



CENTRE FOR DISEASE CONTROL  
NORTHERN TERRITORY

# THE NORTHERN TERRITORY DISEASE CONTROL BULLETIN



Vol. 22, No. 3, September 2015

ISSN 1440-883X

## Firework-related injury survey report 2015: comparison to pooled survey data over 18 years

Nick Georges<sup>1</sup> and Meredith Neilson<sup>2</sup>

<sup>1</sup>Health Gains Planning and Office of the Chief Health Officer, Department of Health

<sup>2</sup>CDC, Darwin

### Abstract

1 July, Territory Day in the Northern Territory (NT), is the only day and place anywhere in Australia that fireworks can be legally purchased and used by the public. An annual survey in public hospitals and various NT health services has been conducted by the NT Centre for Disease Control since 1998 to monitor injuries resulting from Territory Day celebrations and to inform firework safety campaigns. This year the database of injuries going back to 1998 was reviewed, cleaned and standardised.

In 2015 there were firework-related injuries (FWRIs) to 24 people, 6 required hospital admissions, 16 were bystanders and the majority of injuries occurred in females. Since 1998 there have been 353 FWRIs in total with 61 people hospitalised and 205 occurring in males. Generally the hands and arms were most often affected in the combined years data, but this year injuries to the face and eyes predominated.

The continuing occurrence of avoidable injuries and the high proportion of affected innocent bystanders in 2015 reinforces the need to maintain scrutiny of firework-related injuries, to continue public education activities and to pursue targeted regulatory changes.

Key words: fireworks; injuries; burns; legislation; Northern Territory

### Background

Every year since 1980<sup>1</sup> ‘cracker night’ has become synonymous with Territory Day. July 1 celebrations commenced to commemorate the establishment

### Contents

Firework related injury survey report 2015: comparison to pooled survey data over 18 years.....	1
Wagait Beach mosquito investigation 14-15 January 2015.....	8
A reflection of caring for TB patients in Central Australia: the challenges, complexities and adventures involved with caring for patients from different populations .....	12
One Disease Update: Tackling scabies and crusted scabies across the Top End.....	15
Update of the <i>Healthy Skin Guidelines</i> .....	17
Fact sheet update July-September 2015.....	18
NT malaria notifications April-June 2015 .....	18
<i>Chironex fleckeri</i> (box jellyfish) fact sheet.....	19
Abstracts from peer reviewed published articles related to the NT .....	21
NT notifications of diseases by onset date and districts ...	24
Graphs of selected diseases and STIs .....	25
Comments on notifications.....	26
CDC Conference .....	26
Immunisation coverage .....	27
Disease control staff updates July-September 2015 .....	28

Editor: Vicki Krause

Assistant Editors: Lesley Scott  
Kate Hardie  
Anthony Draper  
Peter Markey  
Heather Cook  
Jiunn-Yih Su

Production Design: Meredith Neilson

Email: [vicki.krause@nt.gov.au](mailto:vicki.krause@nt.gov.au)

Centre for Disease Control  
PO Box 40596  
Casuarina  
Northern Territory 0811



Website: <http://www.nt.gov.au/health/cdc/cdc.shtml>

of self-government in the Northern Territory (NT). Despite ongoing debate from the inception of these festivities over firework safety<sup>1-3</sup> firework use by the public has continued, albeit with increased regulation.

Firework-related injuries (FWRIs) remain a public health problem as they often entail serious and avoidable injuries, are concentrated to a specific time of year,<sup>4</sup> often affect innocent bystanders and are associated with holiday revelry that may entail reckless activities that go against accepted values and responsibilities.<sup>5</sup>

Internationally there is continued interest in FWRIs at a city and national level<sup>4,6-9</sup> as well as at a health service/clinic level.<sup>10-13</sup> There have also been publications documenting specific severe FWRI incidents or linked cases due to specific firework types.<sup>10,14,15</sup> These studies have helped devise targeted health promoting actions and guidelines such as the banning of bottle rockets, the avoidance of wearing synthetic clothing which is prone to catching fire and directive education against lighting multiple sparklers together to prevent a 'super ignition' that can cause severe hand burns. Increasingly there is interest in the role of legislation in curbing the harm associated with firework use.<sup>16-20</sup>

The mandate to monitor injuries associated with Territory Day fireworks use<sup>1</sup> was achieved in 1998, the inaugural year of the fire-work related injury survey.<sup>21</sup> With the exception of 1999<sup>22</sup> the NT Centre for Disease Control (CDC) has annually monitored the number, severity and mechanism of harm of FWRIs through health service surveys in order to inform public health activities. To this end CDC along with its partners at NT WorkSafe, NT Fire and Rescue Services and the Burns Unit at Royal Darwin Hospital (RDH) engage in a pre-Territory Day firework safety campaign which includes schools, hospitals, health centres, social and broadcast media and fireworks sales outlets.<sup>23</sup> It is important to maintain scrutiny of FWRIs in the NT to inform and evaluate future harm minimisation efforts.<sup>24</sup>

## Methods

Key personnel at all 5 Emergency Departments at NT public hospitals, the Burns Unit at RDH,

Australian Defence Force Health Services and Palmerston GP Super Clinic were contacted to participate in the FWRI survey for 2015. The participating health facilities were all provided with survey and consent forms, patient summary sheets, safety pamphlets and information sheets for clinicians and patients along with firework safety posters.

All people presenting at these sites between 30 June and 6 July with primary or secondary FWRIs (i.e. injuries from direct impact of fireworks or those sustained from trying to avoid a firework) had basic medical and demographic details, the severity<sup>†</sup> of their injury and their bystander<sup>a</sup> status recorded on the summary sheet and were invited to take part in the survey. The survey sought more detailed information on when, where and how the injury occurred, the type of firework causing the harm, whether the patient had consumed alcohol, and what measures were taken to treat the injury.

Data were entered into a Microsoft Excel spreadsheet. The database of line-listed records for available years (noting that 1999, 2000 and 2005 only had aggregate figures) was cleaned, standardised and entered into a pivot table. Data were also imported into Stata 13.0<sup>25</sup> and analysed. Analyses were conducted on 2015 results and for the combined years since 1998. Results were examined descriptively and the associations between variables were tested using the independent samples t-test or chi-squared test as indicated.

## Results

There were 24 FWRIs reported across the NT in the 2015 survey period and a total of 353 FWRIs in the overall years, 1998 to 2015. Only 7 surveys were completed this year as a result of either patients not consenting to the survey or emergency staff being diverted by more pressing matters; however patient summary sheets from each health service captured a wide range of information. The majority of people with injuries (15 FWRIs or 62.5%) presented to RDH, 4 of whom were hospitalised (see Table 1). Alice Springs Hospital had the next highest

<sup>†</sup>Severity was defined as mild if needing 1 medical review, moderate if needing 2 or more health service visits, and severe if needing hospitalisation

<sup>a</sup>A bystander is a person who is injured by a firework without having lit the firework him/herself.

**Table 1. Distribution by hospital and severity of FWRI in 2015**

Health Service	Severity of injury†			Total
	Severe	Moderate	Mild	
Royal Darwin Hospital	4	11	-	15
Alice Springs Hospital	2	-	2	4
Gove District Hospital	-	1	-	1
Katherine Hospital	-	2	-	2
Defence Health Services	-	-	1	1
Palmerston GP Super Clinic (PSC)	-	1*	-	1
<b>Total</b>	<b>6</b>	<b>15</b>	<b>3</b>	<b>24</b>

\*1 additional case at PSC was admitted to Royal Darwin Hospital (RDH) and is incorporated in the RDH total.

**Table 2. FWRI survey summary information for 1998-2015 (n=353) and 2015 (n=24)**

Characteristics	1998-2015		2015	
	Total	group%	Total	group%
<u>Sex</u>				
Male	205	58.1	11	45.8
Female	113	32.0	13	54.2
Unknown	35	9.9		
<u>Age Group</u>				
0-5 years (yrs)	22	6.2	3	12.5
6-15 yrs	91	25.8	7	29.2
16-30 yrs	130	36.8	10	41.7
31-45 yrs	57	16.1	3	12.5
Over 45 yrs	28	7.9	1	4.2
Unknown	25	7.1		
Median age*		[20yrs]		[17yrs]
Mean age*(SD)		[23.3(14.3)yrs]		[19.3(14.6)yrs]
Range		[1-74yrs]		[1-61yrs]
<u>Bystander</u>				
Yes	139	39.4	16	66.7
No	127	36.0	7	29.2
Unknown	87	24.6	1	4.2
<u>Severity of injury</u>				
Mild	81	22.9	3	12.5
Moderate	185	52.4	15	62.5
Severe	61	17.3	6	25.0
Unknown	26	7.4		
<u>Body site affected</u>				
Head	69	19.5	8	33.3
Hands & arms	101	28.6	5	20.8
Feet & legs	51	14.4	4	16.7
Torso	30	8.5	4	16.7
Multiple	32	9.1	2	8.3
Unknown	70	19.8	1	4.2
<u>Firework type</u>				
Banger/Cracker	35	9.9	1	4.2
Fountain	11	3.1	1	4.2
Sparkler	36	10.2	1	4.2
Skyrocket	32	9.1	4	16.7
Multishot	37	10.5	2	8.3
Spinner	26	7.4	1	4.2
Homemade/illegal	12	3.4	2	8.3
Unknown	164	46.5	12	50

\*Individual age was available only in 256 entries for 1998-2015, which were used to calculate the mean and median age values

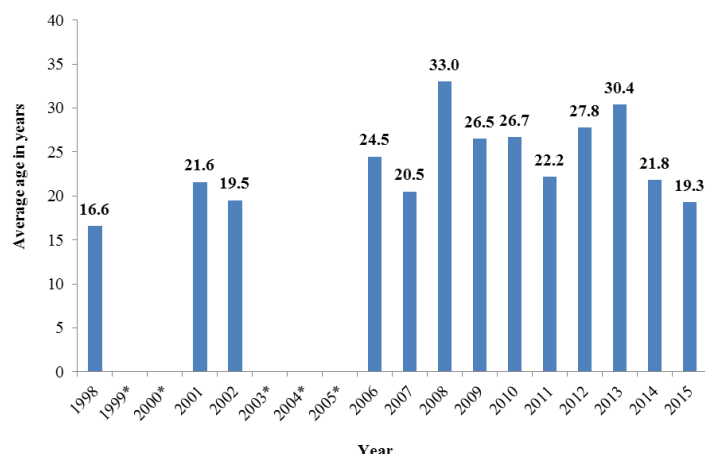
number of presentations (4 with 2 hospitalisations). There was a high proportion of moderate injuries (15 of 24 or 62.5%), and severe injuries outweighed mild ones by a ratio of 2 to 1.

In the 1998-2015 database no line-listed data could be found for the years of 1999, 2000 and 2005. The 48 patients lacking line-listed data were excluded from statistical analysis, however, summary data for these years were used for descriptive reporting. As shown in Table 2, in 2015 more females were injured than males (13 vs. 11 cases), but the aggregate measure for 1998-2015 had a preponderance of males (205 vs. 113 cases). The difference between proportions of injuries (females vs. males) between the 1998-2014 and 2015 data was significant (p=0.02).

Like gender there was a significant difference in the number of bystanders in 2015 compared to the average of 7.7 for 1999-2014 (bystander status was not recorded in 1998). There were 16 bystanders, 7 firework users and 1 person of unknown bystander status who were injured in 2015. When split by gender, 10 females and 6 males were injured as bystanders, whereas 5 males and 2 females were firework users. The high number of injured female bystanders compared to injured female firework users was not statistically significant due to the small sample size (Pearson  $\chi^2$  of 2.25, p=0.13) however the difference in the proportion of injured bystanders for 1998-2014 and 2015, of 0.52 and 0.7 respectively, was significant (p=0.05). Interestingly there have been more people injured as bystanders than as firework users in all years combined (139 of 266 people with disclosed status or 52.3%).

The age groups of people with FWRI for 2015, as with the 1998-2015 data, showed the highest proportion in the 16-30 year age bracket followed by the 6-15 year age category. The median, mean and range of ages of people that were injured were similar between the 2015 and 1998-2015 groups. The graph of the annual mean age of people suffering FWRI ranges between 16.6 and 33.0 years and shows no particular pattern (see Figure 1).

When comparing the annual number of FWRI presentations to health services, the number of

**Figure 1. Annual average age of FWRI cases 1998-2015**

\*No individual ages were available for 1999, 2000, 2003, 2004 and 2005

admissions and the bystander status of affected individuals (see Figure 2) there is no obvious trend over time except for an increased proportion of bystanders.

