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NORTHERN TERRITORY

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Benzathine penicillin – down but not out

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The cumulative valve damage from repeated episodes of acute rheumatic fever (ARF) is what causes most of the morbidity and mortality seen from rheumatic heart disease (RHD). Since first developed in the USA over 50 years ago intramuscular (IM) benzathine penicillin G (BPG) has been the gold standard for preventing recurrences of ARF (secondary prophylaxis) and therefore for minimizing valve damage and its consequences. BPG works by preventing the infections with Group A streptococci (GAS, *Streptococcus pyogenes*) which result in ARF. A specific chemical reaction joins together 2 molecules of penicillin G to produce BPG. IM BPG produces prolonged but low blood levels of penicillin for up to 4 weeks, while another form of repository penicillin, IM procaine penicillin G, produces therapeutic blood levels for 24 hours and hence is used daily for instance in treatment of pneumonia.

Because the half-life of oral penicillin V is only around 1 hour, even 100% compliance with twice daily oral penicillin V has been considered to be inferior to IM BPG in preventing recurrent RF. While absolute adherence to twice daily oral penicillin V would make breakthrough recurrent ARF unlikely, the potential consequences of missed doses of oral penicillin V have sometimes become tragically evident in the NT when the oral option has been favored. In addition, the oral

alternatives of erythromycin, roxithromycin and azithromycin are not substitutes for BPG because there are some GAS which are resistant to these drugs.

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Despite decades of penicillin use, all GAS isolates remain exquisitely sensitive to penicillin, with no resistance ever having been documented. This unique situation is why BPG works, despite the relatively low blood levels maintained over the weeks after the IM injection.

The availability of BPG in Australia has had a rocky course. The 2 ml injectable syringe of Bicillin® L-A (Long Acting) given via a Tubex® injector, containing 1.2 million units = 900mg BPG for secondary prophylaxis, did not become available in Australia until 1995, while it had been available in the USA since 1952.

Prior to the Australian availability of 2 ml Bicillin® L-A a 4 ml Bicillin® L-A syringe with 2.4 million units = 1.8g BPG had already been available to provide the larger dosing needed for syphilis therapy. This “horse syringe” had a 19-gauge needle and was removed from the Australian market several years ago.

Until the 2 ml Bicillin® L-A became available in 1995, secondary prophylaxis against recurrent ARF using BPG was provided either by decanting half a 4 ml Bicillin® L-A “horse syringe” into another syringe or by use of 1 of a number of powder preparations of penicillin which require reconstitution with water for injection. Various powder products were available at different times, the most widely used being Bicillin AP (All Purpose), which had a combination of BPG with procaine penicillin G and benzyl penicillin G (the fastest acting IV/IM penicillin).

It is not surprising that confusion was common in the dosing volumes and intervals required for different indications such as ARF prophylaxis and pneumonia.

The Bicillin AP had been available and widely used in Australia, including for ARF prophylaxis, since at least 1962, but then it was suddenly withdrawn in 1994. This resulted in intense lobbying for availability of the Bicillin® L-A. It was combined and coordinated efforts from public health, clinical and pharmacy staff across both Government health services and Aboriginal Medical Services that resulted in a favorable response to registration, marketing and distribution of Bicillin® L-A from the Australian Government Therapeutic Goods Administration (TGA) and industry.

However in both 2001 and 2004 there were sudden periods of shortage of supply of Bicillin® L-A, requiring special restrictions on its use. Now it looks like it may be gone forever – and again at short notice. Although we have been told alternative manufacturing of prefilled syringes to replace the Bicillin® L-A may be available in 6-12 months, there is a chance that this will never eventuate and we need to plan for this possibility.

Trying to unravel the BPG manufacturing saga and why the recurrent difficulties have occurred has been depressing, with no straight answers obtained. Despite personal support from individuals within both TGA and industry, it seems that protecting the commercial-confidence interests of industry takes precedence over Indigenous health and increasingly so. The current BPG situation is precarious globally, and colleagues across several continents have been attempting to coordinate documentation of reliable supplies of good quality BPG.

The protocol developed by NT CDC, coordinated by Peter Markey, for use of the replacement powder BPG (Pan Benzathine Penicillin, see pp 3-5) has resulted from widespread consultation with health staff across the NT. Most critical is that the IM volumes needed to provide the same doses are over twice those when using Bicillin® L-A. Avoiding confusion and under-dosing will require ongoing widespread dissemination and reinforcement of the protocol. Some points of relevance to secondary prophylaxis are:

1. This larger volume injection in the new formulation is the standard in quite a few overseas countries, where we are told it is well tolerated. We need to accept it is necessary for this preparation and document how it goes (see the Benzathine Penicillin feedback chart p 3, prepared by Keith Edwards).
2. Some NT clinics have used lignocaine with BPG and prefer this option. There is some use of lignocaine in some locations overseas, but it is not standard. It is included in the protocol as an option and this is a good opportunity to document results of its use.
3. What has been documented in a randomized trial is that local application of firm pressure over the injection site from the non-injecting

New preparation of Benzathine Penicillin

Bicillin® LA — is no longer available

The replacement Pan Benzathine Penicillin is a powder that needs to be mixed up.

The doses of Benzathine Penicillin will be the same but the volume of the injection will be more:

- For syphilis treatment you need to give 9.2ml of Pan Benzathine Penicillin instead of 4ml of Bicillin® L-A
- For rheumatic fever prophylaxis you need to give 4.6ml of Pan Benzathine Penicillin instead of 2ml of Bicillin® L-A

PAN BENZATHINE PENICILLIN WILL REPLACE BICILLIN® L-A WHERE NOTED IN THE CARPA MANUAL 4TH EDITION.

Full details of the situation, preparing the mixture and administration guidelines are overleaf.

Bicillin® L-A will soon be unavailable from the manufacturer and this situation is expected to last for the next 12 months. Northern Territory pharmacies will cease to supply Bicillin® L-A from Monday 17 July 2006.

An alternative preparation of Benzathine Penicillin manufactured by Laboratoires Panpharma will replace Bicillin® L-A from 17 July 2006. The Therapeutics Goods Administration has approved this preparation for use in Australia.

The new product is labelled as:

- Pan Benzathine Penicillin 1,200,000 units.

Pan Benzathine Penicillin is provided in a vial and is a freeze-dried powder (for reconstitution) in a strength of 900mg or 1.2 million units. Pan Benzathine Penicillin 900mg is supplied in boxes of 10 containing 1 product information leaflet. It does not require refrigeration however must be stored below 25°C.

To reconstitute a single vial (900mg) of Pan Benzathine Penicillin add 4ml of Water for Injection. The final volume will be approximately 4.6ml.

Therefore the volume in ml of Pan Benzathine Penicillin (4.6ml) is more than double that of Bicillin LA® (2ml) for a 900mg dose.

- DO NOT USE LESS THAN 4ml TO RECONSTITUTE EACH VIAL

Bicillin® L-A	Pan Benzathine Penicillin
900mg in 2ml liquid in a single vial given via a Tubex® injector	900mg powder to be mixed with 4ml of water for injection
PLEASE NOTE THE DOSES FOR BENZATHINE PENICILLIN HAVE NOT CHANGED BUT THE VOLUMES OF INJECTION HAVE	

**For more information contact:
Your regional Centre for Disease Control or
Sexual Health Unit**

Administration guidelines

The doses for Benzathine Penicillin have not changed but the volumes of injection have

Rheumatic fever prophylaxis		See page 308 in CARPA
Prevention of further attacks of rheumatic fever		
Dose:	Pan Benzathine Penicillin 900mg or 1.2 million units = 1 vial	
Reconstitute:	Add 4ml of water for injection	
Administration:	Deep intramuscular injection into the outer quadrant of the buttock or the mid lateral aspect of the thigh	
<u>Notes</u>		
If the patient weighs >45kgs – administer as a single dose		
If patient weighs < 45kg, divide the volume into two 2.3ml doses and administer into two sites i.e. buttocks or thigh		
For children less than 20kg refer to Dosage Table 1 and consider dividing dose for injection into both thighs in a child with small muscle bulk		
If lignocaine is used instead of water for injection, it should be 0.5% and not the usual 1% - so use either;		
<ul style="list-style-type: none"> • 4ml of 0.5% lignocaine or • 2ml of water for injection and 2ml of 1% lignocaine 		
*NB Do NOT use lignocaine with adrenaline		

Impetigo See page 312 in CARPA	Pan Benzathine Penicillin will replace Bicillin® L-A in the treatment of these conditions. Refer to Dosage Table 1.
Strep Throat or Tonsillitis See page 322 in CARPA	Please refer to the CARPA Manual 4 th ed. for full treatment guidelines.
Post Streptococcal Glomerulonephritis Refer to CDC guidelines	

Dosage Table 1 (based on 1 vial reconstituted with 4 ml water)

Weight	3 kg to less than 6 kg	6 kg to less than 10kg	10kg to less than 15kg	15kg to less than 20kg	20kg+ and Adults
Bicillin® L-A	0.5ml	0.75ml	1ml	1.5ml	2ml
Pan Benzathine Penicillin	1.1ml	1.7ml	2.3ml	3.4ml	4.6ml

Administration guidelines

Syphilis		See pages 252 – 245 in CARPA
Early Syphilis - primary or secondary syphilis or syphilis of less than 2 years duration		
Dose	Pan Benzathine Penicillin – 1 dose of: 1.8g or 2.4 million units = 2 vials	
Reconstitute	<u>Each vial</u> with 4ml of water for injection.	
Administration	4.6ml (1 vial) into each buttock.	
Syphilis of more than 2 years duration or unknown duration		
Dose	Pan Benzathine Penicillin - 3 doses of: 1.8g or 2.4 million units = 2 vials At 1 week intervals.	
Reconstitute	<u>Each vial</u> with 4ml of water for injection.	
Administration	4.6ml (1 vial) into each buttock.	
Genital Ulcer Disease - Not likely to be Herpes Infection		
Dose	Pan Benzathine Penicillin – 1 dose of 1.8g or 2.4 million units = 2 vials	
Reconstitute	<u>Each vial</u> with 4ml of water for injection.	
Administration	4.6ml (1 vial) into each buttock.	
Syphilis or Non-herpes Genital Ulcer in Pregnancy		
Dose	Depending on stage of disease Pan Benzathine Penicillin – 1 dose of: 1.8g or 2.4 million units = 2 vials. OR Pan Benzathine Penicillin - Three doses of: 1.8g or 2.4 million units = 2 vials. At 1 week intervals	
Reconstitute	<u>Each vial</u> with 4ml of water for injection.	
Administration	4.6ml (1 vial) into each buttock.	

Christmas in July at Wadey!!

Monday the 17th of July was set aside for the Community Launch of the *National Acute Rheumatic Fever and Rheumatic Heart Disease Guidelines* in the Territory. A great day was planned for all including a routine cardiology outreach visit. The agenda included games, poster making and puppet shows. Young people had the chance to tell their own stories through poster making and they did not disappoint. A

scrumptious BBQ lunch was provided, courtesy of the NT branch of the National Heart Foundation. The Pan Benzathine Penicillin guidelines were distributed there and across the Territory (see p 4).

For queries please phone the Centre for Disease Control Rheumatic Heart Disease program on 89227932 or 89228044.

Pandemic Influenza Planning

Prepared by Lesley Scott, Project Officer, and Christine Selvey, Head of Immunisation, CDC Darwin

Planning and preparedness is the best way to mitigate the potentially serious consequences of a new influenza pandemic. Pandemic influenza may appear at any time as a result of the emergence of a new viral subtype for which there is little or no immunity in the population and which is capable of transmitting between humans to infect a high proportion of those exposed. The current spread of avian influenza from South East Asia into Europe and Africa is being monitored carefully to look for any evidence that this H5N1 influenza virus has changed allowing efficient human-to-human transmission.

Table 1 shows the number of human cases and deaths from avian influenza since 2003 worldwide. The data to April 2006 showed that the case fatality rate was 56%, with the highest death rate in the 10-19 year old age group (73%).¹

Considering that there have been millions of birds infected and many thousands of people potentially exposed to the H5N1 virus, the total number of human cases is low. There have been a few cases where it appears that human-to-human transmission has occurred, but there is no evidence to date that this occurs readily.²

The World Health Organisation (WHO) recognised the continuing risk of H5N1 becoming better adapted to humans and has taken the lead role for pandemic influenza planning internationally. The WHO has urged governments around the world to formulate pandemic plans and undertake preparedness steps.

The WHO uses 6 phases of pandemic alert to inform about the seriousness of pandemic threat and the need to launch preparedness activities.

The current phase of the pandemic is in the pandemic alert period and is classified as:

- Global Phase 3 (Australian – Overseas 3) where there is human infection overseas with new subtype(s) but no human-to-human spread, or at most, rare instances of spread to a close contact.
- Australia is at Australian Phase 0: no circulating animal influenza subtypes in Australia that have caused disease.

As part of Australia's response, the Australian Government released the *Australian Management Plan for Pandemic Influenza* (AMPPI) in June 2005 to guide the development of jurisdictional plans. The latest version of the

Table 1. WHO laboratory-confirmed human H5N1 cases since 26 December 2003 as at 4 July 2006

Country	2003		2004		2005		2006		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Azerbaijan	0	0	0	0	0	0	8	5	8	5
Cambodia	0	0	0	0	4	4	2	2	6	6
China	0	0	0	0	8	5	11	7	19	12
Djibouti	0	0	0	0	0	0	1	0	1	0
Egypt	0	0	0	0	0	0	14	6	14	6
Indonesia	0	0	0	0	17	11	35	29	52	40
Iraq	0	0	0	0	0	0	2	2	2	2
Thailand	0	0	17	12	5	2	0	0	22	14
Turkey	0	0	0	0	0	0	12	4	12	4
Viet Nam	3	3	29	20	61	19	0	0	93	42
All cases	3	3	46	32	95	41	85	55	229	131

Source: http://www.who.int/csr/disease/avian_influenza/en/

Australian Health Management Plan for Pandemic Influenza (AHMPPI) was released nationally on 30 May 2006.¹ It outlines, from a health perspective, what the Australian Government is doing, and what the health sector, key stakeholder groups, the community and individuals can do to prepare for pandemic influenza.

The AHMPPI describes 2 major strategies. The first is containment, with the aim to minimise spread of the virus. Key measures include border control, isolation of cases, quarantine of contacts, widespread adoption of infection control and good hygiene practices, and the use of antivirals for those exposed to the virus. The second strategy will come into effect if containment fails and there is widespread transmission of the virus in the community. Efforts will then concentrate on the maintenance of social functioning. If sustained transmission is happening in a region that can be isolated, a decision may be made to change to maintaining social functioning within that region, while continuing the containment strategy in the rest of Australia.

The Australian Government has undertaken several key steps in preparing Australia for pandemic influenza including:²

- establishing the Office of Health Protection to coordinate planning and emergency responses;
- creating the National Medical Stockpile of antiviral medications, personal protective equipment (PPE) and other necessary stores;
- financing H5N1 vaccine development;
- entering into contracts with vaccine manufacturers for pandemic vaccine supply;
- strengthening surveillance and laboratory capacity to detect early cases and allow rapid diagnosis; and
- providing funding for research on influenza and pandemics.

Recent epidemiological modelling suggests that a combination of containment strategies could delay the onset of a pandemic in Australia for up to 12 months.² This would allow time for the development of an effective vaccine. The key containment strategies include:²

- delaying the arrival of a pandemic in Australia by border control measures such as early advice to Australians to return to

Australia, restrictions on travel to Australia from affected countries, quarantine of people entering Australia and infection control for at risk border workers;

- slowing the spread in Australia by widespread adoption of infection control measures, early identification on new cases, the provision of post-exposure prophylaxis with antivirals for those exposed to cases, pre-exposure prophylaxis for those at continued high risk of exposure, and possible restriction of movement within Australia; and
- setting up of fever clinics and influenza hospitals.

If containment cannot be sustained, strategies for maintenance of social functioning include:²

- social distancing measures such as school closure and encouraging people to stay at home from work if possible;
- the use of antivirals will switch to prevention of infection among people who provide essential services and whose work puts them at high risk of exposure; and
- use of earliest available vaccines in those at high risk of exposure and providing essential services.

