Introduction

This report follows on from the last 4 years of active surveillance of firework injuries conducted by the Darwin Centre for Disease Control.\(^1\)

Methods

Surveillance involved identifying self-reported firework-related injuries during the period midnight Friday 28\(^{th}\) June – midnight Tuesday 2\(^{nd}\) July 2002 in the Darwin/Palmerston area. Letters requesting participation in the community survey and a fax-back survey form were sent out to 42 medical centres one week prior to the survey. The Royal Darwin Hospital (RDH) Emergency Department (ED) participated in the survey. Data on the number of firework-related incidents attended by St John Ambulance NT and the Police, Fire and Emergency Services (FES) were gathered from the services Computer Aided Dispatch systems.

Severity of injury was rated as follows:

- **Severe** admitting to hospital (IV antibiotics, analgesia, dressing).
- **Moderate** requiring 2 or more reviews by a health practitioner.
- **Mild** requiring only one visit to a health practitioner.

In the past, the Government has been limited in its ability to collect information on the circumstances around firework injuries. This year the survey included a patient consent form to allow follow up interviews by officers from the Office of Work Health & Electrical Safety (OWHES).
The 2002 survey included a costing of health services. The Hospital Services Branch of the Department of Health & Community Services (DHCS) conducted this exercise. Hospital Inpatient costs were calculated by Weighted Inlier Equivalent Separation (WEIS) payment for 2001/2002 and Outpatient costs were calculated based on national prices for Burns Clinics.

Results

Between 1998 and 2000 there was a significant decline in the number of reported cases and the number of children injured from fireworks (see figures 1 & 2). However, the 2002 figures indicate a reversal in that trend with an increase in the number and severity of cases.

Figure 1. Total number of firework-related injuries Darwin & Palmerston 1998-2002

The OWHES through their licensing database found an increase in the numbers of firework wholesalers and retailers over the last 5 years, leading to a greater number of firework products being sold.

In 2002 there were 14 firework injuries reported in the Darwin and Palmerston area, 5 more than last year (see table 1). Ten cases were seen in the RDH ED (9 of these consented to follow-up interviews) and the remaining 4 by General Practitioners (no consent forms were completed). There were 13 burns and 1 eye injury. There were no fatalities but 5 cases were severe, with 4 burns cases requiring admission and 1 eye injury required a day surgery procedure. No injuries occurred in the 0-5 year age group, 5 cases occurred in the 5-15 year age group and 8 cases in the 16-30 year age group. There was only 1 case aged over 45 years. Eight cases were female and 6 cases male. Two female cases sustained burns when their clothing was set alight. Eight of the injuries were to bystanders. All injuries occurred at private displays.

Injuries in 2002 included:

- A multi blast firework (suspected illegal unit) malfunctioned and lodged in a women’s thigh resulting in a deep burn to subcutaneous fatty tissue requiring a 3 day hospital admission.

- A woman’s T-shirt was set alight by a firework at Mindil Beach resulting in combined partial thickness and superficial burns to her chest requiring hospital admission and a skin graft.

- A child’s pants were set alight by a firework burning her abdomen, thigh and hand, which required hospital admission for 5 days.

- A shell from an incorrectly fired firework lodged in a man’s sandal causing partial thickness burns to the sole of his foot and toes, requiring hospital admission.

- A child stood too close while lighting a firework and sustained a corneal foreign body and scleral injury.

The increased number and severity of cases (see figure 3) put a significant burden on the public health system. There were approximately 21 visits to the ED and the Burns Clinic (there are still 3 patients being seen in the Burns Clinic at time of report), 5 hospital admissions, and 2
surgical procedures. The estimated cost of health care to treat firework related injuries was $33,500 (see table 1).

Other incidents reported/alleged included:
- FES fought 66 grass fires over a 24-hour period in the NT (39 in the Greater Darwin area) which coincided with the sale of fireworks for personal use.
- Police were inundated with calls from the public reporting noise complaints.
- More than 3.5 tonnes of fireworks debris was cleaned up after Territory Day celebrations by council workers - it took 25 people several hours.
- Three dogs were killed by cars and several animals were injured during the Territory Day celebrations (reported in the media).
- The RSPCA, vets and local councils received more than 300 calls involving dogs scared by fireworks.
- Multiple reports of fireworks being set off outside the authorised time (6pm - 11pm, 1st July). The severe childhood eye injury was sustained on the 2nd July.

**Figure 3. Severity of cases**

* 14 cases in 1999 were reported as both moderate and severe (unable to clarify further) and have been split between both categories.

**Table 1. Firework Related Injuries in Darwin 2002**

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age Category</th>
<th>Severity</th>
<th>Type</th>
<th>Cause</th>
<th>Attendance</th>
<th>No. Visits</th>
<th>Total no. of cases</th>
<th>Est costs</th>
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<tbody>
<tr>
<td>F</td>
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<td>Mild</td>
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<td>ED - Discharged</td>
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<td>GP</td>
<td>1</td>
<td></td>
<td>$50</td>
</tr>
<tr>
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<tr>
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<td>Burn</td>
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<td>ED/Burns Clinic</td>
<td>2</td>
<td></td>
<td>$430</td>
</tr>
<tr>
<td>M</td>
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<td>Moderate</td>
<td>Burn</td>
<td>Holding cracker</td>
<td>ED/Burns Clinic</td>
<td>5</td>
<td></td>
<td>$1,075</td>
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<tr>
<td>M</td>
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<td>Moderate</td>
<td>Burn</td>
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<td>ED/Burns Clinic</td>
<td>5</td>
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<tr>
<td>M</td>
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<td>Burn</td>
<td>Holding cracker</td>
<td>ED/Burns Clinic</td>
<td>3</td>
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<td>$645</td>
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</table>

Hospital Inpatient costs were calculated by Weighted Inlier Equivalent Separation (WEIS) payment for 2001/2002

Outpatients costs were calculated based on National prices for Burns Clinics

$33,421
Discussion

The decline in cases during 1998-2000 coincided with the implementation of the OWHES – Work Health Strategy to promote safer firework celebration in the NT. A joint committee was formed in 2001 with representatives from OWHES, Police, FES and the DHCS to coordinate ongoing implementation of this strategy.

