similar number of messages generated as in 2006 (109 in 2007 compared to 113 in 2006). Nearly one third of all messages (32.4%) called for either an outright ban (18.4%) or further restriction (13.8%). A further, one quarter of messages expressed clear annoyance with the current situation or an understanding of the need for a ban. Those in favour of the continued use of fireworks comprised 25.7% of messages in this year's discussion.

Table 3. Comparison of stance on fireworks discussions in the *NT News* between 2006 and 2007

	2006 % (n=113)	2007 % (n=109)
In favour of restriction on fireworks (OB + FR)	30.1	32.1
Annoyance or accepting of ban (AN + AOB)	34.5	24.8
Against ban on fireworks (AB)	26.5	25.7
Unclear (UC)	8.8	17.4

AB = against ban, AN = annoyed, AOB = accepting of ban, FR = further restriction, OB = outright ban, UC = unclear.

Compared to 2006, the proportion of those against any ban or restriction is essentially unchanged, as is the number in favour of such moves[1] (See Table 3). The numbers expressing a more general negative concern were reduced this year (AN or AOB) with an increase in the number of messages whose intent was not clear (UC).

This analysis suggests that the majority of people expressing a view via the letters pages of the NT news are dissatisfied with personal use of fireworks in some way, with little change in the range of opinions expressed since last year.

References

1. Skov S., Glover J. "Cracking up about crackers" An analysis of letter and text message discussion in the NT News of the personal use of fireworks surrounding Territory day *NT Dis Control Bull.* 2006;13(3):12-4.
2. Glover J, Skov S. Firework related injury community survey report 2007. *NT Dis Control Bull. 2007;14(3):8.*

****

An investigation of a cluster of *Salmonella* Oslo cases.

Michelle Harlock, Katrina Roper, Peter Markey, Emily Fearnley, Natasha Clements, Phuong Le, Dagmar Schmitt, Xavier Schobben, CDC, Darwin

Introduction

Between 19 February and 8 June 2007, there were 46 cases of *Salmonella* Oslo notified to the Northern Territory (NT) Centre of Disease Control (CDC). The outbreak was first detected in early March when an outbreak investigation was initiated. This article summarises the methods and findings of the investigation.

Salmonella Oslo is an uncommon serovar in the NT, with only 2 to 3 cases reported each year [1] and it is rare in the rest of Australia. The majority of cases in the early 1990s were in Darwin, with cases in Far North Queensland occurring from the late 1990s onwards (J. Powling, personal communication, 4 April 2007). There have been sporadic cases reported in other Australian states over the last 10 years, with several of these cases occurring in Queensland.[2]

Isolates of *Salmonella* Oslo from non-human sources are also uncommon. In the NT these have included isolation from a poultry processing effluent (1998) and crocodile meat (1991). Environmental testing on a frog faecal sample as part of another study currently being undertaken at CDC isolated *Salmonella* Oslo (S. Williams, personal communication, August 2007). The frog faeces sample was located in suburban Darwin and tested in July 2007. Other isolates have been found in a snake in South Australia (2006), a koala in Queensland (1998) (J. Powling, personal communication, 27 February 2007) and tree nuts tested in New South Wales (2005).[3]

Investigations

The outbreak investigation was initiated following the receipt of 4 notifications of *Salmonella* Oslo in a 2-week period. The investigation team consisted of staff from the CDC's Surveillance Section, the OzFoodNet epidemiologist, Masters of Applied Epidemiology students, Environmental Health Officers and laboratory staff as required.

Case interviews and hypothesis generation

Methods

Each case was interviewed with a standard salmonellosis questionnaire that included questions about symptoms, duration of illness, a 3-day food history and environmental exposures. A 7-day trawling (hypothesis-generating) questionnaire listing individual food items was also administered after the third week.

In addition, for the first time at CDC, the outbreak was mapped by geo-coding address using geographic information software (Map-Info Professional 8.5).

Figure 1. Cases of Salmonella Oslo in the Northern Territory by week of onset, 2007.

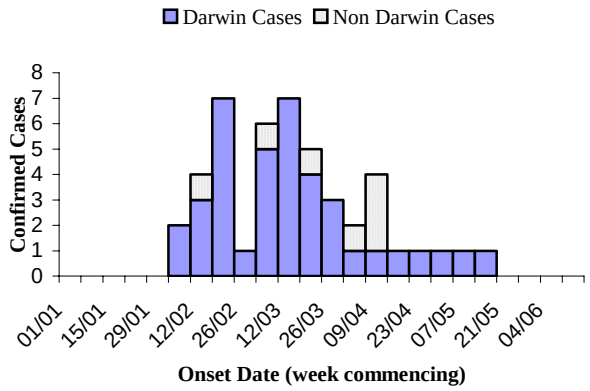
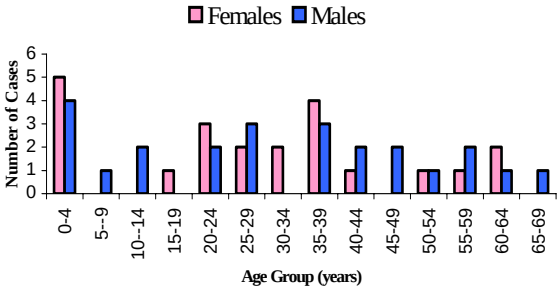


Figure 2. Sex distribution of Salmonella Oslo cases by 5-year age group.



Results

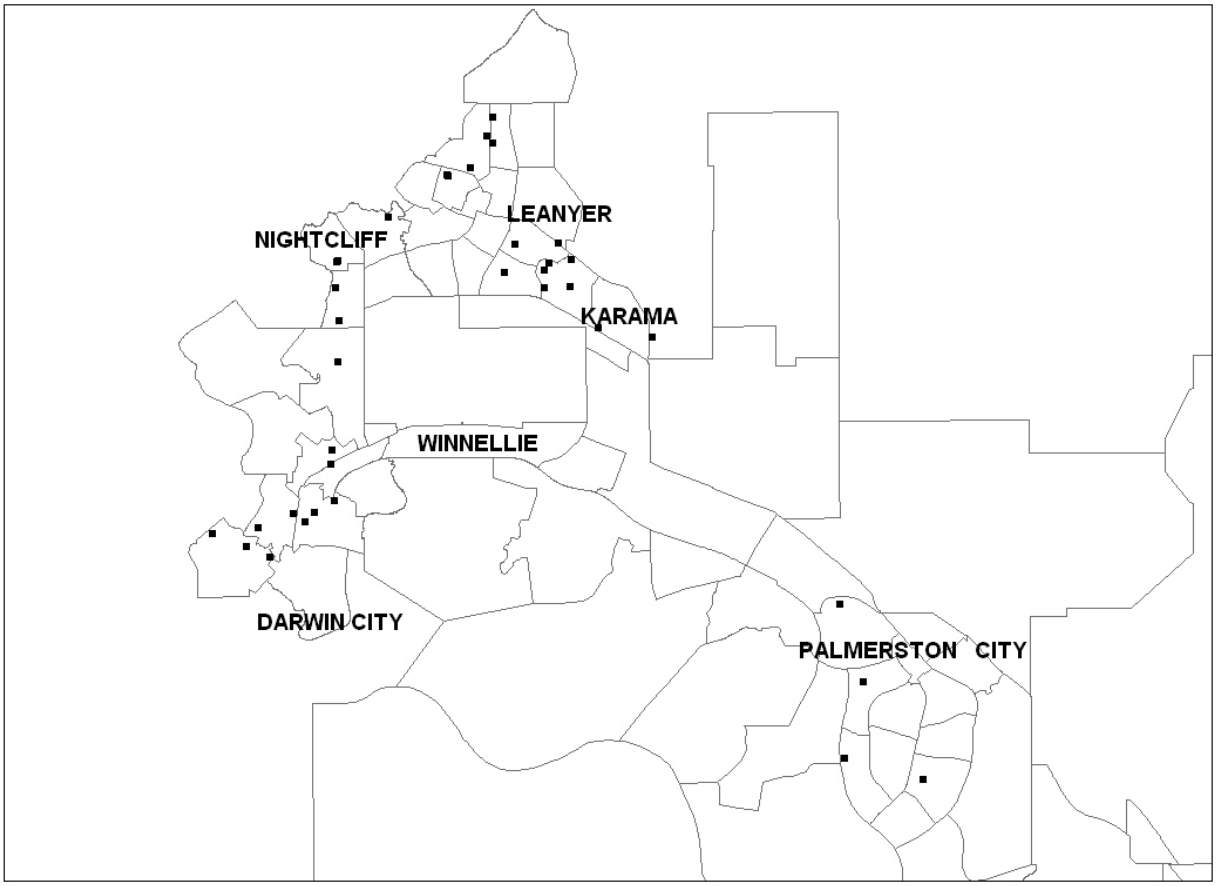
The outbreak comprised of 46 cases of *Salmonella* Oslo as illustrated in Figure 1. The majority of cases (~85%) were restricted to the Darwin urban area with occasional cases being reported in other NT districts.

The cases were evenly distributed among the sexes (52% males) and over a wide age range (Figure 2), with 76% aged over 14 years. The median age was 31 years (range 2 months to 67 years). Cases were spread over a wide geographic area (Figure 3).

The interviews did not identify clear links between cases, although early in the outbreak several cases had reported shopping in a particular supermarket without having any food item (or fresh produce) in common.

In the first weeks of the outbreak a case series of 14 was examined. A high proportion of these cases (76%) had 'eaten out' in the 2 weeks prior to illness. In addition, 50% of these had eaten 'salads' while eating out.

Figure 3. Distribution of Salmonella Oslo cases by suburb of residence. Each square represents a case randomly distributed in the suburb of residence.



Given that the outbreak was almost exclusively confined to the Darwin urban area (without being restricted to a particular suburb) and affected all ages and sexes, the likely vehicle of transmission was proposed to be locally produced food eaten either uncooked or partly cooked. There are fresh produce items that are grown and sold only in Darwin and the previously reported non-human NT sources suggest low levels of *Salmonella* Oslo may be in the environment.

Questions were raised at investigation team meetings about environmental changes and their possible impacts on the food supply. It was noted that there was at least one known change in suburban Darwin this year with the arrival of cane toads. There were also anecdotal reports of members of the public attempting to increase populations of local frog species by encouraging them to breed in backyards and properties. No cases indicated they had had direct contact with frogs or toads. However, interesting hypotheses were raised regarding the influence of such factors on food, particularly foods grown in the local area.

Case-control study

Methods

A case control study was commenced on 12 April 2007. The hypothesis was that cases were more likely than controls to have:

- eaten 'out'
- eaten a locally grown food item
- shopped at or eaten food bought at Supermarket X

It was decided to recruit 2 controls for every case and power calculations suggested that a minimum of 27 cases and 54 controls were required to obtain a statistically significant results; odds ratio of >4.0 (α=0.05 β=80%). The study was conducted via telephone interviews using a 10-15 minute questionnaire. Controls were recruited using random-digit dialling of numbers with the Darwin or Palmerston prefix.

The study asked about a selection of locally grown vegetables that cases had reported eating in the hypothesis-generating questionnaires. These included lettuce, cucumbers, fresh mint, fresh basil, chillies, snake beans and bean sprouts. This list was selected before the food sampling results detailed below had become available.

Results

There were 19 cases and 38 controls recruited for the study. The targeted sample size was not achieved.

Exposures with significant odds ratios on univariate analysis are listed in Table 1 below. Interestingly, lettuce eaten away from home was the only food item with a significant odds ratio. No particular type of lettuce was identified from the study. Bean Sprouts eaten away from home produced an odds ratio of 3.6 (95% CI 0.36 – 47.01) while Supermarket X had an odds ratio of 1.5 (95% CI 0.35 – 6.2).

On multivariate analysis, age-group and day of the week of interview were suspected to confound the association between exposures and illness. Adjusting for these, the odds ratio for eating lettuce away-from-home remained significant (OR=14.5; 95% CI 2.3-92) while the odds ratio for shopping at the markets fell (OR=4.77; 95% CI 0.76-29.8). The odds ratios for eating out (OR=31.9) and eating at a restaurant (OR=12.6) remained significant.

Food sampling

Methods

With the lack of any clear links between cases, the investigation team began to focus on food items such as lettuce, tomato, cucumbers and

Table 1. Exposures with significant odds ratios on univariate analysis

Exposure	Cases	Controls	Odds ratio	95% CI
Eating 'out'	18/19	22/38	13.1	1.65-578
Shopped at the markets	6/19	2/38	8.3	1.23-90
Ate at a restaurant	7/19	3/35	6.8	1.25-45.4
Ate lettuce away from home	9/15	9/38	4.8	1.13-21.0

sprouts as these are commonly found in salads and had been reported by several cases. In particular, the focus was on the major distributors who supply fresh produce to Darwin food businesses.

Environmental Health Officers undertook a comprehensive inspection of the major food distributors in the Darwin urban area. A detailed investigation of particular food items and trace back was not possible as the investigation team had not clearly identified a suspected vehicle of transmission.

Samples of fresh produce from local markets and fresh produce distribution companies were collected between 31 March and 2 April 2007 for microbiological analysis. In total 49 individual samples were tested. Details about the investigation are documented in the *Salmonella* in fresh produce article p20.[4]

An additional inspection and food produce sampling exercise was carried out at a lettuce farm located in the NT in early May 2007. Although there was no definitive evidence that lettuce from this particular farm were linked to the outbreak, this farm had supplied lettuce to a number of produce distributors and supermarkets around the time of the outbreak. Environmental Health Officers worked in consultation with officers from the Department of Primary Industry, Fisheries and Mines (DPIFM) and a number of food samples were taken.

Results

There were no particular distributors linked to the food businesses listed by cases. The environmental health inspections revealed no source of contamination at the food distributor's premises or within the food distribution chain.

No *Salmonella* Oslo was isolated from any of the samples taken but evidence of environmental *Salmonella* contamination of fresh produce was demonstrated by the sample findings. The positive results from the food sampling are listed in Table 2. Details of the results of the investigation are documented in the *Salmonella* in fresh produce article p20.[4]

No samples from the lettuce farm returned positive results for *Salmonella* species.