The proposed allocation of antivirals is shown in Table.²

The National Medicine Stockpile, by early 2007, will contain:

- 8.75 million courses of antiviral drugs;
- 2 million P2 masks;
- 40 million surgical masks;
- significant supplies of gloves and goggles;
- equipment to deliver 50 million vaccinations;
- other equipment.

Some of the personal protective equipment (PPE) will be pre-packaged for deployment to airports, quarantine facilities and other sites in the event of a pandemic.²

There are 3 supporting annexes to the AHMPPI.

- Interim Infection Control Guidelines for Pandemic Influenza in HealthCare and Community Settings.
- Interim National Clinical Pandemic Influenza Guidelines.
- Communications strategy overview.

Table 2. Allocation criteria for national allocation of antivirals from the stockpile, April 2006*

Purpose for antiviral	Proportion of stockpile	Criteria for national allocation
Treatment trial	10%	Protocol for research trial
Containment for 6 months	8% - 10%	Containment need (no jurisdictional entitlement)
Work and risk category 1 – continuous prophylaxis	65%	Reserved pro rata by jurisdiction
Work and risk category 2 – post-exposure prophylaxis	10%	Reserved pro rata by jurisdiction
Contingency reserve	5% – 7%	
Total	100%	

Guidelines for use of antiviral medication for treatment of cases and antiviral post-exposure prophylaxis are outlined in the *Interim National Clinical Pandemic Influenza Guidelines*.

The AHMPPI and other pandemic influenza preparedness resources can be located on the pandemic influenza web page:

<http://www.health.gov.au/internet/wcms/publishing.nsf/Content/Pandemic+Influenza-1>.

In late February 2006, the Council of Australian Governments (COAG) endorsed the establishment of a Pandemic Influenza working group in order to develop a whole of government plan for endorsement by June 2006. This National Action Plan was endorsed at the July 2006 COAG meeting.

The Northern Territory Department of Health and Community Services is coordinating the development of a NT *Special Counter Disaster Plan for Human Pandemic Influenza* that incorporates a whole of government approach. The functional sub plans include Public Health, Medical, Welfare, Communications and Media, Public Utilities, Transport and Stores, Food, Public Order and Recovery. The plan is due to go to the Counter Disaster Council for ratification in July.

The Divisions of General Practice have a lead role in the development of the NT Primary Health Care Sub-Group of the Medical Planning Group as part of this process. The purpose of this group is to plan for the primary health care sector's role in managing pandemic influenza. Specific responsibilities include planning for fever clinics, mass vaccination clinics, remote health services, information dissemination, assisting general practices in preparation and

contribution in a pandemic and in conjunction with the Welfare group for intermediary care for those who do not require hospitalisation but cannot be cared for at home. Fever clinics will be planned with the aim of rapid assessment of people with symptoms of influenza with access to further treatment as necessary, and as a strategy to reduce the risk of transmission of influenza to people who are well. Members of the public will be strongly advised to go to a fever clinic if they have influenza symptoms. This is an infection control measure to try to keep general practices 'flu free' and it will also reduce the influenza workload on primary health care providers, anticipating that this will allow some GPs to work in the fever clinics.

General practitioners (GPs) and primary care workers are identified as key personnel in education about pandemic risk and effective infection control and surveillance, including possibly identifying and notifying the first cases. Health promotion messages about personal hygiene practices such as handwashing, cough etiquette and keeping a distance of 1 metre away from other people will be important. Resource kits were distributed to GPs in 2005 and copies are available from the website link above. Currently the NT has 11 GPs who are regular reporters to the Territory Influenza Surveillance Scheme that forms part of the national sentinel surveillance for influenza like illness. The primary health care planning subgroup is developing an intra-site operational plan to guide general practitioners on what plans they should be developing in response to each phase of the pandemic. This includes a checklist for infection control in the general practice setting.

A health simulation exercise, *Exercise Cumpston 06* will be held over 4 days from 16-19 October

*Source AHMPPI

2006 to validate the capacity and capability of the Australian health response to a pandemic situation in accordance with the *Australian Management Plan for Pandemic Influenza* (AHMPPI). It is also designed to exercise health aspects of the National Action Plan and the National Emergency Protocol being developed under the auspices of the COAG, and state and territory preparedness plans.

The main operational phase of the exercise will be based at Brisbane airport simulating the arrival of a person infected with pandemic influenza. Responses to be tested include border control and quarantine. It will also simulate containment and transition to the maintenance phase in a community setting, including the deployment of antivirals and the establishment of fever clinics. Nationally there will also be testing of the governance arrangements and decision making within and between jurisdictions at all levels.

Strategic plans for management of pandemic influenza in the Northern Territory have been worked on with a whole of government approach with significant input from the Divisions of General Practice. These plans will be continually updated as new information becomes available. The Department of Health & Community Services has representation on national committees such as the Communicable Diseases Network Australia, National Influenza Pandemic Action Committee and the Australian Health Protection Committee and will continue

to ensure that as the national plans evolve information is disseminated NT wide to key stakeholders.

In conclusion, the key messages are:

- NT, like all other states and territories, is actively making plans in the event of an influenza pandemic.
- Significant contributions that primary health care providers can make in trying to avoid or lessen the impact of pandemic influenza are:
 - to vaccinate as many people at risk with pneumococcal vaccine and the annual influenza vaccine;
 - to take a travel history in people who present with influenza symptoms;
 - to make a plan to manage high risk patients in the surgery to reduce the chances of transmission ; and
 - to become part of the Territory Influenza Surveillance Scheme (TISS) by calling the Centre for Disease Control on 89228044.

References

1. Weekly Epidemiological Record, No.26, 30 June 2006, 81, 249-260, <http://www.who.int.wer>. Accessed 13/07/2006.
2. Australian Government Department of Health and Ageing. Australian Health Management Plan for Pandemic Influenza. 2006. <http://www.health.gov.au/internet/wcms/publishing.nsf/Content/ohp-pandemic-ahmppi.htm>. Accessed 13/07/2006.

Outbreak of norovirus gastrointestinal illness at Robertson Barracks

Katrina Roper and Shellee Williams, CDC Darwin and Master of Applied Epidemiology Scholars, NCEPH, ANU

Background

On Wednesday 22 March 2006, the Centre for Disease Control (CDC) of the Northern Territory Department of Health and Community Services in Darwin received a telephone call from a Registered Nurse at Robertson Barracks Medical Centre (RBMC) indicating that there had been a number of soldiers admitted to the Centre with a gastrointestinal illness. At that stage, 5 cases were admitted to RBMC, and 6 other cases had been admitted earlier in the week and discharged. These 11 cases within a week represented a higher than usual number of gastrointestinal illness.

Brigade approval was obtained to allow the CDC investigation team onto Robertson Barracks, where the CDC staff (2 MAE scholars and 1 public health nurse) met with 1 Combat Service Support Battalion Environmental Health team (1CSSB EH team, led by a Captain and containing personnel of ranks Warrant Officer, Sergeant, Corporal and Private). An investigation into the outbreak commenced with the 1CSSB EH team and the CDC team working together.

Methods

Case definition

A case was initially defined as anyone who had experienced diarrhoea (3 or more loose stools) between 20 March and the first day of investigation (22 March). This timeframe was later extended to include the preceding 12 days (start date of 8 March) when we became aware that there had been numerous other cases of gastroenteritis among soldiers reporting to Regimental Aid Posts (RAPs) across Robertson Barracks prior to 20 March.

Questionnaire

A detailed questionnaire was developed by the CDC team to assist in identifying the potential sources of the illness. The questions covered areas such as work and home locations, symptoms and time of onset, travel and activities in the preceding week, contact with animals and

a 4-day food history. This questionnaire, however, was only used for the 5 patients that were interviewed by the joint CDC/1CSSB team. All subsequent interviews were conducted only by members of the 1CSSB EH team. This team used the Australian Defence Force Publication (ADFP) 717 Sample Questionnaire to conduct the interviews, a form which is less detailed than the CDC questionnaire. In particular, the food history used in the ADFP form was less extensive than the CDC generated form.

Environmental testing

The NT Environmental Health team was informed of the outbreak and brought into the investigation. Dr Narinder Bansal, a Molecular Biologist from the Division of Analytical Laboratories of Western Sydney Area Health Service, was contacted for background information regarding methodologies involved in conducting environmental testing for norovirus should this be deemed necessary.

Results

Interviews and presumptive diagnosis

Detailed interviews were conducted with the 5 soldiers who were in RBMC on 22 March by CDC staff in conjunction with members of the 1CSSB EH team. On the basis of their symptoms, a presumptive diagnosis of norovirus was made. Norovirus is characterised by vomiting, cramps, diarrhoea, headache and fever.¹ Of the 5 soldiers interviewed on 22 March, 3 experienced diarrhoea (specifically watery diarrhoea), 5 experienced vomiting, 2 had cramps, and 4 had headaches. All reported a sudden onset of symptoms. Table 1 summarises their illness characteristics. These findings fit the Kaplan Criteria for the identification of outbreaks of gastroenteritis due to norovirus (see Table 2).

From the interviews, it was identified that all 5 soldiers had attended a function on Monday 20 March at the Other Ranks Mess (ORs Mess). The time range for onset of symptoms if the function was assumed to be the source of infection was 28-37 hours with a mean of 32

hours. Norovirus has an incubation period of 15-77 hours (usually 24-48 hours).¹ From 7 interviews conducted over the following days by the 1CSSB EH team, and assuming the function to be the source, the incubation period was calculated to be 33-66 hours, with a mean of 51.5 hours. Figure 1 shows the time of onset for these 12 cases relative to the Chief of Army (CA) function.

Table 1. Illness characteristics for the 5 soldiers interviewed on 22 March indicating the number affected by each characteristic.

Illness Characteristic	Number
Vomiting	5
Diarrhoea	3
Cramping	2
Headaches	4
Sudden onset of symptoms	5
Duration of illness (24-48 hrs)	5

Table 2. The Kaplan criteria for the identification of outbreaks of gastroenteritis due to norovirus.²

Criteria
Vomiting in more than half of affected persons
Mean (or median) incubation period of 24-48 hrs
Mean (or median) duration of illness of 12-60 hrs
No bacterial pathogen in stool culture

The function was a luncheon, buffet-style, that commenced at about 12:30pm, with the soldiers being seated in the gymnasium after the function to hear an address by the visiting CA.

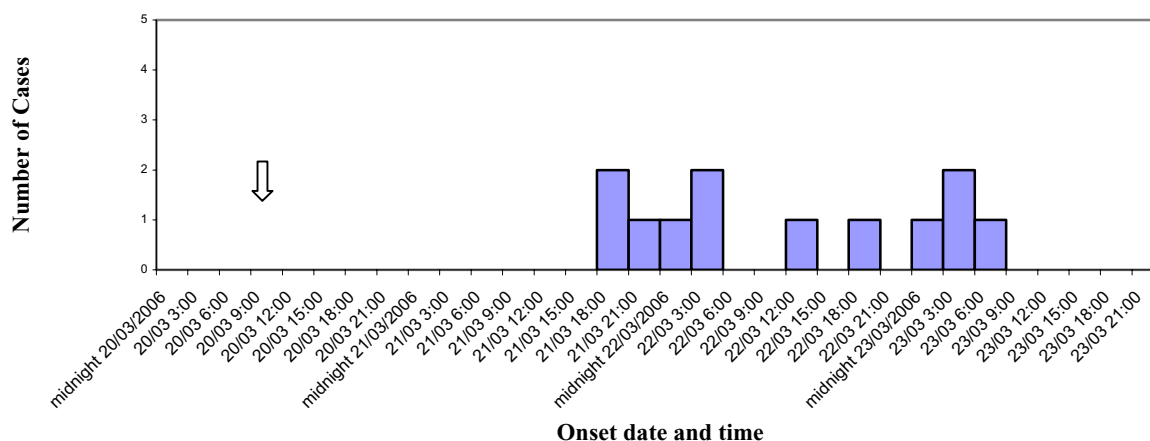
While 4-day food histories were taken from each soldier, and a menu plan from the ORs mess for the CA function was obtained, it was not possible to determine a common food linking these 5 cases. In light of the fact that there had been cases of gastroenteritis prior to 20 March, it is likely that the CA function was an amplification point for the suspected norovirus with a sick individual at the event and/or a common point of contact such as a lavatory handle or bathroom tap rather than a specific food item. It is not known if there were shared utensils being used during tea and coffee production that may also have been a vector for transmission between individuals.

The duration of illness (24-48 hours) observed for those admitted to RBMC also fitted the profile for norovirus.³

Laboratory testing

The staff of RBMC were advised to collect stool and vomit samples from patients where possible for pathogen testing including for norovirus and rotavirus. Laboratory results for the 5 samples collected between 20 - 23 March were negative for all pathogens. However, the samples were tested only for *Salmonella*, *Shigella*, *Yersinia*, *Campylobacter* and *Aeromonas* species and had not been tested for norovirus. After further

Figure 1. Epidemic curve with cases reported by time of onset of symptoms. Arrow indicates time of function.



other cases of gastroenteritis that were reported to RAPs in the 10 days preceding 18 March. Table 3 shows the breakdown of cases by reporting unit (unit RAP or RBMC) at Robertson Barracks. Figure 2 shows the epidemic curve for the outbreak.

Discussion

The investigation into this outbreak neatly demonstrated the benefits of epidemiological profiling. A correct diagnosis of the cause was identified on the basis of clinical symptoms and epidemiological features ahead of receipt of laboratory results. This enabled management interventions to be initiated early in the investigation. The initial presumptive diagnosis of norovirus based on clinical symptoms was well founded with all aspects of the Kaplan criteria being met (Table 2).

The investigation was incomplete in some areas as, for example, it was not possible to determine with the information gathered, a source (food or person) for the norovirus, nor was the mode of transmission clear. It is possible that a combination of food-borne, person-to-person and fomite spread was occurring at various times during the outbreak.

The food histories used in the ADFP form only requested history of the previous 4 meals, rather than the previous 4 days. In some instances, this meant that the timeframe reported fell within a 24-hour period of developing symptoms. As norovirus has an incubation of up to 77 hours, a foodborne source could have been missed in some of the cases. While the lack of complete food histories for the incubation period did not affect the management of this outbreak, the use of agreed questionnaires to obtain comprehensive information for informed decision making in the future deserves review.

Missing data around the denominators would have enabled calculation of population at risk. It is not known how many persons attended the CA function. In the absence of this number, it is not possible to determine the risk of illness for those who attended the function. The number of personnel working at the units at the time of the outbreak are also not known, so the numbers of cases per unit cannot be translated into an attack rate.

Despite not being able to identify a source for the cases of norovirus, intervention measures were able to be implemented. Information was provided to the staff of RBMC on hand washing in the early days of the outbreak.⁴ This information was given to patients when discharged from RBMC and also disseminated via email to all RAPs. The information was also directed for circulation through Brigade units to all personnel, with the note that the information was clearly applicable to dependents.

When norovirus was confirmed, specific information was provided from various web pages.^{5,6,7,8} Information was also provided on appropriate chemical disinfectants for use in environmental control, in particular the use of chlorine-based products at an appropriate strength.⁹

It was interesting that the outbreak was confined to ORs with no officers being affected, suggesting that the source, both initially and ongoing, was restricted to the ORs. The OR Mess remained a suspect location, in that it was likely to be a common factor in terms of place of contact. It is also notable that the outbreak was confined to Robertson Barracks. There were no reports of illness from RAAF Base Darwin in Winnellie or from Larrakeyah Army Barracks, both of which are at separate locations in other parts of Darwin.

Conclusion

This outbreak investigation was a good example of the usefulness of epidemiology in the management of a situation ahead of laboratory results. Using only epidemiological clinical information, interventions and management strategies were able to be put in place to assist control of the situation prior to the receipt of confirmatory laboratory results.

The case also served to reinforce ties between the CDC and the Defence establishment. The communication and cooperation between these 2 services during this investigation was very good. The opportunity to assist the Barracks with the investigation was welcomed by the CDC. The working relationship between the CDC and Defence could be further strengthened by linking Defence and civilian training of Environmental Health Officers and epidemiologists, particularly for foodborne outbreak investigation.

In addition, having made contact with Dr Bansal, it was considered by NT Environmental Health staff that knowledge regarding environmental testing for noroviruses had been improved and would prove useful should circumstances require implementation of such testing in the future.