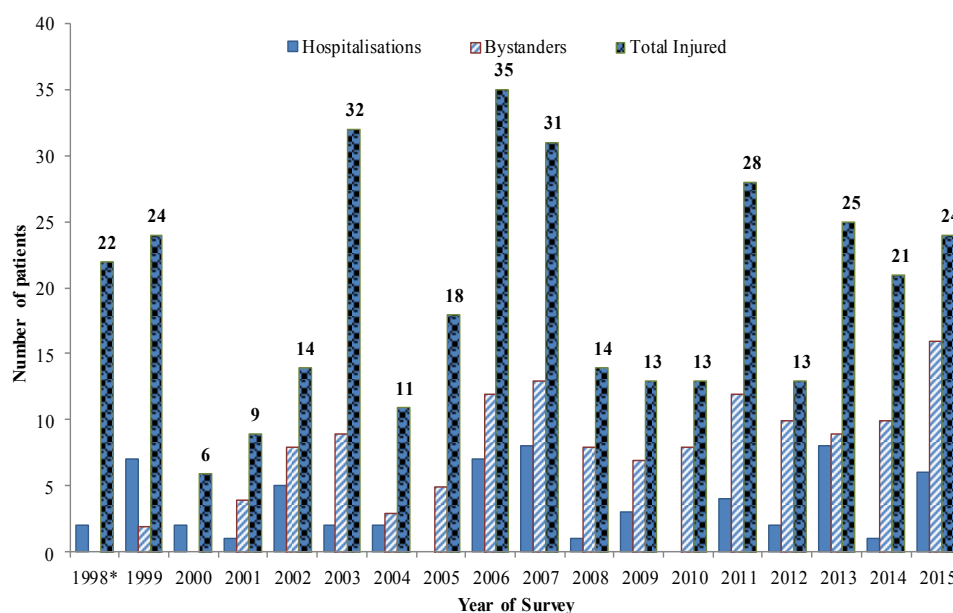
## Discussion

The number of firework-related injuries has fluctuated over the years with no clearly discernible trends.<sup>26,27</sup> It is not possible to confidently correlate these fluctuations with public health education campaigns or other initiatives because of the low numbers of presentations, the high turnover of the population over time and the undocumented reach of these programs to date. A household telephone survey

of firework safety knowledge in the Darwin and Alice Springs areas may be useful after a well-structured education campaign, given that the majority of FWRIs occur in these regions. The per capita FWRI rate in the NT for this year of 9.8 per 100,000 people is of note and comparable to concerning international rates (2.7-16.2 per 100,000 in the US<sup>4,6</sup> and 7 per 100,000 children years in Greece).<sup>9</sup>

Overall the proportion of males with FWRIs in the 1998-2015 combined data was 64.5% or 1.8 to every female, slightly lower than rates observed in international studies (which range from 73% to 87%).<sup>4,6,9,10,13,28</sup> Surprisingly in 2015 there were more females than males who sustained FWRIs, an event that has occurred only 3 times previously in 18 years (in 2001, 2002 and 2008). The majority of females injured this year were bystanders (10 bystanders among the 13 females with FWRIs).

There were also more bystander injuries in total this year (16 of 24 people were identified as bystanders and 1 was unknown). Both the higher proportion of bystanders and females this year was statistically significant. A South African study by Smittenberg et al found that most firework-related self-inflicted injuries occurred among boys, whereas girls suffered injuries

**Figure 2. Total annual FWRIs, injured bystanders and hospitalisations, by year, 1998-2015**

\* Bystander status was not measured in 1998

mostly as bystanders.<sup>11</sup> A social media campaign to inform bystanders of firework risks near firework users may be of some benefit.

In the combined years database, bystander status had no effect on severity of injury with firework users requiring 18 hospitalisations from 110 injuries (16.4%) compared to 23 hospitalisations from 119 injuries (19.3%) for bystanders, noting that 20 admissions lacked information on bystander status. Sundelin and Norrsell also observed that there was no correlation of seriousness of injury by whether the patient was a firework user or bystander in a Swedish study.<sup>29</sup> This demonstrates that mere vicinity to a firework user places an individual at risk<sup>8</sup> with a bystander being no less likely to be severely injured than a firework user.<sup>28</sup>

Witsaman et al found that the most commonly injured body sites among firework users are the hands, fingers and eye, whereas for bystanders they are the lower extremities, face and eye.<sup>28</sup> The 2015 data did show a higher proportion of lower limb, torso, face and eye injuries with a reduction of hand and arm injuries, perhaps reflecting the higher number of bystanders this year. For the 1998-2015 combined data, as was also observed in large epidemiological studies, the more conventional body site of hands and arms was the most represented.<sup>4,10,13</sup>

Misuse of fireworks such as holding fireworks while lighting them, modifying fireworks, watching fireworks too closely, delaying distancing oneself from fireworks once lit, using homemade and illegal fireworks and other improper use was responsible for many injuries over the years in the NT. In a study by Puri et al<sup>10</sup> misuse of fireworks accounted for 41% of injuries with device failure (unexpected blast and erratic flight) accounting for another 35%. Lack of supervision of children was integral to many injuries in the literature.<sup>10,13</sup> Low reporting levels in the NT restrict the analysis of firework-related injury aetiology.

### ***Reckless behaviour***

Throughout the years that the Territory Day FWRI survey has been conducted, there have been a number of cases where individuals have been harmed through reckless actions or wilful intent by others.<sup>14</sup> This year was no exception with at least one person suffering burns from a firework that was thrown at him.

Holiday festivities mingled with alcohol are well recognised to compromise common sense and to alter the perception of risk in individuals. The loss of judgement and social norms caused by mass celebrations may lead to denial of responsibility in otherwise conventional people and cause risk-taking behaviour that leads to FWRIs.<sup>5</sup> Young men are particularly prone and are more likely to behave dangerously.<sup>17</sup> An overseas study identifies young age group, familiarity with fireworks and an inflated perception of ability to deal with adverse circumstances as being more likely to lead to injury.<sup>30</sup> Reckless behaviour could be addressed by firmly enforcing laws,<sup>16</sup> monitoring firework use at venues with mass gatherings, requiring that all children are supervised<sup>10</sup> and prosecuting all perpetrators who harm others recklessly or with wilful intent.

### ***Role of regulations and legislation***

A number of measures have been introduced to control firework use in the NT. In 1998 fireworks were sold for 3 days prior to Territory Day and were allowed to be set off from 6-11 pm on July 1 only at several designated areas.<sup>21</sup> Subsequently people had to be aged over 16 years to buy approved fireworks from licensed retailers. The age requirement was later increased to age 18 years or over. Firework use in sections of Mindil Beach and certain other public areas are now banned. In 2008 extra funding became available and a communication strategy and firework safety campaign was initiated. Over time firework purchases were only allowed on Territory Day and it became illegal to have or use fireworks beyond July 1. Greater restriction was placed on retailers and various firework types were banned (including bottle rockets and large bangers). This year the fine for breaching these conditions was doubled and there was greater enforcement of firework-restriction laws by the authorities.

There is continuing interest in the international literature on the impact of legislation on firework use and associated harm.<sup>16-20</sup> Several studies revealed up to a three-fold increase in FWRIs<sup>18,20</sup> when there was a national or state easing of firework restrictions. Fogarty and Gordon in Northern Ireland found that more liberal firework legislation did not result in a significant increase in firework injuries, however their study was focused on a

specialised regional plastic surgery and burns unit and more severe injuries.<sup>16</sup> They concluded that more rigorous enforcement of firework quality standards by licensed traders and targeted educational campaigns were more likely to be effective than legislation alone.

Despite the many public health measures undertaken in the NT which follow key suggestions to curb FWRI in the literature,<sup>6,9-11,28</sup> serious injuries continue to occur and have long-term impact on the lives of those affected. The way forward to minimise the public health burden from fireworks on the NT community entails maintaining the current restrictions on fireworks sale and use and the strict standardisation and quality control of fireworks to avoid device failure ensuring that only standardised fireworks are sold.<sup>10</sup>

Firework safety educational programs need to continue and to target children, parents<sup>16,17</sup> and young males who are the main purchasers.<sup>4</sup> Wide-scale targeted education programs can be effective with messages around ensuring all children are supervised,<sup>10</sup> and restricting children less than 5 years old from holding sparklers.<sup>15,16</sup> In Denmark an intensified firework safety campaign involving provision of cheap protective glasses to 750,000 school children and young men was able to significantly reduce the rate of eye injuries.<sup>31</sup>

Other measures to be considered include banning fireworks known to be particularly dangerous such as multishot fireworks, the most common cause of FWRI in the NT, which often fall over and misfire. Ceasing the sale of bottle rockets was effective in notably reducing injury rates in Norway.<sup>19,23</sup> Increasing fines for illegal fireworks and strongly enforcing firework laws<sup>11,16</sup> are other measures shown to be effective. Continuing to raise public awareness of the dangers involved in using specific fireworks and of the penalties imposed for breaching firework laws is needed. A forum involving law enforcement authorities, educators, parents and politicians on how best to address FWRI is recommended. The overwhelming consensus in the literature is that the best way to prevent FWRI is to leave firework use to trained professionals.<sup>22,28,30,32</sup>

### **Limitations**

There were a number of limitations to the current study. Firstly there was a very poor survey response rate in 2015. This may be due to waning interest in completing the more detailed survey forms by staff and patients alike. Incentives for the completion of the forms may be useful.

The data collected over the years was of variable quality and line-listed data was not always maintained. Despite this the data was adequate for simple data manipulation, descriptive analysis and summary measures.

It is likely that there is under-representation of the true figure of FWRI as not all health services, GP clinics or Community Health Centres are included. Some patients may also choose not to seek care or to disclose that their injuries were due to fireworks. It is most likely that only reporting of mild injuries is affected as persons with more serious injuries are likely to end up in hospital.

Classifying an injury as severe due to hospitalisation may not reflect the seriousness of the injury. For instance a deep hand burn needing prolonged aftercare but not leading to hospital admission (classified as a moderate injury) may be more serious than a FWRI leading to overnight admission for pain management (classified as a severe injury).

Finally there may be recall and several bias among survey participants e.g. injured persons may be more willing to admit they were bystanders than firework users and be less likely to report alcohol intake.

### **Conclusion**

There was a high number of FWRI in females and bystanders this year. The private use of fireworks continues to cause substantial harm to the NT community. FWRI are not reducing in number or severity. The literature emphasises that the safest way to prevent FWRI is to leave firework use to trained professionals. It is hoped that targeted educational programs, the annual safety campaign and future regulatory changes will reduce firework-related harm.

## Acknowledgements

Margaret Brennan and Alison Mustapha, RDH; Lorraine Hook, DoH Media Centre; Amanda Wheeler, PSC; Robyn Davies, DHS; the CNC staff and duty officers at the 5 public hospital Emergency Departments across the Territory; and Steven Skov, Community Physician CDC.