Interventions

Following the isolation of *Salmonella* species from market produce, the stalls that returned a positive preliminary result were provided with detailed food safety advice regarding the washing of produce prior to sale. The Director of Environmental Health issued a subsequent media release on 3 May 2007 advising consumers to wash all fresh produce prior to consumption in response to the ongoing investigations into the *Salmonella* Oslo cluster. This media release received significant coverage on radio, television and in print.

The Environmental Health Darwin Urban section worked in consultation with the DPIFM and carried out farm inspections on those premises whose produce was found to be *Salmonella* positive (Environmental Health does not have jurisdiction over primary producers under the NT *Food Act*).

Discussion

No vehicle of transmission was identified for the *Salmonella* Oslo outbreak. However, food sampling results from the local markets highlighted some issues around food safety of locally grown and sold fresh produce. In light of

Table 2. Summary of positive food samples taken as part of S. Oslo investigation.

Item	Premises Sampled	Serovar identification
Bean Sprouts	Local Market	*S.* Kino doni
Bean Sprouts	Local Market	*S.* subspecies IIIb ser 61 : - : - (non motile)
Lebanese Cucumbers x 2	Local Market	*S.* Anatum
Basil	Local Market	*S.* Anatum
Basil	Local Market	*S.* Rubislaw
Mint	Local Market	*S.* Ball
Snake Beans	Local Market	*S.* Hvittingfoss

these results, it was possible that there may have been previous *Salmonella* Oslo contamination of food which had been sold before any sampling was done.

There is no microbiological limit for *Salmonella* and fresh fruit and vegetables in the current Food Standards. Local growers supplying interstate markets are regulated to some extent by the DPIFM and participation in quality assurance programs is often a requirement for export interstate or when supplying produce to some supermarkets. Quality assurance programs often have a component on the risks potentially associated with fresh produce (such as *Salmonella* contamination) and include education and advice regarding the washing of fresh produce.

The subsequent isolation of *Salmonella* Oslo from frog faeces as part of an environmental serovar study highlights the point that the serovar is found in the tropical environment. Given the demographic and tempero-spatial distribution however, it is unlikely to explain the entire outbreak.

The investigation of this outbreak allowed CDC staff to gain experience in case-control study design and analysis and, for the first time in the NT, to use geographic information software to plot cases on a local map. This experience will be of great value in investigating outbreaks in the future.

References

1. NTNDS. Northern Territory Notifiable Disease System. Northern Territory Government, Department of Health and Community Services. 2007. Unpublished data. (Accessed 19 July 2007).
2. NNDSS. National Notifiable Diseases Surveillance System. Australian Government Department of Health and Ageing. 2007. Unpublished data. (Accessed 19 July 2007).
3. Microbiological Unit, Department of Microbiology and Immunology. *National Enteric Pathogens Surveillance System Non-Human Annual Report 2005*. Melbourne: University of Melbourne, 2006.
4. Ward T, Schobben X, Clements N, Le P, Schmitt D, Luthy C. Salmonella species in fresh produce – an emerging food safety issue for the NT. *The Dis Control Bull* 2007;15(3):20.

****

Salmonella species in Fresh Produce – an emerging food safety issue for the NT.

Tracy Ward, Xavier Schobben, Natasha Clements, Phuong Le, Dagmar Schmitt and Chris Luthy, CDC, Environmental Health.

Food borne illness outbreaks associated with fresh produce continue both in Australia and overseas.[1,2] Recent events in the Northern Territory (NT) have highlighted the presence of salmonella species in fresh produce and reinforced the importance of conveying appropriate food safety messages to both industry and consumers.

In November 2006, the NT Department of Health and Community Services (DHCS) Environmental Health program was notified by OzFoodNet that rockmelon traced back to the NT had tested positive to *Salmonella* Saintpaul. The rockmelon had been tested by the Victorian Department of Human Services as part of its investigation into an increase in the number of notified *Salmonella* Saintpaul cases in the eastern states.

The Environmental Health program consulted with both OzFoodNet and Queensland Health and launched a joint environmental investigation with the Department of Primary Industry, Fisheries and Mines (DPIFM). The rockmelon-growing season had concluded and no fresh produce could be sampled. However, 31 environmental samples were submitted to the University of Melbourne Microbiological Diagnostic Unit (MDU) for analysis. Samples were taken of water, soil, fertilizers and rockmelon skin. Swabs of the packing equipment and materials were also submitted to MDU.

Salmonella was detected from 3 samples. *Salmonella* Welikade was isolated from dust swabbed from the top of packing boxes, *Salmonella* Aberdeen and *Salmonella* Cerro

were isolated from the dust on the floor of the packing room shed and *Salmonella* Virchow and *Salmonella* Aberdeen were isolated from stagnant water around the bore. Although the outbreak organism was not isolated in this investigation, the presence of these other Salmonella species indicates the potential for food borne disease outbreaks.

DHCS and DPIFM worked closely with the producer to identify any potential food safety hazards and provided advice and assistance to the producer to control those hazards.

In March 2007, the Environmental Health unit began an environmental investigation into an increase in the number of *Salmonella* Oslo cases notified to the Centre for Disease Control (CDC), Darwin. A comprehensive inspection and sampling program was initiated. Action included taking samples of locally grown fresh produce from the markets, supermarkets, suppliers and distributors to local food premises.

Major food distributors that supply fresh produce to Darwin food businesses were visited by Environmental Health Officers (EHOs) between 16 March 2007 and 30 March 2007 to identify any potential environmental source of the outbreak. Samples of water used in processing were submitted to the MDU for analysis. Salmonella species were not detected.

An additional 49 fresh food samples collected from local markets on 31 March and 1 April 2007 were sent to MDU for analysis. During the investigation, food business proprietors were provided with advice regarding washing of produce presented for sale. It was noted by EHOs that the majority of proprietors already washed produce prior to sale. Preliminary results detected Salmonella species on 8 samples (basil, mint, Lebanese cucumber, snake beans and bean sprouts). Following these preliminary results, EHOs revisited market stalls that sold fresh produce on the weekend of 14/15 April and further advice in the form of a letter was given to the market stall holders regarding the importance of washing produce and handwashing when handling fresh produce.

Final results from MDU confirmed the presence of Salmonella species (Salmonella *Ball*, Salmonella *Anatum,* Salmonella *Hvittingfoss* and Salmonella *Kinondoni*) on 8 samples. Although the Oslo outbreak strain of Salmonella was not detected, a media release was subsequently prepared to provide consumers with advice to wash fresh fruit, herbs and vegetables. This media release received significant coverage on radio, television and in print.

The NT *Food Act,* in line with the National Model Food Act, and Food Safety Standards, specifically excludes primary food production and processing, including fruit and vegetable farms from its coverage. Accordingly, Environmental Health works closely with DPIFM in managing food safety in fresh produce. DPIFM has agreed to include food safety on farms as part of its advisory and extension service to industry.

The minimum processing required for fresh and fresh-cut produce, which omits any effective microbial elimination step, results in food products that naturally carry microorganisms, some of which may be potentially hazardous to human health.[2] The survival and/or growth of pathogens on fresh produce is influenced by the organism, produce item and environmental conditions in the field and subsequent storage conditions. Eliminating concern regarding microbial contamination of fresh produce is not simple, especially as each fruit and vegetable has different characteristics that may contribute to its inherent risk.[1] The Australian Government has agreed that food safety should be addressed throughout all parts of the food supply chain (i.e. from paddock to plate) to ensure appropriate food safety outcomes. This approach aims to improve public health and safety and ensure that consumers can continue to have the highest confidence in the safety of the food they consume. Food Standards Australia New Zealand (FSANZ) has responsibility for developing standards for primary production and processing. A primary production and processing standard has been listed for development in 2007/08 that will establish mandatory food safety requirements for horticulture. It is anticipated that the development of mandatory food safety controls on farm will lead to a reduction in outbreaks associated with fresh produce.

References

1. Kirk M, (2007) OzFoodNet – fresh produce and foodborne disease in Australia. *Food Safety and Hygiene Bulletin March 2007* Australian Food Safety Centre of Excellence: NSW.
2. Food and Drug Administration (FDA) 2001 Outbreaks Associated with Fresh-cut Produce. Incidence, Growth and Survival of Pathogens in Fresh and Fresh-Cut Produce in Analysis of Preventative Control Measures for the Control and Reduction/Elimination of Microbial Hazards on Fresh and Fresh-Cut Produce (cited June 2007); http://www.cfsan.fda.gov/~comm/ift3-4a.html accessed 17/09/2007.

****

Gastroenteritis in Aged Care Facilities

Introduction

Centre for Disease Control (CDC) has been involved in the management of an outbreak of gastroenteritis at an Aged Care Facility (ACF).

The initial notification came when a doctor working at the Hospital Emergency Department notified CDC that 13 residents of an ACF had gastroenteritis. This doctor had become aware of the situation through the admission of 1 of the residents to the hospital. She had visited the ACF as the unit's general practitioner and documented the associated cases, which were reported to CDC.

Routine testing on faecal specimens had been requested for a number of residents. The hospitalised patient had received fluid replacement treatment. Other residents had received increased oral fluid replacement provided by the ACF nursing staff.

Both the hospital and the ACF had down-played the possibility of an infectious cause of disease. No pathogen had been identified on pathology testing; 1 resident referred to the hospital had been diagnosed with 'non-infectious diarrhoea'; and dietary changes were common over the 'festive season' because of additional food brought in by family members.

Outbreak investigation steps

1. Confirm existence of an outbreak

Diarrhoea and vomiting occur in all ACF at a low rate. However, the large number of cases occurring in a period of less than 1 week was outside of levels normally seen. Routine recording of bowel habits of all residents documented both numbers of residents with increased frequency of stool and also watery stools.

2. Verify diagnosis and determine aetiology

The pattern of illness, with high attack rates, mostly mild and short duration of illness together with lack of identifiable bacterial pathogen led to the suspicion that the outbreak was due to norovirus. This was confirmed when specimens from 2 residents were referred for specific testing.

3. Develop case definition, start case-finding and collect information on cases

The case definition included all residents with diarrhoea onset from mid-December until the first week during which no residents had diarrhoea in mid-January. It was noted that all residents had diarrhoea were housed in 1 wing of the ACF. Routine recording of bowel function of all residents enabled a high level of case-finding.

The timing of the first case was 3 days following the arrival of an agency nurse from interstate. The nurse was well and denied any symptoms of gastroenteritis. Public health authorities in this state were already aware of norovirus outbreaks occurring in ACF in their state.

4. Describe person, time and place and generate hypotheses

Superficial linkages between the residents, timing and symptoms were obvious. No bacterial pathogen was detected in specimens from a number of residents and this lead to the hypothesis of norovirus as a cause of the outbreak.

The timing of cases was consistent with a propagated outbreak, as new cases continued over a period of 3 weeks.

5. Test hypothesis

Routine testing of faecal specimens for bacterial, parasitic and a range of viral pathogens demonstrated no alternate pathogen to norovirus. Exclusion of other infectious causes, demonstration of norovirus in faecal specimens of a number of residents and staff, and epidemiological suspicion were consistent with norovirus being the cause of the outbreak.[2]

The history of recent arrival from interstate of 1 staff member was the suspected source of the virus.

CDC initiated discussions about guidelines for control of norovirus. These revealed a number of areas where the infection could have been spread, despite adequate standards of infection control in the ACF.

Residents whose stools were negative for norovirus were referred to general practitioners for consideration of other causes of diarrhoea.

6. Environmental or other studies to supplement clinical and laboratory data

Environmental testing is not recommended for norovirus. Transmission is from person to person, although virus may remain viable on inanimate surfaces. All surfaces must be cleaned with concentrated chlorine solution to eliminate the virus. There was no evidence to suggest a point source of infection, as cases continued to occur well outside the incubation period and there was no peak of incidence.

7. Combine evidence to draw conclusions

Clinical, epidemiological and laboratory evidence all supported the hypothesized introduction of norovirus from interstate, and wide rapid transmission through 1 wing of the ACF.

8. Recommended control measures

Clear, concise guidelines for control of norovirus in ACF have been published.[2] These were presented to the ACF and their implementation discussed in depth.

Control of the outbreak was difficult because of the fastidiousness of norovirus. Standard enteric precautions may not control this organism[2] which is tolerant of soaps and detergents, and highly infectious. Additional highly restrictive precautions are recommended when norovirus is circulating. These include limiting visitors and movement of clients of the facility. Routine tuberculosis screening at the ACF was postponed for the duration of the outbreak.

The increased level of illness of residents during the outbreak, transfer of some to hospital and illness of staff members all increased workload in the ACF. Nurses from agencies are commonly employed at the Facility and were an important source of staff during the outbreak.

However, the large number of agency staff working at the Facility created hazards during the outbreak. Agency nurses' conditions of employment do not encourage them to admit to symptoms, seek medical care and remain off duty for recommended periods. As norovirus is extremely infectious, it its recommended that health care providers and food handlers do not return to work for at least 48 hours after symptoms resolve.[2] Health care providers entitled to sick leave are usually not disadvantaged financially by following these recommendations. However, health care providers without access to sick leave such as agency staff, have financial disincentives to following recommendations.

In this situation, CDC would recommend that agency staff maintain their professionalism and discuss their situation confidentially but openly with employers. Employers need to work toward a solution that will lead to the best outcome for employee, employer and clients.

9. Communicate and educate

Norovirus has distinctive epidemiological and clinical features. These include high attack rates, high evidence of vomiting relative to diarrhoea, and short duration of illness.[1] Even once the diagnosis was made, it was difficult to implement the rigorous standards necessary to reduce spread of the organism.[2] It is likely that the outbreak ran its course irrespective of any measures taken. However, development of relationships between hospital, public health and ACF staff may enhance control of future outbreaks.

10. Follow-up recommendations and ensure implementation of control measures

Norovirus infection may be trivial or subclinical in most members of the population. Its significance is in the potential for large numbers of people to be affected, with a total burden of disease spread over a large number of people. However severe illness and death may occur in elderly people.

Conclusions

Health care providers should be aware of the possibility of infectious disease outbreaks especially among vulnerable and high-risk groups, including residents of facilities and children in childcare. Infections that may be subclinical or mild in young adults may be fatal in groups at risk.