Acknowledgements

We wish to thank Meredith Hansen-Knarhoi, the ICSSB Environmental Health team and the staff of Robertson Barracks Medical Centre for their invaluable assistance during the investigation, and also Vicki Krause for input into the drafting of the report.

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Postscript

There have been subsequent cases of laboratory-confirmed norovirus gastroenteritis from Robertson Barracks in late April through to late May. A total of 10 cases were admitted to RBMC in April and a further 14 admissions in May, making a total of 24 further cases. In addition, a personal communication from the Emergency Department Physician at Royal Darwin Hospital on 11 April indicated that there were "high numbers" of cases of diarrhoea and vomiting amongst spouses of defence personnel from 5/7 RAR presenting at RDH Emergency Department. The outbreak appears to have ceased by early June, with no new cases of norovirus being reported by staff at RBMC after late May. Contact is being maintained with the staff of RBMC in this regard.

Abbreviations

1ARMD	1 Armoured Regiment
1AVN	1 Aviation Regiment
1CER	1st Combat Engineer Regiment
1CMC	Coonawarra Medical Centre (Larrakeyah)
1CSR	1 Combat Support Regiment (Signals)
1CSSB	1 Combat Service Support Battalion
2CAV	2nd Cavalry Regiment (Light armoured vehicles)

321 CSS	321 Combat Support Squadron (RAAF)
5/7	5/7 Royal Australian Regiment (Infantry)
8/12 MR CA	8/12 Medium Regiment (Artillery) Chief of Army
MAJ	Major
OR	Other Rank
RAP	Regimental Aid Post
RBMC	Robertson Barracks Medical Centre

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Factsheet

Norovirus

What is norovirus infection?

Norovirus is a virus that can cause infection of the gastrointestinal tract. It has been known previously as the “Norwalk virus”, “winter diarrhoea” and “winter vomiting disease”.

What are the symptoms?

Norovirus infection causes sudden onset of profuse vomiting and/or watery diarrhoea and stomach cramps. Other symptoms may include fever, headache and muscle aches. Symptoms usually develop between 24 and 48 hours after ingestion of the virus, but may occur as early as 12 hours after exposure.

The illness is usually self-limiting, with recovery being complete within 72 hours of onset of symptoms.

How is it spread?

Norovirus is highly infectious. Very few virus particles are necessary to cause infection, and as such it often occurs in outbreaks.

Norovirus can be found in the vomit or faeces of infected people and can be spread by the ingestion of tiny particles of vomit or faeces that have contaminated food or water. It can also be spread via direct contact with an infected person or via contaminated surfaces. Raw or undercooked seafood, such as oysters, have also been a source of infection.

What is the infectious period?

People are infectious to others from the moment they are ill until 48 hours after symptoms have stopped. In some cases, a person can still be infectious up to 2 weeks after recovery. Because of this long infectious period, it is particularly important to use good hand washing and other hygienic practices after norovirus infection.

There is no evidence that an infected person can become a long-term carrier of norovirus.

Who is at risk?

All age groups may be affected by norovirus. Dehydration is the most common complication, especially amongst the very young and the elderly.

An episode of norovirus infection does not cause a person to be immune from norovirus for life. Therefore people may get sick if infected again on another occasion. There is no vaccination against norovirus.

What is the treatment?

There is no medication that specifically treats norovirus infections. Management focuses on preventing and treating dehydration caused by vomiting or diarrhoea. Anyone with vomiting or diarrhoea should drink extra fluids to avoid dehydration. Rehydration therapy with oral glucose/electrolyte solution is particularly effective. If children refuse this solution, diluted fruit juice or soft drinks may be given (1 part juice/soft drink to 3 parts water).

Babies should continue to be offered their normal feeds plus extra fluids in between feeds.

Medicines to prevent vomiting or diarrhoea should not be given, especially to children, except when prescribed by a doctor.

How can norovirus infection be controlled?

Good hygiene is important in limiting the spread of norovirus. Hands should be washed thoroughly with warm soapy water, particularly:

- after going to the toilet
- before preparing or handling food

- after every nappy change
- after touching soiled linen or clothing

Surfaces that may be contaminated (bathrooms, bench tops etc) should be cleaned thoroughly with a bleach-based product diluted 1 in 10 with water.

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

Health care workers and food handlers should not go back to work until 48 hours after diarrhoea and vomiting have ceased.

Children with vomiting or diarrhoea should not attend childcare/school until the symptoms have ceased.

Anyone with diarrhoea should not swim, wade

or paddle in public pools.

Cooking oysters thoroughly before eating them will reduce the risk of infection.

Should I see my doctor?

Children with diarrhoea, who vomit or who refuse extra fluids should see a doctor. Anyone with prolonged or severe diarrhoea or who is concerned about their symptoms should see a doctor.

Doctors and public health workers are interested in preventing outbreaks of diarrhoea. If there are two or more infected persons in a group, reporting the illness to the Centre for Disease Control may help public health officers identify the source of the infection and prevent further spread. Advice can also be provided on how to prevent a large scale outbreak occurring.

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>

Introducing hepatitis C enhanced surveillance in the Northern Territory

Marianne Bookallil¹, and Peter Markey², CDC Darwin

Background

Notifications of hepatitis C in the Northern Territory (NT) have been collected as part of the notifiable diseases surveillance system since the early 1990s. Although initial case definitions allowed for the reporting of “acute” (ie newly acquired) cases¹, notified cases were not individually investigated. As a result almost all notifications were classified as “unspecified”. This system allowed for some monitoring of disease burden, but given that it was not possible to determine when “unspecified” cases had been acquired, it was only a crude measure of transmission.

In 2000, enhanced surveillance was implemented for a trial period of a few months. Each case was followed up by contacting the referring doctor and asking questions about previous testing and risk factors. However, privacy issues made the collection of the data difficult and the system was not continued. Since that time, amendments to the schedules pertaining to the Notifiable Diseases Act² have allowed enhanced surveillance to be implemented under the provisions of the Act.

Nationally, an enhanced data set for hepatitis C has been developed as part of the National Notifiable Diseases Surveillance System (NNDSS). A national case definition for hepatitis C – both “newly acquired” and “unspecified” was implemented in January 2004.

Epidemiology

After an initial fall in the late 1990s, notification rates in the NT have been trending upwards. Given that nearly all these cases are “unspecified,” the extent to which this trend reflects increased transmission is not known. Nationally, notification rates have been trending down since 2001, although there was an increase in 2005 (Figure).

Since the early 1990s through to the end of 2005 there have been 3209 cases notified. This number cannot be taken as the total number of cases in the NT as it does not allow for deaths or relocation interstate or overseas. In 2005, the

notification rate in the NT was 125.3 per 100,000 which was 1.7 times the national notification rate.

Without further data collection, it is not possible to know whether the current higher rates in the NT (or future increases) are due to higher rates of testing, a higher background prevalence or higher transmission rates. Investigation into an increase in the local notification rate in Darwin in 2004 revealed that the majority of newly notified cases had tested positive in another jurisdiction in the past and were aware of their status. The higher NT rates therefore might reflect unspecified cases presenting for testing rather than a larger number of people acquiring disease.

Rationale

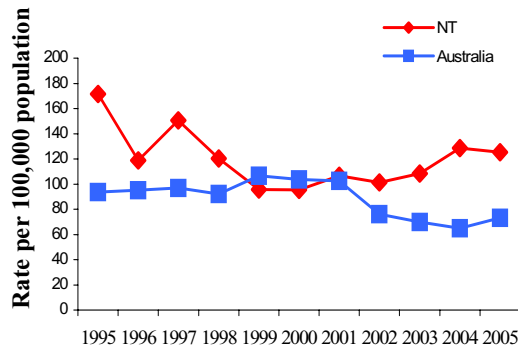
In the NT, hepatitis C is notifiable by both doctors and laboratories. In addition, acute viral hepatitis is urgently doctor notifiable and clinicians should contact the Centre for Disease Control (CDC) without delay, if they suspect the condition.

Cases are categorised into acute and unspecified according to the national case definitions. However, unless a doctor specifically notifies a case as acute, classification relies on information that is only available through enhanced surveillance. Hence, most cases are still entered as unspecified and as such it is not possible to measure transmission rates or monitor risk factors for recent acquisition.

Enhanced surveillance will allow CDC to appropriately categorise cases and most importantly monitor the number of newly acquired cases and their risk factors. It will allow outbreak detection and risk factor monitoring which will help detect breaches in infection control in the community, for example during tattooing or body piercing. It can also be used as an evaluation tool for the needle and syringe program and will provide information to assist resource allocation for preventative activities for hepatitis C.

¹Australasian Faculty of Public Health Medicine (AFPHM) trainee, ² Head of Surveillance

Figure. Hepatitis C notifications, NT and Australian 1995—2005



Methodology

The enhanced data set was established by the Communicable Disease Network Australia (CDNA) and the Australian Hepatitis Council consulted before this project began. A data collection survey form was produced and a letter was sent to general practitioners (GPs) in the Top End, Clinic 34 and the Alcohol and Other Drugs Service advising of the new data collection system. Central Australian GPs were notified via email and the new system was discussed in the surveillance newsletter. Hospital doctors were notified via hospital management.

Enhanced surveillance will commence from 1 July 2006 using the nationally defined dataset. Information will be collected via a 2 page questionnaire from all doctors who diagnose hepatitis C. The questionnaire asks about the timing of diagnosis, clinical symptoms, previous tests and risk factors. It will be mailed to general practitioners, and doctors in Clinic 34 and the Alcohol and Other Drugs Service. They will be

asked to fill in the form and send it back by fax or self addressed envelope. Hospital doctors will be paged and the form will be faxed to them or filled in over the phone. Recent updates to the schedules of the Notifiable Disease Act allow medical practitioners to supply this information.¹

The collection of enhanced data for the entire NT will be done through the Sexual Health epidemiologist in Darwin. Data will be coded and entered into the enhanced hepatitis C database in the NT Notifiable Diseases System. From there it will be analysed by extract, but future developments will include transferring the data into the departmental data warehouse and analysing it through standard data analysis tools. Evaluation of the system is planned following a trial period of 3 months.

Summary

The public health benefits of hepatitis C surveillance in the NT have been constrained by the limitations on the amount of information which has been collected. With the introduction of enhanced surveillance the system will be better equipped to measure disease transmission, detect outbreaks and monitor the benefits of public health interventions such as needle and syringe programs.

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Chlamydia Rates Are Rising Sharply in the NT

Jiunn-yih Su, Project Officer & Steven Skov, Public Health Physician, Sexual Health and BBV Unit, CDC, Darwin

Genital chlamydia has been the most frequently reported notifiable condition in Australia in the last few years. The notification rate of chlamydia has increased from 87.1(16,974 cases) in 2000 to 203.0 (41,261 cases) per 100,000 population in 2005 in Australia – a 2.3 fold increase in 5 years.¹ The notification rate of chlamydia for the Northern Territory (NT) has been the highest among all jurisdictions in the last 10 years and has also been on the increase.¹

A significant increase in the number of chlamydia notifications in the NT has been noted in the first quarter of 2006. As shown in Table 1, 515 notifications of chlamydia were recorded in the first quarter of 2006. This was significantly higher than the 'Means' of any quarter for the period 2000-2005. In fact, it was the highest number of notifications ever recorded in the NT, and the annualised rate for this quarter exceeds the expected value based on the existing increasing trend from 1996-2005 (Figure 1).

Examining the data on all tests for sexually transmitted infections (STI) performed by a private pathology laboratory, that processes the majority of NT notified STI cases showed no evidence of increased testing done in this time period compared to the same period in the previous 3 years. To our knowledge, no large scale screening activity for STIs was undertaken in this period either. This increase appears to represent a true rise in incidence, rather than an increase due to case finding from expanded testing.

Further analysis showed that a significant increase in chlamydia notifications was recorded in Darwin Urban, Darwin Rural, Alice Springs Urban, East Arnhem and Barkly Areas (Table 2). In these areas the number of cases was 1.7 - 1.9 times higher than the first quarter 'Mean' for 2000-2005. In contrast the number of cases fell in Alice Springs Rural Area. Of the 515 notifications 38% (197) occurred in Darwin

Table 1. Quarterly number of chlamydia notifications, NT, 2000-2005 & 2006 (Q1)

Years	2000	2001	2002	2003	2004	2005	Mean (2000-2005)	95% CI for mean	2006
Jan-Mar	219	304	299	423	376	375	332.7	256.0-409.4	515
Apr-Jun	283	305	377	395	441	467	378	301.6-454.4	
Jul-Sep	276	324	376	388	384	330	345.5	272.6-418.4	
Oct-Dec	218	313	378	381	403	380	345.5	272.6-418.4	
Total	996	1,246	1,430	1,587	1,604	1,552			

Figure 1. Annualised notification rate of chlamydia by quarter, NT, 1996-2005 & 2006 (Q1)

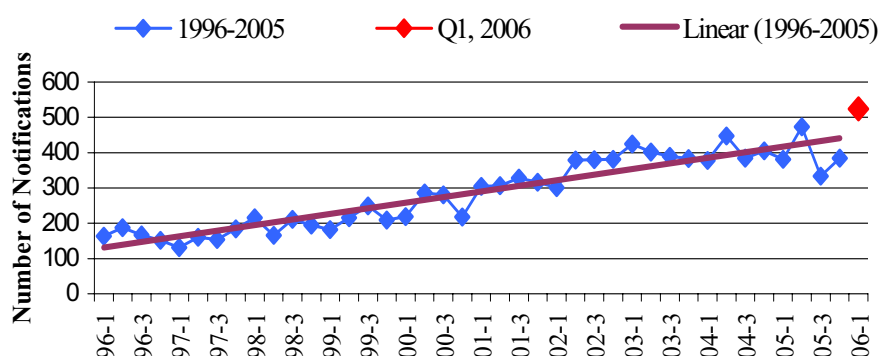


Table 2. Number of chlamydia notifications in the first quarter of the year by district, NT, 2000-2006

District	2000	2001	2002	2003	2004	2005	6 yr-Mean	95% CI	2006	Ratio
Alice Springs Rural	66	72	45	85	63	89	70.0	53.2-86.8	59	0.8
Alice Springs Urban	35	50	42	101	78	73	63.2	36.8-89.6	111	1.8
Barkly	3	3	7	6	13	10	7.0	2.9-11.1	13	1.9
Darwin Rural	13	21	20	31	21	14	20.0	13.2-26.8	34	1.7
Darwin Urban	60	102	104	123	130	122	106.8	80.1-133.6	197	1.8
East Arnhem	16	28	28	38	27	38	29.2	20.6-37.8	56	1.9
Katherine	19	26	49	37	37	20	31.3	19.0-43.6	42	1.3

Table 3. Notifications of chlamydia by sex and ethnicity, Darwin Urban Area, Quarter 1, 2006

Sex	Aboriginal	Non-Aboriginal	Unknown	Total
Female	23	75	17	115
Male	16	47	19	82
Total	39	122	36	197

Urban Area. While overall Aboriginal cases represented nearly 60% of all chlamydia notifications, in Darwin Urban Area (Table 3), non-Aboriginal cases represented 60% of all notifications. Most of the cases were recorded in the 15 to 24 years age groups (Figure 2).

By annualised notification rate, Alice Springs Rural Area recorded the highest rate, followed by Alice Springs Urban and East Arnhem Areas (Figure 3).