## References

- Department of Arts and Museums, NT Government. Cabinet records. 1980 Cabinet Decision Highlights – Fireworks Day, 1980. [http://www.artsandmuseums.nt.gov.au/\\_data/assets/pdf\\_file/0011/22997/Decision\\_1050.pdf](http://www.artsandmuseums.nt.gov.au/_data/assets/pdf_file/0011/22997/Decision_1050.pdf) (accessed 21 August 2015).
- Walcott J, Skov S. Fireworks spark debate: an analysis of letter and text message discussion in the NT News of the personal use of fireworks surrounding Territory Day. *NT Dis Control Bull* 2007;14(3):12-16.
- Edwards L, Skov S. "Crackerwars" - an analysis of opinions published by the NT News on the use of fireworks surrounding Territory Day. *NT Dis Control Bull* 2010;17(3):18-22.
- Canner JK, Haider AH, Selvarajah S, Hui X, Wang H, Efron DT, et al. US emergency department visits for fireworks injuries, 2006-2010. *J SurgRes* 2014;190:305-311.
- Buzzell T. Holiday revelry and legal control of fireworks: a study of neutralisation in two normative contexts. *West Crim Rev* 2005;6(1):30-42.
- Moore JX, McGwin G Jr, Griffin RL. The epidemiology of firework-related injuries in the United States:2000-2010. *Injury* 2014;45:1704-1709.
- Abdulwadud O, Ozanne-Smith J. Injuries associated with fireworks in Victoria: an epidemiological overview. *Inj Prev* 1998;4:272-274.
- Saadat S, Naseripour M, Smith GA. The health and economic impact of fireworks-related injuries in Iran: a household survey following the New Year's Festival in Tehran. *Injury* 2010;41:e28-e33.
- Konte V, Petridou E, Trichopoulos D. Firework-related childhood injuries in Greece: a national problem. *Burns* 2004;30:151-153.
- Puri V, Mahendru S, Rana R, Deshpande M. Firework injuries: a ten-year study. *J Plast Reconstr Aesthet Surg* 2009;62:1103-1111.
- Smittenberg MN, Lungelow D, Rode H, van As AB, Millar AJW. Can fireworks-related injuries to children during festivities be prevented? *S Afr Med J* 2010;100:525-528.
- Wang C, Zhao R, Du W-L, Ning F-G, Zhang G-A. Firework injuries at a major trauma and burn center: a five-year prospective study. *Burns* 2014;40:305-310.
- Bagri N, Saha A, Chandelia S, Dubey NK, Bhatt A, Rai A, et al. Fireworks injuries in children; a prospective study during the festival of lights. *Emerg Med Australas* 2013;25:452-456.
- Glover J. Beyond the burns: effects of firework-related injuries. *NT Dis Control Bull* 2009;16(3):10-11.
- Singh S. Sparklers as a major hazard for burn injury. *Burns* 1997;23(4):369-372.
- Fogarty BJ, Gordon DJ. Firework related injury and legislation: the epidemiology of firework injuries and the effect of legislation in Northern Ireland. *Burns* 1999;25:53-56.
- Edwin AFL, Cubison TCS, Pape SA. The impact of recent legislation on paediatric fireworks injuries in the Newcastle upon Tyne region. *Burns* 2008;34:953-964.
- Roesler JS, Day H. Sparklers, smoke bombs, and snakes, oh my! Effect of legislation on firework-related injuries in Minnesota, 1999-2005. *Minn Med* 2007; July:46-47.
- Bull N. Legislation as a tool to prevent firework-related eye injuries. *Acta Ophthalmol* 2011;89(8):e654-655.
- Johnston JJ, Jenkins M, McKinney LA. Fireworks related injuries: does changing legislation make a difference? A thought for next Halloween. *Emerg Med J* 2001;18:232.
- Mein J. Territory Day celebrations 1998 in the Top End of the NT - an outbreak of firework-related injuries. *NT Dis Control Bull* 1998;5(3):9-12.
- Glover J, Skov S. Fireworks-related injury community survey report 2007. *NT Dis Control Bull* 2007;14(3):8-11.
- Johnston V, Neilson M, Skov S. Firework-related injury survey report 2013. *NT Dis Control Bull* 2013;20(3):1-5.
- Coffey P, Skov S. Firework-related injury survey report 2014. *NT Dis Control Bull* 2007;21(3):1-6.
- StataCorp. Stata Statistics/ Data Analysis Program Special Edition 13.0 for Windows. Texas: StataCorp, 2013.
- Aratchiwe PE, Krause V, Skov S. Firework-related injury survey report 2011. *NT Dis Control Bull* 2009;18(3):13-18.
- Boyd R, Neilson M, Skov S. Firework-related injury survey report 2012. *NT Dis Control Bull* 2012;19(3):4-7.
- Witsaman RJ, Comstock RD, Smith GA. Pediatric fireworks-related injuries in the United States: 1990-2003. *Pediatrics* 2006;118(1):296-303.
- Sundelin K, Norrsell K. Eye injuries from fireworks in western Sweden. *Acta Ophthalmol Scand* 2000;78(1):61-64.
- Saadat S, Naseripour M, Karbakhsh M, Rahimi-Movaghar V. Perceived risk and risk-taking behaviour during the festival firework. *Am J Health Behav* 2010;34(5):525-531.
- Thygesen J. Ocular injuries caused by fireworks: 25 years of experience with preventive campaigns in Denmark. *Acta Ophthalmol Scand* 2000;78(1):1-2.
- Medical News Today. American Academy of Ophthalmology warns parents to leave fireworks to the professionals, 2007 June 21. [http://www.cdc.gov/ncipc/duip/spotlite/firework\\_spot.htm](http://www.cdc.gov/ncipc/duip/spotlite/firework_spot.htm) (accessed 12 August 2015).

## Wagait Beach mosquito investigation 14-15 January 2015

Allan Warchot, Nadine Copley and Nina Kurucz, Medical Entomology, CDC, Darwin

### Abstract

Following receipt of a mosquito enquiry from Wagait Shire Council on 9 January 2015, Medical Entomology staff undertook a mosquito field investigation at Wagait Beach. Adult mosquito trapping showed moderate to high levels of the northern salt marsh mosquito, *Aedes vigilax*, a potential vector for Ross River virus (RRV) and Barmah Forest virus (BFV). Site investigations revealed extensive *Ae. vigilax* breeding in coastal sand dune depressions at the northern fringe of Wagait Beach. Aerial photography suggested large seasonal mosquito breeding sites exist nearby to Wagait Beach, not only for *Ae. vigilax*, but also for *Culex annulirostris*, the principal vector for RRV, BFV, Murray Valley encephalitis and Kunjin virus and for *Anopheles* mosquitoes, the potential vectors for malaria. The most feasible mosquito mitigation measures for Wagait Beach residents are likely to be personal protection and mosquito avoidance.

**Key words:** Wagait Beach, mosquito, vector, personal protection

### Background

Medical Entomology (ME) of the Northern Territory (NT) Department of Health received a mosquito enquiry from Wagait Shire Council on 9 January 2015. The enquiry was received at a time of high salt marsh mosquito (*Aedes vigilax*) numbers in the Darwin northern suburbs, and other coastal areas in the Top End. However, in light of a lack of recent mosquito data from Wagait Beach, a mosquito investigation was carried out by ME on 14-15 January 2015, to determine mosquito species causing the problem, the number of

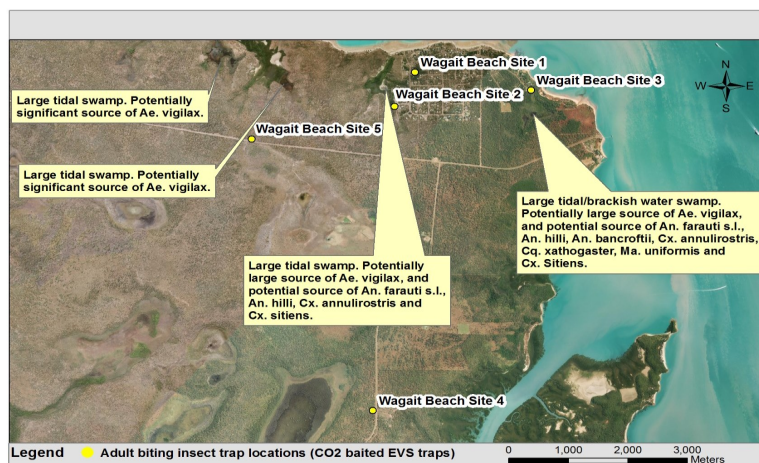
mosquitoes compared to the most affected suburbs in Darwin and the likely sources of the problem mosquitoes.<sup>1</sup>

### Methods

Five adult mosquito trap sites, within close proximity to potential mosquito breeding sites, were chosen for this investigation (Figure 1). The traps used were carbon dioxide baited Encephalitis Vector Survey traps, which were set in the late afternoon on 14 January and collected the following morning.

On the same day, field surveys for mosquito larvae were also conducted at 7 potential

**Figure 1. Wagait Beach overnight mosquito trapping 14-15 January 2015**



**Figure 2. Wagait Beach larval mosquito survey 14 January 2015**



mosquito breeding sites as shown in Figure 2. Potential mosquito breeding areas were identified by examining high resolution aerial photography and are indicated in Figure 1.

## Results

### Adult mosquito trapping

The results of the adult mosquito trapping for the 5 most abundant species collected are shown in Table 1. Overall there were a total of 1641 adult female mosquitoes collected from the 5 traps representing a total of 14 different mosquito species. It is only the female mosquito that bites and can spread mosquito borne diseases. Therefore although some male mosquitoes were recorded during trapping, they are not of importance except to suggest the proximity of nearby breeding sites.

*Aedes vigilax* was the most abundant mosquito accounting for 77% of all mosquitoes collected. Highest numbers were collected at trap site 3 near the large brackish water swamp at the end of De Lissa Drive. This result is typical of the early wet season in coastal areas when *Ae. vigilax* predominates. Overall all trap sites recorded what is considered to be moderate to high levels of this mosquito.

*Culex annulirostris* was the second most abundant mosquito, accounting for 11% of all mosquitoes collected. Highest numbers were collected at trap site 5 on Charles Point Road, with potential breeding sites located to the north and south of this trap site. Overall abundance was considered minor for this species at all trap sites.

The 3 other mosquitoes indicated in Table 1 were recorded in minor numbers for these species. The container breeding mosquito *Aedes notoscriptus* was only recorded in the traps set adjacent to residential lots, suggesting the presence of artificial breeding sites in nearby residential yards. *Ae. notoscriptus* can also breed in natural containers such as tree holes and small rock pools.

### Larval mosquito survey

The results of the larval mosquito survey are shown in Table 2.

Mosquitoes found during the larval survey included *Ae. vigilax*, which was collected in moderate to high numbers in the beachfront paperbark lined sand dune depressions at the NW corner of the township (Wagait Larval 05), and NE of De Lissa Drive (Wagait Larval 02). *Culex annulirostris* and *Culex sitiens* were collected in high numbers at a grassy sand dune depression site NE of De Lissa Drive (Wagait Larval 01).

The remaining 4 sites surveyed did not find breeding mosquitoes, but are likely to be mosquito breeding sites during other periods of the year.

## Discussion

### Northern salt marsh mosquito, *Aedes vigilax*

The high adult mosquito numbers at Wagait Beach in January 2015 were typical of coastal areas of the NT in early January. *Ae. vigilax* appears in high numbers 9 days after a flooding

**Table 1. Wagait Beach overnight adult mosquito trapping results 14-15 January 2015**

Trap location	<i>Ae.</i> ( <i>Och</i> ) <i>vigilax</i>	<i>Cx.</i> ( <i>Cux</i> ) <i>annulirostris</i>	<i>Ae.</i> ( <i>Fin</i> ) <i>notoscriptus</i>	<i>Ve.</i> ( <i>Ver</i> ) <i>funerea</i>	<i>Cx.</i> ( <i>Cux</i> ) <i>sitiens</i>	Other	Totals	%
Wagait Beach Site 1	312	28	15	12	1	1	369	22.49
Wagait Beach Site 2	174	12	13	1	1	7	208	12.68
Wagait Beach Site 3	366	21	41	37	31	4	500	30.47
Wagait Beach Site 4	239	33	0	0	0	8	280	17.06
Wagait Beach Site 5	174	88	0	0	13	9	284	17.31
<b>Totals</b>	<b>1265</b>	<b>182</b>	<b>69</b>	<b>50</b>	<b>46</b>	<b>29</b>	<b>1641</b>	<b>100.00</b>
<b>%</b>	<b>77.09</b>	<b>11.09</b>	<b>4.20</b>	<b>3.05</b>	<b>2.80</b>	<b>1.77</b>	<b>100.00</b>	

Table 2. Wagait Beach larval mosquito survey results 14 January 2015

Trap location	Water presence	Breeding area (m <sup>2</sup> )	Average no of larvae per dip	Species	Total no in sample	1st instar	2nd instar	3rd instar	4th instar	Pupae
Wagait Larval 01 NE of lot 8 De Lissa Drive. Interdunal beachfront.	Pooling	40	100	<i>Cx. (Cux) annulirostris</i>	3	1	2	0	0	0
				<i>Cx. (Cux) sitiens</i>	16	16	0	0	0	0
Wagait Larval 02 NE of lot 10 De Lissa Drive. Interdunal beachfront.	Pooling	5	50	<i>Ae. (Och) vigilax</i>	15	0	0	0	15	0
Wagait Larval 03 Lot 3 Cox Drive. Swamp on N boundry.	Pooling	0	0	<i>Nil mosquitoes</i>	0	0	0	0	0	0
Wagait Larval 04 Lot 76 Cox Drive, Cox Country Club. Swamp NE corner.	Flowing	0	0	<i>Nil mosquitoes</i>	0	0	0	0	0	0
Wagait Larval 05 NW corner of township, interdunal area behind beach front.	Pooling	N/C	4	<i>Ae. (Och) vigilax</i>	16	0	0	1	5	10
Wagait Larval 06 Lot 227 Vangemann St. E edge of swamp on lot.	Flooded	0	0	<i>Nil mosquitoes</i>	0	0	0	0	0	0
Wagait Larval 07 Lot 133 Erickson Cres. Swamp at rear of lot.	Flooded	0	0	<i>Nil mosquitoes</i>	0	0	0	0	0	0

or heavy rain event, and survives up to 2 weeks, depending on humidity. Adult mosquito trapping at Wagait Beach occurred about a week after extreme pest levels were experienced (P. Wanrooy pers. comm.) and while the traps recorded appreciable levels of this species, it is likely that collections would have been much higher if traps were set a week earlier. The *Ae. vigilax* numbers recorded in Wagait Beach township were considered high for a residential area.

The presence of extensive potential *Ae. vigilax* breeding habitat around Wagait Beach is most likely resulting in seasonal pest problems over many months of the year. Upper tidal swamps and drainage lines are likely to cause most of the *Ae. vigilax* problems from September to early January, while breeding in sand dune areas would occur in May after unseasonal rainfall or very high tides. However May peaks are usually much lower than September to January peaks due to residual wet season freshwater ponding restricting the size of available *Ae. vigilax* breeding habitat.