Pathology testing for clinical care requires consideration of different organisms from pathology testing for outbreak investigation and management. Of note, rotavirus antigen testing is now routine on all faecal specimens submitted for microscopy and culture. However, norovirus is not.

Agreements between health care workers and employers about staff members with potentially infectious conditions rely on professionalism. Entitlements to sick leave have important benefits for both employees and employers.

References

1. Turcios RM, Widdosson MA, Sulka AC, Mead PS, Glass RI. Reevaluation of epidemiological criteria of identifying outbreaks of acute gastroenteritis due to norovirus; United States 1998-2000. *Clin Infect Dis* 2006;42:964-9.
2. Government of South Australia, Department of Health, Communicable Diseases Branch. Guidelines for the management of infectious gastroenteritis in Aged Care Facilities in South Australia. Accessed online 22 Jan 2006 at http://www.dh.sa.gov.au/pehs/publications/gastro-aged-care-jan05new.pdf.
3. Kaplan JE, Feldman R, Campbell DS, Lookabaugh C, Gary GW. The frequency of a Norwalk-like pattern of illness in outbreaks of acute gastroenteritis. *Am J Public Health* 1982;72:1329-1332.

****

Salmonella Paratyphi B var Java in a child and their pet turtle

Shellee Williams, CDC, Darwin

Abstract

As part of a study of environmental *Salmonella* in Darwin 0-4 year olds, samples were taken from the home of a 16 month old child notified with *Salmonella* Paratyphi B var Java, who had a pet turtle. This serotype was isolated from all samples from the turtle aquarium in the child's home using enrichment culture technique consistent with World Health Organisation procedures.[22] The isolate from the child and those from the aquarium were phage type Dundee and resistant to the same antibiotics. *Salmonella* Paratyphi B var Java has previously been associated with aquariums and tropical fish.[1-5] Several cases of salmonellosis caused by this and other serovars, including one causing death in a baby, have been associated with pet turtles.[6-21]

Introduction

The first reported case of *S.* Paratyphi B var Java occurred in the Northern Territory (NT) in 1991.[23] To date, 165 cases have been notified with an annual average of 11 cases between 1997 and 2006.[23] Over the same period, the greatest proportion of notifications (47%) occurred in 0-4 year olds, in urban Darwin (36%). The highest rate of notifications from 1996 to 2005 occurred in Aboriginal children resident in rural NT health districts.[23]

Case Report

The case was a girl aged 16 months from urban Darwin who was taking previously prescribed antibiotics at the time of onset. She had a 2-day history of fever followed by watery diarrhoea,

which continued for 7 days. This peaked at more than 20 bowel movements in a 24-hour period. Blood was present in the stool after 2 days of diarrhoea and persisted for several days. The child was anorexic, irritable and lethargic but was not hospitalised.

Stool culture revealed *S*. Paratyphi B var Java.

As part of a research project examining the environmental cause of salmonellosis in infants, samples were taken from the child's home 25 days after onset. Samples were taken from the family turtle aquarium including the filter, 70mL of water and 70mL of sediment and stones. All samples grew *S*. Paratyphi B var Java.

Sensitivity testing of the human and aquarium isolates were performed by the Australian *Salmonella* Reference Centre, Institute of Medical and Veterinary Science (IMVS) using the single break-point agar dilution method as described by the National Committee for Clinical Laboratory Standards (NCCLS).[25] Antibiotic sensitivity testing included gentamicin, kanamycin, nalidixic acid, chloramphenicol, ampicillin, tetracycline, streptomycin, sulphadiazine, trimethoprim, ciprofloxacin and cefotaxime. All isolates had the resistance profile*: Res Ap Sm Tc Cm Su (which included the antibiotic the child was taking). This resistance profile is indistinguishable from that previously associated with tropical fish in other states (spectinomycin sensitivity has not been tested). It was the first time this serovar with this multi-resistant profile has been reported in the NT.[1, 26]

Discussion

This multi-drug resistant serovar is thought to have been imported into Australia via tropical fish around 2003[1] and may gradually be establishing itself in the pet industry. Antimicrobial-resistant, non-typhoidal *Salmonella* have been associated with an increased rate of hospitalisation and bacteraemia compared with pan-susceptible *Salmonella*.[27-29] Since small children are particularly vulnerable to salmonellosis and are frequently involved in pet handling, it is important to inform parents of the risks associated with pets such as amphibians and reptiles, and how to enjoy their pets and clean aquariums while minimising this risk.

In this case the infection by *Salmonella* would have been facilitated due to inhibition of normal microbiota and thereby the competitive effect, however, without inhibition of the ingested *Salmonella*.[24]

Salmonella is part of the normal intestinal flora of both free-ranging and captive reptiles.[30] As a result, they shed *Salmonella* intermittently, usually without exhibiting disease, and act as a reservoir for human infections.[30] They are also more likely to shed *Salmonella* when stressed; this may occur for many reasons including inappropriate environmental temperature, overpopulation, inadequate housing, malnutrition or concurrent disease.[31, 32]

The prevalence of *Salmonella* in reptiles and amphibians sold as pets is unknown, however small studies have demonstrated prevalences ranging from 11.3% (turtles in the United States of America (USA)) to 81% (crocodiles in the NT).[30] *Salmonella* may be transmitted from animal to man via urine and faeces and has been shown to penetrate turtle eggs, infecting the hatchlings.[30]

The implicated turtle was approximately 16 months old and had been owned by the family for this time. It was described as the size of a 20 cent piece at the time of purchase. The turtle was farmed locally and *Salmonella* was isolated from the breeding tanks at this farm, however it was not *S*. Paratyphi B var Java. The turtle had been fed live fish and 'ground fish cubes', both of which were purchased locally. The live fish may have been sourced locally or from interstate while the 'fish cubes' were sourced from interstate. The fish may have been the original source of this serovar in this case.

Legislation has existed in the USA since 1975 to restrict the sale of turtles to those 4 inches or longer, because they can less easily fit into a child's mouth, after it was demonstrated that 14% of salmonellosis was attributable to pet turtles.[33] No such legislation exists in the NT.

The pet store was aware of the risk of salmonellosis from reptiles and informed the parents about this at the time of purchase of the turtle. Written information regarding turtle care is provided by the pet store, however there is no reference to *Salmonella* and little information regarding minimising the risk of transmission from tank or turtle to human.

* Footnote: Ap=ampicillin, Sm=streptomycin, Tc=tetracycline, Cm=chloramphenicol, Su=Sulfadiazine

Box 1. Recommendations for preventing transmission of *Salmonella* from reptiles and amphibians to humans

- Pet store owners, health-care practitioners, and veterinarians should provide information to owners and potential purchasers of reptiles and amphibians about the risk for acquiring salmonellosis from their pets.
- Persons should always wash their hands with soap and water after handling reptiles and amphibians or their cages.
- Persons at increased risk for infection with serious complications from salmonellosis (eg. Children aged <5 years and immunosuppressed persons) should avoid contact with reptiles and amphibians
- Reptiles and amphibians should be kept out of households with children aged <5 years or immunocompromised persons. Families expecting a new child should give away their pet reptiles and amphibians before the infant arrives.
- Reptiles and amphibians should not be kept in child-care centres.
- Reptiles and amphibians should not be allowed to roam freely throughout the house.
- Reptiles and amphibians should be kept out of kitchens and other food-preparation areas to prevent contamination. Kitchen sinks should not be used to bathe pets or to wash their dishes, ages or aquariums. If bathtubs are used for these purposes, they should be thoroughly cleaned afterwards.

Source: Mermin J, Hutwagner L, Vugia D, et al. Reptiles, amphibians, and human *Salmonella* infection: a population-based, case-control study. *Clin Infect Dis*. 2004;38(Suppl 3):S253-61).

Given the potential severity of antibiotic resistant salmonellosis, the provision of detailed information to parents at the point of sale of pet fish, reptiles and amphibians is warranted. Box 1 shows the recommendations regarding reptiles and amphibians from US Department of Health and Human Services, Centers for Disease Control and Prevention.[20]

Acknowledgements

I would like to thank the family, pet store and turtle breeder involved for their invaluable cooperation and assistance. I would also like to thank Environmental Health Officer, Michael Bethune, for his aid with investigations; and Suresh Benedict, Berrimah Veterinary Laboratories, NT Department of Business, Industry & Resource Development and Dianne Davos, Australian Salmonella Reference Centre, IMVS for their technical expertise and support.

The human *Salmonella* isolation was performed by Western Diagnostic Pathology, serotyping by IMVS, Adelaide and phage typing by the Microbiology Diagnostics Unit, Melbourne.

References

1. Musto J, Kirk M, Lightfoot D, Combs BG, Mwanri L. Multi-drug resistant *Salmonella* Java infections acquired from tropical fish acquariums, Australia, 2003-04. *Commun Dis Intell* 2006;30 (2):222-227.
2. Senanayake SN, Ferson MJ, Botham SJ, Belifante RT. A child with *Salmonella* enterica serotype Paratyphi B infection acquired from a fish tank. *MJA.* 2004;180(5):250.
3. Lewis DA, Paramathasan R, White DG, Neil LS, Tanner AC, Hill SD, et al. Marshmallows cause an outbreak of infection with Salmonella enteritidis phage type 4. *Commun Dis Rep.* CDR Rev 1996;6(13):R183-6.
4. Gaulin C, Vincent C, Ismail J. Sporadic infections of Salmonella Paratyphi B, var. Java associated with fish tanks. *Can J Public Health*. 2005;96 (6):471-4.
5. Levings RS, Lightfoot D, Hall RM, Djordjevic SP. Aquariums as reservoirs for multidrug-resistant Salmonella Paratyphi B. *Emerg Infect Dis*. 2006;12(3):507-10.
6. Turtle-associated salmonellosis in humans--United States, 2006-2007. *MMWR.* 2007;56 (26):649-52.
7. Kaibu H, Iida K, Ueki S, Ehara H, Simasaki Y, Anzai H, et al. Salmonellosis of infants presumably originating from an infected turtle in Nagasaki, Japan. *Jpn J Infect Dis*. 2006;59(4):281.
8. Nagano N, Oana S, Nagano Y, Arakawa Y. A severe Salmonella enterica serotype Paratyphi B infection in a child related to a pet turtle, Trachemys scripta elegans. *Jpn J Infect Dis.* 2006;59(2):132-4.
9. Salmonellosis associated with pet turtles--Wisconsin and Wyoming, 2004. *MMWR.* 2005;54 (9):223-6.
10. Stam F, Romkens TE, Hekker TA, Smulders YM. Turtle-associated human salmonellosis. *Clin Infect Dis*. 2003;37(11):e167-9.
11. Geue L, Loschner U. Salmonella enterica in reptiles of German and Austrian origin. *Vet Microbiol*. 2002;84(1-2):79-91.
12. O'Grady KA, Krause V. An outbreak of

salmonellosis linked to a marine turtle. *Southeast Asian J Trop Med Public Health.* 1999;30(2):324-7.
13. Lynch M, Daly M, O'Brien B, Morrison F, Cryan B, Fanning S. Salmonella tel-el-kebir and terrapins. *J Infect*. 1999;38(3):182-4.
14. Austin CC, Wilkins MJ. Reptile-associated salmonellosis. *J Am Vet Med Assoc*. 1998;212 (6):866-7.
15. Woodward DL, Khakhria R, Johnson WM. Human salmonellosis associated with exotic pets. *J Clin Microbiol*. 1997;35(11):2786-90.
16. Dessi S, Sanna C, Paghi L. Human salmonellosis transmitted by a domestic turtle. *Eur J Epidemiol*. 1992;8(1):120-1.
17. Turtle-associated salmonellosis--Ohio. *MMWR*. 1986;35(47):733-4, 739.
18. Altman R, Gorman JC, Bernhardt LL, Goldfield M. Turtle-associated salmonellosis. II. The relationship of pet turtles to salmonellosis in children in New Jersey. *Am J Epidemiol*. 1972;95 (6):518-20.
19. Clinical rounds from the Massachusetts General Hospital: salmonella infections. Discussion of two cases, one acquired from a pet turtle and another mimicking acute appendicitis which subsequently developed into ulcerative colitis. *Clin Pediatr* (Phila). 1967;6(1):33-40.
20. Turtle-Associated Salmonellosis in Humans - United States, 2006-2007. Morbidity and mortality Weekly Report 2007;56(26):649-652.
21. Reptile-Associated Salmonellosis - Selected States 1998-2002,. *MMWR*. 2003;52(49):1206-1209.
22. Laboratory Protocols, Level 1 Training Course, Isolation of *Salmonella*, 4th Edition. In: Hendriksen RS, editor.: Global Salm-Surv - A global *Salmonella* surveillance and laboratory support project of the World Health Organisation; 2003.
23. Northern Territory Notifiable Diseases Surveillance System. 2007.
24. Barza M, Travers K. Excess infections due to antimicrobial resistance: the "Attributable Fraction". *Clin Infect Dis*. 2002;34 Suppl 3(5): S126-30.
25. Australian Salmonella Reference Centre 2004 Annual Report. Adelaide: Institute of Medical and Veterinary Science; 2004
26. Davos D. Senior Scientist, Australian Salmonella Reference Centre. In: Williams S, editor.; 2007.
27. Martin LJ, Fyfe M, Dore K, Buxton JA, Pollari F, Henry B, et al. Increased burden of illness associated with antimicrobial-resistant Salmonella enterica serotype typhimurium infections. *J Infect Dis*. 2004;189(3):377-84.
28. Varma JK, Greene KD, Ovitt J, Barrett TJ, Medalla F, Angulo FJ. Hospitalization and antimicrobial resistance in Salmonella outbreaks, 1984-2002. *Emerg Infect Dis*. 2005;11(6):943-6.
29. Varma JK, Molbak K, Barrett TJ, Beebe JL, Jones TF, Rabatsky-Ehr T, et al. Antimicrobial-resistant nontyphoidal Salmonella is associated with excess bloodstream infections and hospitalizations. *J Infect Dis*. 2005;191(4):554-61.
30. Infectious Diseases and Pathology of Reptiles: Color Atlas and Text. Boca Raton, Florida: CRC Pr I Llc; 2007.
31. Perez-Ruiz M. Department of Primary Industry, Fisheries and Mines, Northern Territory Government: Personal communication, Darwin; 2007.
32. Shilton C. Veterinary Pathologist, Berrimah Veterinary Laboratories, Department of Business, Industry and Resource Development, Northern Territory Government: Personal communication, Darwin; 2007.
33. Pet-turtle-associated salmonellosis--Puerto Rico. *MMWR* 1984;33(10):141-2.