The 2002 safety campaign did not obtain the high media profile that it has in the past. A study of past copies of the NT News (24th June – 1st July) revealed that there was a striking difference in the number of articles leading up to cracker night in the years 1999, 2000 and 2001 compared to 2002. During 1999-2001 the NT News included several well-placed articles and Wicking cartoons on safety issues. There were also several paid safe handling messages from the Department of Industries and Business and notices about pet safety from the Darwin City Council. In 2002 the OWHES provided media releases covering the safe handling and use of fireworks as usual, but there were no articles or cartoons in the NT News on safety issues leading up to cracker night. There were 2 paid safety messages from the Department of Education Employment & Training (DEET).

Reports from police and OWHES stated that people at public displays were generally well behaved. However, there were reports from the media/general public of people taking dangerous risks and groups discharging fireworks in crowded areas. There were also reports of fireworks being incredibly loud this year suggesting higher explosives than permitted, i.e. display fireworks.

Territory Day often falls over school holidays making it difficult to target young children through schools. Next year it is recommended that there be a combined departmental media campaign to raise community awareness of safety issues, including an intensive school campaign run through DEET to complement Burns Awareness week, which falls in the week prior to Territory Day.

To date officers from the OWHES have conducted a number of interviews with cases to examine the cause of injuries. The preliminary findings from these interviews are that:

- the majority of reported injuries were due to operator error, poor parental supervision or folly;
- there are some cases being investigated for impending prosecution;
- there is a perception that there has been an increase in the number of display fireworks sold by illegal operators (despite a joint operation between the NT Police and OWHES that seized a significant stock of illegal fireworks - investigations for prosecutions are pending); and it appears the increases in illegal sales are a direct result of increased public demand for the supply of illegal fireworks (all agencies will be targeting this area).

Recommendations

1. Extend the DHCS Firework Related Injury Community Survey to the 5 major centres across the NT.
2. Strongly recommend to Government the gradual ban of private firework displays, starting with restricted hours of sale and use.
3. DHCS to work with the OWHES early in 2003 to coordinate a firework safety campaign in schools.
4. For the 3 departmental (DHCS, FES, OWHES) public affairs units to work together to develop a media safety awareness campaign.
5. Continue to support Burns Week from 24 June – 1 July to get maximum benefit in community safety awareness.

Acknowledgment

Special thanks to Dr Jacki Mein (who first implemented the community surveillance of firework injuries in 1998) for developing an excellent proforma that allows her successors to conduct the survey with ease.

References


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**Salmonella Ball outbreak investigation in the NT, May-June 2002**  
*Rosanne Muller, MAE Scholar, Centre for Disease Control, Darwin*

**Background**

In the Northern Territory (NT) salmonellosis is one of the most common notifiable diseases each year. The rate in the first quarter of this year was 259/100,000 as compared with 57/100,000 nationally.\(^1\) The majority of cases are sporadic in nature and point source outbreaks are uncommon. Over the past 8 years, 3 outbreaks of salmonella have been investigated in the NT. In 1996, a cluster of cases of *S.* Mbandaka occurred during an Australia–wide outbreak, where the source was contaminated peanut butter.\(^2\) An outbreak of *S.* Chester in 1998 was linked to ingestion of green turtle in an Aboriginal community.\(^2\) Most recently, an outbreak of *S.* Mgulani across the Top End was investigated in 2001, and no point source was identified.\(^3\)

*S.* Ball is a serovar rarely reported in Australia outside of the NT. It is an Australian serovar, meaning, the first *S.* Ball ever isolated was from Australia and it was typed in Adelaide in 1949 (personal communication Joan Powling, National Enteric Pathogen Surveillance Scheme (NEPSS)). In the past 10 years, the NEPSS has reported one case each in Victoria, South Australia and Tasmania, 16 cases in Queensland, 11 cases in WA, and 181 cases in the NT.\(^4\) In 2001, 33 cases were reported in the NT, with 41, 36, 26 and 11 cases reported in 2000, 1999, 1998 and 1997 respectively. In the first 6 months of this year, 38 cases were reported, approximately a twofold increase compared with the number of expected cases as seen visually in figure 1.\(^5\)

In the NT, all stool samples positive for salmonella species are referred interstate for serotyping. There are two private and one public laboratories in Darwin which usually send salmonella samples interstate separately, to different reference laboratories. Delays in this process due to transport time can mean that notification of serotype reaches CDC generally between 1-3 weeks after the collection of the stool sample, making timely detection of an outbreak difficult. This together with the gradual nature of the outbreak, meant that the increase in cases was not appreciated until early May 2002.

**Figure 1.** *S.* Ball notifications in the NT by month 1998-2002

Figure 1 shows the organism to be endemic in the NT with no apparent seasonal distribution. During the first half of 2002, total salmonella notifications were not increased compared with previous years, but there was a proportional increase in *S.* Ball, which accounted for 17% of all salmonellas. It is the most frequently occurring serovar in the NT this year to date.