*Ae. vigilax* is the principal pest mosquito in coastal areas of the NT from September to January. It is aggressive and bites in shaded areas during the day as well as at night. This species is also a known vector for RRV and

BFV. Macropods such as wallabies are presumed to be the natural host for RRV, and in areas such as Wagait Beach, which is surrounded by relatively undeveloped land, wallaby hosts are likely to be abundant. Therefore, the RRV risk at Wagait Beach might be higher compared to Darwin and Palmerston, and probably similar to mosquito prone areas in Litchfield Shire. The BFV risk at Wagait Beach is also likely to be similar to other mosquito prone areas in Litchfield Shire.

#### Other mosquito species

The common banded mosquito *Cx. annulirostris* is likely to be seasonally present in numbers sufficient to result in potential mosquito borne disease transmission. The mid wet to post wet season is likely to be the peak period for this mosquito. It is less of a pest species compared to *Ae. vigilax* as it only bites at night, and is more timid in the presence of lights and personal protection. Further trapping after the wet season is required to determine the seasonal peak of this species at Wagait Beach. *Cu. annulirostris* is considered the principal vector for Murray Valley encephalitis, Kunjin, RRV and BFV in the NT.

Although no *Anopheles* mosquitoes were detected during this survey, they are likely to be

seasonally present at Wagait Beach, with the late wet to mid dry season likely to be the peak period. Further trapping is required during this period to determine the seasonal peak of *Anopheles* species. However due to the presence of potential breeding habitat, it is likely that this mosquito would at least be present in sufficient numbers to pose a potential risk of malaria transmission, if a person infected with malaria is bitten by *Anopheles* species mosquitoes at Wagait Beach. The malaria risk however is not likely to be any higher than in other areas of the NT, with the NT Department of Health surveillance systems in place to minimise the potential for local malaria transmission.

*Verrallina funerea* is likely to pose a very high seasonal problem to residents living next to brackish water paperbark swamps and dune depressions, with January to March the likely peak season. This mosquito does not venture far from dense vegetation at the breeding sites, and is not thought to be involved in RRV transmission in the NT, and therefore would be a localised pest problem only.

Freshwater pest mosquitoes such as *Coquillettidia xanthogaster* and *Mansonia uniformis* (not collected on 14<sup>th</sup> January) may occur in sufficient numbers to cause seasonal pest problems, most likely in the early to mid-dry season. As they are not known to be involved in human disease transmission they would only pose a pest problem to residents of Wagait Beach.

### ***Mosquito mitigation measures***

The best form of mosquito control is habitat modification to remove breeding sites or to shift the ecological balance in favour of mosquito larvae predators (e.g. fish). Feasibility, as well as environmental factors, would need to be considered prior to habitat modification measures being implemented. However due to the low density living at Wagait Beach, it is unlikely there would be support for such action.

Aerial larval mosquito control of the large tidal swamps within a few kilometres of Wagait Beach is an option to reduce *Ae. vigilax* numbers. Tidal swamps and depressions within 5km of the residential area, would need to be regularly sprayed with a suitable target specific larvicide, which kills mosquito larvae but has no

deleterious effect on other aquatic organisms. An aerial larval mosquito control program such as this could also reduce numbers of other problem mosquito species, such as *Cx. annulirostris*, but might not be an economically viable option at Wagait Beach.

The annual maintenance of stormwater drains would reduce *Ae. vigilax* numbers to some extent, by ensuring drains are clear of obstructions that could otherwise cause high tide/early wet season water ponding and mosquito breeding. Shallow sand filling of the dune depressions could also be carried out to fill the depressions to above the wet season water table.

The use of residual barrier insecticides, such as bifenthrin or alpha-cypermethrin, is likely to reduce adult mosquito numbers around residences when applied to mosquito harbourage areas, such as shrub vegetation and outdoor shaded areas. However, the insecticide is non target specific and toxic to aquatic organisms. Therefore, if barrier spraying is to be considered, it is recommended to engage a qualified pest controller to apply the insecticide.

Personal protection, such as insect screens in houses, the use of outdoor mosquito lanterns, mosquito coils and personal insect repellents, is likely to be the most effective long term measure for residents to reduce exposure to mosquitoes. Medical Entomology also produces annual pest calendars for *Ae. vigilax* based on tide events, and issues media warnings when significant pest mosquito problems are expected, or when there is an elevated risk of mosquito borne disease. These would all apply to Wagait Beach.

### **Acknowledgements**

Medical Entomology would like to thank Pam Wanrooy from Wagait Shire Council for providing access, and for providing general knowledge on the location of swamps and seasonally flooded areas within and adjacent to the Wagait community.

### **References**

1. Warchot, A. and Copley, N. 2015. Mosquito investigation Wagait Beach January 2015. Medical Entomology, Centre for Disease Control, NT Department of Health Branch Report.

## **A reflection of caring for TB patients in Central Australia: the challenges, complexities and adventures involved with caring for patients from different populations.**

**An excerpt from a presentation at the CDC Conference, 8-10 September 2015**

*Kate Wales CDC Alice Springs*

I have been working in the unique and wonderful world of tuberculosis (TB) control in Central Australia for almost 18 months now. It has been a challenging and frustrating time but an incredibly rewarding experience that has taught me so much, most importantly the resilience of a TB patient and the patience of a TB nurse.

I want to briefly talk about some of my experiences, some of the challenges I have had and give you a little snap shot of some of my patients.

I jumped ship from the Trachoma Unit into TB when Helen Tindall went to go and work for Medecins Sans Frontieres in a TB Unit in Cambodia. I always enjoyed listening to Helen tell me about the adventures she had chasing her TB patients through Central Australia. I thought this could be interesting and fun. It has been fun, rewarding and at the same time frustrating.

I have often found myself feeling baffled by the situations I get myself into all in the name of TB Control. Just when I think I know what I am doing and I feel like I have a good grasp on my patient and my day is perfectly organised, something happens to leave me questioning myself.

My experiences are not unique and many TB nurses can relate to these adventures but I have learned a great deal and have loved every part of my role.

I was thrown in head first to the multi-faceted and complex world of being a TB nurse. I read a great deal about TB and then quickly realised that I had a lot more to learn. You find the index case, treat him or her with the tried and tested medication that is administered through Directly Observed Therapy (DOT). When you find an active case you follow up all close contacts with a brief clinical review, a Mantoux if indicated and TB education.

I kept reading. I knew that it largely affected the poor, the hungry and the ethnic minorities in our communities. Risk factors such as overcrowding, malnutrition, alcohol use, poverty, immune-compromising health conditions and ethnicity play a big role. As I began to care for my patients I realised that the things I was reading were correct. These social determinants of health and their influence on TB were very apparent and most of my patients were living examples of these circumstances. Their living conditions, where they came from, who they socialised with, what medical conditions they had, their social situation all paved the way to becoming unwell. I quickly realised that being a TB nurse was not that easy. I had to manage people with challenging lifestyles for a minimum of 6 months sometimes 9 months. I was not just dealing with their disease but working with them in every aspect of their lives and having to find ways to address these issues with them. The involvement I had with my patients was not just a matter of giving them tablets and offering their family a Mantoux test it was and is a great deal more.

The next challenge was to give the medication through DOT. I can do this I thought. I can hand out tablets to my patients. How wrong I was. What do you do when your patient lives on a remote outstation 7 hours drive from Alice Springs and the clinic struggles to DOT them? How do you DOT someone who is homeless and has a heavy dependence on alcohol and sleeps where he falls? How do you make appointments with someone who does not have a phone or if they are given one – seems to lose it on a very regular basis? And how do you communicate with someone who only speaks Punjab or Pitantjara? Maybe just as importantly how much from my language do they understand, how much of what I say do I get across?

My daily DOTs trips have led me on many adventures. Visits to various town camps searching for my patients have put me in some well, maybe confronting, but most always

confidence building situations. Very quickly though you are welcomed by respective family groups and I have found people are very willing to help and point me in the right direction. I have been able to track a patient from South Australia to Western Australia and back to the Northern Territory (NT) all within a week having TB medication scattered throughout the Tri-state region. I have arrived at a patient's house in the morning to be told I just missed them and that now they were en route to a community a few hours out of Alice – with no medication. I also learnt that if I hadn't found my patient by Friday afternoon that my little pot of TB meds would be accompanying me everywhere I went on the weekend just in case I bumped into them.

I have been through the KFC drive through one too many times, sat through church services spoken only in Pitantjara, sat in Centrelink waiting lines, danced around in a sari, consumed my weight in curry and cake and sat out the front of many a local pub waiting for patients. All to facilitate DOTs. While this may appear to be pushing the boundaries in most cases I feel it was warranted as taking TB medication is often at the bottom of the list of priorities for my patients. Sincere efforts are made to educate and empower the patient and their families but when you are struggling daily to find your next meal or wonder where you are going to sleep that night, treatment seems insignificant. I feel I can at least offer getting this individual, my patient, to be healthy and cured and then as a healthy and strong individual hopefully improved health determinants can follow.

As a TB nurse you quickly develop an innate ability to spot your patient from a mile away. You quickly begin to learn their swagger, their habits and local haunts and even on days off I still find myself scouting the crowd. The challenge of administering medication in theory is easy but given the circumstances many of my patients are living with was challenging and required a flexible and different approach to delivering care.

My greatest challenge and one that is ongoing is contact tracing. It is largely influenced by location, distance and overcrowding. Overcrowding due to a shortage of housing and homes that are in dire need of repair is an

ongoing issue in the Territory. I knew this from my trachoma work but truly began to understand the extent of it when working in TB. There were just too many people living in poorly ventilated run down houses not suitable for one person let alone 30 people with a few babies and then you introduce the possibility of a heavily smear positive TB patient staying there. The challenge of having to contact trace a bush bus load of people that were now scattered throughout Central Australia, most of whom had used incorrect names to check in to the bus made it very difficult to track them down. I have left Alice Springs at the crack of dawn to drive 180 kms down the Plenty Highway only to arrive and to be told that the lone car I passed on my travels contained every single person I had planned on visiting. I am known at a town drinking club and get express entry there when the security guards see me arrive with my trusty little plastic ruler for measuring Mantoux's. I have found contact tracing to be the biggest challenge and seems to be never-ending but always adventurous.

Reliance on alcohol and its associated problems are very real and probably well recognised by anyone working with many disenfranchised people in the Territory. Alcohol has played a big role in many patient's disease process and recovery. In Alice Springs alcohol-related problems are very apparent. I have had patients who have been in the depths of alcohol dependence and have watched them be troubled emotionally, medically and physically as a result. One of my patients could not remember the last time he had been 100% sober. The last few years were a blur. He was malnourished, slept rough and drank heavily daily. He was due to enter mandatory rehab but decided that was not for him. He jumped on the bus and headed south. He ended up in a fountain in Adelaide, got hypothermia and was soon on his way back to us. His treatment lasted 9 months, for the first few months I found him in some crisis situations but I am very happy to now say he is sober and healthy. I have witnessed domestic violence; I have rightly or wrongly attempted to break up altercations and have had to contact the police numerous times. Alcohol and the social issues associated with it are a damaging and confronting aspect of patient care that I have had to try and find ways to deal with it on a regular basis.

My very first patient is someone that I got to know very well as his treatment was difficult both medically and socially. I initially met him when he was transferred from Alice Springs Correctional Centre to Alice Springs Hospital. He was commenced on treatment in the setting of being homeless, having a heavy alcohol addiction and generally not coping. He was referred to programs such as Safe and Sober, various homeless shelters, NT housing and Anglicare but with no success. The staff at the Alice Springs Centre for Disease Control (CDC) donated blankets and clothes; he was given a tarp and a cooking stove to help him get through the freezing cold nights during winter. He set his camp up on the side of Anzac Hill and if that was too cold I could find him in an abandoned car in one of the town camps. He survived by what we could provide for him. He asked one CDC nurse to give him a pair of cowboy boots so his feet wouldn't get cold but he also showed he retained some form of style. My husband questioned why all his old clothes went missing and why did he keep finding receipts for steak and chops in the car when his wife was a vegetarian? I witnessed as my patient cried and talked about his fears about living rough and dying from his illness. After much convincing he entered alcohol rehab much to my relief. I had tears in my eyes as I bid him farewell knowing how much courage it took for him to be there. His last day of treatment coincided with his graduation from rehab, it marked a very important day for him and for me. His journey was difficult but the bond that was built with not just me but with many of the other staff at CDC is very special and unique.

My next patient was overseas born and now living in Alice Springs. He was working up to 16 hours a day and had developed a cough. He could not afford to take the time off work as he feared losing his job. He would medicate himself with homemade onion juice in the hope to shake his illness and get back to work.

After 6 weeks of being very unwell he reluctantly presented to his GP. It turns out that onion juice is not a good cure for TB.