****

Campylobacteriosis factsheet

What is campylobacteriosis?

Campylobacteriosis is a bowel infection caused by the bacteria *Campylobacter*.

How is it spread?

People become infected by swallowing the bacteria. Most cases are associated with handling or eating raw or undercooked poultry meat.

Animals can be infected and some people have acquired the infection from contact with the infected faeces of an ill animal.

Campylobacteriosis can also spread from person to person via contaminated faeces.

What are the symptoms?

The symptoms generally develop between 1-10 days, most commonly 2-5 days, after the person is infected.

Symptoms include diarrhoea (which may be bloody) cramping, abdominal pain, fever, nausea and vomiting.

Most people recover within 2 to 5 days although sometimes it may take up to 10 days.

Many infected people may have no symptoms at all.

What is the infectious period?

While the *Campylobacter* bacteria remains in their faeces, infected people can pass the infection onto others. This can be from a few days to weeks after the symptoms have gone. The risk of infecting others decreases markedly after the diarrhoea has settled.

Who is at risk?

Anyone can become infected with *Campylobacter*, however the young, the elderly and malnourished people are most at risk of contracting severe disease.

What is the treatment?

Antibiotics are not usually recommended, or required, except in severe cases.

Anyone with diarrhoea should drink extra fluids to avoid dehydration. Children with diarrhoea, who vomit or who refuse extra fluids should see a doctor. Anyone with prolonged or severe diarrhoea, or who have symptoms that concern them, should see a doctor.

Medicines to prevent vomiting or diarrhoea should not be given, especially to children, except where specifically advised by a doctor.

How can campylobacteriosis be prevented?

Good hygiene and food handling practices are the best way to prevent campylobacteriosis.

Hands should be washed thoroughly with warm soapy water:

- after going to the toilet
- before preparing or handling food
- after handling raw poultry and meats
- after every nappy change
- after touching soiled linen
- after touching animals.

In the kitchen:

- cook all poultry thoroughly (no longer pink) and the juices run clear
- use separate cutting boards for meat and other foods
- carefully clean all cutting boards, counter tops and utensils with soap and hot water after preparing meat
- avoid drinking unpasteurised milk and untreated surface water

Other measures include:

- never change nappies on tables or counters where food is prepared or eaten

- clean change areas with warm soapy water and disinfectant after every nappy change
- clean books, toys, equipment, furnishings, floors and toilets regularly (including toilet door handles)

People with diarrhoea should not prepare or handle food that will be eaten by others.

How can it be controlled?

Anyone with diarrhoea should not attend childcare/school/work until the diarrhoea has ceased.

Anyone with diarrhoea should not swim, wade or paddle in public pools.

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

Disease Control fact sheets on various topics are available by contacting your nearest centre or from our web site at http://www.nt.gov.au/health/cdc/cdc.shtml

Influenza report

The influenza notifications for the Northern Territory to the end of the September quarter reflect the outbreak that has been seen nationally in 2007.

	Alice Springs	Barkly	Darwin	East Arnhem	Katherine	Total:
Jan			2			2
Mar			5			5
Apr			4			4
May			1			1
Jun			2			2
Jul	3	1	6		6	16
Aug	28	2	90	8	9	137
Sep	1		10			11
Total	32	3	120	8	15	178

Influenza A has dominated the notifications for 2007 with only 2 of the 178 being influenza B.

Influenza Type	Subtypes	Total
Influenza A Virus	H3N2 (not further characterised)	1
Influenza A Virus	Not typed	157
Influenza A Virus	H3N2 Wisconsin/67/2005-like*	14
Influenza A Virus	H1N1 Solomon Islands/3/2006-like	4
Influenza B Virus	Not typed	2

*In 2007 vaccine

Updated information about national influenza surveillance, pandemic influenza planning and avian influenza can be accessed from http://www.health.gov.au/internet/wcms/publishing.nsf/Content/portal-Influenza.

Dengue mosquito incursion and the eradication program on Groote Eylandt NT.

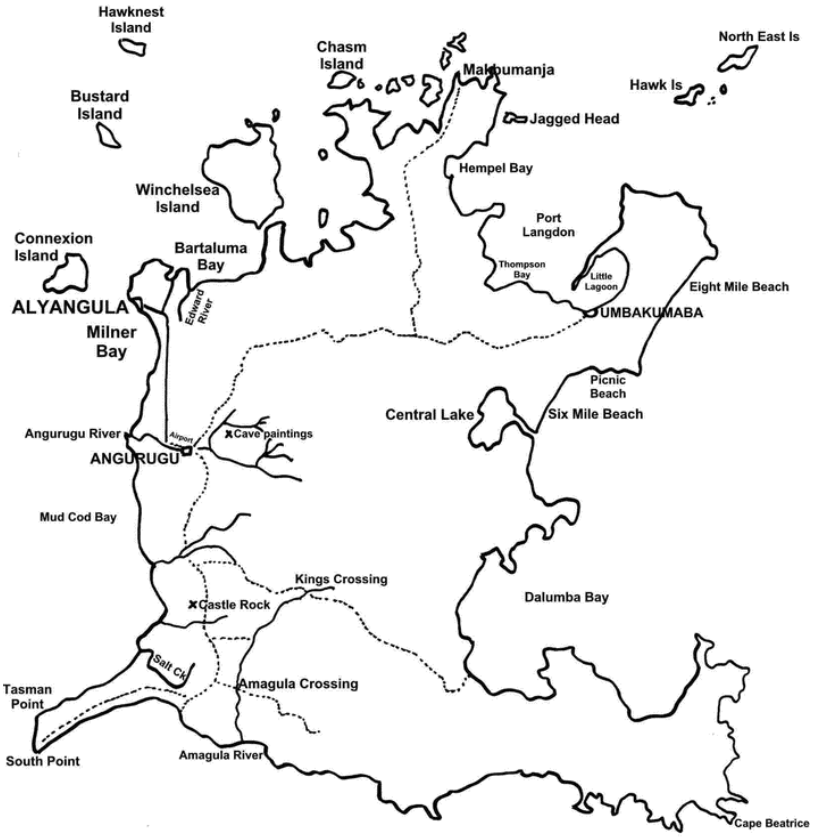
Myron Kulbac and Peter Whelan MEB, CDC Darwin

Introduction

Groote Eylandt, located in the Gulf of Carpentaria approximately 50 km off the east coast of Arnhem Land in the Northern Territory (NT), is Australia's third largest island (2258 sq km) (Figure 1). The largest town on the island is the mining town of Alyangula. The traditional owners are the Anindilyakwa people and there are a number of communities on the island, with the largest, Angurugu, located near the airport (Figure 2). A large manganese ore deposit in the western portion of Groote Eylandt is mined by GEMCO (Groote Eylandt Mining Company Pty Ltd) and regular shipments of ore are loaded at the wharf located near Alyangula. In Alyangula there are approximately 400 properties which house or support 1400 people who are mainly GEMCO employees or employees of support services. The town has a shopping arcade,

Figure 1. Groote Eylandt*

Figure 2. Groote Eylandt†



* Source: CRASE, B. and C. Hempel (2005): Object based land cover mapping for Groote Eylandt: a tool for reconnaissance and land based surveys. In: Proceedings of NARGIS 2005 - APPLICATIONS IN TROPICAL SPATIAL SCIENCE. 4th - 7th July 2005 Charles Darwin University, Darwin, NT, Australia.

† Source: Groote Eylandt Map (black/white) http://www.users.bigpond.com/mjantke

recreation club, school and health centre, with the port located approximately one kilometre from the town centre.

In October 2006, the dengue mosquito (*Aedes aegypti*), which is capable of transmitting the dengue virus, was discovered in the port area of Alyangula. This report outlines the detection and NT response to this exotic vector incursion.

Dengue disease and the mosquito vector.

Dengue is a viral disease that causes high fever lasting 3-7 days, severe frontal headache and muscle and joint pains. A more severe form, dengue haemorrhagic fever, can progress to coma and can be fatal. Dengue is an increasing public health problem in tropical regions of the world, with large outbreaks involving many thousands of cases of disease and many deaths in various tropical countries to our north.

Although dengue virus disease is not endemic in Australia, the major vector of this disease, *Aedes aegypti*, is present in North Queensland where importation of the virus in infected travelers leads to regular outbreaks of dengue disease.[1] The NT has been free of *Aedes aegypti* since the late 1950s to early 1960s when it disappeared as a result of a combination of elimination of rainwater tanks and a reduction of other favoured breeding sites.[2]

The NT is particularly vulnerable and receptive to the reintroduction of the dengue mosquito. There have been numerous interceptions of *Aedes aegypti* on vessels and cargo in the Darwin Port area by the Australian Quarantine Inspection Service (AQIS) and a number of detections have also been made in ovitraps around the Darwin Port area.[3,4,5]

The NT is also vulnerable to importation of *Aedes aegypti* from North Queensland. An incursion of *Aedes aegypti* into Tennant Creek in 2004 during the building of the Alice Springs to Darwin railway project was declared eradicated in 2006 after an intensive program by the Medical Entomology Branch (MEB) of the Department of Health and Community Services (DHCS).[6] DNA analysis of these mosquitoes indicated the incursion was imported from North Queensland.[7]

Detection of incursion

The MEB operates a surveillance program across the NT to detect the possible importation or establishment of exotic mosquitoes and particularly those *Aedes* species that can carry dengue.[8] This surveillance is aimed particularly at ports that are visited by overseas vessels, and includes Alyangula.

The surveillance program includes the use of special egg traps (ovitraps) that consist of a black coated, 2-litre glass jar containing water and a 'masonite' paddle. The paddle provides a very attractive place for female *Aedes aegypti* to lay eggs. Each week the ovitraps are inspected for larvae and the paddles are sent to the MEB in Darwin for inspection and rearing of any eggs to 4th instar larvae for identification.

During routine sampling of an ovitrap from the Alyangula wharf area retrieved on 31 October 2006, 5 *Aedes aegypti* mosquito larvae were identified from eggs reared from the paddle. The detection of these larvae indicated that at least 1 female *Aedes aegypti* had been imported to the island. An analysis of the DNA of these specimens indicated that this incursion was not imported from North Queensland, but rather from some unknown overseas location. The likely mode of transport was probably as eggs on freight or rubbish items from an overseas vessel arriving at Alyangula, or discarded water receptacles from an illegal fishing vessel.

Eradication program - Alyangula

Following the discovery of the *Aedes aegypti* mosquito at Alyangula port, the MEB quickly deployed a control team of MEB and other DHCS staff to Groote Eylandt to survey and treat any water holding receptacles in the port and nearby residential area. The methods used were those employed in the Tennant Creek eradication program and for receptacle treatment in receptacles onboard overseas vessels arriving in the NT.[9] At the same time, the NT DHCS applied to the Commonwealth Department of Health and Ageing for financial assistance for an eradication program.

An initial survey indicated that the dengue mosquito was widely established in the

Alyangula residential area. A program of house-to-house surveying and spraying of insecticides was initiated in November 2006. Every potential mosquito-breeding receptacle was sprayed with the residual insecticide lambda-cyhalothrin (DEMAND) and many sites that were likely to harbour adult dengue mosquitoes were treated with bifenthrin (BRIGADE). Receptacles used for pet or human food, water consumption, or recreation were cleaned with chlorine to ensure any eggs on the insides of the container were destroyed. Pools of water found in tanks, boats or other large receptacles that could not be drained were treated with methoprene (PROLINK) mosquito growth hormone pellets or briquettes to prevent further mosquito breeding.

At the completion of the first round of inspection and treatment in December 2006, 45 (10.1%) Alyangula properties were found to be positive for *Aedes aegypti*. As can be seen in Table 1, subsequent surveys and treatments of Alyangula have reduced the presence of *Aedes aegypti* in Alyangula properties, with 18 (4.0%) properties positive for *Aedes aegypti* at the end of Round 3 in April 2007 and 1 (0.2%) property positive at the end of Round 4 in June 2007. By continuing regular rounds of survey and treatment, it is hoped that this trend will continue until the mosquito is completely eradicated. It is anticipated that this will take until the end of the 07/08 wet season.

Survey and treatment programs – other Groote Eylandt and neighbouring communities

The other major communities on Groote Eylandt include Angurugu (169 properties) and Umbukumba (67 properties). There are also a number of smaller communities and outstations, which range from 2 to 10 properties. As can be seen from Table 1, most of these communities have been surveyed and treated at least 2 or 3 times since November 2006.

Angurugu, which is located approximately 20 kms from Alyangula, was the only other community where *Aedes aegypti* larvae were found. They were present only in a single property. The larvae were found in a boat, which had been recently towed from Alyangula and fortunately were discovered before the mosquito was able to establish itself in Angurugu. After the first rounds of survey and treatment in Angurugu, no further properties have been found positive for *Aedes aegypti* in this or any of the other communities on Groote Eylandt, apart from Alyangula.

Bickerton Island and Numbulwar are 2 communities located relatively close to Groote Eylandt. These communities have regular barge and private dinghy sea connections to Groote Eylandt and are possible sources or destinations where *Aedes aegypti* could be transported to or from Alyangula. Both communities have been visited twice by the eradication teams and to date there have been no properties positive for *Aedes aegypti*.

Ongoing eradication program

The NT DHCS requested and received $582,000 funding assistance from the Commonwealth Department of Health and Ageing in March 2007 for a 2-year program to conduct full scale eradication and surveillance operations on Groote Eylandt and nearby island and mainland localities. This enabled the funding of a 6-person eradication team, who have been conducting the eradication program since December 2006 on a fly-in-fly-out weekly basis. Other financial and logistic support has been provided by GEMCO and the NT Government. GEMCO acknowledge the potential consequences of a dengue outbreak in the Groote Eylandt communities and have been very supportive by providing staff and facilities to assist the program.