**Literature Review**

A search of the international literature for *S.* Ball specifically did not identify any articles on this serovar. A request for information was made to Enter-Net, a UK-based international salmonella surveillance system, with a response that there is no record of *S.* Ball occurrences outside of Australia [(email communication, Dr Ian Fisher)]. Discussions with microbiologists at the Institute of Medical and Veterinary Science (IMVS), Adelaide, a national reference centre for salmonella, indicated that *S.* Ball is likely to be an environmental rather than food-borne pathogen, which has established an ecological niche in the tropics [(Chris Murray and Dianne Davos, IMVS, personal communication)]. Consultation with the Berrimah Veterinary Laboratories and the National Enteric Pathogen Surveillance Scheme [(Suresh Benedict and Joan Powling respectively, personal communication)] confirmed that *S.* Ball has previously been isolated from vertebrate species in the NT and WA, including lorikeets, camels, goats, crocodiles, beef offal, buffalo meat, and aboriginal camp dogs. Water birds and geckos...
and other lizards have been shown (in overseas studies) to be hosts to a range of salmonella serovars, as have marsupials in the tropics of WA, but no direct link between S. Ball and these species was found in the literature.6-9

A search for information about salmonellas in tropical regions lead to a number of studies investigating salmonella infections in the Pacific Islands. Robert Haddock in Guam carried out several studies in the 1980’s to investigate a 10 year epidemic of S. Waycross among infants in Guam. As all food is imported into Guam, it seemed apparent that it was not a food-borne pathogen. Haddock conducted a case-control study looking at possible environmental risk factors such as personal hygiene and environmental sanitation, pet ownership, footwear storage practices and infant care practices. No statistically significant differences between cases and controls were found. Salmonellae were isolated from soil and vacuum cleaner samples from both case and control households. A statistically significant association was shown between infant salmonellosis cases and salmonella contamination of the vacuum cleaner, suggesting that the infection may result from contact with contamination in the home environment.10,11

Description of the outbreak

There were 38 cases of S. Ball notified between the 1st January and the 30th June in the tropical and sub-tropical Top End of the NT (Figure 2). The majority (n=31) were residents of the Darwin Urban region, with 3 cases in Darwin Rural regions, one case in East Arnhem district, and 3 cases in Katherine district. In the Darwin Urban region, no geographical clustering of cases was noted, with cases being distributed across most of the Darwin suburbs.

The predominant symptoms described were diarrhoea (100%), fever (68%), vomiting (50%) lethargy (56%) and abdominal pain (45%). Bloody diarrhoea was present in 41% of cases. The mean incubation period could not be calculated on the available information. The mean duration of symptoms was 17 days with a range of 2 to 90 days. Several of the cases are known to be chronic carriers for the illness, with stool cultures remaining positive 3 months after the initial illness. Hospitalisation ranging from 1 to 6 days was required for 3 cases (however the child admitted for 6 days developed diarrhoea 5 days after admission for another reason).

The Investigation

Laboratory Collaboration:

Delays in the notification of S. Ball infection meant that cases had often recovered from their illnesses before a questionnaire interview was conducted. Recall was often a problem when seeking questionnaire responses, particularly regarding food consumption. The lack of timeliness in serotyping results has been an ongoing issue in the NT, discussed previously in a report published after the S. Mbandaka outbreak.13

During the current investigation, an arrangement was reached with the directors of the 3 pathology laboratories in Darwin whereby all salmonella-positive samples would be batched together and freighted daily to IMVS for the duration of one month. The turn-around time for results was much improved during this period. This assisted greatly with the investigation of new cases
arising. Cost implications meant that this was seen as a temporary and extra-ordinary arrangement, which reverted to normal at the end of the one month period.

Case Questionnaires

Hypothesis generating interviews were conducted with 22 cases in May and June 2002. The selected cases for interview were Darwin Urban residents of age 5 years or below. In the NT, sporadic enteric infections are not routinely investigated in cases above 5 years of age (unless the case is known to be a food handler or unless part of an outbreak), or at any age in remote areas, so this was in keeping with established local protocol. Phone interviews were conducted with the mothers or carers of cases. The questionnaire used was based on the Salmonella Questionnaire of Human Services, Victoria, with the addition of questions more relevant to the NT (eg. food purchased at local markets). Information was sought on demographics, symptoms and duration of illness, employment (of parents), contact with other cases, attendance at child-care groups or schools, travel, social activities or functions attended, animal contact, pool usage, and food consumption for the 2 week period prior to the onset of symptoms. The interview generally took around 30 minutes to complete, and all interviews were conducted by the same investigator (RM).

The interviews failed to identify any common sources of infection or exposure among the cases. Cases were geographically distributed throughout most suburbs of Darwin, and did not attend common child care centres or play groups. Of the cases, 41% were reported to have been in contact with another person with diarrhoea in the 2 weeks before their illness.

The foods most frequently eaten in the two weeks prior to illness were as follows: custard (64%), baby food (59%), fresh vegetables (59%), chicken (55%), minced meat (50%), and infant formula (50%). With regards to all of these, a variety of different types were named. There was no predominance of any one brand of custard or infant formula. Most baby food was of the Heinz brand, but many varieties of Heinz were named. The vegetables were brought from a variety of stores, and in no cases were organically grown vegetables bought. These results suggest that a common food source was unlikely. Infant formula and Heinz baby foods are imported into the NT from interstate or overseas, therefore if these were the source, a national distribution of illness would be expected.