He was heavily smear positive and as the TB medical officer said he had a cavitation so great 'you could drive a truck through it'. My patient was terrified as he had seen his grandfather die from TB and watched his father lose everything as a result of his own TB; his job, his home and

his marriage. In fact, my patient didn't think that you recovered from TB; to him he had a very grim outlook.

His treatment and recovery however *was* straightforward and easy. He presented to the clinic daily showering the CDC staff with cakes and strudels in thanks. As all TB patients do he began to put on weight as he recovered, as did his TB nurse as I consumed my weight in chocolate mud cake and apple strudel that he made for us. He is now back working 16 hours a day but beat his illness and is ever so grateful for the treatment he received. He now wants to be an advocate for TB awareness and wishes to share his experiences about his recovery with people in his home country.

A recent patient is an old Indigenous man from a remote community. When diagnosed he had been living in a derelict caravan on an outstation 8 kms from the community. He lived there alone and survived on food he could hunt from the bush and tinned food that a friend would deliver to him every few months. He was commenced on treatment but quickly became withdrawn and sung for his homeland daily. He was a powerful Nungkari, a traditional Indigenous healer, who struggled with his illness and loss of connection to his country. He did not believe in the big mob of tablets I gave him for breakfast every morning. We tried to meet half way. He taught me language and about his culture and I worked to accommodate this into my care. He now has a more positive acceptance of his treatment.

In summary every TB patient has a story and usually a very big story. Their recovery requires different approaches, ideas and ways to address some of the circumstances that lead to them becoming unwell. TB is a disease that requires medication and monitoring but it also often requires the nurse to take on the patient's wider world. While at times it has been overwhelmingly disheartening and frustrating, these moments quickly fade as the bond that is built with the most unlikely characters is overwhelmingly rewarding and restores the emotional energy to care for a TB patient. I have loved my role very much and will cherish the bonds I have developed with some of the most unlikely, interesting and determined characters and will always fondly remember all the adventures I have had driving around in the TB taxi.

## One Disease Update:

### Tackling scabies and crusted scabies across the Top End

*Fiona Hildebrand, Heidi Pretty, Chris Saroukos, Shelley Thompson, Ritjilili Ganambarr, Bandiyal Maymuru, Michele Bray, Duneeshya Gunasekara, Anna Wills and Sam Prince, One Disease team, Darwin*

*One Disease* is a non-profit organisation that aims to eliminate crusted scabies and scabies as a health issue in Australia. Scabies is a highly contagious skin disease, which has reached endemic proportions in many remote Aboriginal communities.<sup>1</sup> In some Top End communities 7 out of 10 children acquire scabies at least once.<sup>2,3,4</sup> Scabies may underly up to 70% of *Streptococcus pyogenes* (group A streptococcus; GAS) skin infections,<sup>5</sup> which in turn can trigger acute conditions such as post-streptococcal glomerulonephritis and probably acute rheumatic fever and ultimately long-term chronic kidney disease and rheumatic heart disease.<sup>6,7</sup> In the past, mass administration of permethrin has been successful in reducing scabies,<sup>8</sup> but these results have not successfully been scaled or sustained in the long term.<sup>9,10</sup> The reasons for this are complex and community specific, but the presence of individuals with unmanaged crusted scabies is a major contributor.<sup>11,12</sup>

When a person contracts scabies, the body usually mounts an immune response that limits the number of scabies mites to 10-15.<sup>13</sup> Some Indigenous Australians with no known immune suppression develop crusted scabies, which is infestation with 1,000s of mites.<sup>14,15</sup> In the Northern Territory (NT) prior to the development of the *NT scabies and crusted scabies guidelines* in the 1990s crusted scabies had a 5-year mortality rate of up to 50%.

Starting in late 2011 in East Arnhem Land, *One Disease* has brought a renewed focus to crusted scabies. As part of the *East Arnhem Healthy Skin Program*, a joint initiative with Miwatj Health Aboriginal Corporation and NT Department of Health, *One Disease* trialled a new approach which manages crusted scabies as a chronic condition. This includes regular use of benzyl benzoate as a prophylactic to kill any mites reinfesting patients (as suggested by Currie et al 2004),<sup>14</sup> moisturisers to keep the skin hydrated and regular skin checks. A review of hospital and clinic data found this regimen led to a significant reduction of recurrences of

hyperinfestation among individuals, and scabies episodes among their close contacts.<sup>12</sup> The 6<sup>th</sup> Edition of the *CARPA Standard Treatment Manual* reflects the recommended protocols for these practices.

Following on from the work undertaken in East Arnhem, *One Disease* has now expanded operations to the rest of the Top End. Our Healthy Skin Program is only implemented in communities that welcome us and give us permission to work with their people, when the elders and the local clinics see the need for our expertise.<sup>16</sup> The ultimate goal is to empower the community with knowledge of the disease and treatment. *One Disease* has an office in the Menzies School Of Health Research building (JMB) with 4 team members, our NT Program Director and 3 Healthy Skin Clinicians. The key priorities of the Healthy Skin Clinicians are to:

- Identify all cases of crusted scabies and initiate preventative care plans in partnership with clinics across the Top End
- Carry out ongoing disease surveillance
- Support community-based organisations, clinics, health services, schools and other groups to run initiatives aimed at reducing scabies and skin sore rates
- Train Indigenous community-based workers to conduct skin screenings and also provide ongoing community education.

*One Disease* also has a Public Health Projects Coordinator based in Maningrida whose priorities include:

- Conducting program monitoring and evaluation
- Assisting with community engagement and development activities
- Assisting in developing, delivering and evaluating Community Based Worker training and providing locational support to Community Based Worker teams
- Developing, delivering and evaluating health education, promotion and training materials.

There is also a Project Officer based in the Gove Peninsula region whose priorities include:

- Developing a holistic Community Based Worker strategy
- Creating professional development plans, mentoring, peer support and regional team building for Community Based Workers
- Capacity building and providing support for Community Based Workers
- Developing a strategy for the remote management of Community Based Workers.

Broadly, and with some community differentiation, *One Disease* can offer support to Top End communities across the following areas:

- Health professional education and in-service sessions around the identification/diagnosis and management of scabies and crusted scabies. This includes an eLearning module *Managing Scabies and Crusted Scabies* developed by Remote Area Health Corps (RAHC) in conjunction with *One Disease*.
- Supporting communities and health services to manage crusted and problematic scabies utilising self-management principles. This includes utilising our two Guides, *Managing Crusted Scabies in Remote Aboriginal Communities* and *Managing Households with Recurrent Scabies* (These Guides can be found at [www.1disease.org](http://www.1disease.org)).
- Community-based workforce development to carry out scabies surveillance and treatment.
- Community-wide screening and targeted treatment of children. So far in 2015 One Disease has been involved in screenings in Wurrumiyanga, Maningrida, Ramingining and the Gove Peninsula. Screenings involve education and distribution of Lyclear/Eurax. We work alongside community and clinic health workers to ensure that all community members are encouraged to present to clinics if they suspect any family members have scabies or require any ongoing assistance.
- Collaboration with various existing stakeholders to prevent duplication and enhance sustainability.

At the present time, *One Disease* has 84 confirmed cases of crusted scabies across 28 communities and with the help of local clinics, our Healthy Skin Clinicians are designing personalised care plans which include providing education to patients, organising initial acute treatment and developing chronic condition management plans. *One Disease* aims to have a presence across the whole of the NT within the next 18-24 months and will commence recruitment of a Healthy Skin Clinician for the Katherine region this month.

Further information about *One Disease* can be found at [www.1disease.org](http://www.1disease.org) or questions can be directed to Anna Wills (NT Program Director) [anna.wills@1disease.org](mailto:anna.wills@1disease.org).

## References

1. McCarthy JS, Kemp DJ, Walton SF, Currie BJ. Scabies: more than just an irritation. *Postgrad Med J*. 2004;80:382-387.
2. Clucas DB, Carville KS, Connors C, Currie BJ, Carapetis JR, Andrews RM. Disease burden and health-care clinic attendances for young children in remote Aboriginal communities of northern Australia. *Bulletin of the World Health Organisation*. 2008 April;86(4):275-281.
3. McMeniman E, Holden L, Kearns T, Clucas DB, Carapetis JR, Currie BJ, Connors C, Andrews RM. Skin disease in the first two years of life in Aboriginal Children in East Arnhem Land. *Australian J Dermatol*. 2011;52:270-273.
4. Kearns T, Clucas D, Connors C, Currie BJ, Carapetis JR, Andrews RM. Clinic Attendances during the First 12 Months of Life for Aboriginal Children in Five Remote Communities of Northern Australia. *PLoS One*. 2013;8(3).
5. Carapetis JR, Connors C, Yarmirr D, Krause V, Currie BJ. Success of a scabies control program in an Australian aboriginal community. *Pediatr Infect Dis J*. 1997 May;16(5):494-9.
6. Hoy WE, White AV, Dowling A, Sharma SK, Bloomfield H, Tipiloura BT, Swanson CE, Mathews DJ, McCredie DA. Post-streptococcal glomerulonephritis is a strong risk factor for chronic kidney disease in later life. *Kidney Int*. 2012 May;8(10):1026-32.
7. Currie BJ, Carapetis JR. Skin infections and infestations in Aboriginal communities in northern Australia. *Australian J Dermatol*. 2000 Aug;41(3):139-43.
8. Wong LC, Amega B, Connors C, Barker R, Dulla ME, Ninnal A, Kolumboort L, Cumaiyi MM, Currie BJ. Outcome of an interventional program

- for scabies in an Indigenous community. *Med J Aust.* 2001 Oct1;175(7):367-70.
9. Andrews RM, Kearns T, Connors C, Parker C, Carville K, Currie BJ, Carapetis JR. A Regional Initiative to Reduce Skin Infections amongst Aboriginal Children Living in Remote Communities of the Northern Territory, Australia. *PLoS Negl Trop Dis.* 2009;3(11).
  10. Centre for Disease Control, Department of Health, Northern Territory. Healthy Skin Program Guidelines for Community Control of Scabies, Skin Sores and Crusted Scabies in the Northern Territory. 2010.
  11. Kearns T. Scabies and strongyloidiasis prevalence before and after a mass drug administration in a remote Aboriginal community in the Northern Territory. [PhD thesis] Darwin NT: Charles Darwin University. 2013.
  12. Lokuge B, Kopczynski A, Woltmann A, Alvoen F, Connors C, Guyula T, Mullholland E, Cran S, Foster T, Lokuge K, Burke T, Prince S. Crusted scabies in remote Australia, a new way forward: lessons and outcomes from the East Arnhem Scabies Control Program. *MJA.* 2014 June 16;200(11):644-648.
  13. Walton SF, Currie BJ. Problems in Diagnosing Scabies, a Global Disease in Human and Animal Populations. *Clinical Microbiology Reviews* 2007 April;20(2):268-297.
  14. Currie BJ, Harumal P, McKinnon M, Walton SF. First Documentation of In Vivo and In Vitro Ivermectin Resistance in *Sarcoptes scabiei*. *Clin Infect Dis.* 2004 Jul 1;39(1).
  15. Roberts LJ, Huffam SE, Walton SF, Currie BJ. Crusted scabies: clinical and immunological findings in seventy-eight patients and a review of the literature. *J Infect.* 2005 Jun;50(5):375-81.
  16. Prince S. Power of One. *MJA Insight.* 2015 May 11;17.

\*\*\*\*\*

## Update of the Healthy Skin Guidelines

The Northern Territory's *Healthy Skin Guidelines* have been updated for the fourth time and are now available as the August 2015 version from the Centre for Disease Control publications web page: [www.nt.gov.au/health/cdc](http://www.nt.gov.au/health/cdc)

These *Guidelines* are provided for the community control of scabies, skin sores and tinea infection in remote communities with the aim to provide health practitioners with expert advice to reduce the prevalence of scabies, tinea, streptococcal skin sores and associated post streptococcal illness in the Northern Territory (NT).

The updated *Healthy Skin Program. Guidelines for the Community Control of Scabies, Skin Sores, Tinea and Crusted Scabies in the Northern Territory* is based on the document developed in 1997 *Guidelines for Community Control of Scabies and Skin Sores* with principal author Dr Christine Connors. The 1997 document was then revised in 2003 and 2010 by Professor Bart Currie and Lesley Scott from Centre for Disease Control. This 2015 edition was revised by Dr Ella Meumann with contributions from Professor Bart Currie, Nicola Slavin, Dr Dana Fitzsimmons, Lesley Scott, and A/Professor Vicki Krause.