In the dry season months of 2007, the eradication teams will focus on Alyangula to further reduce the number of actual and potential breeding sites by treating all receptacles with insecticide, by promoting clean up strategies to remove potential breeding receptacles, and by operating adult mosquito trapping devices in higher potential breeding locations. The traps will be used in higher potential breeding locations to both detect any remaining *Aedes aegypti* and to locate potential breeding places by detecting the location of endemic *Aedes* species. GEMCO has also committed to help by purchasing equipment which will clean out and improve the towns underground storm water drainage systems and clean house roof gutters to prevent water pooling. Staff of the GEMCO Health, Safety, Environment and Quality Department have also agreed to participate in a

Table 1. Groote Eylandt *Aedes aegypti* Eradication Program 2006 / 07

Groote Eylandt and nearby Major Communities Progress Data Summary						
				PROPERTIES		
Location	**Round No.**	**Start Date**	**Finish Date**	**Surveyed & Treated**	**Surveyed Only**	**Positive for *Aedes aegypti* (%)**
Alyangula	Round 1	07/11/2006	11/12/2006	445		45 (10.1)
	Round 2	18/12/2006	19/01/2007	445		22 (4.9)
	Round 3	06/03/2007	12/04/2007	445		18 (4)
	Round 4	27/05/2007	22/06/2007	445		1 (0.2)
Alyangula Port/Industry	Round 1	15/11/2006	23/11/2006	29		0 (0)
	Round 2	15/02/2007	23/02/2007	29		0 (0)
	Round 3	13/04/2007	23/04/2007	29		0 (0)
	Round 4	18/06/2007	25/06/2007	29		0 (0)
Angurugu	Round 1	27/11/2006	01/12/2006	169		1 (0.6)
	Round 2	15/01/2007	01/02/2007	169		0 (0)
	Round 3	19/04/2007	29/05/2007	169		0 (0)
Mine Site	Round 1	16/04/2007	17/04/2007	14		0 (0)
Umbukumba	Round 1	13/12/2006	13/12/2006	67		0 (0)
	Round 2	08/02/2007	08/02/2007		61	0 (0)
Milyakburra (Bickerton Is.)	Round 1	12/12/2006	12/12/2006	47		0 (0)
	Round 2	13/02/2007	13/02/2007		48	0 (0)
Numbulwar Mainland	Round 1	20/12/2006	20/12/2006	84		0 (0)
	Round 2	14/02/2007	14/02/2007		130	0 (0)

Table2. Groote Eylandt *Aedes aegypti* Eradication Program 2006 / 07

Groote Eylandt Minor Communities Progress Data Summary						
				PROPERTIES		
Location	**Round No.**	**Start Date**	**Finish Date**	**Surveyed & Treated**	**Surveyed Only**	**Positive for *Aedes aegypti* (%)**
Malkala	Round 1	28/11/2006	28/11/2006	10		0 (0)
	Round 2	07/02/2007	07/02/2007	10		0 (0)
	Round 3	18/04/2007	18/04/2007	10		0 (0)
Bartalumba Bay	Round 1	17/11/2006	17/11/2006	4		0 (0)
	Round 2	07/02/2007	07/02/2007	4		0 (0)
	Round 3	18/04/2007	18/04/2007	4		0 (0)
Dugong Beach Resort	Round 1	19/04/2007	19/04/2007	1		0 (0)
	Round 2	21/06/2007	21/06/2007	1		0 (0)
Gibie Development	Round 1	17/04/2007	17/04/2007	6		0 (0)
	Round 2	21/06/2007	21/06/2007	6		0 (0)
Ndunga	Round 1	17/04/2007	17/04/2007	6		0 (0)
Emerald River	Round 1	30/11/2006	30/11/2006	3		0 (0)
	Round 2	23/04/2007	23/04/2007	3		0 (0)

general cleanup operation of the township to minimise water-bearing receptacles able to provide breeding locations.

Summary

Ten months after the discovery of *Aedes aegypti* on Groote Eylandt, the incursion is currently confined to the community of Alyangula and is at a very low level. It will be necessary to continue to survey all communities on Groote Eylandt and to maintain vigilance on other island and mainland sites. However most of the treatment effort for the foreseeable future will be focused on Alyangula. Survey and treatment of Alyangula properties will continue with new rounds of inspection and treatment every 6 weeks, with more intensive surveying, trapping and treatment operations in the 07/08 wet season. Adult mosquito trapping programs using visual attraction BG traps, dry ice baited EVS traps, and insecticide laced lethal ovitraps will help locate any possible remaining *Aedes aegypti* breeding sites, and further reduce the number of adult mosquitoes.

The aim of the program is to completely eradicate the dengue mosquito from Groote Eylandt and to put in place a continuous surveillance program to ensure that the island and the rest of the NT stays free of *Aedes aegypti,* and is hence free of the threat of dengue disease.

Acknowledgments

The current success of the eradication team has been made possible by the enormous contribution and cooperation of GEMCO and all the residents of Groote Eylandt who have provided assistance and allowed access to properties for inspection and treatment. The efforts of the eradication team are specially acknowledged including past members Geoff Cole, Graham Goodwin and Sam Gualandi, present members Brett Devitt, Bruce Hitchins, Kevin Horig, Melina McDowell, Colin Smith and Darren Bowbridge and all the staff of the MEB who were all involved initially in field activities and continue to be part of both field and support activities. The contribution of members of NAMAC and DoHA, particularly Phil Wright, in advocating for funding for the project, and Dr Vicki Krause of CDC, DHCS for organising bridging funding and overall support is also gratefully acknowledged.

References

1. Ritchie SA Hanna JN, Hills SL et al 2002. Dengue control in north Queensland: case recognition and selective indoor residual spraying. *Dengue Bulletin* **26**;7-13
2. Whelan PI. 1981. The vulnerability and receptivity of the Northern Territory to mosquito borne disease, *Transactions of the Menzies Foundation.* Vol. 2, 'Living in the North'. pp. 165-171.
3. Whelan PI, Hayes G, Tucker G, Carter J, Wilson A and Haigh B. 2001. 'The detection of exotic mosquitoes in the Northern Territory of Australia'. *Arbovirus Research in Australia,* Vol 8; 395-403.
4. Whelan PI, Russell RC, Hayes G, Tucker G and Goodwin G 2001. 'Exotic *Aedes* Mosquitoes: Onshore Detection and Elimination in Darwin, Northern Territory, Australia.' *CDI*,25; 4;283-285.
5. Whelan PI, Lamche G, Prosser C and Espinoza H 2003: 'Exotic Mosquitoes Detected in Cargo at East Arm Port Area 19 March 2003' *The Northern Territory Disease Control Bulletin* 10; 2; 29-30.
6. Whelan PI, Krause V, Lamche G and Kurucz N. 2004. '*Aedes aegypti* mosquitoes, vectors for dengue, found in Tennant Creek – Elimination Campaign in Progress'. *The Northern Territory Disease Control Bulletin.* 11:1:1-3.
7. Whelan PI, Pettit W, and Krause V. 2005. 'Dengue Mosquito Eradication Project Tennant Creek. End of January 2005 Progress Report'. *The Northern Territory Disease Control Bulletin.* 12:1:24-29.
8. Whelan PI. 2007. Mosquito Vector Control in the NT *The Northern Territory Disease Control Bulletin.* 12: 1; 24-29.
9. Shortus M, Whelan PI. 2006. Recommended Interim Water Receptacle Treatment for Exotic Mosquitoes on International Foreign Fishing Vessels Arriving in Australia. *Northern Territory Disease Control Bulletin.* 13:2.32-34.

****

Timor-Leste AusAID Mosquito Project – an update

Bill Pettit and Peter Whelan, Medical Entomology Branch, CDC, Darwin

Vector-borne disease in Timor-Leste

Mosquito-borne diseases are common in Timor-Leste. Approximately 20-25% of consultations in Timor-Leste's health facilities are either directly related to, or are compounded by mosquito-borne disease (dengue, malaria, Japanese encephalitis, filariasis and chikungunya).[1] Reducing the incidence of mosquito-borne disease in Timor-Leste will require a significant improvement in the training of vector control staff in vector control, and the planning and implementation of vector control programs to specifically target the mosquito species responsible for disease transmission.

A brief outline of the project

Since September 2006 the Northern Territory (NT) Department of Health and Community Services (DHCS) has been involved in an AusAID funded project in collaboration with the Timor-Leste Ministry of Health (MoH) in the area of mosquito surveillance and control. The aim of the project is to increase the capacity of the MoH to carry out effective mosquito surveillance and control programs so that the incidence of mosquito-borne disease in Timor-Leste can be reduced. This collaborative effort involves DHCS officers from both the Medical Entomology Branch (MEB) and the Health Policy Branch. Initially the Timor-Leste AusAID Mosquito Project will focus on the development and implementation of vector control programs to reduce the incidence of dengue in Timor-Leste.[2]

The key outputs of the 3-year project will be to:

- ensure that essential equipment and chemicals are available for training purposes;
- increase the skills of mosquito control and surveillance officers in Timor-Leste;
- provide assistance to develop and implement effective operational protocols for mosquito surveillance and control;
- provide assistance to improve community education on prevention of mosquito-borne disease; and
- provide assistance to improve the collection and analysis of data in relation to mosquito surveillance and mosquito borne disease.

Effect of civil unrest on project outcomes

Since the people of Timor-Leste formally gained independence from Indonesia in 2002 there have been intermittent periods of violent civil unrest, and several of these have been prominently reported in Australian media. Civil unrest in Timor-Leste (especially Dili) during the last 12 months has had a negative impact on the ability of the AusAID Mosquito Project to undertake regular training activities with MoH staff in Timor-Leste. It has also adversely affected the ability of senior MoH management to consider and implement DHCS proposed activities to improve the MoH dengue vector control program. Despite these difficulties there have been several positive outcomes from project activities that were carried out during the last year.

Procurement of appropriate insecticides and equipment for use in vector control

At the commencement of the AusAID Mosquito Project in September 2006 the MoH possessed very limited quantities of insecticides and functional insecticide application equipment with which to carry out dengue vector control activities. On the advice of DHCS, the MoH has since procured reasonable quantities of a range of insecticides for use in its Dengue Control Program (enough for Dili during one wet season), and PPE (Personal Protective Equipment) for 30 vector control field workers. The MoH is in the process of purchasing up to 65 hand-held pressure sprayers and 40kg of S-methoprene pellets (insect growth regulator). It is hoped that this equipment and insecticide will arrive in Timor-Leste before the onset of the build-up rains at the end of this year. The MoH will then have enough insecticides and application equipment to carry out an extensive receptacle treatment program in Dili during the next build-up and wet season. All vector control activities carried out in Dili will be evaluated

and used in dengue control programs in all districts where dengue is prevalent in following years.

The procurement process within the MoH can be lengthy. After the MoH receives quotes from local companies in Timor-Leste for the supply of goods it can take up to three months to receive the goods in Dili. Despite the length of the procurement process, DHCS is encouraging MoH vector control officers to use the MoH procurement process so that they:

1. gain experience in the procurement of essential vector control insecticides and equipment;
2. learn what information (product specifications, product reseller contact information) needs to be provided to local companies in order to ensure the supply of the specified goods to MoH;
3. build a good working relationship with the MoH Purchasing Department; and
4. gain an understanding of how the MoH procurement process works and how to use it most efficiently.

Vector control equipment and insecticide inventories in the districts of Timor-Leste are either very limited or non-existent. The MoH will need to make provision in its future budgets to purchase equipment and insecticide so these can be distributed to the districts and used to carry out appropriate vector control as required.

Mosquito surveillance and control training of MoH staff

In September 2006, 2 MoH officers (Ivo Guterres and Bernadino da Silva) travelled to Mandurah, WA, to participate in a 5-day mosquito surveillance and control course. The course introduced the MoH officers to mosquito surveillance and control training and theory, and also gave them a chance to spend time and exchange information with officers that implement vector surveillance and control programs in Australia.

The knowledge gained by the 2 MoH officers at the mosquito surveillance and control course in Mandurah was quickly put to use when they assisted DHCS officers to deliver a 3-day vector surveillance and control workshop for Dili-based vector control officers and volunteer staff in Dili in October 2006. Ivo and Bernadino capably coordinated the logistics support for the workshop and also acted as interpreters for the sessions that were presented in English. The workshop was hosted by the MoH, while the lectures and practical sessions were produced and presented by MEB officers Peter Whelan and Bill Pettit. The subjects covered in the workshop included mosquito biology and identification, field surveys for larvae and adults, insecticide and application equipment handling and use, and the insecticide treatment of receptacles for the control of breeding mosquitoes (ie dengue mosquitoes). The practical sessions of the course provided participants with an opportunity to handle and use insecticide application equipment, identify actual and potential dengue mosquito breeding sites, and to view mosquito larvae and adults under the microscope.

In the second year of the project DHCS and MoH are planning to conduct another mosquito surveillance and control workshop in Dili for MoH vector control staff and volunteers (November 2007), and DHCS plans to host a number of study tours to Darwin for MoH staff to learn about the planning, implementation and management support of vector control programs. Lecture notes and general information handouts will be translated to Tetum (the native language of Timor-Leste) when possible.

DHCS role in planning mosquito control activities in Timor-Leste (2006/2007)

A major aim of the AusAID Mosquito Project is to assist the MoH in the development and implementation of effective operational protocols for mosquito surveillance and control. The initial focus of the project is on dengue vector surveillance and control and a document, *Operational Plan and Protocols for Dengue Outbreak Control in Dili,* has been developed and presented to the Vice-Minister of Health Timor-Leste for consideration (May 2007). A complementary document, *Operational Plan and Protocols for Routine Dengue Mosquito Surveillance and Control in Dili,* is being finalised and will soon be presented to the Vice-Minister of Health for consideration. These 2 documents contain DHCS recommendations and protocols for the control of dengue vectors on a

year round basis. They are based on DHCS operational protocols, on world best practice (mosquito control literature and WHO recommendations), and have been tailored for use by MoH staff and volunteers.