In light of the above results, the hypothesis was that \(S\). Ball is an environmentally transmitted pathogen. Young children may pick up this infection by contact with contaminated surfaces, fomites or animals. In collaboration with the staff from the Environmental Health program, an additional questionnaire was developed around possible environmental sources of salmonella. The questions focussed on particular exposures relevant to the NT, such as visits to open air markets, beaches or wildlife parks, exposure to wild-life such as birds, lizards, insects and bats at home, and the presence of pets, sand-pits and swimming pools at home. These questionnaires were completed during home visits for five cases. Home visit investigations were conducted with the assistance of an environmental health officer. During the home visits, it was noted that the cases, being young infants, have very limited environments, and spend the majority of time inside the house. This would indicate a source of infection within the house. Interestingly, only 50% of cases have pets, but many homes in Darwin experience a variety of geckos, frogs, insects, and birds around the house and verandahs. Environmental sampling would be required to ascertain a possible source.

Conclusions

This investigation did not reveal a conclusive source for \(S\). Ball infections occurring predominantly in infants. The organism appears to have found a niche in the tropical environment of the NT, and has become a prominent cause of endemic salmonella in the NT. An environmental source of infection around the home seems likely, but we were unable to produce a specific hypothesis regarding the possible source. Infection with \(S\). Ball results in significant morbidity, with a long duration of symptoms, occasional hospitalisation, and the need for considerable time off work for the carers of affected children.

Because of the delay with serotyping and the fact that the increase in cases occurred over several months, the investigation did not commence
until May, even though in retrospect cases had been on the rise earlier. Hence, recall was a problem for mothers completing the questionnaire. The investigation was closed at the end of June when no further notifications had been received over a 4 week period. Subsequently, one notification was received for July. There is ongoing discussion about continuing the investigation with environmental sampling, or a “trawling” case-control study in the future.

Recommendations

In 2002 to date, infections due to 63 different salmonella serovars have been notified in the NT, some of which are rarely seen in other states. There are apparently environmental factors not yet identified which sustain and promote transmission of some disease producing serovars in this part of the country. Increased collaboration with Environmental Health staff is important in any future investigations. Currently, CDC and Environmental Health staff meet at regular but infrequent forums such as the annual CDC conference, and biannual zoonotic meetings. Previously an environmental health representative attended monthly CDC section head meetings, but this practice has not continued. Contact between the 2 departments generally occurs on an as required basis. This investigation illustrates how increased regular interaction between the departments would be of benefit, and subsequently, this has been discussed. A representative from Environmental Health will now attend CDC unit meetings on a fortnightly basis to allow regular review of shared issues and follow-up of environmental investigations involved in disease control.

The process of identification and notification of salmonella serotypes is often slow to the point of impeding such investigations. A significant factor in this delay is the infrequent freighting of samples from Darwin to interstate labs. Because of the costs involved, however, more frequent freighting may not be justified unless this is required for an outbreak investigation.

Salmonella outbreak investigations in the NT should employ the use of a locally specific questionnaire. While this has been done in the studies mentioned earlier, no prototype exists. It is useful to have a standard format for outbreaks in urban settings, but in remote Aboriginal communities a specifically tailored questionnaire for each outbreak (such as that used for the S. Chester outbreak) is also required. The appointment of an OzFoodNet enteric epidemiologist to CDC Darwin will hopefully expand the capacity to more fully investigate salmonellosis in the Territory.

References:

Tuberculosis in the Northern Territory: Highlights from 2000
Vicki Krause and Nathan Zweck, TB/ Leprosy Unit, CDC, Darwin.

Introduction

The Northern Territory (NT) has always had rates of TB higher than those reported nationally. A well organised national TB control campaign saw TB rates drop over the period 1948 to 1981. However, despite rates still 3 times the national average and a high burden of disease in the Aboriginal population, the NT TB unit was disbanded in 1982 when federal funding was cut.

In 1989 there were 7 deaths among the 42 notified TB cases in the Aboriginal population; a case-fatality rate of 16.6%. This statistic contributed to the re-establishment of a TB Control Unit in the NT with a high priority for standardising TB treatment and providing and documenting curative treatment with directly observed treatment. The NT case-fatality rates in the ensuing period, 1990 to 2000, were 5.0%, 4.7% and 3.8% in the non-Aboriginal Australian-born, Aboriginal and overseas-born populations, respectively. Since 1989 extended data has been collected in the NT, including outcome and completeness of treatment data to help direct program priorities. The following presents TB data from 2000 with some historical perspectives.

Methods

TB is a notifiable disease in the NT with the following case definition:
- Isolation of Mycobacterium tuberculosis complex (M. tuberculosis, M. bovis, M africans) from a clinical specimen

OR
- Demonstration of acid-fast bacilli (AFB) in a clinical specimen when a culture is not available in a patient with compatible symptoms or clinical or radiological signs

OR
- Compatible signs and symptoms and evidence of resolution following anti-TB treatment

TB is also a nationally notifiable disease with the following national case definition that is accommodated by NT surveillance:

TB (new case):
- A case which has been confirmed by the identification of Mycobacterium tuberculosis (or M. africanum or M. bovis) by culture

OR
- A case which has been diagnosed to be active clinically and which has been accepted as such by the State or Territory Director of TB.

TB (relapse):
- A case of active TB diagnosed again (bacteriologically, radiologically or clinically) having been considered inactive or quiescent following previous full treatment (as deemed appropriate by the State or Territory Director of TB).