There has been a steady increase in chlamydia notifications throughout Australia in recent years that is similar in magnitude to that seen in the NT. It is not known yet whether a similar

Figure 3. Annualised notification rate of chlamydia by district, NT, first quarter 2006

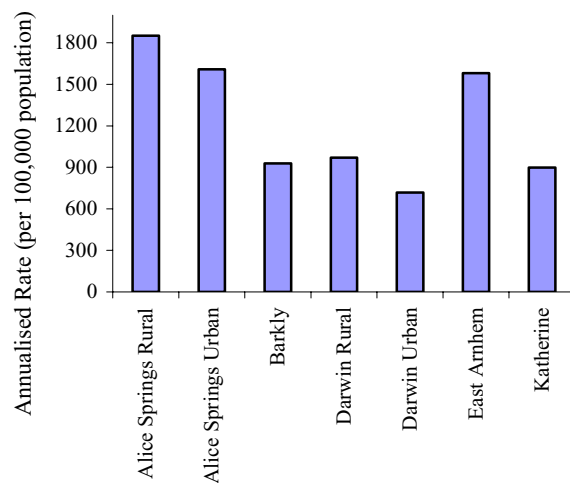
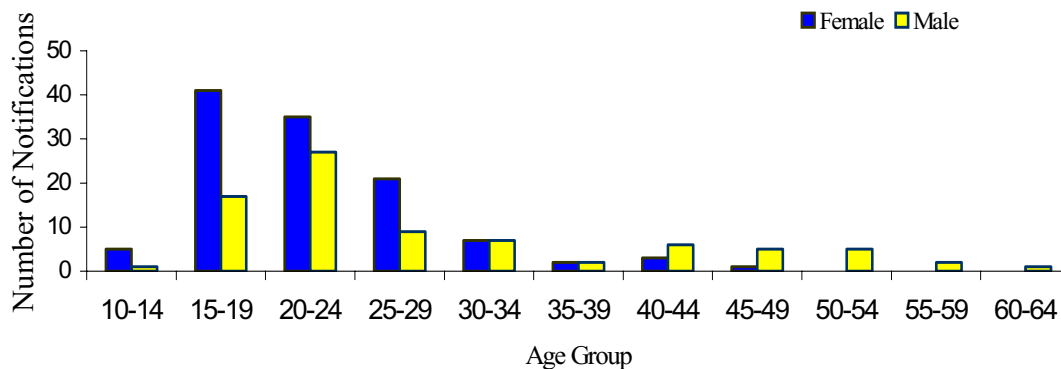


Figure 2. Number of chlamydia notifications by age and sex, Darwin Urban Area, Quarter 1, 2006



increase in the first quarter of this year has been seen in other jurisdictions. The Sexual Health and Blood Borne Viruses Unit will undertake an investigation to look for geographic patterns or changes in the way that clients are presenting to health care providers that might shed light on this increase.

In the meantime health care providers, particularly in urban areas, are encouraged to be vigilant for STIs and to pro-actively offer testing for clients in the 15-24 years age group.^{2,3} One of the major reasons why chlamydia spreads easily is that as many as 50% of males and 70% of females who are infected are asymptomatic.⁴⁻⁶

At a time when there may be increased transmission of infection, the treatment of sexual partners is very important. Health care providers should be active in inquiring about sexual partners of people with infection and in ensuring that they also receive treatment. The staff at Clinic 34 are able to assist general practitioners to undertake this contact tracing. Education and advice for patients concerning the risks of infection and safe sex practices are also

important and Clinic 34 can provide patient education resources and support.

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Contact Numbers of Clinic 34

Darwin	89992678
Katherine	89739047
Nhulunbuy	89870356
Alice Springs	89517549
Tennant Creek	89624250

Mosquito control and the Katherine flood April 2006

Peter Whelan, Director & Nina Kurucz, Operations Manager, Medical Entomology Branch, CDC

Introduction

In January 1998 the town of Katherine, approximately 280 km south of Darwin, was extensively flooded. In the aftermath of the flood, the Medical Entomology Branch (MEB) of the Centre for Disease Control (CDC) in the Department of Health and Community Services (DHCS) carried out large-scale mosquito control operations, which reduced mosquito numbers and prevented an outbreak of mosquito borne disease.¹

On 7 April 2006 Katherine was again flooded. Katherine has a seasonal risk of the mosquito borne disease, including Murray Valley encephalitis (MVE), which has a peak risk from March to June in the Top End. Mosquito monitoring in Katherine just before the flood showed relatively high numbers of *Culex annulirostris*, the main mosquito vector of MVE, which indicated that mosquito control was required urgently to prevent a possible outbreak of disease, as well as to prevent a major pest problem from mosquitoes.

Mosquito control in Katherine in general is limited to regular fortnightly applications of larvicide to the storm water drain system by the Katherine Town Council. Larval control of the other defined mosquito breeding sites is either by the landowners or by a contracted pest control company. The flood disrupted local capabilities of mosquito survey and control and the extent of the flood meant that large-scale mosquito control was beyond the local resources.

This report outlines the result of the DHCS survey and subsequent mosquito control operations in Katherine.

The Katherine Flood April 2006

The Katherine River peaked at 19.01 metres early after midnight on the morning of 7 April 2006. By the morning of 8 April, the river began to drop and many residents in the town were able to return to their houses. This was the worst flooding in Katherine since the floods of January 1998, when the Katherine River reached a peak

of 21 metres and flooded various urban areas with up to 3 metres of water.

Many of the recently flooded areas were major mosquito breeding sites in 1998. The extent of the flood and the disruption to normal services meant that extensive mosquito monitoring and control was beyond the resources of local health staff.

Mosquito survey and control

It was clear from the 1998 flood that mosquito egg-laying would begin about 1 to 2 days after the peak of the flood. This meant that larvae would be at the first or second growth stage by day 4 after the peak of the flood, leaving 2 to 3 days to carry out control measures before the larvae reached the late fourth instar and began transformation to the pupal stage, at which stage insecticide treatment would no longer be effective.

The MEB team of 4 arrived by road in Katherine on the evening 10 April and immediately began setting mosquito traps to evaluate the level of adult mosquitoes. The MEB survey team overflowed the Katherine area within a 5 km radius of the town centre on the morning 11 April. Areas of flooding were mapped on large aerial photos and landing coordinates were recorded with a GPS unit. An on-ground assessment of the mosquito breeding was made by 3 MEB staff running through flooded areas within 100m of each helicopter landing site and assessing the habitats by dipping for the presence and density of mosquito larvae.

Details for each collection, including the GPS coordinate, the average number of larvae per dip, habitat type and the developmental stages of the larvae were recorded on the sample jars at each landing site. The flooded areas and the average density of mosquito larvae and GPS coordinates were marked on the aerial photos.

The survey of the flooded areas indicated that floodwaters covered a considerable area and were still actively draining back to the river in most areas. However there were considerable

areas of stabilised water. Mosquito larvae were present in most areas surveyed. The mosquito larvae were either absent or present at varying densities. Some sites had very low densities while other areas had a medium density of larvae from 4 to 5 per dip. Sites with sewage contamination had relatively large densities of up to 100 per dip. The flooded areas and areas of mosquito breeding are outlined in Figure 1.

High numbers of larvae were found in areas with rotting legume vegetation or high organic wastewater. The highest concentrations of larvae were found in water contaminated by the primary sewage pond overflow at the sewage treatment plant. In general the mosquito larvae were relatively young (mainly first and second stage or less commonly third stage). The majority of larvae in most collections were *Culex annulirostris* (the common banded mosquito). However there were also numbers of *Ochlerotatus normanensis* (the floodwater mosquito), *Cx. pullus* and *Cx. gelidus* in a few collections.

The larval surveys indicated that the flooded areas upstream from the town had little mosquito breeding. These areas were generally relatively shallow, open with sparse native grass and had not received run off from urban areas.

The areas designated for aerial control were chosen with a priority on higher density of larvae and the proximity of the breeding to urban areas. Aerial spraying was carried out on the afternoon of 11 April and all day on 12 April.

The helicopter equipment included a 400 litre insecticide belly tank equipped with 2 spray booms with 32 T jet flat fan nozzles which produce droplets of around 500 micron size. The swath width was 15 to 18 metres using a spray height of 2 to 3 metres and an air speed of 50 knots.

The larvicide used was an aqueous suspension of Vectobac®, which contains *Bacillus thuringiensis var. israelensis* (*Bti*), a biological insecticide. This was applied at around 1.7 litres active ingredient per hectare, although the rate was increased to around 2 litres per hectare for the deepwater sewage overflow area near the sewage treatment ponds. In general one 400 L load was applied over 7 ha. Approximately 88 ha on 11 April and 42 ha on 12 April was treated by

helicopter. The areas sprayed are shown in Figure 1.

The area of sewage overflow treated by *Bti* on 11 April was re-assessed on the afternoon of 12 April and found to contain very high numbers of newly hatched first instar larvae of *Cx. annulirostris*. A second spray operation using the higher rate of *Bi* was applied to this area on the afternoon of 12 April.

The ground-based larval control used all terrain quad bikes equipped with a 100L tank and a pressure spray unit. *Bti* was applied to smaller areas of 0.5 ha and 0.3 ha respectively on 11 and 12 April by ground application of temephos granules and *Bti* application using the quad bike sprayer.

An area of flooded grass near a semi rural development on the Gorge Road was sprayed by a local pest control company on 12 April and 18 April using a vehicle mounted spray unit following complaints about adult mosquitoes biting in the area.

It was obvious from the survey operation that there were some engineering aspects adding to the flooding and mosquito breeding problems. There were a number of critical choke points in drains or drainage pathways in the Katherine town and semi rural area that were restricting flood water drainage back to the Katherine River. Some of these choke points were holding back very large areas of floodwater and were responsible for considerable areas of mosquito breeding.

The most important choke points were the road culverts on the Kalano access road and the Stuart Highway south of the main town, which blocked access of residents to emergency services during, and for a short time after the flood. Both of these culverts are under sized and restricted flood drainage from very large areas that could breed mosquitoes from 3 or 4 days to up to 3 weeks post flood. The drainage could be rectified by installing increased sized culverts, and deepening the approach and exit flow paths in the vicinity of the culverts.

The most mosquito productive area was the non-draining area of overflow from the sewage treatment ponds. This problem could be solved by the installation of a pipe from the flooded

Figure 1. Katherine residential flooding survey 11-12 April 2006

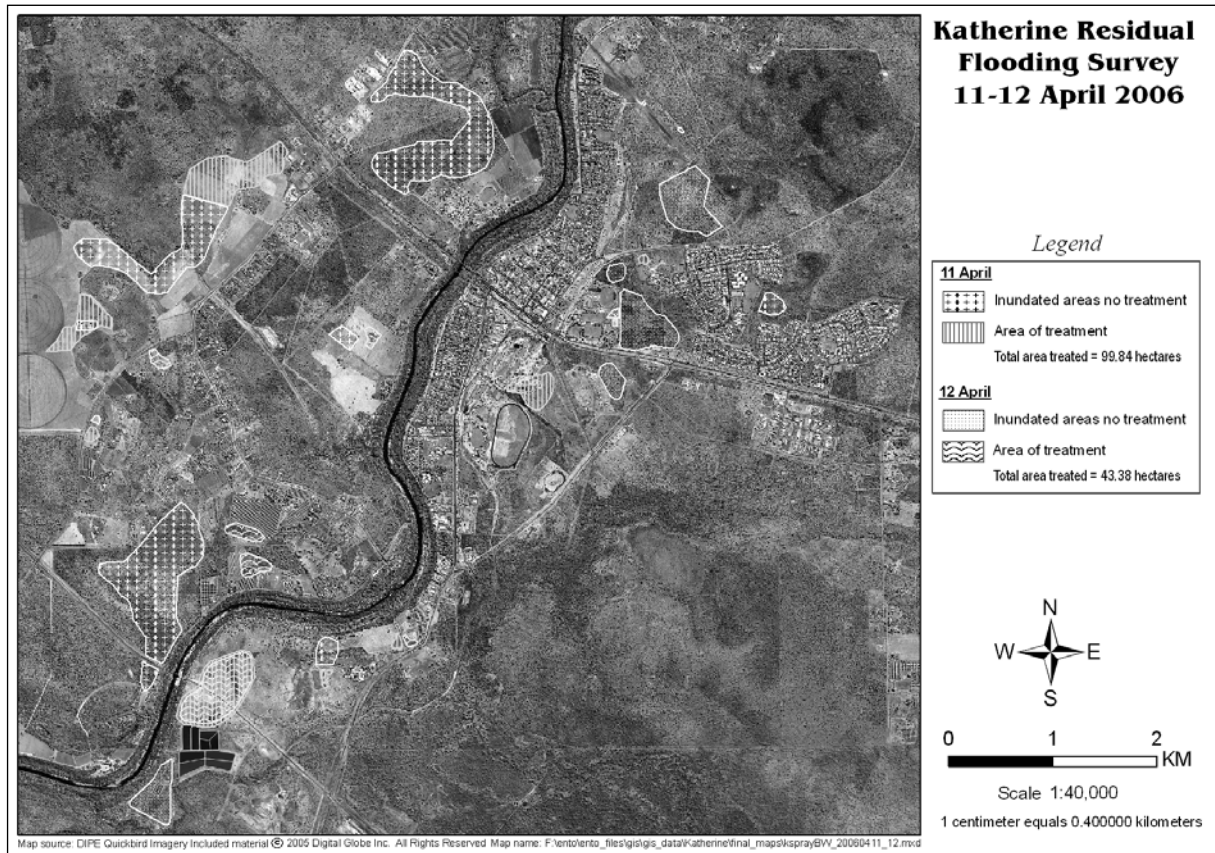
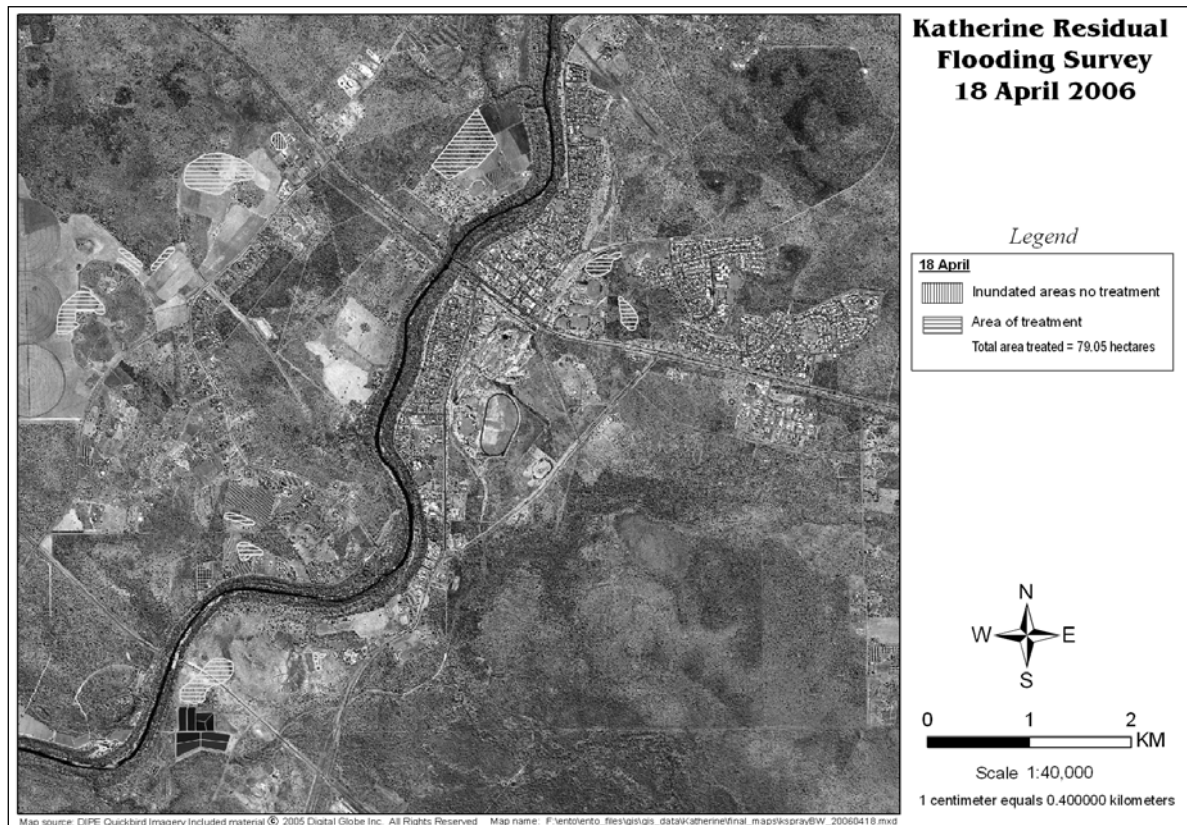


Figure 2. Katherine residential flooding survey 18 April 2006



area to the Katherine River. The next highest priority is the drainage enhancement around Hickey's Lake to reduce mosquito numbers affecting the main urban and nearby rural areas. A list of these choke points has been tabulated and is available.

Improvements in post flood drainage are needed to both reduce the extent of the flooding and the extent of flooded areas requiring mosquito larval control. The drainage improvements would enable earlier access to certain areas and ensure floodwaters drained much sooner after flooding. It could also prevent property damage in some areas when the next flood occurs. Some of these points were included in a MEB report on the previous Katherine flood of 1998¹ but only the Hickey's Lake area had been partially rectified when the present flood occurred.