Adoption and implementation of DHCS recommendations by MoH (2006/2007)

A number of the DHCS recommendations and protocols for MoH have already been tested in the field by MoH staff and volunteers in Dili during the 2006/2007 build-up and wet season. A 3-day Pilot Project for Dengue Outbreak Control in Dili (Pilot Project) in December 2006 trialled the use of some of the DHCS recommendations for property inspections and insecticide treatment of receptacles. During the Pilot Project, Bill Pettit (DHCS) provided demonstrations and guidance to 8 MoH staff and volunteers on how properties should be surveyed for dengue mosquito larvae and how receptacles should be treated with insecticide to prevent colonisation by mosquitoes (Figure 1). The project took place in the Dili suburb of Motael, and in a 3-day period the group (in 3 teams) surveyed and treated 54 houses. The project gave MoH staff and volunteers practice in the handling and use of insecticides and application equipment, and demonstrated to them that the DHCS protocols can be applied in the field in Timor-Leste.

A dengue outbreak started in Dili in January 2007 and provided an opportunity for MoH staff to implement some of the DHCS recommendations for dengue outbreak control that were included in the Operational Plan and Protocols for the Pilot Project (December 2006). During a 1-week period while Bill Pettit (DHCS) was in Dili 2 dengue case houses were identified and all houses within a 50m radius were inspected for mosquito larvae and treated with insecticide. A total of 77 houses in 2 separate urban areas of Dili were inspected and insecticide treated in a 3-day period by 8 MoH staff and volunteers. This dengue intervention activity was very limited in extent and did not cover all of the dengue case houses in Dili that were known to the MoH. It was a valuable training exercise for MoH staff and volunteers, but it was not a realistic attempt to limit the spread of dengue in Dili at that time.

Although the MoH has not formally accepted and adopted any of the DHCS formal recommendations for the dengue control program, the trial use of some of the recommendations on several occasions during the 2006/2007 wet season indicate that the MoH has been willing to accept DHCS assistance and test DHCS recommendations in the field. The MoH has also made purchases of insecticide and equipment based on DHCS recommendations.

Implementation of dengue control programs in Timor-Leste

Periodic civil unrest in Timor-Leste during the last 5 years since independence has caused the displacement of up to 10% of the country's 923,000 people from their homes.[3] As a direct result of civil unrest no DHCS project officer has travelled to Timor-Leste since the end of February 2007. This has made it difficult for DHCS staff to work through the DHCS proposals with MoH senior management and vector control staff, and trial aspects of the proposals on the ground. Since the last visit communications between DHCS and their MoH counterparts has continued by phone, email and fax. A visit by the Project's Medical Entomologist/Technical Advisor, Bill Pettit was carried out in the first week in October 2007.

In June 2007 Timor-Leste had parliamentary elections, and the new government was sworn in to parliament in early August 2007. The Timor-Leste Mosquito Project has enjoyed a high level of support from the outgoing Minister of Health, Dr Rui Araujo, and the outgoing Vice-Minister of Health, Mr Luis Lobato. This high level of support looks set to continue under the leadership of the new Minister of Health, Dr Nelson Martins. Dr Martins recently completed his PhD, *Operational research on tuberculosis control program in Timor-Leste*, with the Menzies School of Health Research in Darwin.

Future for AusAID Mosquito Project in Timor-Leste

AusAID has agreed to fund the Timor-Leste Mosquito Project for a period of 3 years to September 2009, conditional on the achievement of agreed outcomes. While current conditions in

Figure 1. MoH staff surveying for dengue mosquito larvae in an area of dengue transmission in Dili.

Timor-Leste make it unlikely that all agreed project outcomes will be achieved, progress is being made towards the establishment of practical vector control programs. A continuation of AusAID funding in the second and third years of the project will give DHCS many opportunities to work with the MoH to implement effective vector control programs at both national and district levels.

References

1. East Timor Ministry of Health (2005), National mosquito-borne disease control strategy (draft). Version 11/2005.
2. Pettit W. and Whelan P. (2006) East Timor AusAID Mosquito Project. *NT Dis Control Bull.* 2006;13(3): 17.
3. UN OCHA (2007) Consolidated Appeals Process – Timor Leste.

****

Detection and elimination of *Aedes albopictus* on cable drums at Perkins Shipping, Darwin, NT - April 3 2007

Huy Nguyen & Peter Whelan, Medical Entomology Branch, CDC, Darwin

Introduction

Northern Australian seaports are considered the most at-risk ports for exotic mosquito introduction in Australia.[1] Northern Territory (NT) seaports, such as those in Darwin and Nhulunbuy are especially vulnerable since they tend to be the first port of call for international seagoing vessels including cargo vessels, foreign fishing vessels, refugee boats and yachts.[2] These vessels have the ability to harbour and transport exotic mosquitoes as eggs, larvae and or adults in drinking water receptacles such as large drums, jerry cans[3] and any artefacts that have the capacity to hold water, including tarpaulins, machinery, equipment, and vehicle tyres.[4]

The Australian Quarantine Inspection Service (AQIS) conducts inspections of all seagoing vessels and cargo to detect and eliminate any importations of exotic vectors. The Medical Entomology Branch (MEB) of the Centre for Disease Control, NT Department of Health and Community Services, also conducts routine surveillance for exotic mosquito introductions by trapping for adult mosquitoes and egg laying occurrences using ovitraps. In addition, precautionary ground surveys and treatments for receptacles in and around the 400m-quarantine containment zone* that have the potential to harbour and breed mosquitoes are undertaken at the start of each wet season. During a routine cargo pre-clearance inspection in April 2007, an AQIS officer found larval mosquitoes present in water pooling in the structures of cable drums. This report details the detection and elimination measures implemented after this detection.

Detection

On the morning of the 3 April 2007, an AQIS officer conducted a pre-clearance inspection of cargo that had arrived from Singapore on the previous day and had been unloaded onto Perkins International Shipping Wharf in the Darwin Port area. The cargo consisted of 27 loose 30 tonne cable drums (Figure 1), all of which held water or had been holding water at some stage. Water was seen collecting in the spokes (Figure 2) of the drum structures and pooling on the centre axle surface (Figure 3). Total water volume held by each cable drum varied with a maximum water volume estimated to be up to 5 litres. The AQIS officer commented that while the cable drums were unloaded from the ship onto the wharf, water held within the drum structures were seen spilling out.

A preliminary identification of samples was conducted at AQIS laboratories with the larvae identified as belonging to the *Aedes scutellaris* group. These were confirmed as *Ae. scutellaris* group, probably *Aedes albopictus* (Skuse) species by a medical entomologist at the MEB on the same day of collection. The diagnostic features of the larval specimens were found to be at variance with published descriptions, similar to that found by Lamche and Whelan,[5] with one aberrant specimen having the appearance of *Aedes pseudoalbopictus.*

Of the 27 cable drums, 2 were positive for mosquito larvae, which consisted of five larvae and 1 pupa. The mosquito samples were collected from the spokes of the drum structures and preserved in 70% alcohol on site. No flying adult mosquitoes were observed.

A MEB follow up site survey of the cargo for possible pupal skins to indicate the possibility of adult emergence and dispersal, resulted in the collection of 2 more 2nd instar larval specimens from the spokes of a cable drum, but no pupal skins. Thus, a total of 3 cable drums were positive with 7 larvae and 1 pupa. The 2nd instar larvae were reared in the MEB insectary to the 4th instar and then through to the adult stage in a secure rearing capsule. The emerged single female and single male adult specimens were confirmed as *Ae. albopictus.*

* Any equipment or animals arriving from foreign ports (not necessarily international) are received into a quarantine zone, an area in which 'goods' are placed under strict movement control until appropriately tested and or treated to prevent exotic pests and diseases from establishing in an area previously free from such organisms. The quarantine zone in this case extends 400m radius from the wharf docking area.

Figure 1. Quarantined cable drum

Figure 2. *Ae. albopictus* larvae found in water pooling in spokes

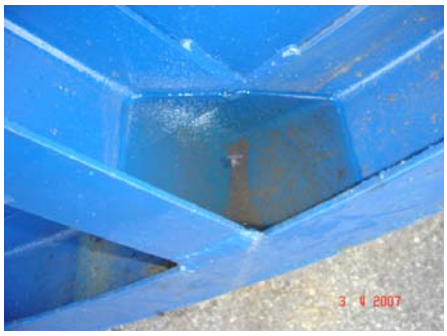


Figure 3. Central axle holding water

Figure 4. Fogging route: Perkins shipping area

The presence of a single male pupa and a small number of larvae indicate a low to moderate importation risk. For *Ae. albopictus* eggs hatched as a batch, male mosquitoes tend to emerge before female mosquitoes, thereby enabling them to be ready for flight and to copulate with newly emerged females. Although no pupal skins were collected from the water in the cable drum spokes, the water that had been displaced while loading the drums onto the wharf could have contained more larvae, pupae or pupal skins. Therefore, possible adult emergence could not be discounted.

Elimination Procedures

After the AQIS and MEB samples were collected from the cable drums, a chlorine treatment of the water was performed and a spray of Perigen® 500 (active ingredient: permethrin 500g/L) was applied by an AQIS approved pest control contractor to all surfaces capable of holding water when rotated. This was an interim measure to kill any possible larvae or pupae remaining in the water contained on the cable drums until fumigation of the 27 cable drums for possible eggs could be conducted. Three to 4 cable drums at a time were covered and fumigated by a contract pest controller with methyl bromide for 24 hours at 48g/m3 at 21^{o} or above from 4 April over a one-week period.

A precautionary adulticide fogging operation was conducted by MEB on the evening of 3 April. Perkins Shipping and the neighbouring industrial premises, Frances Bay Marine, were fogged (Figure 4) using an Ultra Low Volume (ULV) LECO fogging machine with an application of bioresmethrin at a ratio of 1:1.5 insecticide to diesel, and at a rate of 330ml per minute. All Perkins personnel were absent excluding security personnel. The Perkins shipping area, including the engineering yard and sheds and building areas that could be accessed, was fogged from between the hours 18:30 to 19:10 and 19:27 to 19:44. The next-door premise, Frances Bay Marine, was fogged between 19:14 and 19:23.

Surveillance

Adult mosquitoes

One routine Encephalitis Virus Surveillance (EVS) adult mosquito trap and 2 extra EVS adult mosquito traps A and B were set by AQIS on a

Figure 5. AQIS increased adult mosquito surveillance; Perkins shipping area: includes MEB and AQIS routine ovitrap locations

Interception Point

AQIS Routine EVS Adult Mosquito Trap Site (REAMTS)

Extra EVS Adult Mosquito Trap Site, AQIS

MEB and AQIS ovitraps as indicated

To see in detail refer to website http://www.nt.gov.au/health/cdc/bulletin/index.shtml

weekly basis from the 12 April to 10 May within the Perkins Shipping compound to monitor for possible adult *Ae. albopictus* presence (Figure 5). The traps did not pick up any adult *Ae. albopictus*, but did suggest the presence of a possible breeding site for exotic mosquitoes as indicated by 12 adult *Culex quinquefasciatus* in the Perkins EVS trap A.

Larval

Previous recent ground surveys and treatment of mosquito breeding receptacles in the Perkins Shipping yard by AQIS and the MEB found *Cx. quinquefasciatus* breeding in water holding receptacles such as tyres that were used by Perkins and Frances Bay Marine as cushioning devices. These may be the possible source of the adult *Cx. quinquefasciatus* found in the EVS adult mosquito traps.

Ovitrap

The operation of routine AQIS and MEB ovitraps (Figure. 5) was seen as sufficient for the risk level present. No *Ae. albopictus* were detected within the ovitraps collected from the Perkins shipping area for the next 2 months.

Conclusion

The elimination procedures and increased surveillance efforts outlined above were deemed appropriate to conclude that there was no establishment of *Ae. albopictus* from this importation.

If there were any adult mosquito survivors from this importation, the routine adult monitoring trapping and ovitraps set in the area are considered adequate to detect any subsequent establishment after the start of the next wet season. A precautionary ground survey and treatment round will be conducted at the beginning of the wet season around November by AQIS and the MEB.

Acknowledgments

Mr. Stuart Hensen of AQIS for detection and organising cargo fumigation, and Mr. William Pettit of the MEB greatly assisted in the fogging operation.

References

1. Russell R. A Report to AQIS on the Requirements and Procedures for Vector Mosquito Monitoring at Quarantine Proclaimed First Ports of Entry (Sea-and Air-) to Australia. 1998 *(Unpublished).*
2. Whelan PI. The vulnerability and receptivity of the Northern Territory to mosquito borne disease. *Transactions of the Menzies Foundation, vol. 2, Living in the North*, 1981;*165-171*.
3. Whelan PI. (2002). Exotic mosquitoes arriving on seagoing vessels: recommended inspection & eradication procedures. *Bull. Mosq. Cont Assoc. Aust. 1998;10(2).*
4. Whelan PI. (1991). The Northern Territory remains free of Dengue Fever vectors. *Bull. Mosq. Cont Assoc. Aust. Vol.3 (1):7-9.*
5. Lamche GD, Whelan PI. Variability of larval identification characters of exotic *Aedes albopictus* (Skuse) intercepted in Darwin, Northern Territory. *CDI. 2003;27(1):105-109.*

****

Disposal of used injecting equipment in the Northern Territory

Jamie Broadfoot, CDC, Darwin

This paper outlines issues related to the disposal of used injecting equipment in the Northern Territory (NT). It is in response to a recent article published in the *Sunday Territorian* newspaper discussing a needle stick injury to a member of the public whilst walking on the beach.

Blood-borne virus infections that can potentially be transmitted by a needle stick injury include HIV, hepatitis B and hepatitis C. As these viruses do not survive for long outside the body, the risk that a member of the public will contract one of them following a community needle stick injury is minimal.

A 2003 review found that there have been no *published* cases of blood-borne virus transmission following community needle stick injury in Australia.[1] The authors of this review concluded, "The risk of blood-borne virus transmission from syringes discarded in community settings appears to be very low. Despite this, procedures to systematically follow up individuals following significant needle stick exposures sustained in the community setting should be developed."

A more recent case study in 2006 outlined 2 cases of hepatitis C seroconversion following community needle stick injuries. It concluded that all needle stick injuries should be properly investigated with appropriate pathology.[2]

The NT Misuse of Drugs Act (2006) requires that needles and syringes used in the administration of dangerous drugs be put into a rigid walled and puncture resistant container that is sealed and does not allow the contents to be a danger to others. This container can then either be placed in the household bin with normal garbage or handed in to an existing needle and syringe program (NSP) outlet, pharmacy or identified NSP waste disposal bin.