Prospectively collected enhanced NT TB data have been collected since 1989. All cases are reviewed and information entered onto an Epi Info database by the NT TB Director. Data collected includes age, sex, ethnicity (Aboriginal or other), transfer in, NT district, country of birth, risk factors (eg. TB contact, excess alcohol use, malnutrition, diabetes, renal failure, cancer, chronic lung disease, corticosteroid use, meatworker, health worker, prisoner and peripartum), relapse, primary site of disease and other sites, BCG status, Mantoux status, microscopy, culture, drug susceptibility, histology, HIV status, treatment outcome (completed, defaulted defined as completing less than 80% of treatment in 8 months, died from other than TB, died of TB and transferred out) and method of case finding (eg. clinical presentation, contact screening, prison screening, community screening, TBU [see pg 14]).

‘Primary site of disease’ is defined as the site causing the clinical presentation. However if a patient is found to be sputum smear positive, regardless of the clinical presentation, pulmonary disease is designated as the primary site. If a patient presents with eg., extensive lymph node disease, but has chest x-ray changes of TB and/or is sputum culture positive but not smear positive, then they remain classified according to the presenting site, in this case, as nodal TB.
Results

Notification rates and distribution by districts

There were 59 cases notified in the year 2000 with an incidence of 30.3 per 100,000 population and including one relapsed case treated with PAS and isoniazid in 1966. There was a 50% increase from a rate of 20 per 100,000 in 1999. The mean incidence for the period 1989-2000 was 23.3 per 100,000 population, and the last year in which the incidence exceeded 30 per 100,000 was in 1990 (Figure 1) when an outbreak was occurring in the Katherine district. Of the 59 cases, 1 was classified as “transferred in” signifying the diagnostic material was collected interstate and nationally notified by that state as per protocol. As the case was an NT resident and had treatment and contact tracing carried out in the NT, the patient was counted in local statistics to reflect disease and workload.

Figure 1. TB case rates, NT 1989-2000

Figure 2 shows the number and Figure 3 shows the rate of TB cases per 100,000 for the districts.

Figure 2. TB case numbers in the NT by district, 1989-2000

Figure 3. TB case rates by district, NT, 1991-2000

Figure 4 shows that Darwin and Alice Springs in combination accounted for the majority (88%) of cases in 2000, and this reflects both an increase in notifications in Alice Springs district and a decrease in Katherine district compared with all notifications in the period 1989-2000.

Figure 4. Proportion of TB cases by district in the NT, 1989-2000, and 2000.
**Distribution by sex, age, and primary site of disease**

In 2000, 37 cases occurred in males and 22 in females, a male to female ratio of 1.7:1. In the years 1989-2000 there were 277 male and 215 female cases, a male to female ratio of 1.3:1. In 2000 male cases were at least twice that of females in the age group from 25 to 64 years, but females predominated in the 65 years and over age group (Figure 5).

**Figure 5. TB cases in the NT, 2000, by age category and sex (n=59)**

Figure 6 shows the cases 1989–2000 by age categories and sex. In 2000 the male to female ratio in Aboriginal cases was 1.1:1, in overseas born 3.8:1 and in non- Aboriginal Australian-born there were 2 male and no female cases. This compares with ratios of 1:1, 3.6:1 and 1.6:1 in these groups over the years 1989-2000, respectively.

**Figure 6. TB cases in the NT, 1989-2000, by age category and sex (n=492)**

The majority of the disease burden occurred in the age group 25-49 years in 2000 (58%) as was also seen when looking at the 10-year period from 1991-2000 (51%). However, the case rates are highest in the age groups over 50 years (Figure 7).

**Figure 7. TB cases in the NT and mean TB case rates by 5-year age category, 1991-2000**

Pulmonary disease constituted 67.8% of cases and lymphatic disease 16.9% of cases (Table 1). Interestingly there were 2 cases of breast TB in Aboriginal women, both also having nodal involvement. Two cases of breast TB had been notified in 1999 in Aboriginal women also with nodal disease.

**Table 1. Notifications of TB by primary site of disease, NT, 2000**

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<thead>
<tr>
<th>Site of disease*</th>
<th>n</th>
<th>%</th>
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<td><strong>Total</strong></td>
<td>59</td>
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</table>

*10 notifications had more than one site of disease

**Distribution by ethnicity and country of birth**

In 2000, 19 (32%) of notified cases were overseas-born while 40 cases (68%) were
Australian-born. Of the Australian-born cases, 38 were Aboriginal and 2 were non-Aboriginal, 64% and 3% of the total cases, respectively. Of the overseas-born, 7 cases occurred among male Indonesian nationals incarcerated in the Darwin Correctional Centre. Of the 38 Aboriginal cases, 11 occurred in a single Top-End community (with an additional 3 cases being associated with this community) and 4 were from one Central Australian community. Of the 492 cases diagnosed in the NT in the years 1989 to 2000 61% were Aboriginal, 30% were overseas born and 9% were non-Aboriginal Australian born.

Incidence rates in 2000 for Aboriginal, overseas-born, and non-Aboriginal Australian-born people were 68, 59, and 2 per 100,000 population respectively. The rate for Aboriginal people in 2000 was the highest since 1990, and more than twice that recorded in 1999 (Figure 8).

**Figure 8. TB case rates in the NT by ethnicity, 1989-2000 (n=492).**

Countries of birth for the overseas-born cases in 2000 compared to the period 1989-2000 are shown in Table 2. In the year 2000, 4 cases occurred in persons from the African continent, 3 of whom were serving with UN-related agencies in Dili, East Timor, and were referred for diagnosis and management to the Royal Darwin Hospital. Indonesians transporting unauthorised entrants accounted for all 7 cases from this country in 2000, and were found to have TB on screening prior to incarceration at the Darwin Correctional Centre.