The 2015 *Healthy Skin Guideline's* appendices include the:

- Scabies fact sheet
- Impetigo (school sores) fact sheet (based on material provided by the National Health and Medical Research Council's *Staying Healthy. Preventing infectious diseases in early childhood education and care services* and is included with their permission)
- Managing Households With Recurrent Scabies and Managing Crusted Scabies in Remote Aboriginal Communities reproduced with the permission of *One Disease*
- Educational resource list
- Equipment list for community screening and treatment
- Example spreadsheet for baseline screening
- Baseline screening and community treatment
- Example spreadsheet for ongoing surveillance
- Maintenance program

Recognizing scabies is endemic in many remote NT Aboriginal communities and underlies a large proportion of streptococcal skin infections makes the control of scabies critical in controlling streptococcal skin infections and their sequelae. Periodic outbreaks of acute post streptococcal glomerulonephritis (APSGN)

have been documented in the NT communities with NT studies showing that children who have had APSGN are 6 times more likely to develop chronic kidney disease (CKD) as adults. For more information see the *Northern Territory Guidelines for Acute Post-Streptococcal Glomerulonephritis* from the Centre for Disease Control publications web page: [www.nt.gov.au/health/cdc](http://www.nt.gov.au/health/cdc)

The incidence of acute rheumatic fever (ARF) and prevalence of rheumatic heart disease (RHD) in communities in the NT are among the highest in the world. Low incidence of streptococcal pharyngitis and high incidence of streptococcal skin infections and ARF in Aboriginal communities have led to the hypothesis that ARF can occur as a complication

of streptococcal skin infection. The *Australian Guideline for Prevention, Diagnosis and Management of Acute Rheumatic Fever and Rheumatic Heart Disease* (2nd edition) is available at:

<http://www.heartfoundation.org.au/information-for-professionals/Clinical-Information/Pages/arf-rhd.aspx>

The high rate of streptococcal infection is likely to be a significant contributing factor to the high prevalence of CKD and RHD in the NT. Having a best practice approach to managing skin conditions are promoting healthy skin are objectives of the *Healthy Skin Program. Guidelines for the Community Control of Scabies, Skin Sores, Tinea and Crusted Scabies in the Northern Territory, August 2015.*

\*\*\*\*\*

## Fact sheet update July-September 2015

The Centre for Disease Control (CDC) fact sheets are updated on a regular basis and can be found on the CDC website at:

[http://health.nt.gov.au/Centre\\_for\\_Disease\\_Control/Publications/CDC\\_Factsheets/index.aspx](http://health.nt.gov.au/Centre_for_Disease_Control/Publications/CDC_Factsheets/index.aspx)

### Updated fact sheets

- Ciguatera fish poisoning
- Azithromycin for contacts of a person with pertussis (whooping cough)
- Erythromycin for contacts of a person with pertussis (whooping cough)

- Pertussis information for medical practitioners
- Pertussis (whooping cough)
- Scabies
- Box jellyfish
- Cryptosporidiosis
- Campylobacter
- Giardiasis
- Norovirus
- Shigellosis

### New fact sheet

- Irukandji syndrome

\*\*\*\*\*

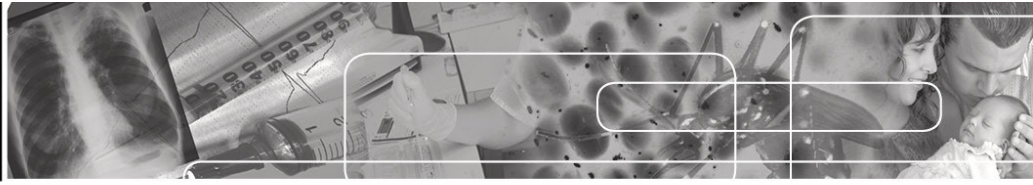
## NT malaria notifications April to June 2015

*Belinda Farmer, CDC Darwin*

There was 1 case of malaria notified in the 2nd quarter of 2015. The following table provides details about where the infection was thought to be acquired, the infecting agent, whether chemoprophylaxis was used and where the patient lived.

No. cases	Origin of Infection	Reason Exposed	Agent	Chemoprophylaxis	NT Region
1	Uganda	Expatriate visiting	<i>Plasmodium malariae</i>	Yes	Darwin

\*\*\*\*\*



Centre for Disease Control

September 2015

## *Chironex fleckeri* (box jellyfish)

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

### Why is the box jellyfish so dangerous?

'*Chironex fleckeri*', also known as the major box jellyfish has the most rapidly acting venom known to science and is capable of killing a person in under 5 minutes.

### What does the *Chironex fleckeri* (box jellyfish) look like?

The bell of the jellyfish is a rounded box shape with the bottom missing, with 4 fleshy appendages, 1 at each corner, from which tentacles trail.

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

Visible baby box jellyfish have bodies 2-5cm in diameter, while the larger mature specimens can often be 20cm across or even larger. An adult jellyfish may have 40 or more tentacles, each of which may be 2 metres or more in length.

### When and where are they found?

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

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

### What happens if you are stung?

The tentacles contain millions of 'nematocysts' which store and can inject venom. A sting occurs when the tentacles contact the bare skin causing these nematocysts to very quickly (within 3 milliseconds) inject millions of little doses of venom along the lines of the tentacle contact.

A massive dose of venom can cause heart problems and even lead to death within 5 minutes of being stung.

Children are at greater risk of a severe, life threatening reaction because of their smaller body mass. There have been 14 deaths in Top End since 1975 – all have been children.

### What other symptoms occur when stung by a box jellyfish?

There is immediate severe pain at the site of the sting. Within minutes white welts appear where the tentacles contacted the skin, followed by red whip-like lines which may later blister. Subsequent skin death can occur and lead to permanent scarring.

In up to 60% of cases an itchy bumpy rash can occur days later at the site of the sting. This 'delayed reaction' can be intensely itchy. The rash usually resolves within 10 days although it may occasionally persist for weeks. The itching may be relieved by antihistamines and steroid cream if the skin is not broken.

[www.nt.gov.au/health](http://www.nt.gov.au/health)

## Box jellyfish

### How can I prevent a box jellyfish sting?

The best prevention is to stay out of the water where there may be jellyfish especially during the 'stinger season'.

If entering the water wear protective clothing. Any clothing, even if very thin, will provide protection as long as there are no gaps or exposed skin. The more skin that is covered, the greater the protection. Special stinger suits are available for those undertaking coastal water activities.

### What is the initial treatment if stung?

Immediate first aid is vital and cardiopulmonary resuscitation (CPR) may be needed.

- Remove the person from the water
- Call for help (dial 000 or get a surf life saver or life guard if available to help you)

- Assess the patient and commence CPR as necessary
- Pour vinegar if available on the area of the sting to stop further discharge from nematocysts – do not wash with fresh water
- If vinegar is unavailable, pick off any remnants of the tentacles (the skin of the pads of the fingers and palm is thicker so any stinging will usually be minor) and rinse sting well with salt water (not freshwater)
- Seek urgent medical assistance with rapid transport to hospital. Treatment with antivenom may be required in severe stings.

Ice may be applied for local pain relief for less severe stings.

#### For more information contact the Centre for Disease Control in your region

Alice Springs	8951 7540
Darwin	8922 8044
Katherine	8973 9049
Nhulunbuy	8987 0357
Tennant Creek	8962 4603
or	
<a href="http://www.nt.gov.au/health/cdc">www.nt.gov.au/health/cdc</a>	

## Abstracts from peer reviewed published articles related to the Northern Territory

### Interim estimates of male human papillomavirus vaccination coverage in the school-based program in Australia

*Brotherton J, Batchelor M, Bradley M, Brown S, Duncombe S, Meijer D, Tracey L, Watson M, Webby R*

*CDI 39(2)2015 E197-200.*

In February 2013, following the successful establishment of the National Human Papillomavirus (HPV) Vaccination Program for females in Australia in 2007, the program was extended to males. This followed a recommendation by the Pharmaceutical Benefits Advisory Committee that extension of the quadrivalent HPV vaccine program to males would be acceptably cost-effective compared with female only vaccination, and subsequent listing on the National Immunisation Program of quadrivalent HPV vaccine for males. The program extends routine school-based HPV vaccination offered during the first year of high school (at age approximately 12–13 years) to males, with a 2 year catch-up program for males aged 14–15 years delivered in 2013 and 2014. The 3 dose coverage (completed course) in the female program has been consistently around 71% by age 15 years, with higher 1 (~81%) and 2 (~79%) dose coverage (National HPV Vaccination Program coverage data (<http://www.hpvregister.org.au/research/coverage-data>)). In this report we present interim estimates of male HPV vaccination coverage achieved in the school-based program in 2013.

### Development of a culturally appropriate bilingual electronic app about hepatitis B for Indigenous Australians: towards shared understandings

*Davies J, Bukulatjpi S, Sharma S, Caldwell L, Johnston V, Davis J.*

*JMIR Res Protoc 2015;4(2):e70 doi:10.2196/resprot.4216*

**Background:** Hepatitis B is endemic in Indigenous communities in Northern Australia; however, there is a lack of culturally appropriate educational tools. Health care workers and educators in this setting have voiced a desire for visual, interactive tools in local languages. Mobile phones are increasingly used and available in remote Indigenous communities. In this context, we identified the need for a tablet-based health education app about hepatitis B, developed in partnership with an Australian remote Indigenous community.

**Objective:** To develop a culturally appropriate bilingual app about hepatitis B for Indigenous Australians in Arnhem Land using a participatory action research (PAR) framework.

**Methods:** This project was a partnership between the Menzies School of Health Research, Miwatj Aboriginal Health Corporation, Royal Darwin Hospital Liver Clinic, and Dreamedia Darwin. We have previously published a qualitative study that identified major knowledge gaps about hepatitis B in this community, and suggested that a tablet-based app would be an appropriate and popular tool to improve this knowledge. The process of developing the app was based on PAR principles, particularly ongoing consultation, evaluation, and discussion with the community throughout each iterative cycle. Stages included development of the storyboard, the translation process (forward translation and backtranslation), prelaunch community review, launch and initial community evaluation, and finally, wider launch and evaluation at a viral hepatitis conference.

**Results:** We produced an app called “Hep B Story” for use with iPad, iPhone, Android tablets, and mobile phones or personal computers. The app is culturally appropriate, audiovisual, interactive, and users can choose either English or Yolŋu Matha (the most common language in East Arnhem Land) as their preferred language. The initial evaluation demonstrated a statistically significant improvement in Hep B-related knowledge for 2 of 3 questions ( $P=.01$  and  $.02$ , respectively) and overwhelmingly positive opinion regarding acceptability and ease of use (median rating of 5, on a 5-point Likert-type scale when users were asked if they would recommend the app to others).

**Conclusions:** We describe the process of development of a bilingual hepatitis B-specific app for Indigenous Australians, using a PAR framework. The approach was found to be successful with positive evaluations.

### Exploring the benefits of molecular testing for gonorrhoea antibiotic resistance surveillance in remote settings

Hui B, Ryder N, Su JY, Ward J, Chen M, Donovan B, Fairley C, Guy R, Lahra M et al

*PloS ONE* 2015 10(7): e0133202. Doi:10.1371/journal.pone.0133202

**Background:** Surveillance for gonorrhoea antimicrobial resistance (AMR) is compromised by a move away from culture-based testing in favour of more convenient nucleic acid amplification test (NAAT) tests. We assessed the potential benefit of a molecular resistance test in terms of the timeliness of detection of gonorrhoea AMR.

**Methods and Findings:** An individual-based mathematical model was developed to describe the transmission of gonorrhoea in a remote Indigenous population in Australia. We estimated the impact of the molecular test on the time delay between first importation and the first confirmation that the prevalence of gonorrhoea AMR (resistance proportion) has breached the WHO-recommended 5% threshold (when a change in antibiotic should occur). In the remote setting evaluated in this study, the model predicts that when culture is the only available means of testing for AMR, the breach will only be detected when the actual prevalence of AMR in the population has already reached 8 – 18%, with an associated delay of ~43 – 69 months between first importation and detection. With the addition of a molecular resistance test, the number of samples for which AMR can be determined increases facilitating earlier detection at a lower resistance proportion. For the best case scenario, where AMR can be determined for all diagnostic samples, the alert would be triggered at least 8 months earlier than using culture alone and the resistance proportion will have only slightly exceeded the 5% notification threshold.

**Conclusions:** Molecular tests have the potential to provide more timely warning of the emergence of gonorrhoea AMR. This in turn will facilitate earlier treatment switching and more targeted treatment, which has the potential to reduce the population impact of gonorrhoea AMR.

### High burden of invasive group A streptococcal disease in the Northern Territory of Australia

Boyd R, Patel M, Currie B, Holt D, Harris T, Krause V.

*Epidemiol. Infect.* 2015 doi:10.1017/S0950268815002010

Although the incidence of invasive group A streptococcal disease in northern Australia is very high, little is known of the regional epidemiology and molecular characteristics. We conducted a case series of Northern Territory residents reported between 2011 and 2013 with *Streptococcus pyogenes* isolates from a normally sterile site. Of the 128 reported episodes, the incidence was disproportionately high in the Indigenous population at 69.7/100 000 compared to 8.8/100 000 in the non-Indigenous population. Novel to the Northern Territory is the extremely high incidence in haemodialysis patients of 2205.9/100 000 population; and for whom targeted infection control measures could prevent transmission. The incidences in the tropical north and semi-arid Central Australian regions were similar. Case fatality was 8% (10/128) and streptococcal toxic shock syndrome occurred in 14 (11%) episodes. Molecular typing of 82 isolates identified 28 emm types, of which 63 (77%) were represented by four emm clusters. Typing confirmed transmission between infant twins. While the diverse range of emm types presents a challenge for effective coverage by vaccine formulations, the limited number of emm clusters raises optimism should cluster-specific cross-protection prove efficacious. Further studies are required to determine effectiveness of chemoprophylaxis for contacts and to inform public health response.