The ideal way to dispose of used injecting equipment is to use dedicated sharps containers. These are available free of cost at any of the 13 NSP outlets in the NT and can be returned to them or placed in waste disposal bins for incineration at a later date. Disposal in household garbage is not encouraged.

The NT has 3 primary and 10 secondary NSP outlets, which account for an annual output of approximately 400,000 syringes. This does not include needle and syringe sales from NT pharmacies, which are likely to be considerable, or the usage of insulin syringes by people with diabetes.

Community Sharps

The safe management of needles, syringes and other sharps used by injecting drug users (IDU) is an important public health initiative. An important role of the NSP is the collection of used injecting equipment. Needles and syringes that are used in the non-clinical arena (including usage undertaken at home or in public places) are collectively known as community sharps.

The NT NSP uses 3 major disposal strategies to ensure the safe collection and disposal of community sharps. These are:

- puncture-resistant 'generic' containers (eg. drink bottles) discarded in household garbage (not encouraged),
- community drop boxes, and
- sharps containers turned in at the NSP outlets located around the NT (listed overpage in Table 1).

Table 1. Northern Territory Needle and Syringe Programs

Site	Location	Hours of service	Contact Details
Alice Springs Centre for Disease Control (CDC)	Alice Springs Hospital- Gap Rd. (Opposite the Centralian Advocate Newspaper)	8am - 4.20pm	8951 7549
Alice Springs Hospital Emergency Department (ED)	Alice Springs Hospital	4.20pm - 8am	8951 7777
Northern Territory AIDS and Hepatitis Council- Alice Springs	14 Railway Terrace, Alice Springs	Mon to Fri: 9.30am – 5.30pm Sat: 10am – 2pm	8953 3172
Tennant Creek CDC	Tennant Creek Hospital (beside ambulance depot)	8am - 4.20pm	8962 4250
Tennant Creek Hospital ED	Tennant Creek Hospital	4.20pm - 8am.	8962 4399
Yulara Medical Centre RFDS	Yulara Drive Yulara.	8am - 5pm	8956 2286
Katherine CDC	Katherine Hospital	8am - 4.20pm	8973 9049
Katherine Hospital ED	Katherine Hospital	4.20pm - 8am	8973 9211
Nhulunbuy CDC	Cnr Matthew Flinders Way and Chesterfield circuit, Nhulunbuy	8am - 4.20 pm	8987 7037
Gove District Hospital ED	Gove District Hospital	4.20pm - 8am.	8987 0211
Northern Territory AIDS and Hepatitis Council- Darwin	46 Woods Street, Darwin.	Mon to Fri: 9am – 5pm Sat: 9am – 2pm	8941 1711
Northern Territory AIDS and Hepatitis Council- Palmerston	Palmerston Health Precinct Cnr Temple Terrace and Royston Avenue Palmerston	Mon-Thur: 10am to 4.30pm Fri: 10am to 5.30pm Closed for lunch: 12.30-1.30pm	8931 3676

Although NT NSPs do not operate on an exchange basis, they are required to provide sharps disposal facilities including providing free disposal containers for injecting equipment and places in which to appropriately dispose of disposal containers when full. The systems used differ depending on locality. Darwin, Palmerston and Alice Springs, for example, have large 240L medical waste bins that are accessible 24 hours a day. They are located at the 3 primary NSP outlets at the NT AIDS and Hepatitis Council premises and are regularly collected by a waste management contractor and delivered to NT hospitals to be disposed of with other medical biohazard material. The 10 secondary NSP outlets also provide free disposal containers and accept their return when full. Operating times differ depending upon location and details can be found in Table 1. NT hospital emergency departments (except Darwin) also operate as secondary NSP outlets outside of normal business hours.

These waste management initiatives operate to minimise the inappropriate disposal of community sharps and any risk to the public.[3] Experience has shown that the most successful community sharps management programs involve partnerships and a shared responsibility approach between IDUs, local councils, health departments, waste contractors and non-government organisations.

For any needles or syringes found in public places please call the NT AIDS and Hepatitis Council on the number above or contact your local council.

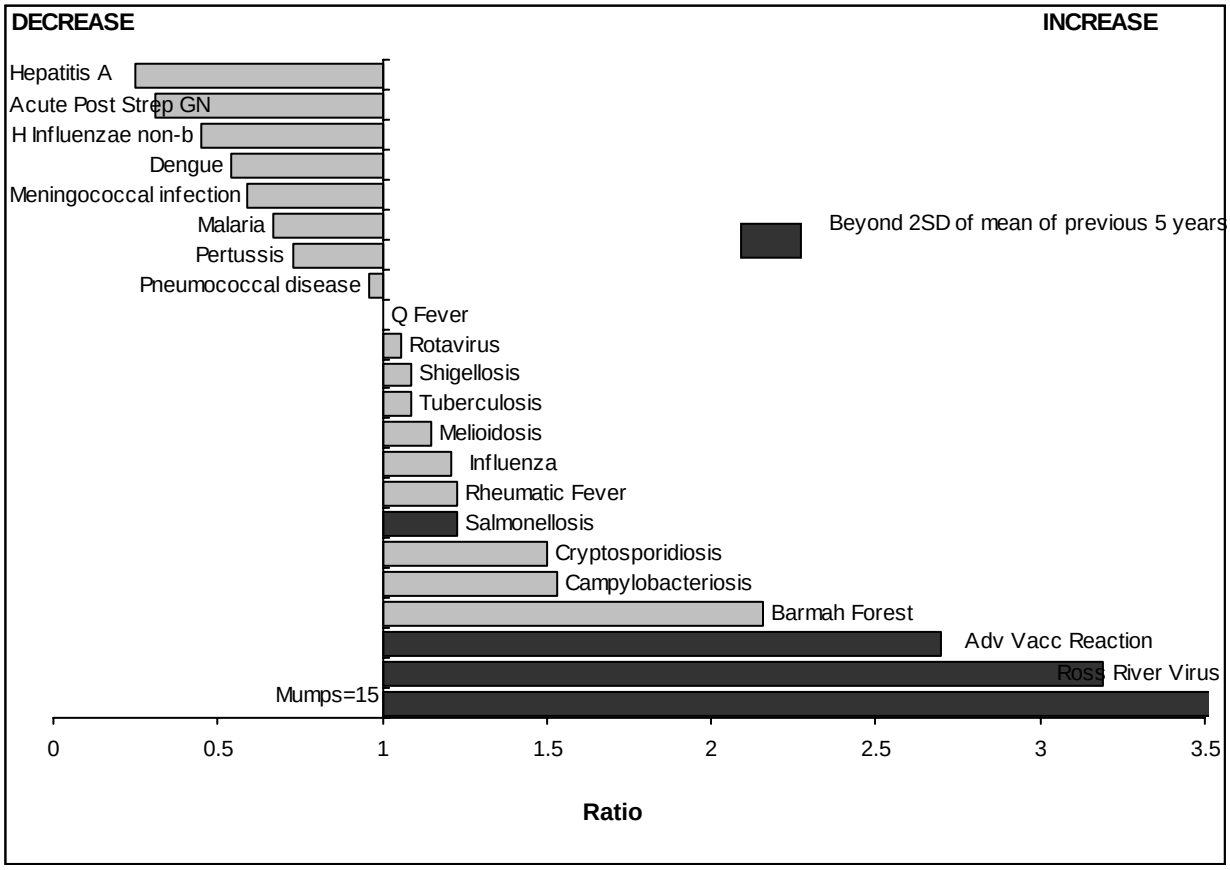
References

1. Thompson SC, Boughton CR, Dore GJ. Blood-borne viruses and their survival in the environment: is public concern about community needle stick exposures justified? *Aust N Z J Public Health.* 2003 Dec; 27(6): 602-7.
2. Haber PS, Young MM, Dorrington L, Jones A, Kaldor J, De Kanzow S, Rawlinson WD. Transmission of hepatitis C virus by needle-stick injury in community settings. *Journal of Gastroenterology and Hepatology*. 2006 doi:10.1111/j.1440-1746.2006.04568.x
3. NSW Health. Community Sharps Management Guidelines for NSW Councils. (2004).

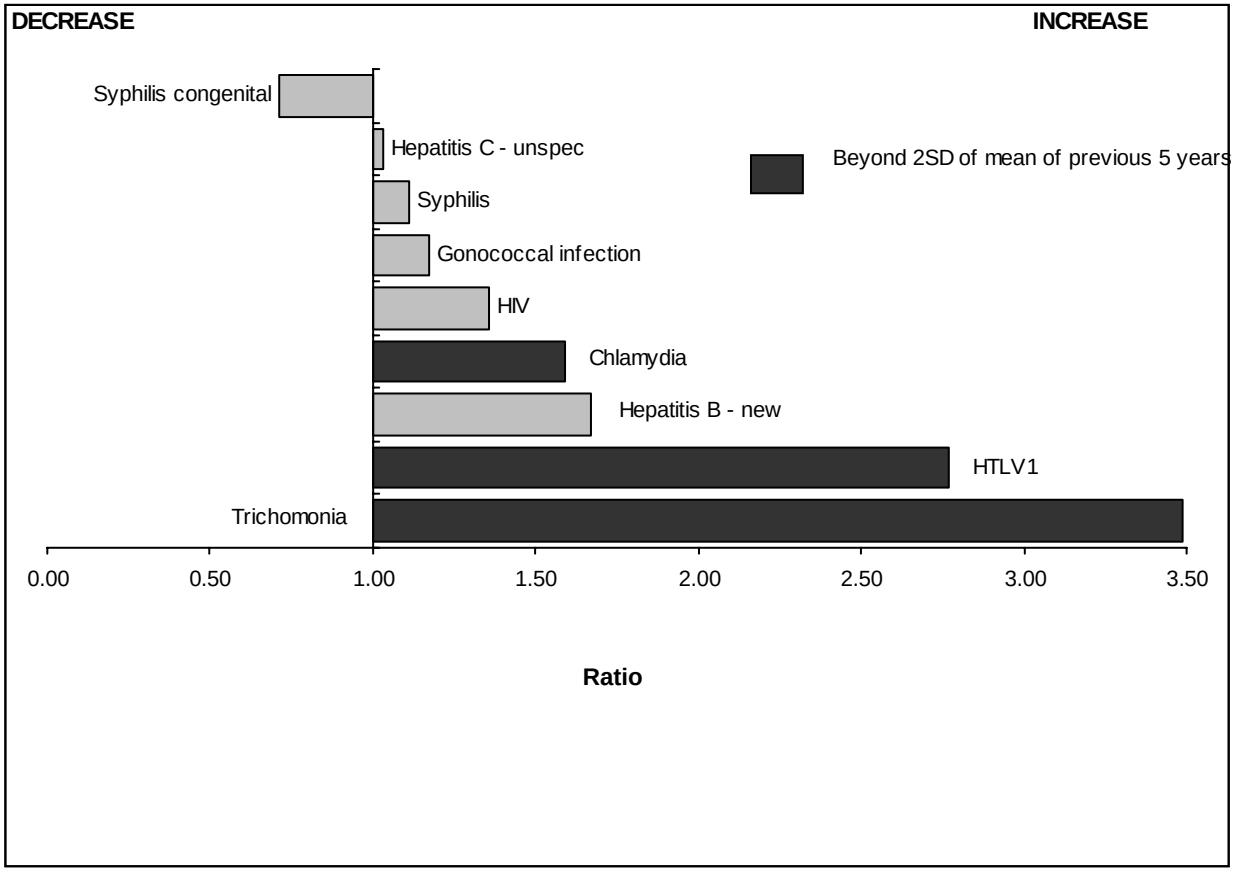
NT NOTIFICATIONS OF DISEASES BY ONSET DATE & DISTRICTS
1 April - 30 June 2007 & 2006

	Alice Springs		Barkly		Darwin		East Arnhem		Katherine		NT	
	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006
Acute Post Streptococcal GN	3	0	0	0	0	6	0	0	0	0	3	6
Adverse Vaccine Reaction	2	2	0	0	18	6	0	2	0	0	20	10
Amoebiasis	0	0	0	0	0	1	0	0	0	0	0	1
Barmah Forest	3	5	0	0	23	21	2	6	4	5	32	37
Campylobacteriosis	24	14	4	2	61	42	2	3	7	4	98	65
Chickenpox	3	2	0	0	13	15	1	1	3	5	20	23
Chlamydia	396	286	7	1	212	173	48	30	45	33	708	523
Chlamydial conjunctivitis	7	0	1	0	2	2	0	1	1	0	11	3
Creutzfeldt-Jakob disease	0	1	0	0	0	0	0	0	0	0	0	1
Cryptosporidiosis	14	4	4	0	12	3	3	4	3	2	36	13
Dengue	0	0	0	0	3	3	0	0	0	0	3	3
Donovanosis	0	1	0	0	0	0	0	0	0	0	0	1
Food/water borne disease	2	0	0	0	2	0	0	0	0	0	4	0
Gonococcal conjinctivitis	1	0	0	0	0	0	0	1	0	0	1	1
Gonococcal infection	384	349	11	9	59	90	21	31	64	40	539	519
Hepatitis A	0	0	0	0	2	3	0	0	0	4	2	7
Hepatitis B - chronic	12	23	1	0	20	38	37	22	1	6	71	89
Hepatitis B - new	0	0	0	0	1	1	2	1	2	0	5	2
Hepatitis B - unspecified	20	23	2	0	22	14	2	9	9	3	55	49
Hepatitis C - new	0	1	0	0	0	0	0	0	0	0	0	1
Hepatitis C - unspecified	9	16	1	1	41	41	1	0	6	1	58	59
***H Influenzae* non-b**	0	1	0	0	1	1	0	0	0	1	1	3
HIV	0	0	0	0	3	3	0	0	0	0	3	3
HTLV1 asyptomatic/unspecified	30	28	3	0	3	1	0	0	0	0	36	29
Hydatid	0	0	1	0	0	0	0	0	0	0	1	0
Influenza	0	0	0	0	7	3	0	0	0	2	7	5
Legionellosis	0	1	1	1	1	0	0	0	0	0	2	2
Malaria	0	0	0	0	9	17	0	0	0	1	9	18
Melioidosis	0	0	0	1	5	7	0	1	1	1	6	10
Meningococcal infection	0	1	0	0	1	1	1	0	0	0	2	2
Mumps	0	0	0	0	12	1	0	0	0	0	12	1
Non TB Mycobacteria	0	1	0	0	0	0	0	0	0	0	0	1
Pertussis	4	10	0	1	3	10	0	5	0	0	7	26
Pneumococcal disease	11	7	1	1	5	5	0	0	0	1	17	14
Q Fever	0	2	1	0	0	0	0	0	0	0	1	2
Rheumatic Fever	5	3	1	0	5	3	2	2	6	4	19	12
Ross River Virus	6	0	0	0	54	20	2	3	5	6	67	29
Rotavirus	100	66	10	3	20	179	2	11	16	27	148	286
Salmonellosis	37	19	8	3	61	65	2	5	14	15	122	107
Shigellosis	22	19	2	1	8	7	4	5	3	3	39	35
Syphilis	78	74	3	0	7	6	5	6	7	6	100	92
Syphilis congenital	2	2	0	0	0	1	0	0	0	0	2	3
Trichomoniasis	378	97	12	7	102	84	62	59	76	23	630	270
Tuberculosis	0	1	0	0	7	2	0	1	0	0	7	4
Typhoid	0	0	0	0	0	1	0	0	0	0	0	1
Varicella unspecified	2	0	0	0	0	0	0	0	0	0	2	0
Vibrio food poisoning	0	0	0	0	0	1	0	0	0	0	0	1
Yersiniosis	0	0	0	0	0	1	0	0	0	0	0	1
Zoster	3	6	0	1	11	11	2	2	0	2	16	22
Total	**1,558**	**1,065**	**74**	**32**	**816**	**889**	**201**	**211**	**273**	**195**	**2922**	**2392**