<table>
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<tr>
<td><strong>Total</strong></td>
<td><strong>147</strong></td>
<td><strong>100</strong></td>
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</table>

**Table 2. Number and proportion of TB cases by country/place of birth in overseas-born persons, 1989-2000, and 2000.**

*Causative organism and smear and culture status*

An organism was cultured in 40 of the 59 cases (68%) in 2000 with *M. tuberculosis* identified in 39 cases and *M. bovis* identified in one adult Aboriginal male patient. Overall 17 cases (29%) were AFB sputum smear positive and 28 (47%) were sputum culture positive.

Analysis of the 40 cases classified as pulmonary disease showed 17 (43%) were sputum smear positive and 27 (68%) were sputum culture positive. One case with nodal disease as the presenting primary site also had culture positive pulmonary disease. Of the 10 cases notified as nodal TB, 3 biopsy specimens, all in patients suspected of and with risk factors for TB, were placed in formalin preventing culture of an organism.

**BCG status**

BCG status was known for 50 of the cases with 44 having 1 or more BCG vaccination. All 9 TB cases under 15 years of age had been BCG vaccinated as infants.
Mantoux status

There were 44 Mantoux tests recorded either as positive (≥10mm) at any time in the past or negative in the 3 months prior to diagnosis with the results shown in Fig 9. Mantoux measurements ranged from 0 to >75 mm with only 1 (2%) measuring less than 10 mm.

Risk factors

For risk factors other than ethnicity and country of birth, the most common was being a contact of a TB case (49%) followed by excess alcohol use (28%), malnutrition (22%), diabetes (14%) and chronic lung disease (10%). In each of the years 1989-2000, being a TB contact was the commonest risk factor (48% overall). However, 56% of the Aboriginal notified cases were contacts compared to 35% of other cases. The second and third most common risk factors reported for Aboriginal cases were excess alcohol use (42%) and malnutrition (35%), respectively, while in other cases they were malnutrition (23%) and excess alcohol use (21%), respectively.

Association with HIV

In 2000, 48 (81%) of the 59 patients had their HIV status evaluated and 1 (2%) patient was HIV positive. Of the 11 not tested 4 were under 10 years of age and 2 were above 65 years; however 5 were between 21 and 53 years of age. Of the 381 (77 %) tested from 1989 to 2000, 3 (0.8%) have been HIV positive. There has been a trend for more complete testing in recent years.

Drug Susceptibility

Of the 40 culture positive cases in 2000 – all had susceptibility testing done. The M. bovis case was resistant to pyrazinamide, as expected. One Aboriginal case had primary resistance to isoniazid and another overseas-born case had primary rifampicin and ethambutol resistance. Of the 349 culture positive cases from 1989 to 2000 there have been 10 cases (3%) of isoniazid resistance and the 1 case (0.3%) of rifampicin and ethambutol resistance as above.

Treatment outcome

Treatment outcome for 2000 included 48 (81%) completing treatment, 4 (7%) transferring out to overseas locations, 2 (3% case-fatality) dying of TB, 3 (5%) dying from other causes (cancer, cardiac and trauma) and 2 (3%) cases defaulting and not completing treatment despite follow up action. Restricting the analysis to those who were available for a full course shows that 48 of 50 or 96% completed treatment.

For the 12 years 1989-2000, 77% completed treatment, 6% defaulted, 6% died from causes other than TB, 5% died of TB and 6%...
transferred out of the NT to other health services. For those cases available for full treatment in the NT, 93% completed treatment.

**Method of Case Finding**

Case finding in 2000 was by presentation to a health care provider with symptoms for 42 (71%) cases while 7 (12%) were found by contact tracing, 7 (12%) by prison screening, 2 (3%) by urban community screening and 1 (2%) by a Tuberculosis Undertaking (TBU) required by the Department of Immigration and Multicultural and Indigenous Affairs.

**Discussion**

The NT continues to have the highest rates of TB in Australia with an incidence of 30.3 per 100,000 in 2000, compared to a national rate of 5.5 per 100,000. The Territory differs from the rest of the nation by having the majority of disease in the Australian-born population with 64% of all cases in the Aboriginal population, while national data shows 78% of cases in the overseas born.1 Rates for Aboriginal people in the NT in 2000 were 34 times the non-Aboriginal Australian-born NT rates. An outbreak in a Top End community and another in a central Australian community contributed to increased Aboriginal numbers but also reflects appropriate active case finding by contact tracing, and community awareness for timely passive case finding. Nevertheless, 12 years of data reflect the continued high burden of disease in the Aboriginal population.

Treatment completion rates have been excellent and while case-fatality rates have decreased in the Aboriginal population, factors such as overcrowding, malnutrition, excess alcohol use and increased prevalence of co-morbid diseases such as diabetes and renal disease hamper the ability to reduce TB disease and its transmission.

Rates in the NT overseas-born remain high as well. Increases in this group in 2000 were due in part to a change in Commonwealth legislation which increased sentences for Indonesian boatcrew for transporting unauthorised entrants to Australia. Prompt and coordinated screening of this high risk group allowed for individual cures and prevented spread within the prison system. UN personnel and foreign nationals working in East Timor diagnosed and treated in Darwin also boosted overseas-born case numbers.

The main burden of disease is in the 25 to 49 year age group as is reported in the developing world, but still the rates in the NT are highest in those 50 years and older. Diagnosis of the commonest extrapulmonary manifestation, nodal TB, can be improved if all nodal biopsy specimens are partitioned into a fresh sample for mycobacterial culture in addition to a formalin-fixed specimen for histopathology.