Reduction in areas of mosquito breeding is required because large scale mosquito larviciding operations as carried out in this instance may not always be possible after floods due to the unavailability of insecticides, personnel, helicopters or other unforeseen aspects. Large areas of mosquito breeding close to residential areas, if untreated, could lead to outbreaks of either Ross River virus disease, Barmah Forest virus disease, or the more dangerous MVE virus disease.

The potential mosquito breeding areas were again surveyed on 18 and 19 April in a similar manner to the first survey. The priority areas were the sewage-contaminated areas near the sewage treatment ponds. The floodwaters had retreated considerably since the first survey period. Flooding in the Hickey's Lake area was much smaller due to the drainage via the drain leading to the Katherine River. The flooded area around the sewage treatment works had retreated considerably (Figure 2).

Aerial control operations were similar to the first operation. Approximately 43 ha was sprayed with *Bti* and 36 ha with methoprene applied at 360 mls per ha during this second episode.

Mosquito and disease monitoring

The routine adult mosquito monitoring in Katherine was last conducted on 24 March, just before the flood. Adult mosquito monitoring was carried out during the flood control

operations and continued by the Environmental Health Officer each fortnight after the flood. The adult mosquito monitoring results are shown in Figure 3 for the Hickey's Lake site and Figure 4 for the sewage ponds site.

For the Hickey's Lake site, the rainfall figure (cumulative rainfall between mosquito monitoring periods) indicates that the steep rise in mosquito numbers before the flood was due to rainfall in the period before the flood (Figure 3). *Culex annulirostris* adult numbers were actually relatively low 4 days after the flood, which was probably due to the disruption of the breeding sites by the flood. However if the larvae found during the survey and control operation were not controlled, adult mosquito numbers would have reached enormous levels a week after the flood. This did not happen. It is obvious that the *Cx. annulirostris* numbers on 21 April and 5 March were well down from those before the flood and this great result is directly due to the 2 episodes of larval control.

For the sewage ponds site (Figure 4) there was no increase in *Cx. annulirostris* numbers in the 2 weeks following the flood, and there was a steep decrease following the second aerial control episode. This containment or decrease is remarkable when it is considered that there were very high numbers of larvae and a very large area of mosquito breeding near the sewage ponds following the flood.

There were a number of black flies (*Austrosimulidae* species, family *Simulidae*) in the traps and there were a number of complaints about "midge attack" by some residents, particularly in the Gorge Road area. MEB officers collected some black flies biting in the area between Katherine and Katherine east on 12 April. It is possible this is the species reported in plague numbers in outback Queensland following floods. These specimens are being further investigated by MEB.

The DHCS has a sentinel chicken program at major towns to provide an early warning system for mosquito borne flavivirus disease activity. This program involves the monthly bleeding of a flock of chickens to detect antibodies to Kunjin virus and MVE virus. One of the sentinel chicken flocks is situated just south of Katherine and was not affected by the flood. Testing for these sentinel chickens was resumed

Figure 3

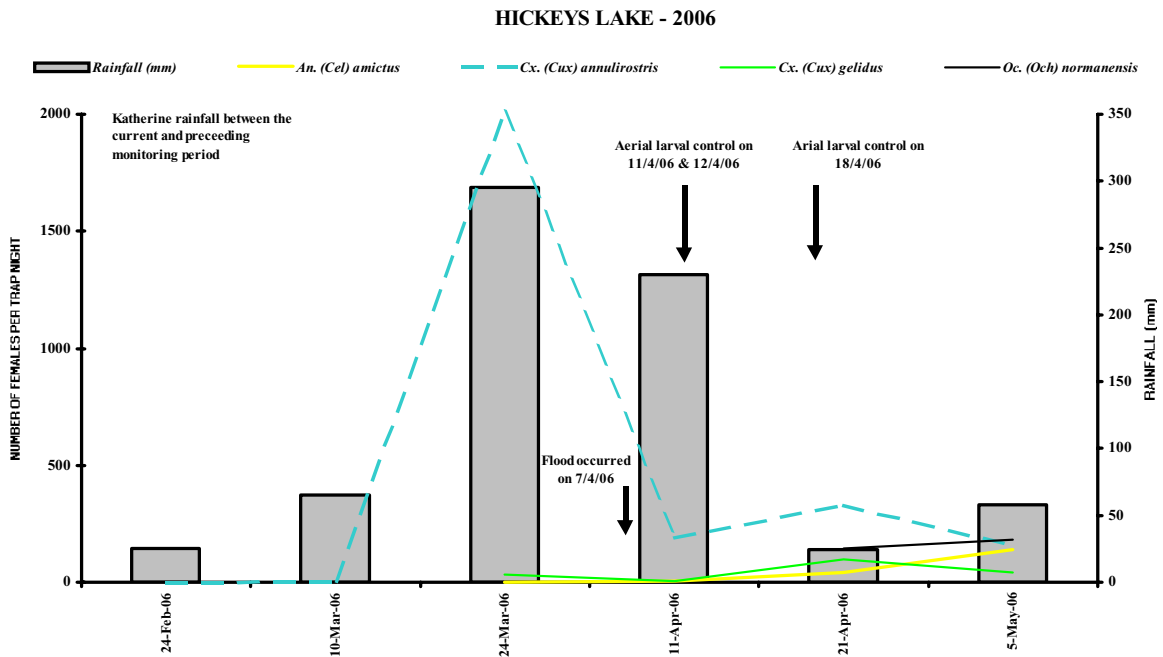
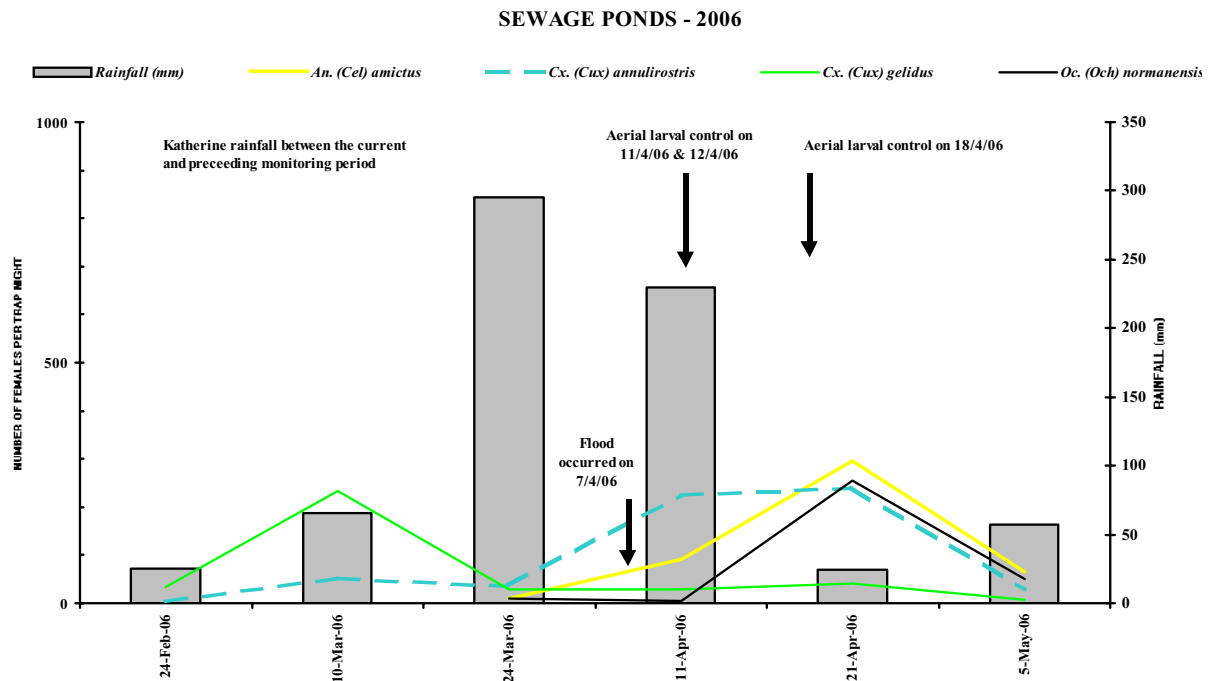


Figure 4



immediately after the flood. On 11 April, 2 of the Katherine sentinel chicken, seroconverted to Kunjin virus. However this virus transmission must have occurred before the flood, as it takes some time for chickens to produce antibodies after being bitten. Testing of the sentinel chickens in May showed further seroconversion in 2 chickens to Kunjin virus. Although this has been due to virus activity after the flood, it was relatively limited and there has been no evidence of MVE activity in the Katherine area so far this year to date.

There have been no human MVE or Kunjin virus disease cases to date in the Katherine area following the flood.

The DHCS issued MVE and Kunjin virus warnings for the Top End, including the Katherine area, in March, April and May 2006. These warnings hopefully alerted people to take personal mosquito protection against mosquito bites. Efforts to reduce vector numbers and these personal measures contributed to a reduced risk of MVE and Kunjin disease.

Ross River virus disease cases in humans are usually on the decrease after February of each year. The fact that there has been no increase in RRV cases in April is not a reflection of the aerial control program but rather the normal seasonal pattern of RRV.

Conclusions

The Katherine flood on 7 April 2006 created large areas of mosquito breeding which was evident 4 days after the flood peak. Some of these areas were in excess of 30 hectares and produced a very high density of *Cx. annulirostris* larvae, a good vector of MVE virus disease and Kunjin virus disease. Disasters including floods are often associated with a high incidence and risk of mosquito borne disease.²

The mosquito control operations, by DHCS, were carried out in a very timely manner, and prevented any large hatch of adult mosquitoes. This control has been a major factor in the lack of any appreciable mosquito pest problem.

There were many aspects that contributed to the successful mosquito control operation. These include the use of a specific cost code to quickly organise the required consumables such as

insecticides, the DHCS contacts on the Katherine Region Recovery Coordinator who assisted enormously in facilitating local arrangements and clearances, the use of a private tanker company to supply water for the spray operation, and the use of a helicopter to conduct speedy and large scale survey and spray operations. Perhaps the most vital parts of the recipe was an expert and experienced MEB team and a specifically experienced helicopter pilot in carrying out the survey and control operations.

There were also many learning experiences from the operation. The principal lesson was that the area of mosquito breeding could have been dramatically reduced if there had been flood mitigation works carried out after the flood in 1998. During the 1998 floods, speedy action was taken to unblock a drain across the Stuart Highway. There needs to be an avenue of communication and a capacity to make quick decisions during disasters to carry out such engineering options to reduce areas of mosquito breeding and enable better vehicle access to various areas.

The suggested flood mitigation works should now be a high priority so that post flood drainage can prevent access problems for residents and prevent pest and disease problems from mosquitoes. There should also be an annual maintenance program in the storm drain system in the dry season of each year to improve drainage flow in the event of flooding during the wet season.

The survey and control operation could have been speeded up with use of 2 helicopters and would have enabled surveys to take place while control was carried out. The use of methoprene pellets, while more expensive, would allow control in flooded areas for up to 30 days, which would remove the need to resurvey controlled areas and save money on re-applications.

The adult mosquito problem in Gorge Road indicated that mosquito monitoring after floods in Katherine needs to be over a wider area, and that public complaints about mosquitoes need to be relayed to the MEB as soon as possible.

Acknowledgments

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We would also like to thank DHCS staff who organised many aspects which enabled the spray operations, including Sandy Spears who allowed speedy communication and the organisation of accommodation, clearances, and contacts with the relevant people, Dr Vicki Krause of CDC who cleared the way for the MEB response, and Chris Luthy for assistance in surveys and follow up in control aspects.

We also thank Trevor Troy who facilitated contacts and provision of the water tanker, Travis Jones for assistance with the water tanker

during out of hours, Andy Bilske of Murray Pest Control for ground larval control in the Gorge Road area, and various media agencies for public information dissemination, including Amy Collett, Leon Compton and Andrew Priestly.

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Interim report to the National Arbovirus and Malaria Advisory Committee on the detection of exotic mosquitoes in tyres at Perkins Shipping, Darwin, Northern Territory on 12 May 2006

Peter Whelan, Director & Matt Shortus, Exotic Vector Surveillance Officer, Medical Entomology Branch, Centre for Disease Control.

Detection

A Perkins container ship arrived in Darwin Harbour from Singapore on Wednesday 10 May 2006 and docked at the international wharf at Perkins Shipping at 04.30. An Australian Quarantine and Inspection Services (AQIS) officer conducted a pre-clearance inspection of the container ship on Thursday 11 May 2006. A quarantine inspection of the container ship was then conducted by AQIS on the morning of Friday 12 May 2006. During this quarantine inspection, mosquito larvae were found breeding in water pooling at the bottom of 6 large earthmoving tyres. The tyres were stacked upright, and protruding from the top of an open, uncovered shipping container.

Six mosquito larvae, 1 pupal skin and 1 pupae were collected and preserved in 70% ethanol on site by the AQIS officer. There were larvae observed in all of the 6 tyres that were inspected and adults were observed flying in the vicinity. AQIS estimated that there were at least 50 larvae observed in 3 of the tyres and probably less than

50 larvae in the other 3 tyres. Following a preliminary identification of the samples at the AQIS vector laboratory a medical entomologist at the Medical Entomology Branch (MEB) of the Northern Territory Department of Health and Community Services (DHCS) confirmed them to be *Aedes albopictus* on the same day of collection. This exotic species is a very good potential vector of dengue and chikungunya virus.

This risk importation was assessed as being moderate to high because the tyres were exposed and untreated at Perkins international wharf for a period of over 48 hours, and large numbers of larvae (and probably pupae) and adults were observed, and a pupal skin was collected in the sample, indicating that adult mosquitoes had probably emerged from this breeding site and dispersed out of the area. Perkins Shipping is located in very close proximity to Darwin City.

There are a number of residential buildings within 500 metres of the wharf facility that could potentially provide a blood meal for a female

adult *Ae. albopictus*. There are also a large number of potential receptacle breeding sites nearby where a gravid female could lay eggs.

Elimination procedures

The response to this risk situation followed the draft National Arbovirus and Malaria Advisory Committee (NAMAC) guidelines (Proposed protocol for action when a 'risk importation' or introduced exotic mosquito is 'detected', IN PREPARATION). After samples were collected from the tyres by AQIS, the tyres and container were immediately sprayed with a knockdown insecticide (d-phenothrin). The tyres were then taken off the ship and placed on the wharf, where they were covered and fumigated by a contract pest controller with methyl bromide, for 24 hours at 48 g/m³ at 21° or above.

An adulticide fogging operation was conducted at Perkins Shipping and other industrial premises and vegetated areas within 500m of the unloading zone by MEB, using a ULV LECO fogging machine and applying bioresmethrin at a ratio of 1:1.5 insecticide to diesel, and at a rate of 330ml per minute. All Perkins staff were evacuated from the premises between 18:00 and 19:00 on 12 May 2006 and the interior of all the accessible buildings, any areas of vegetation, any accessible opened containers and the engineering yards were fogged between 18:10 and 18:58. The premises next door, Frances Bay Marine, was considered to be a risk premise due to a large number of potential receptacle breeding sites, such as tyres, drums, boat hulls and miscellaneous machinery and boat wrecks being present. This location was also fogged with bioresmethrin between 19:09 and 19:34. Other vegetated areas in public locations and still within 500m of the unloading zone were also fogged between 19:34 and 19:44.

Increased surveillance

The initial surveillance response involved AQIS setting 4 carbon dioxide baited encephalitis virus surveillance (EVS) traps at harbourage sites within the Perkins Shipping site on 15, 16 and 18 May. MEB set another 4 carbon dioxide baited traps at harbourage sites outside Perkins Shipping, within approximately a 400m radius of the shipping facility, on the same dates. Extra adult mosquito trapping will also be conducted

at these 8 locations once a week for another 3 weeks.

AQIS maintain 4 routine ovitraps within Perkins Shipping and another 2 routine ovitraps outside the premises, but within the 400m quarantine zone. MEB also maintain another 3 routine ovitraps inside Perkins, and another 2 routine traps maintained outside Perkins Shipping, but within approximately 500m of the overseas shipping facility.

In response to the exotic incursion on 12 May 2006, AQIS set an extra 4 ovitraps inside Perkins, and MEB placed another 6 ovitraps within an 800m perimeter of the unloading site. These traps will be monitored for a 1 month period after the incursion incident, and will also be reset 1 week after the next rain event.