## Consensus guidelines for the investigation and management of encephalitis in adults and children in Australia and New Zealand

Britton P, Eastwood K, Paterson B, Durrheim D, Dale R, Cheng A, Kenedi C et al

*Internal Medicine Journal* 45 (2015)  
doi:10.1111/imj.12749

Encephalitis is a complex neurological syndrome caused by inflammation of the brain parenchyma. The management of encephalitis is challenging because: the differential diagnosis of encephalopathy is broad; there is often rapid disease progression; it often requires intensive supportive management; and there are many aetiological agents for which there is no definitive treatment. Patients with possible meningoencephalitis are often encountered in the emergency care environment where clinicians must consider differential diagnoses, perform appropriate investigations and initiate empiric antimicrobials. For patients who require admission to hospital and in whom encephalitis is likely, a staged approach to investigation and management is preferred with the potential involvement of multiple medical specialties. Key considerations in the investigation and management of patients with encephalitis addressed in this guideline include: Which first-line investigations should be performed? Which aetiologies should be considered possible based on clinical features, risk factors and radiological features? What tests should be arranged in order to diagnose the common causes of encephalitis? When to consider empiric antimicrobials and immune modulatory therapies? and What is the role of brain biopsy?

## Relative frequency, characteristics, and antimicrobial susceptibility patterns of *Vibrio* spp., *Aeromonas* spp., *Chromobacterium violaceum*, and *Shewanella* spp. in the Northern Territory of Australia, 2000–2013

McAuliffe G, Hennessy J, Baird R

*Am. J. Trop. Med. Hyg.*, 92(3), 2015, pp. 605 – 610

*Vibrio*, *Aeromonas*, *Chromobacterium violaceum*, and *Shewanella* (VACS) are water-associated Gram-negative organisms that can cause a variety of infections. The frequency, patient characteristics, and antimicrobial susceptibilities for 468 isolates from 442 patients from the Northern Territory were reviewed. *Aeromonas* spp. (312 of 468; 67%) were most commonly isolated followed by *Vibrio* spp. (71 of 468; 15%), *Shewanella* spp. (61 of 468; 13%), and *C. violaceum* (24 of 468; 5%). A strong male predominance was found (male to female ratio of 2.3:1). Skin and soft tissue isolations (373 of 468; 80%) from lower limb infections (222 of 371; 60%) were the most common clinical manifestation. The episodes were usually polymicrobial (281 of 468; 60%). Coisolates included *Staphylococcus aureus* (137 of 468; 29%),  $\beta$ -hemolytic streptococci (74 of 468; 16%), enterobacteriaceae (111 of 468; 24%), non-fermentative Gram-negative bacilli (35 of 468; 7%), and other VACS organisms (37 of 468; 8%). Antimicrobial resistance of VACS organisms to ciprofloxacin (0–4%), cefepime (0–3%), and gentamicin (0–0.8%) and *Vibrio* spp., *Aeromonas* spp., and *Shewanella* to cotrimoxazole (0–3%) was rarely shown. For water-associated lower limb skin and soft tissue infections in the tropics, clinicians should consider empirical antimicrobial therapy with agents active against *S. aureus* and VACS organisms.

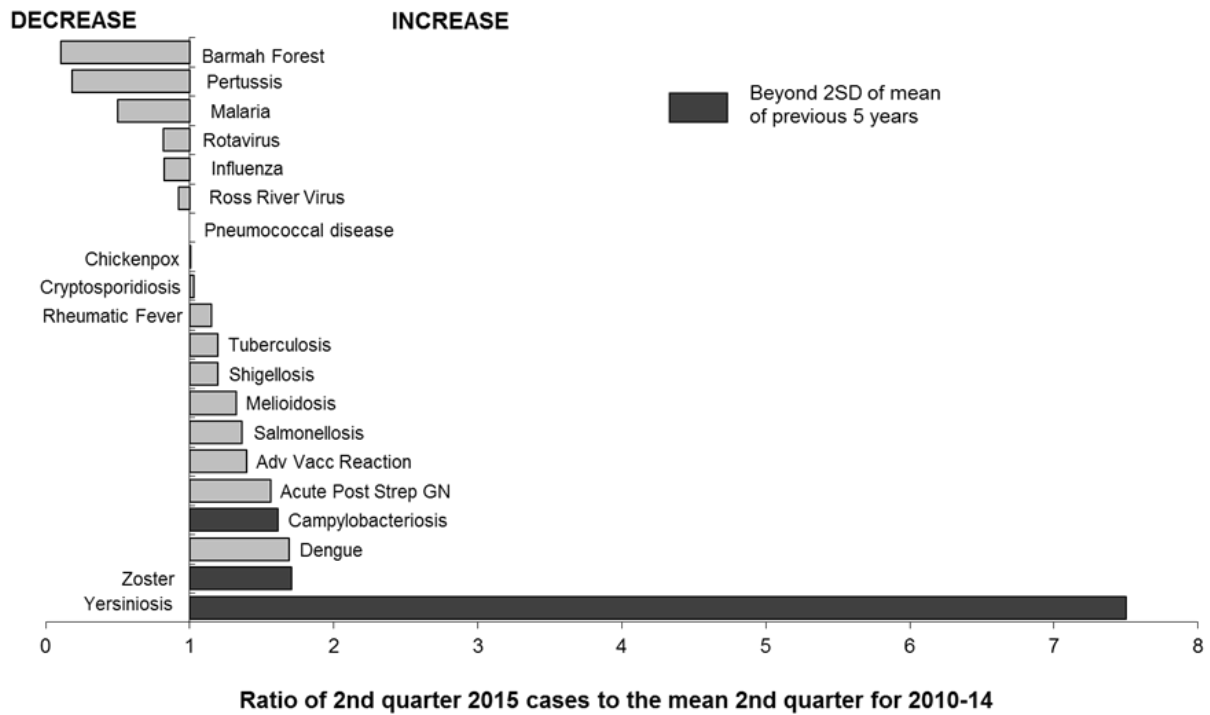
\*\*\*\*\*

## NT NOTIFICATIONS OF DISEASES BY ONSET DATE &amp; DISTRICTS

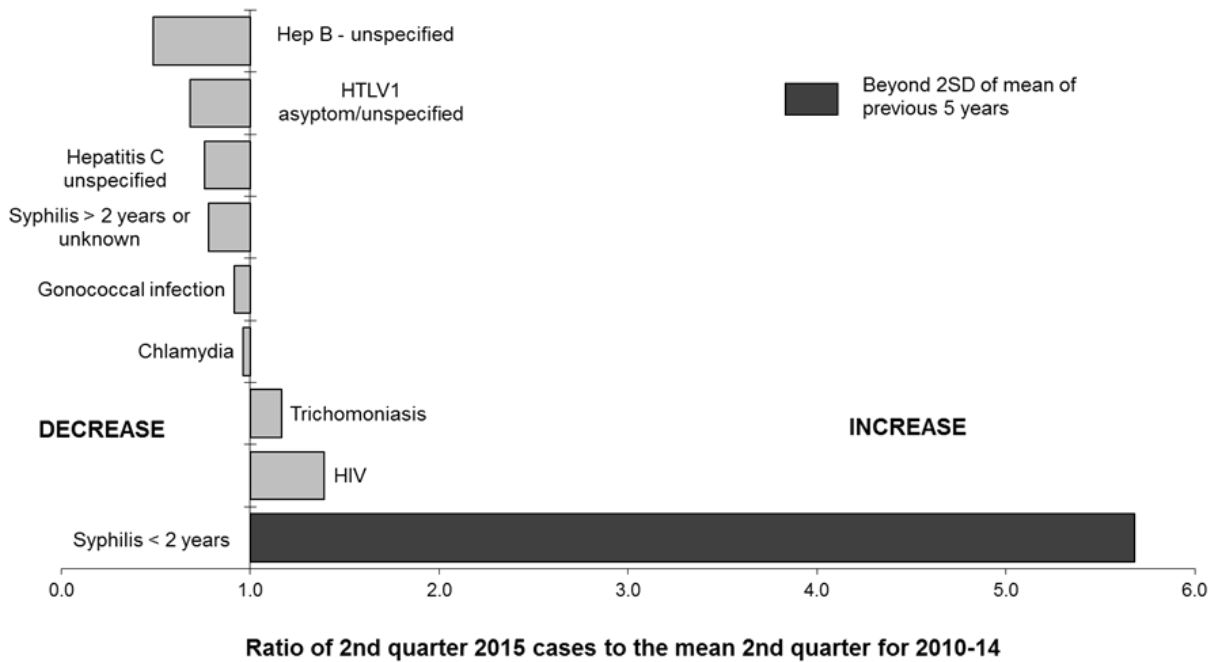
1 April — 30 June 2015 and 2014

	Alice Springs		Barkly		Darwin		East Arnhem		Katherine		NT	
	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014
Acute Post strep Glomerulonephritis	4	2	1	4	7	4	2	3	1	2	15	15
Adv Vacc Reaction	7	4	2	0	12	12	1	2	2	0	24	18
Amoebiasis	0	0	0	0	0	1	0	0	0	1	0	2
Barmah Forest virus	0	0	0	0	5	10	0	1	0	1	5	12
Campylobacteriosis	17	19	1	1	59	42	8	3	4	6	89	71
Chickenpox	5	5	0	0	16	12	2	0	0	5	23	22
Chikungunya	0	0	0	0	3	0	0	0	0	0	3	0
Chlamydia	198	237	8	34	324	392	47	43	100	88	677	794
Chlamydial conjunctivitis	1	7	0	4	3	3	0	0	0	3	4	17
Cryptosporidiosis	2	6	4	2	26	13	1	0	3	2	36	23
Dengue	0	1	0	0	23	17	0	1	1	1	24	20
Food/water borne disease	0	0	0	0	13	0	0	0	0	0	13	0
Gastro - related cases	0	3	0	0	0	0	0	0	0	0	0	3
Gonococcal conjunctivitis	0	1	0	0	0	0	0	0	2	0	2	1
Gonococcal infection	233	215	8	30	93	147	44	21	76	92	454	505
Gonococcal neon ophthalmia	0	1	0	0	1	0	0	0	0	0	1	1
Group A strep invasive	3	6	0	1	6	4	1	0	0	2	10	13
Hepatitis B - chronic	0	11	0	0	1	2	2	2	0	0	3	15
Hepatitis B - new	0	0	0	0	0	0	0	2	0	0	0	2
Hepatitis B - unspecified	12	13	0	0	20	40	3	0	0	1	35	54
Hepatitis C - new	0	1	0	0	0	0	0	0	0	0	0	1
Hepatitis C - unspecified	9	9	0	0	31	38	0	1	3	2	43	50
H Influenzae non-b	1	2	0	0	1	0	0	0	0	1	2	3
HIV	0	0	0	0	5	4	0	0	1	0	6	4
HTLV1 asymptomatic/unspecified	8	4	0	1	1	0	0	0	0	0	9	5
HUS	0	1	0	0	0	0	0	0	0	0	0	1
Influenza	21	18	2	0	25	24	4	2	1	9	53	53
Legionellosis	1	0	0	0	2	0	0	1	0	0	3	1
Leptospirosis	0	0	0	0	1	0	0	0	0	0	1	0
Listeriosis	1	0	0	0	0	0	0	0	0	0	1	0
Malaria	0	0	0	0	1	1	0	0	0	0	1	1
Measles	0	0	0	0	0	2	0	0	0	0	0	2
Melioidosis	0	0	0	0	13	12	2	4	3	1	18	17
Meningococcal infection	0	0	0	0	0	0	1	0	0	0	1	0
MVE	0	0	0	0	0	0	0	0	1	0	1	0
Non TB Mycobacteria	0	0	0	0	2	0	0	0	0	0	2	0
Pertussis	3	8	0	0	8	8	0	2	0	0	11	18
Pneumococcal disease	11	3	0	0	6	5	1	0	2	0	20	8
Rheumatic Fever	8	7	0	0	6	6	10	3	3	4	27	20
Ross River virus	2	10	0	1	59	74	1	5	2	7	64	97
Rotavirus	39	2	1	0	10	6	20	0	1	0	71	8
Salmonellosis	18	29	3	1	133	109	9	5	17	16	180	160
Shigellosis	4	6	0	0	7	10	12	3	5	5	28	24
Syphilis < 2y	20	7	0	0	6	4	0	0	24	3	50	14
Syphilis > 2y or unknown	4	1	0	0	8	9	2	1	6	1	20	12
Trichomoniasis	259	220	20	61	272	307	154	157	133	174	838	919
Tuberculosis	0	1	0	0	11	6	0	0	0	1	11	8
Typhoid	0	0	0	0	0	1	0	0	0	0	0	1
Varicella - unspecified	0	0	0	0	0	0	0	0	1	2	1	2
Vibrio food poisoning	0	0	0	0	0	2	0	0	0	0	0	2
Vibrio invasive	0	0	0	0	0	0	1	1	0	0	1	1
Yersiniosis	0	0	0	0	3	0	0	0	0	0	3	0
Zoster	7	15	0	0	60	43	9	1	13	8	89	67
<b>Total</b>	<b>898</b>	<b>875</b>	<b>50</b>	<b>140</b>	<b>1,283</b>	<b>1,370</b>	<b>337</b>	<b>264</b>	<b>405</b>	<b>438</b>	<b>2973</b>	<b>3087</b>

**Ratio of the number of notifications in the 2nd quarter of 2015 to the 5 year mean (2010-14): selected diseases**



**Ratio of the number of notifications in 2nd quarter of 2015 to the 5 year mean (2010-14): sexually transmitted diseases**



## Comments on notifications from 2nd quarter 2015

### Varicella zoster – shingles

There were 89 cases of shingles in the 2<sup>nd</sup> quarter which was 1.7 times the expected number based on the 5 year mean (52). This increase in notified cases has been well documented and is likely to be due to the increased uptake of PCR testing. However further work will need to be done to confirm this.