As in the rest of Australia, the NT is fortunate in that there is little overlap in those groups infected with *M. tuberculosis* and those infected with HIV. Also, as in other states, single drug resistance is limited and in the NT multidrug resistance (ie. resistance to isoniazid and rifampicin) is yet to be reported.

**Conclusion**

Clinicians in the NT need to maintain a high index of suspicion for TB in Aboriginal and overseas-born persons who present with cough or lymphadenopathy. Diagnosis is facilitated by obtaining 3 sputum specimens or a nodal biopsy for mycobacteriology as appropriate. Specimen collections should be performed as early as possible to prevent transmission of infection and to optimise individual treatment success.

**Acknowledgement:** We recognise and thank all those who have worked in TB Control, CDC, since 1989, in all districts of the NT and have contributed to the comprehensive collection of this data.

**Reference**

Mosquito control at Hickey’s Lake, Katherine, NT

Nina Kurucz and Peter Whelan, Medical Entomology Branch Darwin, and Chris Daly
Environmental Health Katherine, NT DHCS.

Background

The Hickey’s Farm is located approximately 2.5 kilometres north west of the Katherine town centre adjacent to a populated rural area (Fig. 1). An approximate 220-hectare area of this private property is subject to seasonal inundation for up to six months of the year and is known locally as Hickey’s Lake. A large part of the margin of the inundated area produces a significant mosquito-breeding habitat, especially for the common banded mosquito Culex annulirostris. This species is a major vector for Ross River virus (RR) and Murray Valley encephalitis virus (MVE), with the latter causing a potentially fatal human disease.

Extensive mosquito breeding at Hickey’s Lake was first identified by the Medical Entomology Branch (MEB) in liaison with Katherine Environmental Health Officers during the Katherine flood in January 1998. Two aerial mosquito larval control operations were conducted around the margins of the lake and other areas on 5th and 12th February in order to prevent potential outbreaks of RR and MVE.

As a result of the control operations, mosquito numbers and disease cases remained low and similar to previous years. The control operations and results were reported previously.1 One of the conclusions of the report was that “Storm drain maintenance of the town drain system had not

Fig. 1: Katherine flooded areas 3rd February 1998 (8 days after flood).1
been carried out in an adequate manner or on a routine basis. This maintenance should have been carried out before each wet season. If this had been done it would have allowed much more efficient drainage of the remnant flood areas after the initial floodwaters had gone down.” A further major conclusion from the mosquito control operations was the “Need for urgent and additional flood mitigation measures in Katherine. Those areas within 2 km of the residential areas of Katherine, which remained flooded for more than one week after the floods should be either drained or filled so that they are unavailable as mosquito breeding areas. This work is a vital public health measure and is unrelated to flood mitigation measures that may be required to protect property.”

Mosquito surveillance and control

There is a fortnightly adult mosquito-monitoring program in the Katherine area, which is followed up by larval surveys and either larval control or recommendations for other control measures. Since 1998 the Katherine Environmental Health Office (EHO) has undertaken routine mosquito larval surveys around the Hickey’s Lake area. Surveys by the EHO and the MEB in the wet season months revealed extensive breeding, with larval densities greater than 100 larvae per dip and adult mosquito numbers of up to 1601 per light trap adjacent to the lake area (pest level is 600 per trap). Mosquito breeding was initially controlled using backpack spraying and quad bike mounted spraying units but the magnitude of the breeding site eventually necessitated aerial mosquito larval control 3 times in February and March 2002. There was a potentially high public health risk of mosquito borne disease due to the close proximity of breeding sites to populated areas. MEB personnel went to Katherine to assist with pre – and post helicopter control larval surveys. Initially a helicopter was sent from Darwin for the aerial application but associated helicopter transfer costs led to the utilisation of a local helicopter company for the second and third aerial control operation. All 3 operations were successful and adult mosquito numbers at Hickey’s Lake decreased to less than 100 mosquitoes per trap night by March 2002.

Continued treatment of the Hickey’s Lake area utilising insecticide is considered impractical in terms of personnel resources and best practice mosquito control. Physical draining of the Lake area was considered to be consistent with the principles of integrated pest management. This would reduce the need for extensive surveys and use of aerial insecticide spraying over the area. This is a feasible option where land has been extensively modified, such as on intensive farming areas, and which are not considered environmentally sensitive habitats.

Draining of Hickey’s Lake

The Department of Infrastructure Planning and Environment (DIPE) developed a drainage scheme for Hickey’s Lake as part of a flood mitigation plan order to prevent access blockage of Florina Road during the wet season. The Katherine EHO discussed the drainage project with DIPE to ensure that the drainage scheme was in accordance with MEB guidelines for mosquito breeding prevention. The proposed path of the drain across Hickey’s Farm is in a preliminary stage of construction and is anticipated to substantially drain the western basin of the lake, completely drain the eastern basin and drain the majority of the northern basin into the Katherine River (Fig. 2). During the recent wet season of 2001/02 the eastern basin was the centre for control efforts, both because of its proximity to the Katherine town and mosquito breeding productivity. Although it might not be possible to completely drain the western basin, the area is more accessible for control than any other parts of the lake.

Construction of the drainage system commenced in October 2001 with earth removal of a two kilometre section forming the preliminary stage. The drain is currently in an advanced stage of construction with the finished drain expected to be up to five metres deep in some sections. The finished drain is not expected to completely drain Hickey’s Lake. Small ponds will remain in the area. However these should be relatively short lived and more amenable to ground insecticide application. It would be impractical to completely drain Hickey’s Lake with a deeper drainage system because Katherine River floodwaters would go back up a deeper drain. A flap valve on the culvert in Florina Road has been incorporated into the present design to prevent water going back up the drain.
Figure 2. Hickey’s Lake Katherine Drainage Plan.