Prior to the detection of the exotic vector, the last significant rainfall event (over 25mm) was 49.8mm on 26 April 2006. Another 16mm was recorded at Stokes Hill on 22 May, 10 days after the incursion incident. The prevailing wind direction between 10 and 12 May 2006 was SSE-ESE at 33-41 km/h (all information on Bureau of Meteorology web site www.bom.gov.au). On 22 May, 4 days after the rainfall, AQIS and MEB conducted a receptacle survey at Perkins and at 3 other premises within the surrounding 400m quarantine zone. All receptacles that held water and were breeding mosquitoes, or could potentially breed mosquitoes, and receptacles that were empty but could potentially hold water were treated with methoprene pellets or methoprene briquettes and Bifenthrin. Another receptacle survey and treatment operation will be conducted around the whole Darwin city waterfront area after the next significant rainfall event, which will probably be in the early wet season.

Results

Since the risk importation, there have been 2 weeks of extra adult trapping and a receptacle survey of the surrounding premises. Paddles from the extra MEB ovitraps were collected and reset on 29 May, and eggs and larvae are being reared out for identification. No further evidence of *Ae. albopictus* has been observed in the area since the initial detection of larvae, pupae and pupal skins at Perkins Shipping on 12 May 2006.

Figure 1. Exotic vector incursion response 12 May 2006



Conclusions and recommendations

- It would be desirable if pre-clearance surveys by AQIS could target tyres as a high-risk cargo with the potential to import exotic vector larvae and/or eggs and be flagged for examination on the day of arrival.
- The proposed NAMAC protocols for action when a 'risk importation' is detected, recommends treating with a residual

pyrethroid larvicide (such as Bifenthrin or Deltamethrin). This is advisable, as there may be a delay in setting up fumigation proceedings, and a residual treatment will target any recently emerged adults harbouring in the tyre or re-entering the tyre after initial treatments, as well as killing any larvae and pupae in the tyre. The d-phenothrin applied by aerosol can is a good protocol for immediate action to kill any flying adults after detection, but may not

have sufficient residual action to kill adults that later harbour in the tyre or kill larvae or pupae in the water. The effectiveness of aerosol d-penothrin on larvae or pupae should be further examined.

- Only 6 larvae and a pupal skin were collected from a single tyre and preserved in alcohol. It is recommended that samples from all receptacles with water and larvae be collected as separate labelled collections, as this will give a better indication of risk and may indicate other species of mosquitoes.
- In this instance it appears fumigation took place very soon after detection, which is very commendable and will be an important factor in keeping exotic mosquito vectors out of the NT. However if there is a delay, or if there is a sufficient period of time between detection and fumigation, local DHCS medical entomologists can be contacted before fumigation to assist with the collection of adult and larval specimens.
- The local AQIS vector officer put the treatment and enhanced surveillance operations in place quickly and systematically. The notification of the detection to DHCS was very speedy and the increased number of adult traps and ovitraps at Perkins were implemented by AQIS and DHCS rapidly.
- No further evidence of *Ae. albopictus* has been detected in the area following a thorough preliminary joint receptacle survey by AQIS and DHCS at Perkins or other premises within 500m of the overseas docking point. We will not be confident there has been no introduction of *Ae. albopictus* until the end of the extra surveillance measures, and when the additional receptacle survey is undertaken following the next rain event.

Recommended interim water receptacle treatment for exotic mosquitoes on international foreign fishing vessels arriving in Australia

Matt Shortus, Exotic Vector Surveillance Officer & Peter Whelan, Director, Medical Entomology Branch, CDC Darwin

Introduction

Exotic *Aedes* mosquito larvae are commonly found in receptacles as equipment or cargo that hold or have held water, on overseas vessels arriving in the Northern Territory (NT) of Australia. This applies especially to international foreign fishing vessels (IFFV) from Indonesia, which are commonly intercepted fishing in Australian waters by the Royal Australian Navy (RAN) and Customs and detained in Darwin or Gove harbours. The drinking water storage receptacles aboard these vessels are often found to contain *Aedes aegypti* and *Aedes albopictus* larvae. Drinking water storage receptacles are the most commonly detected type of container to carry exotic mosquito pupae, larvae and eggs into the NT. *Aedes* species eggs are desiccation resistant and can often be present in either water holding or dry receptacles. The eggs are laid just above the water level on the inner surfaces of receptacles. Approved procedures to treat drinking water receptacles only allow the use of chlorine, due to the residue concerns posed by the use of insecticides. These treatments are part of routine quarantine inspection and control

procedures on vessels or aircraft in the 400 m quarantine zone around air and seaports.

As part of the previously recommended chlorination procedures, any water holding receptacles were emptied and treated with a chlorine spray to kill possible exotic *Aedes* eggs on inner surfaces.^{1,2,3} However, the previously recommended receptacle treatments that involved spraying the receptacle surface with a 1% active ingredient (AI) chlorine solution to the point of run-off did not adequately kill 100% of mosquito eggs.⁴ This was due to the mosquito eggs not being exposed to the chlorine solution for a long enough period. The vertical position of the treated surface, the large clusters of eggs, the sometimes low relative humidity and the dilution of the chlorine solution are all factors that affected the efficacy of the previous treatment recommendations.⁴

Recent re-evaluations of the efficacy of chlorine against *Aedes aegypti* eggs, as well as the development of new egg treatment methods that use detergents, can be combined to provide an improved interim method of receptacle

treatment. These recommendations are in response to requests by the Australian Quarantine and Inspection Service (AQIS) for suitable receptacle treatment protocols for drinking water receptacles aboard IFFV's. These recommendations will also hold for refugee vessels and general vessels carrying cargo that holds water, or other receptacles, from overseas. The recommendations are for procedures to treat drinking water receptacles containing, or likely to contain exotic mosquito pupae, larvae and/or eggs.

Recommendations (see Figure 1)

Collection of larval and adult samples

When a water storage receptacle breeding site is identified it is important to try and collect larval, pupal and/or pupal skin samples before treating the receptacle. If the IFFV has landed in Australia before being intercepted, the collection of these samples allows an effective risk analysis of an exotic vector incursion to be undertaken. It will also allow a timely and adequate monitoring response to be set up in the event of a suspected or potential incursion, as well as the rapid implementation of any control or eradication procedures that are required if there is a confirmed exotic vector incursion.

The treatment procedure

The recommended procedure for the treatment of drinking receptacles aboard IFFVs is to firstly pump, siphon, or pour out the stored water into the sea and to spray the inner receptacle surfaces with a chlorine/detergent solution to kill any eggs that may be present. All mosquito larvae and pupae would be killed by disposal into the sea, and any eggs remaining on the receptacle wall will be killed by the chemical treatment.

The chemical treatment comprises a mixture of 4.8 litres of a liquid sodium hypochlorite solution, that has at least 10% AI, combined with approximately 200 ml of liquid dishwashing detergent. The 10% sodium hypochlorite solution can be purchased as 'liquid chlorine' (with at least a 10% AI) from most pool shops. The liquid concentrate detergent can be any major domestic or commercial brand name. The ingredients should be mixed thoroughly in a 5-litre pressure sprayer and

applied liberally to the point of run off to all of the inner surfaces of the water storage receptacle. The receptacle should then be sealed with a lid or cover and left to stand. This process should be repeated after 30 minutes. Once the receptacle has been treated twice over a 60 minute period it should remain sealed and let stand for another 24 hours, after which it can be thoroughly cleaned and rinsed.

Improvements in the treatment procedure

The 2 major problems with the previous chlorine surface treatment was that the chlorine solution did not remain in contact with the eggs for long enough to kill them, and that the 1% chlorine solution was too dilute to kill large numbers, and clusters of eggs. Recent studies have found that chlorine solutions with a 10% AI rate, when applied to *Aedes* eggs and left in contact with the eggs for at least an hour, and then left to incubate for at least 24 hours in a high humidity environment, can achieve a 100% mortality rate.⁴ Other studies have found that by adding detergent to a chlorine solution, the mixture becomes a lot more viscous and can adhere to the walls of the receptacle for a longer period of time.⁵

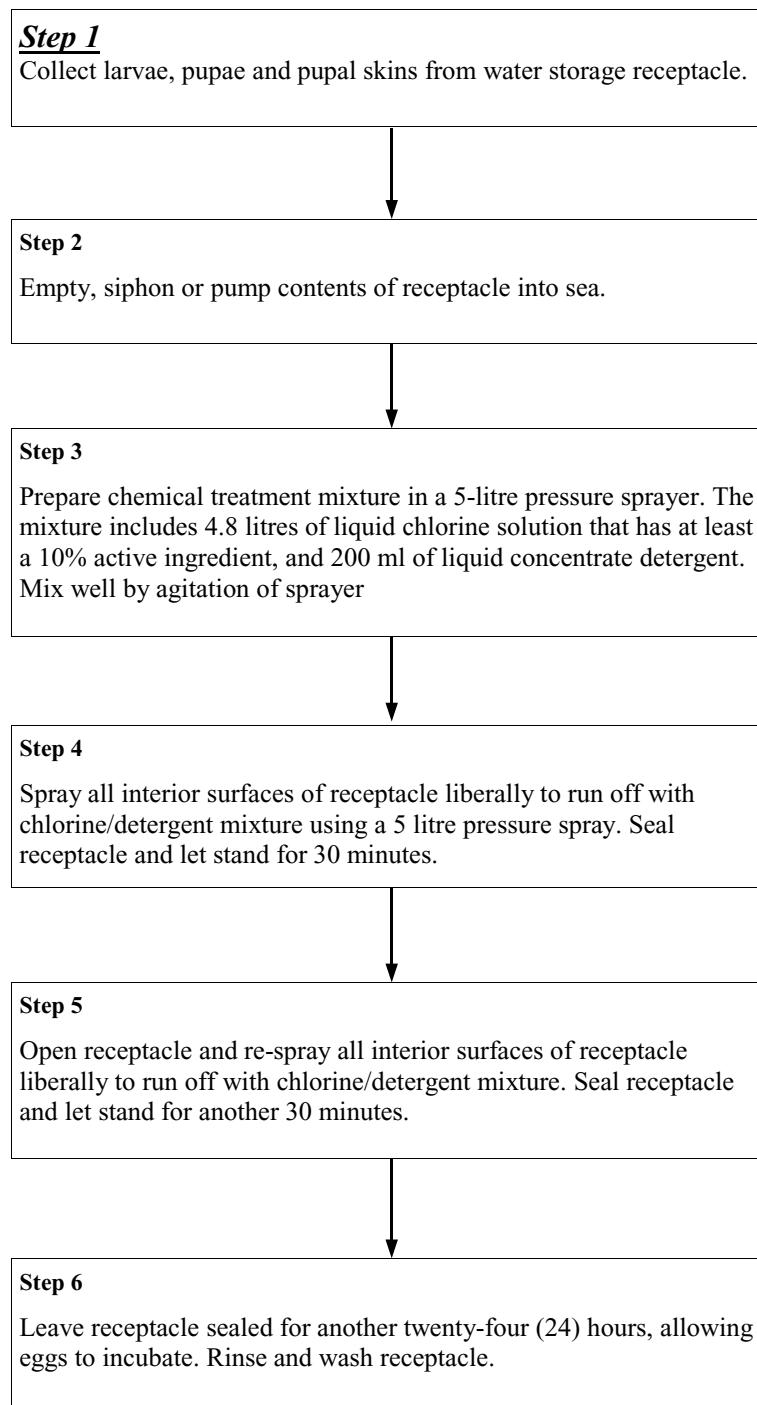
By increasing the strength of the chlorine solution that is in direct contact with the eggs, as well as increasing the time that the treatment mixture is in contact with the eggs and sealing the receptacle to increase the humidity, these interim treatment procedures will provide a more effective control of *Aedes* eggs in IFFV water receptacles than the previous recommendations. **The previous recommendations use only a 1% AI chlorine solution for surface treatment of eggs, which has been shown to be too dilute, as well as too thin so that it runs off vertical surfaces too quickly.**⁴

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Figure 1. Interim treatment procedures for water receptacles on IFFVs



Guidelines for the Design, Operation, Management and Maintenance of Aquatic Facilities

Leah Magee, Special Project Officer - Environmental Health, CDC

Aquatic facilities, such as swimming pools, spas and water slides have become an integral feature of Territory life, and many people participate in swimming and other water activities for recreational and health reasons. Improper design, maintenance or operation of public aquatic facilities can result in these premises becoming a source of infection or injury.

The draft *Guidelines for the Design, Operation, Management and Maintenance of Aquatic Facilities* are currently being finalised and will in future replace the following current standards:

- *Water Quality & Hygiene Standard for Swimming, Diving, Water Slide and Paddling Pools 1995*;
- *Water Quality & Hygiene Standard For Spa And Hydrotherapy Pools 1995*; and
- *Guidelines For The Safe Operation & Maintenance of Children's Wading Pools 1995*.

When implemented, these public health and safety Guidelines will ensure that public aquatic facilities are properly designed, constructed, operated and maintained so as to minimise disease, injury and other health-related complaints associated with their use.

Aquatic facilities may be used by a range of people of all ages, states of health and levels of personal hygiene. People can introduce a range of contaminants to the water body, including body fluids such as saliva, mucus, urine, faeces, perspiration and blood as well as hair, skin and sunscreen lotions. Other introduced environmental pollutants include dust, bird droppings, tree leaves, lawn clippings, make-up water, soil and untreated reticulation water. All of these pollutants can be accompanied by a variety of microorganisms, some of which have the ability to survive and even multiply in recreational water. A number of the microorganisms have the ability to cause infections in various parts of the body, such as the eye, ear, skin and gastrointestinal and nervous systems.

Operators and owners of aquatic facilities therefore need to ensure water treatment

processes provide continuous and effective disinfection capable of quickly and effectively killing disease-causing microorganisms to prevent disease transmission. Special care also needs to be taken with spa pools, hydrotherapy pools and other aquatic facilities that operate with elevated water temperatures, as they provide environments that are even more conducive to the survival and growth of disease causing microorganisms.

The correct use of chemicals used to disinfect the body of water is also required, as inappropriate use can cause patrons to suffer irritation of the eyes and skin conditions such as dermatitis.

The Guidelines are aimed primarily at designers, builders and operators of aquatic facilities and will assist DHCS Environmental Health Officers and other agencies.

The Guidelines will also set out in detail DHCS requirements in the following areas: -

- administrative provisions
- design and construction requirements
- circulation and water treatment systems
- water quality and testing
- general sanitation and operational requirements
- special requirements for small temporary pools
- minimising the risk of cryptosporidium contamination
- faecal and other body fluid accident policy

It is anticipated that the Guidelines will operate for a lengthy trial period to allow for adequate public consultation before formally replacing current swimming pool standards.

The draft Guidelines will be placed on the departmental website for public comment shortly and are in the process of being advertised and widely distributed for public consultation. For further information or to provide feedback, please contact Xavier Schobben, Director Environmental Health at envirohealth@nt.gov.au.



Environmental Health

Food Safety Fact Sheet

Hazardous Foods – Cooling and Reheating

Standard 3.2.2 requires potentially hazardous foods to be kept at specified temperatures including the cooling and reheating of food. All food businesses must comply with these requirements or demonstrate a safe alternative system to ensure that food stays safe to eat.

What are potentially hazardous foods?

Potentially hazardous foods are foods that might contain food poisoning bacteria if not stored at correct temperatures.

Examples are cooked meat and foods containing meat, dairy products, prepared fruits and vegetables, cooked rice and pasta, and cooked or processed foods containing eggs.

The standards require food to be cooled from:

60⁰C to 21⁰C Maximum time 2 hours

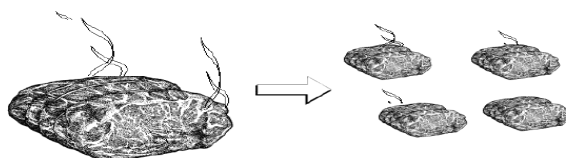
21⁰C to 5⁰C Maximum time 4 hours

Reheating Potentially Hazardous Food

Potentially hazardous food must be reheated rapidly to 60⁰C or hotter. Ideally, you should aim to reheat the food to 60⁰C within a maximum of two hours to minimise the amount of time that food is at temperatures that promote the growth of bacteria.