Ratio of the number of notifications (Q2 2007 to the mean of Q2 2002-2006): selected diseases



Ratio of the number of notifications (Q2 2007 to the mean of Q2 2002-2006): sexually transmitted diseases



Comments on notifications p 45

Chlamydia

The increasing trend in chlamydia notifications identified previously has persisted in this quarter. The majority of the increase occurred in the Alice Springs Rural area, where the annual community STI screen found an increased number of new infections. In addition, there was also a considerable increase in the urban areas (Darwin and Alice Springs), mainly in the 15-29 year age group, which was consistent with the increasing trend in chlamydia reported in other jurisdictions.

Trichomoniasis

The increasing trend noted in previous quarter also persisted in this quarter. Possible reasons for this increasing trend include more consistent reporting practice, more testing, and a true increase in disease incidence. Regardless of the reason the notification rate of trichomoniasis was extremely high in the NT with about 50% of all notifications recorded from the Alice Springs Rural area.

HTLV-1

This increase reflects the enhanced testing which has been ongoing in the Alice Springs District, where about 80% of all notifications were recorded.

Salmonella

There were 122 cases of salmonellosis in the second quarter compared to the 5 yearly mean of 99 cases. There have been increased notifications in the Alice Springs and the Barkly region with a mixture of different serotypes. Salmonellosis notifications have increased nationally this year.

Adverse vaccine reactions

The adverse events following immunisation (AEFIs) reported relate to a wide variety of administered vaccines. The majority (5) were sent in response to local reactions to the 4 year old immunisations (DTPa-IPV and MMR) and are frequently reported vaccine reactions. Peaks in vaccine numbers in this age group occur with the commencement of school terms. A large number of the new HPV vaccine were administered at urban schools within this time frame and accounted for a further 4 notifications. This may account for the increase in numbers during this quarter. The remaining reactions (9) were related to travel vaccines, Pneumovax and schedule 1 and 2 vaccines with no common antigen noted.

Ross River virus (RRV)

While 2005/2006 had the highest number of RRV cases in the NT in 12 years, 06/07 had the second highest in 13 years. In this quarter, the upsurge in cases were due to cases in the Darwin region . The case numbers were relatively high in April, and extended into May, compared with other years. The higher case numbers in the Darwin region can be partly attributed to a much above average rainfall for March (leading to an extended wet season) which resulted in higher numbers of the freshwater vector *Culex annulirostris*, the common banded mosquito) around the coast. Higher case numbers were possibly a result of a very sudden end of the rain after March leading to favourable tidal breeding sites for *Aedes vigilax*, the northern salt marsh mosquito, resulting in unusual and above-average numbers of *Ae. vigilax* in April and May.

In the Darwin urban area, there were relatively more cases in the Palmerston and rural Darwin suburbs compared to Darwin urban suburbs, which reflects the lack of organised larval mosquito control in the former areas compared with the Darwin suburbs where considerable spraying occurs in Leanyer and Holmes jungle swamps and other localised swamps around Darwin. In the Darwin urban suburbs there was no particular suburb with predominantly more cases, despite some suburbs being close to Leanyer swamp.

Mumps

The mumps outbreak is documented further in this Bulletin in the article on page 1.

Immunisation coverage for children aged 12 <15 months at 30 June 2007

Region	Number in District	% DTP	% Polio	% HIB	% Hep B	% Fully vaccinated
Darwin	246	93.90	93.90	95.93	96.34	93.50
Winnellie PO Bag	96	91.67	91.67	97.92	97.92	91.67
Palmerston/Rural	208	91.35	91.35	95.67	95.67	91.35
Katherine	84	90.48	90.48	96.43	95.24	90.48
Barkly	25	88.00	88.00	92.00	92.00	88.00
Alice Springs	137	88.32	88.32	94.16	94.89	88.32
Alice Springs PO Bag	62	85.48	85.48	95.16	93.55	85.48
East Arnhem	52	96.15	96.15	98.08	100.00	94.23
Indigenous	408	88.73	88.73	95.59	95.34	88.48
Non-Indigenous	502	93.43	93.43	96.02	96.41	93.23
Australia Ind	3,034	85.46	85.43	92.58	92.78	84.57
Australia Non Ind	65,851	92.18	92.10	94.70	94.54	91.47
NT	910	91.32	91.32	95.82	95.93	91.10
Aus Total	68,885	91.88	91.80	94.61	94.46	91.16

Immunisation coverage for children aged 24 <27 months at 30 June 2007

Region	Number in District	% DTP	% Polio	% HIB	% Hep B	% MMR	% Fully vaccinated
Darwin	218	94.95	94.04	91.74	95.87	93.12	90.37
Winnellie PO Bag	105	98.10	98.10	93.33	98.10	93.33	93.33
Palm/Rural	180	95.56	95.56	93.89	97.22	95.00	92.78
Katherine	101	99.01	99.01	98.02	100.00	98.02	97.03
Barkly	25	96.00	96.00	92.00	100.00	96.00	92.00
Alice Springs	117	95.73	94.87	94.02	95.73	92.31	89.74
Alice Springs PO Bag	66	98.48	96.97	93.94	98.48	95.45	92.42
East Arnhem	43	100.00	100.00	97.67	100.00	100.00	97.67
Indigenous	408	97.30	96.57	94.12	98.77	95.34	92.40
Non-Indigenous	447	95.97	95.75	93.74	96.20	93.96	92.62
Australia Ind	2,969	94.14	93.87	92.62	97.20	93.36	90.00
Australia Non Ind	63,339	95.27	95.21	94.21	95.92	94.02	92.65
NT	855	96.61	96.14	93.92	97.43	94.62	92.51
Aus Total	66,308	95.22	95.15	94.14	95.98	93.99	92.53

Immunisation coverage for children aged 72 <75 months at 30 June 2007

Region	Number in District	% DTP	% Polio	% MMR	% Fully vaccinated
Darwin	241	81.33	80.50	80.91	79.67
Winnellie PO Bag	131	94.66	94.66	93.89	93.89
Palm/Rural	198	85.35	86.36	86.87	85.35
Katherine	105	86.67	85.71	86.67	85.71
Barkly	20	70.00	75.00	70.00	65.00
Alice Springs	125	84.80	84.00	84.00	82.40
Alice Springs PO Bag	67	88.06	88.06	89.55	88.06
East Arnhem	51	90.20	90.20	90.20	90.20
Indigenous	383	92.17	92.69	92.43	91.64
Non-Indigenous	555	81.44	80.90	81.44	80.00
Australia Ind	2,507	87.36	87.67	88.23	86.52
Australia Non Ind	63,604	88.76	88.84	88.77	88.00
NT	938	85.82	85.71	85.93	84.75
Aus Total	66,111	88.71	88.80	88.75	87.94

Immunisation Coverage 30 June 2007

Immunisation coverage rates for NT children by regions based on Medicare address postcode as estimated by the Australian Childhood Immunisation Register are shown on page 47.

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 to <15 months of age on 30 June 2007 were born between 01/04/2006 and 31/06/2005 inclusive. To be considered fully vaccinated, these children must have received 3 valid doses of vaccines containing diphtheria, tetanus, pertussis, and poliomyelitis antigens, either 2 doses of PRP-OMP Hib or 3 doses of another Hib vaccine, and 2 doses of hepatitis B vaccine (not including the birth dose) (latest doses due at 6 months of age). All vaccinations must have been administered by 12 months of age.

The cohort of children assessed at 24 to <27 months of age on 30 June 2007 were born between 01/04/2005 and 31/06/2005 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 2 doses of hepatitis B vaccine (not including the birth dose) and 1 dose of measles, mumps, rubella vaccine (latest doses due at 12 months of age). All vaccinations must have been administered by 24 months of age.

The cohort of children assessed at 72 to <75 months of age on 30 June 2007 were born between 01/04/2001 and 31/06/2001 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 average for all 3 cohorts. In particular, immunisation coverage in Indigenous children was over 2.5% lower for the 12 to <15 month cohort, within 0.1% for the 24 to <27 month cohort and over 3.5% higher for the 72 to <75 month cohort. This indicates that although coverage rates are eventually higher than average in this population, timeliness of vaccination needs to be improved.

Immunisation coverage for NT children at 72 to <75 months of age (84.75%) remains lower than for the younger cohorts (approx 90%), and this is a concern across Australia.

NT Malaria notifications April—June 2007

Merv Fairley, CDC, Darwin

Six notifications of malaria were 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	Military	*P. falciparum*	No
1	East Timor	Holiday	*P. vivax*	No
1	East Timor	Military	*P. falciparum*	No
1	PNG	Holiday	*P. vivax*	No
1	India	Student	*P. vivax*	No
1	Thailand	Refugee	*P. falciparum*	No

Disease Control staff updates

CDC

The Business unit has seen a number of changes with **Janelle Baker's** retirement after 17 years with CDC. **Tamara Pearce** has moved into this position from the Medical Entomology Branch. **Martin Dunbar** has moved to Queensland after 15 years with CDC and has recently married. **Lisa Fereday** commenced in a new position as Data Manager, Surveillance. She has worked within the Health Department since April 2002 in various positions within Workforce Strategy, Clinical and Organisational Learning. Masters of Applied Epidemiology student, **Emily Fearnley** has transferred to Adelaide to continue her course.

Kerryn Coleman has moved from Perth, WA to join the Katherine CDC team in the medical officer/co-ordinator's position.

RHD/Community Paediatrics

Dale Thompson has moved to Darwin from the Anangu Pitjantjatjara Yankunytjatjara Lands in S.A. and taken up the CNC position previously filled by **Maureen Egan**. Thanks to **Maureen** for her work in establishing this role. **Lyn Barclay** has once again provided support during this transitional period. In Alice Springs **Jenine Gunn** has joined the Rheumatic Heart Disease Program with Eleanor Hooke.

The Community Paediatric Registrar position has changed over with the departure of **Andrea McGlade** and arrival of **Kathryn Roberts.**

TB

This quarter has seen TB MO **Jo Judd** moving back to Adelaide with **Elliot Coates** as her replacement. Elliot will also be working on the Illegal Foreign Fisher and Refugee programmes as well as general TB Unit work and has worked in several areas of RDH, most recently as a Palliative Care Registrar. The second TB MO is **Hussein Farah** who has moved from the Goldfields Population Health Service where he worked as a Public Health Registrar.

Sexual Health & Blood Borne Viruses

In Darwin we saw a welcome return of **Diedre Ballinger** as short term cover for **Anne Davis**. **Sarah Skorupa** has moved from Sport and Recreation to administration officer Clinic 34 Darwin. **Phoebe Ward** has moved from Utopia into a policy development/public health nursing position working with **Autumn Goodall**. **Astrid Stark**, a former Alice CDC staff member, is working on a youth needs assessment.

Alice Springs changes include **Pam Blacker** as the Clinic 34 nurse and **Dyan Kelaart** returning to CDC in the Regional Sexual Health Coordinator position after 2 years in Tasmania. Dy was the Immunisation and Disease Surveillance PHN in 2002.

Katrien Depraetere recently joined Alice Springs Clinic 34 team as community Medical Officer 3 days per week. Her experience includes general practice with Central Australia (Central Australian Aboriginal Congress), the STI clinic in Adelaide and as medical officer for Nganampa Health council. **Anne Cawley** is working 2 sessions per week as MO in Clinic 34 Alice Springs.

Immunisation

HPV Nurses, **Susan McMinn** and **Jennifer Wyllie** have commenced with the HPV vaccination program. They have come from Casuarina Community Care Centre and the Emergency Department at RDH respectively and are travelling to remote locations to deliver the vaccine program. **Amy Ryan** has extended her contract for a further 12 months as the HPV program coordinator. **Kaelene Prince** is the Alice Springs HPV support nurse.

Rebecca Curr has commenced as the Immunisation Project Officer in Alice Springs.

New data entry team members in Darwin include **Adrienne Chalada** and **Janelle Winter**

Surveillance

Krista McCarron replaces **Cate Coffey** (now with Trachoma Program) in the Immunisation/ Surveillance Nurse position, Alice Springs.

Medical Entomology

Kerith Donnan replaces **Tamara Pearce as** administration officer and **Barbara Love** has commenced as technical officer in Darwin and **Darren Bowbridge** as technical officer for the Groote Eylandt Project.

Environmental Health

Chris Daly from policy has completed his short term contract, **Michael Dinnen** from Darwin Urban completed his contract and, **Chris Luthy** in Katherine has resigned.