### Syphilis (both <2 years duration and >2 years or unknown duration)

The increase in this quarter was primarily due to an ongoing outbreak affecting remote Indigenous communities in the Alice Springs, Barkly and Katherine districts. It is part of a greater outbreak that has now spanned across north Queensland, the Northern Territory and northern Western Australia. The Centre for Disease Control has

been working with remote primary health care services and clinicians to contain the outbreak.

### Campylobacteriosis

Part of the increase in campylobacteriosis can be attributed to the introduction of nucleic acid testing in 2013. The new testing method is much more sensitive leading to an increase in notifications that are PCR positive but culture negative.

### Yersiniosis

There were 3 cases of yersiniosis in the 2<sup>nd</sup> quarter which were more than the total (2) of the 5 previous 2<sup>nd</sup> quarters. This is likely due to the introduction of more sensitive nucleic acid (PCR) testing methods in 2013.

\*\*\*\*\*

## CDC Conference ‘Disease Control: Thinking Outside the Square’

The annual Centre for Disease Control (CDC) Conference was held in September at the new Charles Darwin University waterfront campus. The overall theme for the conference was ‘Disease Control – Thinking Outside the Square’ which was attended by over 100 registrants across the 3 days. The topics were diverse and presented by local, interstate and international speakers from multiple disciplines and organisations.

Notable highlights for conference attendees included ‘*Mycobacterium ulcerans*’ with

Medecins Sans Frontieres connections, a presentation on ‘*Notifiable Diseases in Indigenous Australians in the NT – Are We Closing the Gap*’ and ‘*Responding to Ebola, Middle East Respiratory Syndrome and The Next Virus*’, an interesting discussion on gonococcal diagnostics and antimicrobial sensitivity surveillance in Australia and the NT as well as ‘*Syphilis across the Northern Territory*’, a reporter’s view on immunisation issues and a provocative discussion on ‘*Ageing in the NT*’ and ‘*Dementia Friendly Communities*.’



### Immunisation coverage for children aged 12-<15 months at 30 June 2015

Region	Number in district	%DTP	%Polio	%HIB	%Hep	%Pneumo	%Fully vaccinated
Darwin	290	93.4%	93.4%	92.8%	93.4%	93.1%	92.4%
Winnellie PO Bag	71	94.4%	94.4%	94.4%	94.4%	94.4%	94.4%
Palmerston/Rural	242	91.3%	91.3%	91.3%	91.3%	91.7%	91.3%
Katherine	90	91.1%	91.1%	92.2%	92.2%	93.3%	91.1%
Barkly	25	96.0%	96.0%	96.0%	96.0%	96.0%	96.0%
Alice Springs	112	93.8%	93.8%	93.8%	93.8%	93.8%	93.8%
Alice Springs PO Bag	43	95.3%	95.3%	95.3%	95.3%	95.3%	95.3%
East Arnhem	44	90.9%	90.9%	90.9%	90.9%	90.9%	90.9%
NT	917	92.8%	92.8%	92.7%	92.9%	93.0%	92.5%
Non-Indigenous (NT)	559	93.9%	93.9%	93.6%	93.9%	93.6%	93.4%
Indigenous (NT)	358	91.1%	91.1%	91.3%	91.3%	92.2%	91.1%
Australia	77634	92.9%	92.9%	92.7%	92.6%	92.6%	92.1%

### Immunisation coverage for children aged 24-<27 months at 30 June 2015

Region	Number in district	%DTP	%Polio	%HIB	%Hep	%MMR	%MenC	%Varicella	%Fully vaccinated
Darwin	287	95.8%	95.8%	95.1%	95.8%	91.3%	95.1%	90.2%	88.2%
Winnellie PO Bag	67	92.5%	92.5%	92.5%	92.5%	89.6%	92.5%	88.1%	88.1%
Palmerston/Rural	235	97.0%	97.0%	96.6%	97.0%	94.0%	97.9%	93.2%	91.9%
Katherine	84	97.6%	97.6%	97.6%	97.6%	92.9%	96.4%	89.3%	85.7%
Barkly	19	100%	100.0%	100%	100%	100.0%	100.0%	100.0%	100.0%
Alice Springs	127	90.6%	90.6%	90.6%	90.6%	84.3%	89.8%	84.3%	80.3%
Alice Springs PO Bag	36	97.2%	97.2%	97.2%	97.2%	86.1%	97.2%	83.3%	83.3%
East Arnhem	38	94.7%	94.7%	94.7%	94.7%	92.1%	94.7%	92.1%	92.1%
NT	893	95.4%	95.4%	95.1%	95.4%	91.0%	95.2%	89.9%	88.0%
Non-Indigenous (NT)	569	94.9%	94.9%	94.6%	94.9%	92.6%	95.4%	91.7%	89.5%
Indigenous (NT)	324	96.3%	96.3%	96.0%	96.3%	88.3%	94.8%	86.7%	85.5%
Australia	76988	95.5%	95.5%	94.6%	95.2%	90.9%	94.2%	91.9%	89.0%

### Immunisation coverage for children aged 60-<63 months at 30 June 2015

Region	Number in district	%DTP	%Polio	%MMR	%Fully vaccinated
Darwin	253	90.1%	90.1%	91.3%	89.3%
Winnellie PO Bag	66	98.5%	98.5%	98.5%	98.5%
Palmerston/Rural	222	96.4%	96.4%	95.0%	94.6%
Katherine	99	99.0%	99.0%	98.0%	98.0%
Barkly	26	100%	100.0%	100.0%	100.0%
Alice Springs	117	88.0%	88.0%	88.9%	87.2%
Alice Springs PO Bag	49	93.9%	93.9%	93.9%	91.8%
East Arnhem	41	92.7%	92.7%	92.7%	92.7%
NT	873	93.7%	93.7%	93.7%	92.7%
Non-Indigenous (NT)	538	92.4%	92.4%	92.4%	91.3%
Indigenous (NT)	335	95.8%	95.8%	95.8%	94.9%
Australia	78341	92.9%	92.9%	92.9%	92.3%

## Immunisation coverage at 30 June 2015

Charles Strebor, CDC, Darwin

Immunisation coverage rates for Northern Territory (NT) children by regions based on Medicare address postcode as estimated by the Australian Childhood Immunisation Register are shown on page 27.

### Background information to interpret coverage

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

The cohort of children assessed at 12 to <15 months of age on 30 Jun 2015 were born between 1 Jan 2014 and 31 Mar 2014 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 or 3 doses of PRP-OMP Hib or 3 doses of another Hib vaccine, 3 doses of hepatitis B vaccine and 3 doses of pneumococcal vaccine. All vaccinations must have been administered by 12 months of age.

The cohort of children assessed at 24 to <27 months of age on 31 Jun 2015 were born between 1 Jan 2013 and 31 Mar 2013 inclusive. To be considered fully vaccinated, these children must have received meningococcal C vaccination (given at the 12 month schedule point), and dose 2 of measles, mumps, rubella (MMR) and dose 1 varicella vaccination (given in combination as MMRV at the 18 months schedule point). All vaccinations must have been administered by 24 months of age.

The inclusion of these 3 additional immunisations has caused a drop in the reported

coverage rates which are measured at 2 years of age. The primary reason for the decrease is that uptake and/or reporting of the 18 month dose of MMRV is lower than for other vaccines. It is expected that these children will catch-up by their 4<sup>th</sup> birthday when they present for their next scheduled vaccination, if not before. Over time parents and providers will become more familiar with the due date for MMRV and timely coverage should improve.

The cohort of children assessed at 60 to <63 months of age on 30 Jun 2015 were born between 1 Jan 2010 and 31 Mar 2010 inclusive. To be considered fully vaccinated, these children must have received 4 or 5 valid doses of vaccines containing diphtheria, tetanus, pertussis antigens, 4 doses of poliomyelitis vaccine and 2 valid doses of MMR vaccine. All vaccinations must have been administered by 60 months (5 years) of age.

### Interpretation and comment

The vaccination coverage rates for children in the NT are comparable with the national average for all age cohorts: 12 <24 months cohort (NT 92.5%, National 92.1%); 24 to <27 months cohort (NT 88.0%, National 89.0 %); and for the 60 to <63 months cohort (NT 92.7%, National 92.3%).

Indigenous children were less likely to be fully immunised than non-Indigenous children in the 12 to <15 month cohort (Indigenous 91.1 %, Non-Indigenous 93.4%) and 24 to <27 month cohort (Indigenous 85.5%, Non-Indigenous 89.5%) but more likely to be fully immunised in the 60 to <63 cohort (Indigenous 94.9%, Non-Indigenous 91.3%).

Further information about the Australian Childhood Immunisation Register coverage may be found at: <http://ncirs.edu.au/immunisation/coverage/index.php>

\*\*\*\*\*

## Disease control staff updates July-September 2015

### Top End

**Gabrielle Watt** commenced 12 months maternity leave in July 2015 and **Paula Wines** has taken over her role as Trachoma Program Coordinator. Paula was previously employed as a Public Health Nurse in the Trachoma Program and is based in Central Australia. Prior to this, Paula has worked as a Remote Area Nurse for several years and has experience working in a variety of public health programs. Paula will continue to be based in Alice Springs while undertaking this role. **Matthew Thalanany** will add to his role as Section Head of the Sexual Health and Blood Borne Virus Unit (SHBBVU) that of also being the Medical Advisor for the Trachoma Program.

**Kim Jackson** has commenced working with the SHBBVU in Darwin as a Sexual Health Nurse. Kim has previously held positions as a Remote Area Nurse and a Sexual Health Nurse in Darwin. **Judith Burke** has joined the SHBBV team and is the Public Health Nurse in Katherine.

**Tizi De Grandi** has joined the Immunisation Register after more than a decade working in the Commonwealth public service.

**Nina Kurucz and Alexander Roberts** from Medical Entomology were formally recognised by a letter of appreciation from the Chief Minister Adam Giles for their hard work and dedication to the recovery efforts following Tropical Cyclones Lam and Nathan.

### Central Australia

**Sarah Wyatt** has joined the Remote Sexual Health Team in Central Australia as a Sexual Health Nurse. **Paul Bilal** left the Adolescent Sexuality Education Project team to commence a teaching career in Brisbane and to be closer with his family. **Helen Goodwin** is acting as the Remote Sexual Health Manager in Central Australia while **Mark Russell** is on a promotional transfer to TeleHealth.

Rheumatic Heart Disease Coordinator Central Australia **Nina Missen** has commenced maternity leave.

CDC Barkly farewelled Administrative Officer **Breanna McKelvey** who has transferred to the Department of Education.

\*\*\*\*\*

### ***The Northern Territory (NT) Disease Control Bulletin***

Current and past editions of the *NT Disease Control Bulletin* are available on line at:  
[http://www.health.nt.gov.au/Centre\\_for\\_Disease\\_Control/Publications/NT\\_Disease\\_Control\\_Bulletin/index.aspx](http://www.health.nt.gov.au/Centre_for_Disease_Control/Publications/NT_Disease_Control_Bulletin/index.aspx)

You can also find past *Bulletin* articles on various disease control topics via the *NT Disease Control Bulletin* Cumulative Index at the above web address.

We welcome letters to the editor regarding the *NT Disease Control Bulletin*. Please feel free to contact the editor at Vicki.Krause @nt.gov.au.