Cooling Potentially Hazardous Food

If you cook potentially hazardous foods and cool it for later use, you need to cool the food to 5⁰C or cooler as quickly as possible. **Remember**, smaller portions will cool faster.



For more information contact your nearest Environmental Health Office on 1800 095 646.

Further fact sheets can be found at:
http://nt.gov.au/health/healthdev/envIRON_health/factsheets.shtml

Northern Territory OzFoodNet Highlights for 2005

Philippa Binns, Enteric Disease/Ozfoodnet Epidemiologist and Peter Markey, Head of Surveillance, CDC Darwin

Background

OzFoodNet is a network of epidemiologists employed by the State and Territory Health Departments across Australia. Its formation was initiated in 2000 by the Federal Government's Department of Health and Ageing to provide better understanding of the causes and incidence of foodborne disease in the community and to provide an evidence base for policy formulation. The Northern Territory (NT) has been a participating member of the OzFoodNet network since 2003 by employing an epidemiologist at the Centre for Disease Control (CDC) in Darwin to perform enhanced surveillance on enteric disease case notifications, and assist with investigation of foodborne, as well as non-food borne, illness outbreaks.

Enteric disease surveillance in the NT

In the NT, specified enteric diseases of public health importance are required to be notified by laboratories and doctors (Table 1). In addition, doctors are required to notify CDC if they identify 2 or more cases of illness suspected to be of food or waterborne origin, or gastroenteritis involving 1 or more cases in an institution or food handler. This enables the necessary rapid public health response for preventing or investigating an outbreak of gastrointestinal illness.

To facilitate identification of case clusters, notifiable disease data is analysed at least weekly to check for clustering of *Salmonella* serovars, *Shigella* serogroups, and the other notifiable conditions. While this data is an important source of information, it is often several weeks before the final identification of the *Salmonella* serovars and *Shigella* serogroups have been finalised. For this reason enhanced surveillance interviews are performed on receipt of the initial notification for all cases of salmonellosis, shigellosis and hepatitis A in the Darwin urban area and CDC regions, when contacting cases is possible. This enables the collection of information to assist in identifying potential exposures, overseas-acquired

infections, and possible secondary contact cases. Despite notifications and enhanced surveillance, many cases of gastroenteritis do not come to the attention of our public health units due to a number of factors. The majority of cases are probably self-limiting and do not present to health care workers and, if they do, specimens are not always collected for definitive diagnoses. To raise awareness of notifiable diseases among general practitioners and the role of CDC in responding to public health issues Darwin CDC commenced the CDC-GP liaison project during 2005¹, to which the OzFoodNet epidemiologist contributed.

The small population size of many of the communities in remote areas in the NT with limited access to health services also provides limitations to effective and timely enteric disease surveillance. In many remote localities, individual food handling and storage practices are possibly a contributing factor to the incidence of enteric disease, rather than commercial premises that are a major focus in other jurisdictions. The enteric diseases of greatest incidence are also not assumed to be foodborne in origin. In particular, rotavirus and a wide variety of *Salmonella* account for a large number of notifications (Table 1).

Incidence of Enteric Disease

In 2005, the greatest number of enteric disease notifications in the NT were due to *Salmonella* serovars. The NT has consistently had the highest rate of *Salmonella* notifications of all jurisdictions in Australia.² The greatest burden was in children age less than 5 years of age with *S. Ball* and *S. Saintpaul* the predominant serovars. Aboriginal people had 1.8 times the rate of salmonellosis notifications compared to non-Indigenous people in 2005, however this difference has been gradually reducing in recent years (rate ratios: 2.4 in 2000, 2.2 in 2001, 1.9 in 2002, 2.2 in 2003 and 2.0 in 2004).

Children age less than 5 years also had the highest burden of disease for the other 5 common enteric notifications (rotavirus

infections, campylobacteriosis, shigellosis, cryptosporidiosis, hepatitis A). Similarly, the rates for all these diseases were higher in the Aboriginal population compared with the non-Aboriginal population, for instance the rate ratio for rotavirus infection for children age less than 5 years was 2.9, for campylobacteriosis was 3.3, for shigellosis was 10, for cryptosporidiosis was 6.1 and for hepatitis A was 3.2. All hepatitis A notifications in children under 10 years of age were in Aboriginal children. Conversely, notifications in those over 40 years were in non-Aboriginal adults only. With the introduction of the hepatitis A vaccination for Aboriginal children from November 2005 and the availability of rotavirus vaccine in 2006 it will be important to monitor the epidemiology of these diseases over coming years.

Table 1 Number and rate of enteric disease notifications with disease onset during 2005 in the NT

Notifiable enteric diseases in the NT	Number of cases	Number of cases per 100,000
Salmonellosis	393	194
Rotaviral Illness	256	126
Campylobacteriosis	248	122
Shigellosis	196	97
Cryptosporidiosis	82	41
Hepatitis A*	65	32
Yersiniosis	1	0.5
Amoebiasis	0	0
Botulism	0	0
Cholera	0	0
Haemolytic Uraemic syndrome (HUS)	0	0
Hepatitis E*	0	0
Listeriosis	0	0
Shiga-like (Verocytotoxin) toxin producing E. coli	0	0
Typhoid [§]	0	0
Vibrio food poisoning	0	0

Note: Apart from HUS, all enteric disease conditions are required to be notified by laboratories. In addition, some conditions are required to be urgently notified by doctors.

* Urgently notifiable by doctors if suspected on clinical grounds prior to laboratory confirmation

Outbreak Investigations

Six outbreaks were investigated jointly by NT CDC and Environmental Health staff during 2005 (Table 2). Foodborne origin was suspected in 2 of the outbreaks (*S. typhimurium* 12 and suspected *Staphylococcal aureus* toxin), even though sampling of available food did not isolate the organisms. Environmental health inspections and advice regarding safe food preparation and hygiene measures were undertaken.

Of the 4 non-foodborne outbreaks 1 was due to person-to-person spread of norovirus, 1 was due to the *S. Saintpaul* but the vehicle of spread was unknown and 1 was suspected to be of viral aetiology with unknown transmission route. A fourth outbreak occurred in a remote Aboriginal community and was due to multiple organisms. The investigation of this outbreak identified that overcrowding, hygiene facilities and sanitation in houses and public facilities were of a level to explain the outbreak of enteric disease. Interventions to prevent escalation of diarrhoeal disease in the community, whose numbers were to increase significantly due to influx of visitors for a sporting carnival, included distribution of soap to each household, health promotion messages broadcast at the sporting carnival and posters on hand washing in public facilities. Discussions were also held with community council staff regarding improved public latrine facilities in town and the need for a health promotion home hygiene program. In conjunction with the Environmental Health Branch, a revision of the *NT Guidelines for Provision of Public Facilities during Large Community Gatherings* was completed.

Enteric disease cluster investigations

Several cluster investigations were also undertaken which provided opportunities to identify areas to improve surveillance and public health interventions for enteric diseases in the NT.

Cryptosporidiosis linked with a swimming pool

Three cases of cryptosporidiosis in Darwin toddlers were notified within a 6-day period. Case histories identified that they had all swum at the same public swimming pool prior to their illness. Environmental Health Officers recommended super-chlorination of the pool and

Table 2. Summary of foodborne and non-foodborne outbreaks for the Northern Territory, 2005

Onset Month	Setting	No. of Cases	Etiology (no. lab. confirmed cases)	No. exposed	Transmission/Vehicle
January	Institution	8	<i>S. typhimurium</i> 12 (3)	Unknown	Suspected foodborne
January	Institution	7	Norovirus (4)	Unknown	Person-to-person
March	Remote Aboriginal community	49	Mixed organisms (15) - <i>Campylobacter</i> , <i>Shigella</i> , <i>Salmonella</i> , <i>Cryptosporidium</i> , <i>Giardia</i>	Unknown	Unknown/suspected environmental source
May	Market stall	5	Suspected <i>Staph. aureus</i> toxin (0)	Unknown	Suspected foodborne (Vietnamese pork rolls)
August	Military barracks	17	<i>S. Saintpaul</i> (8)	Unknown	Unknown
August	School camp	19	Suspected viral etiology (0)	Unknown	Unknown

health promotional messages be displayed at the premises. No further cases were associated with the pool.

Salmonella Saintpaul linked with turtles.

Two cases with *S. Saintpaul* infections within 1 week were interviewed and it was identified that both had recently purchased pet turtles. Sampling from the tank water of 1 of the turtles also isolated *S. Saintpaul*. A range of other *Salmonellae* were isolated from the other tank. Turtles for sale in the NT are sourced from a single supplier. OzFoodNet is preparing an information sheet for pet-store owners on recommended advice to provide pet turtle owners.

Hepatitis A clusters in Alice Springs and Darwin.

Investigation of an increase in hepatitis A cases from the second quarter of 2005 in the Alice Springs region was unable to identify a point source or source of transmission.³ Both Aboriginal and non-Aboriginal people were affected equally and 25/32 (78%) of cases occurred in the urban area between June-December. Immunoglobulin was offered to contacts after testing for immunity. This testing identified 1 case in an asymptomatic child and no cases occurred because of delays in testing prior to immunoglobulin administration.

A cluster of 5 cases in non-Aboriginal adults in the northern suburbs of Darwin was also investigated in October 2005 but no epidemiological links could be established.

Difficulties with interpretation and implementation of the *NT Hepatitis A Vaccination Policy and Public Health Management Guidelines* were reported during the year by public health officers. These will be revised during 2006.

Shigellosis clusters in the Alice Springs district

Clusters of *Shigella flexneri* 4a mannitol negative variant and *Shigella sonnei* biotype a occurred during the second half of 2005. Where possible each case was interviewed but epidemiological links between cases were unable to be identified.

Salmonella Para B by Java cluster in urban Darwin and Katherine

A cluster of 7 cases of *S. Para B by Java* in Darwin in October were investigated but no common exposures or links were identified.

Research Projects

A case series of *Salmonella* Ball infection among 0-4 year old children in Darwin urban region was conducted by Shellee Williams, a Master Applied Epidemiology scholar, in conjunction with Ozfoodnet and the Berrimah Veterinary Laboratories, to investigate the hypothesis that the likely source of this infection is non foodborne or environmental. It involved the collection of environmental samples as well as completion of a detailed case questionnaire. Results have guided the design of a case-control study commencing in 2006 to further explore the links between environmental contamination by

animals and human salmonellosis. Understanding the ecology of *Salmonella* will help to inform household and behavioural interventions to reduce the incidence of salmonellosis.

Conclusion

The national role of OzFoodNet is to enhance the surveillance of food borne disease in Australia and to provide more evidence on how to prevent food borne illness. The epidemiology of enteric disease in the NT showing the disproportionate burden of disease in the Indigenous population and the predominance of organisms transmitted from person-to-person or of an environmental source highlight the challenges that OzFoodNet face in the NT. The network has an important role in collaborating with communities, councils, the Environmental Health Branch and other stakeholders in advocating for improving health hygiene facilities and education, particularly with respect to individuals' food handling and storage practices. Research investigating the role of environmental pathogens in enteric disease is also necessary.

Acknowledgements

The following people are acknowledged and thanked for their assistance provided to the NT OzFoodNet site during 2005: Michelle Harlock, Rosanne Muller, Marianne Bookalil, Shellee Williams, Vicki Krause, Martyn Kirk and other members of the OzFoodNet Working Party, the doctors, nurses, public health officers and administration officers at the regional NT CDCs, managers and Environmental Health Officers from the NT Environmental Health Branches, and staff from the NT Government Pathology Service, Western Diagnostic Pathology, PathWest, IMVS and MDU.

References

1. Cook H. Progress report on the CDC-GP liaison project "strengthening the links". *The Northern Territory Disease Control Bulletin* 2005;12(1):13-15.
2. Reported foodborne illness and gastroenteritis in Australia: annual report of the OzFoodNet network, 2004. *Commun Dis Intell* 2005;29(2):165-192.
3. Schultz R. Hepatitis A outbreak in Central Australia. *The Northern Territory Disease Control Bulletin* 2005;12(4):4-7.

Comments on notifications P 41-42

Trichomoniasis

The community screening conducted in East Arnhem contributed to some of the increase in this period. However, most of the increase was thought to be due to an increase in testing and in the use of convenient nucleic acid testing method in screening activities.

Chlamydia

There were increases in almost every district. These increases are thought to be due to an increase in incidence. Please refer to the article on page 20 for detailed analysis.

Influenza

There were 7 cases of influenza in the first quarter on 2006 which is significantly higher than the expected number of 2. This was mirrored by a slight March rise in the influenza-

like illness cases in the sentinel surveillance system which is often the case in the NT, supposedly reflecting some mixing from the northern hemisphere winter.

Barmah Forest Virus

There were 48 cases of Barmah Forest Virus in the third quarter compared with an expected 10. Increased arbovirus activity has reflected the late and heavy wet season. Ross River Virus cases were also up but to a lesser extent.

Mumps

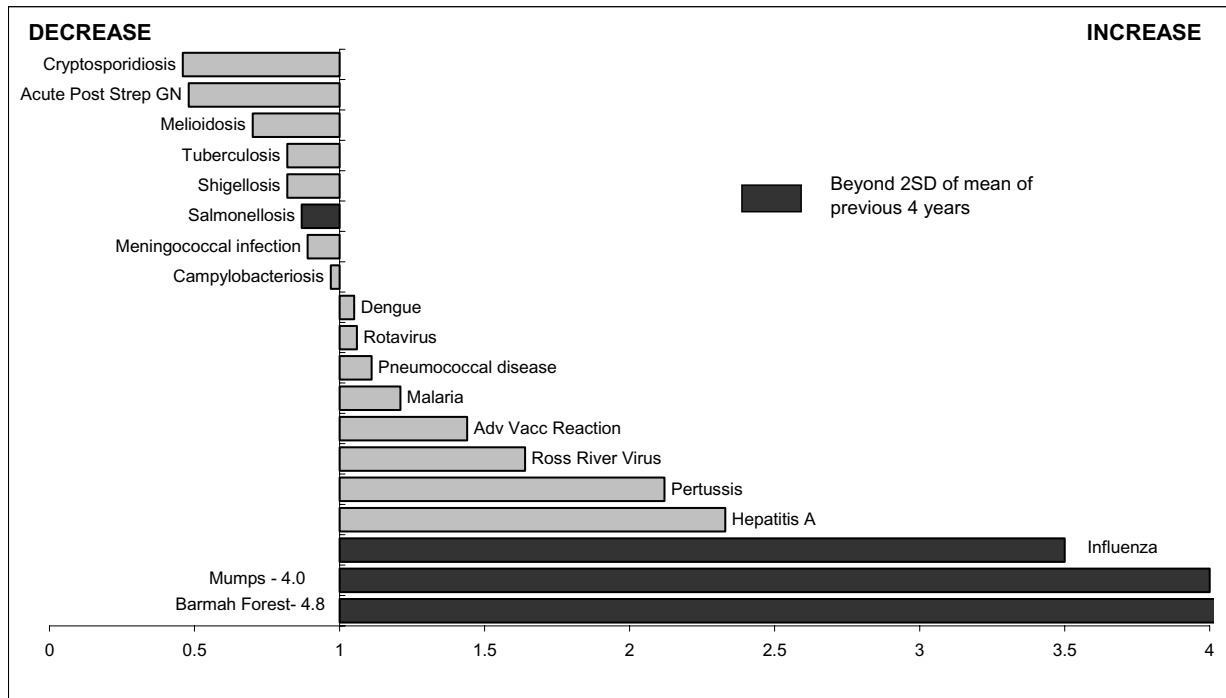
There were only 3 cases of mumps in the first quarter of 2006; this was the same as the first quarter in 2005 but still significantly higher than previous years. This increase is also reflected nationally and is coincident with reports of epidemics in countries such as the USA and the UK in 2004, 2005 and 2006.

NT NOTIFICATIONS OF DISEASES BY ONSET DATE & DISTRICT

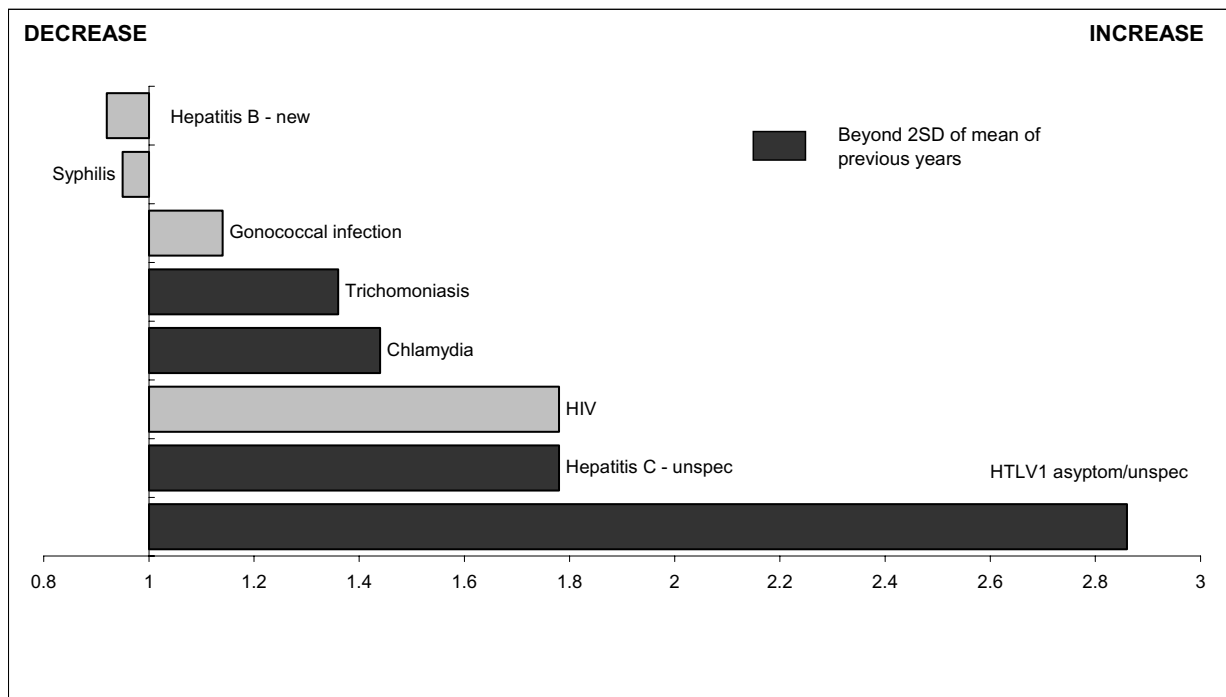
January - March 2006

	Alice Springs		Barkly		Darwin		East Arnhem		Katherine		NT	
	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005
Acute Post Streptococcal Glomerulonephritis	0	5	1	0	3	21	1	11	0	1	5	38
Adverse Vaccine Reaction	1	0	1	0	7	4	4	1	0	1	13	6
Barmah Forest	7	3	1	0	35	10	4	1	1	1	48	15
Campylobacteriosis	22	29	0	1	30	26	3	1	12	5	67	62
Chlamydia	188	176	12	10	238	138	57	38	42	20	537	382
Chlamydial conjunctivitis	1	3	0	0	5	6	0	2	10	7	16	18
Cryptosporidiosis	11	7	0	0	3	30	12	1	3	2	29	40
Dengue	1	0	1	0	8	7	1	0	0	0	11	7
Donovanosis	0	1	0	0	0	0	0	0	0	0	0	1
Food/water borne disease	0	0	0	0	0	0	0	4	0	0	0	4
Gastroenteritis—1 or more related cases	0	0	0	0	0	1	1	7	0	0	1	8
Gonococcal conjunctivitis	1	0	0	0	0	0	0	0	0	0	1	0
Gonococcal infection	250	260	9	8	113	94	38	43	42	39	452	444
Gonococcal neonatal ophthalmia	0	1	0	0	0	0	0	0	0	0	0	1
Hepatitis A	1	2	0	0	10	0	2	0	8	1	21	3
Hepatitis B - chronic	18	22	0	0	20	23	8	8	4	3	50	56
Hepatitis B - new	1	0	0	0	0	1	2	0	0	0	3	1
Hepatitis B - unspecified	23	18	0	0	7	20	11	7	1	1	42	46
Hepatitis C - chronic	0	7	0	0	0	3	0	1	0	0	0	11
Hepatitis C - new	0	0	0	1	0	0	0	0	0	0	0	1
Hepatitis C - unspecified	14	6	1	1	68	56	0	2	7	3	90	68
<i>H Influenzae</i> b	0	1	1	0	0	0	0	0	0	0	1	1
<i>H Influenzae</i> non-b	1	0	0	0	1	1	1	0	0	0	3	1
HIV	0	0	0	0	4	1	0	0	0	0	4	1
HTLV1 asymptomatic/unspecified	18	6	1	0	1	2	0	0	0	0	20	8
Influenza	2	1	0	0	4	0	1	0	0	0	7	1
Legionellosis	0	0	0	0	0	1	0	0	0	0	0	1
Leprosy	0	0	0	0	1	0	0	0	0	0	1	0
Leptospirosis	0	0	0	0	2	0	0	0	0	1	2	1
Malaria	0	0	0	1	10	11	1	2	2	1	13	15
Melioidosis	0	0	0	0	8	20	0	0	2	1	10	21
Meningococcal infection	0	2	0	0	1	0	0	0	1	0	2	2
Mumps	0	0	0	0	0	3	3	0	0	0	3	3
Murray Valley Encephalitis	0	0	0	0	0	1	0	0	0	0	0	1
Non TB Mycobacteria	0	0	0	0	2	3	1	0	0	0	3	3
Pertussis	8	6	0	0	21	18	6	0	0	9	35	33
Pneumococcal disease	10	3	0	0	3	7	0	0	2	0	15	10
Rheumatic Fever	2	6	0	0	4	3	1	0	1	0	8	9
Ross River Virus	4	1	4	0	149	87	6	6	12	14	175	108
Rotavirus	12	0	0	0	19	2	9	1	3	1	43	4
Salmonellosis	20	21	7	4	55	66	11	13	12	21	105	125
Shigellosis	23	49	4	1	7	4	1	3	1	8	36	65
Syphilis	38	22	2	0	11	10	8	2	7	11	66	45
Syphilis congenital	1	3	0	0	0	0	0	0	0	0	1	3
Trichomoniasis	89	84	6	6	63	46	59	22	20	9	237	167
Tuberculosis	2	1	1	0	5	3	0	1	0	1	8	6
Typhoid	0	0	0	0	1	0	0	0	0	0	1	0
Vibrio food poisoning	0	0	0	0	1	0	0	0	0	0	1	0
Total	769	746	52	33	920	729	252	177	193	161	2,186	1,846

Ratio of the number of notifications (Q1 2006 cases to mean Q1 2002-2005): : selected diseases.



Ratio of the number of notifications (Q1 2006 cases to mean Q1 2002-2005): sexually transmitted diseases.



Vaccination coverage for children aged 12 - <15 months as at 31 March 2006

Region	Number in District	% DTP	% Polio	% HIB	% Hep B	% Fully vaccinated
Darwin	185	94.1	93.5	98.4	98.9	93.5
Winnellie PO Bag	81	92.6	92.6	97.5	97.5	92.6
Palm/Rural Area	241	90.9	90.9	95.4	95.9	90.5
East Arnhem	31	93.5	93.5	96.8	96.8	93.5
Katherine	60	98.3	98.3	98.3	98.3	98.3
Alice Springs	99	82.8	83.8	91.9	92.9	82.8
Alice Springs PO Bag	56	96.4	94.6	98.2	98.2	94.6
Barkly	21	90.5	90.5	95.2	95.2	90.5
NT Non-Indigenous	437	92.4	92.7	96.3	96.6	92.4
NT Indigenous	337	91.1	90.5	96.4	97.0	90.2
NT	774	91.9	91.7	96.4	96.8	91.5
Australia	62,587	91.7	91.6	93.8	94.3	90.2

Vaccination coverage for children aged 24 - <27 months as at 31 March 2006

Region	Number in District	% DTP	% Polio	% HIB	% Hep B	% MMR	% Fully vaccinated
Darwin	209	96.2	95.7	93.8	96.2	94.3	92.3
Winnellie PO Bag	87	97.7	97.7	97.7	100.0	98.9	96.6
Palm/Rural Area	251	96.0	96.0	94.8	96.8	95.6	94.4
East Arnhem	38	97.4	97.4	97.4	97.4	97.4	97.4
Katherine	89	97.8	97.8	94.4	98.9	95.5	94.4
Alice Springs	106	98.1	98.1	94.2	100.0	98.1	94.2
Alice Springs PO Bag	52	98.1	98.1	94.2	100.0	98.1	94.2
Barkly	17	94.1	94.1	94.1	94.1	94.1	94.1
NT Non-Indigenous	493	96.6	96.3	95.5	96.6	95.3	94.5
NT Indigenous	356	97.2	97.2	94.4	98.9	96.6	94.1
NT	849	96.8	96.7	95.1	97.5	95.9	94.3
Australia	64,661	95.1	95	93.5	95.9	93.8	92.1

Vaccination coverage for children aged 72-<75 months as at 31 March 2006

Region	Number in District	% DTP	% Polio	% MMR	% Fully vaccinated
Darwin	170	75.9	74.7	75.9	73.5
Winnellie PO Bag	92	91.3	93.5	92.4	91.3
Palm/Rural Area	229	75.5	77.3	77.7	75.1
East Arnhem	61	95.1	96.7	96.7	95.1
Katherine	96	90.6	90.6	90.6	90.6
Alice Springs	85	94.1	92.9	95.3	92.9
Alice Springs PO Bag	38	76.3	78.9	78.9	76.3
Barkly	18	72.2	72.2	72.2	72.2
NT Non-Indigenous	502	78.7	79.1	79.3	77.9
NT Indigenous	287	89.9	90.9	92.0	89.2
NT	789	82.8	83.4	83.9	82.0
Australia	64,923	84.9	84.8	84.9	83.8

Vaccination coverage 31 March 2006 (see page 43)

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

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

The cohort of children assessed at 12-<15 months of age on 31 March 2006 were born between 01/10/2004 and 31/12/2004 inclusive. To be considered fully vaccinated, these children must have received 3 valid doses of vaccines containing diphtheria, tetanus, pertussis, and poliomyelitis antigens, either 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). All vaccinations must have been administered by 12 months of age.

The cohort of children assessed at 24-<27 months of age on 31 March 2006 were born between 01/10/2003 and 31/12/2003 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. All vaccinations must have been administered by 24 months of age.

The cohort of children assessed at 72-<75 months of age on 31 March 2006 were born between 01/10/1999 and 31/12/1999 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. All vaccinations must have been administered by 72 months (6 years) of age.

Interpretation

Immunisation coverage in NT children was above the national average for both the 12-<15 and 24-<27 months cohorts, but below the national average for children aged 72-<75 months. There were no regions that had consistently higher or lower coverage across all three cohorts, although East Arnhem had the highest coverage for both the 2 year olds and the 6 year olds. Coverage in Indigenous children was slightly lower for the 12-<15 months cohort, about the same for children aged 24-<27 months but significantly higher at 72-<75 months of age than for non-Indigenous children. Immunisation coverage for 6 year old children remains lower than for the younger cohorts, and this is a concern across Australia.

NT Malaria notifications January—March 2006

Merv Fairley, CDC, Darwin

Thirteen notifications of malaria were received for the first quarter of 2006. 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	Sierra Leone	Migrant	<i>P falciparum</i>	No
1	Ghana	Migrant	<i>P falciparum</i>	No
2	PNG	Holiday	<i>P falciparum</i>	Yes
1	PNG	Holiday	<i>P vivax</i>	No
1	Tanzania	Migrant	<i>P falciparum</i>	No
1	Solomon Is	Holiday	<i>P falciparum</i>	No
3	Indonesia	Fisher	<i>P falciparum</i>	No
3	Indonesia	Fisher	<i>P vivax</i>	No

**An alert system is already in place! ...a further response to editorial on
“Retrospective audit of immunoglobulin and vaccine uptake in infants at risk of perinatal
transmission of hepatitis B virus”**

Christine Selvey, Head of Immunisation, CDC Darwin

The Editorial on the article by Finn Romanes about his audit of immunoglobulin and vaccine uptake in infants born to mothers who are hepatitis B surface antigen (HbsAg) positive (*The NT Disease Control Bulletin*, Vol 13, No. 1, March 2006 page 21) suggested adding preterm infants to Community Care Information System (CCIS) “Alert System” for highlighting the need for timely hepatitis B vaccination in children born to mothers who are HbsAg positive.

In fact, while not evaluated in the audit, there is already a system on CCIS to alert immunisation providers of the need for extra vaccinations in infants who were preterm and/or of birth weight under 1500 grams. Depending on the gestation and birth weight (which defines whether an extra hepatitis B, Hib and/or pneumococcal vaccines are required) the CCIS record for a preterm infant *should* include the relevant preterm infant administration care plan. This means that the extra immunisations will appear as due immunisations in the child’s diary, and even more importantly, the extra immunisations will appear as due immunisations on the child’s community health centre immunisation recall list.

The Childhood Immunisation Database (CID) receives a monthly birth register report of all neonates born in Northern Territory (NT) public hospitals that records the gestational age and birth weight of each neonate. The appropriate preterm administration careplan is added to the infant’s CCIS record by CID staff. However, all immunisation providers still need to check these details for all infants during the early immunisation visits in case a particular preterm infant has been missed.

The Editorial points out that *The Australian Immunisation Handbook 8th Edition 2003* recommends that infants born under 32 weeks gestation should receive an additional dose of hepatitis B vaccine if measurement of antibody levels post-vaccination indicates a low antibody titre. However because of the difficulties of undertaking blood tests in infants at 7 months of age, and the risk of these not being done or adequately followed up, and because hepatitis B vaccine is extremely safe with a low rate of post-vaccination adverse events, the Centre for Disease Control recommends that **all infants born at less than 32 weeks receive an additional dose of hepatitis B vaccine at 12 months of age.**

This recommendation, already incorporated in care plans will be highlighted in NT vaccination schedules in the future. It is of note that the recommendation to simply administer an additional dose of vaccine was the recommendation from the 2000 7th Edition of the *Australian Immunisation Handbook*.

Recommendations for the immunisation of preterm infants for diseases other than hepatitis B in the NT are:

- infants born at less than 28 weeks gestation or under 1500 g birth weight should receive an extra dose of PRP-OMP Hib (PedvaxHIB) vaccine at 6 months of age; and
- infants born at less than 28 weeks gestation should receive an extra dose of conjugate pneumococcal vaccine at 12 months of age, and: if Indigenous, should receive their 23-valent polysaccharide booster at 24 months of age; and if non-Indigenous should receive a polysaccharide booster at 4 years of age.

Disease Control staff updates

Environmental Health

Both **Richard Elder** (EHO Tennant Creek) and **Kevin Murphy** (EHO Central Australia) have returned to the NT. Resignations include Senior Policy Officer, **Philippe Porgineaux**, a long time staff member who has worked previously as Manager of the Central Australian Environmental Health Unit. Phillippe is moving to the Hunter Public Health Unit, NSW. Both **Alex Smith** and **Edward White** from Central Australia, are heading to Queensland.

Sexual Health & Blood borne viruses

Wendy Armstrong has been appointed as Section Head SH/BBV and assumes her role on Monday 10 July. **Glen Hall** has completed his diploma, "Kigaruk", Indigenous men's Leadership course about what is happening and is not happening in men's Indigenous health. **Virginia Furner** commences as C34 Darwin Specialist in 26 July on contract from Albion Street Centre in Sydney. **Meghan Kennedy** has been appointed as CNC Sexual Health East Arnhem Region replacing **Julie Sankey**.

Darwin SH/BBV Staff held special luncheon to thank **Steven Skov** for his dedicated leadership and guidance as Acting Section Head SH/BBV since October 2005.

TB/Leprosy

Kerryn Gijsbers and **Steven Tong** have a daughter, Ellie (Elizabeth).

Joanne (Jo) Judd has recently relocated from Adelaide. She replaces Kerryn working part-time in CDC doing TB and unauthorised fisherperson clinics.

Immunisation

Samantha Bullen is on secondment to Health Practitioners Licensing Authority from Fri 16 June to Mon 17 July and will be taking up a position with the CCIS team as the Manager – Community Care Information Reporting Services. **Charles Roberts** is acting as Immunisation Database Coordinator during this time.