Anticipated outcome

The reduction of mosquito breeding sites around Hickey’s Lake is anticipated to significantly reduce pest mosquito numbers affecting residents in the Katherine rural and urban area. The Katherine sentinel chicken program shows annual high MVE virus activity, with 3 chickens seroconverting to MVE on average per year. Lowering mosquito vector numbers will reduce the associated public health risk from both MVE and RR virus.

Reference


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Genital Chlamydia trachomatis, Neisseria gonorrhoeae, Trichomonas vaginalis and bacterial vaginosis in women having a suction termination of pregnancy in Darwin.


Summary

This study examined the prevalence of Chlamydia trachomatis, Neisseria gonorrhoeae, Trichomonas vaginalis and bacterial vaginosis in women referred for a suction termination of pregnancy in Darwin. These conditions can cause post-abortal pelvic inflammatory disease if left untreated. Women attending for preoperative examination were offered screening tests using self obtained low vaginal swabs. The swabs were analysed using microscopy, culture and the polymerase chain reaction (PCR). Of 222 women screened, 18.5% (95% confidence interval (CI) ±5.1%) had at least one condition, 17.1% (CI ±5%) had bacterial vaginosis, 4.1% (CI ±2.6%) had chlamydia and 0.5% (CI ±0.9%) had gonorrhoea. No one was diagnosed with trichomoniasis. The study was terminated early due to the high prevalence of relevant conditions, and to difficulties ensuring that all women were offered the opportunity to enrol in the study in a busy clinical setting. As a consequence screening was adopted as routine practice and data collection continued. In conclusion, these results support routine screening of women for the presence of genital C. trachomatis, N. gonorrhoeae, and bacterial vaginosis prior to termination of pregnancy in Darwin. This is in accordance with national guidelines.

Introduction

Suction termination of pregnancy (TOP) is one of the most commonly performed gynaecological procedures in Australia. Approximately 750 TOPs are performed at Royal Darwin Hospital (RDH) each year (personal communication, Dr H Cho); this does not include operations done privately. The procedure carries a risk of pelvic inflammatory disease (PID) which is associated with both short and long term morbidity including tubal factor infertility. Incidence of post-abortal PID has been reported at 4-12%.1,2 This risk is greater in a woman with lower genital tract chlamydial infection. In a study by Moller et al3 the incidence of post-abortal PID was 22% in women with pre-existing lower genital tract chlamydial infection.
This was compared with 2% for women without chlamydia. In the same study, the incidence of PID in women infected with C. trachomatis was reduced to zero if they were treated with doxycycline prior to surgery. Similar findings have been made in women screened and treated for N. gonorrhoeae or bacterial vaginosis (BV) prior to surgery. There is little evidence to support an association between, or causal role for T. vaginalis infection and post-abortal PID.

It is unclear if women should be screened for infection and then treated when the results are available, given antimicrobials prophylactically without screening and universal prophylaxis. There are advantages and disadvantages to each method of management. Screening and follow-up treatment has the advantage that appropriate antibiotics can be administered according to results of identification and antibiotic susceptibility testing. In addition, sexual contacts of infected women can be identified and treated to prevent re-infection, and unnecessary prescription of antimicrobials is avoided. A disadvantage of this method is that false negative results might lead to under treatment. Also, some micro-organisms associated with PID eg Mycoplasma hominis are not routinely tested for, and therefore complications due to these organisms may still occur. Universal prophylaxis is cheaper than screening and treating and has been shown to be more effective at preventing post abortal PID, however contacts of infected women will not be identified and treated and so they are at high risk of reinfection. Presumably a greater proportion of women will develop side effects from the treatment. Another effective intervention to reduce the incidence of PID is a combination of screening and universal prophylaxis. This has the benefits of the 2 other methods and avoids some disadvantages; it is also the most expensive option in the short term. This management debate was recently reviewed by Cameron and Sutherland.

The choice of strategy depends on the prevalence of these infections in the population, resources available for screening and follow-up, and the sensitivity and turnaround time of the tests used.

The Northern Territory (NT) is an area of high prevalence for all sexually transmissible infections (STIs). In 2001 rates per 100,000 women between 15 and 44 years in the Darwin urban area were N. gonorrhoeae, 68, C. trachomatis, 342 and T. vaginalis, 151. There is also a high incidence of PID. There are no data for the prevalence of BV in this population.

Anecdotally, there have been few patients returning to hospital with post-abortion PID (personal communication, Dr H Cho). Patients with PID with low-grade symptoms or subclinical infection may be presenting to their GP. PID, which goes untreated, may still result in infertility or chronic pain.

The National Venereology Council of Australia and the Abortion Providers’ Federation of Australasia (personal communication Dr C Healy) recommend that women should be screened for C. trachomatis prior to TOP. They do not recommend universal prophylaxis. Prior to commencement of this study no policy of screening or universal prophylaxis was in place at Royal Darwin Hospital, however some patients were screened and treated prior to referral to the termination clinic.

Aim

The aim of this study was to determine the prevalence of C. trachomatis, N. gonorrhoeae, T. vaginalis and bacterial vaginosis in women having TOPs, and to use this information to assist in deciding which strategy would be best suited to preventing post abortion PID in this population.

Method

The Top End Human Research Ethics Committee (TEHREC) approved the study. From July 2001, women attending the pre-operative assessment clinic were informed of the study by the gynaecologist and given written information. If they agreed to take part, they signed a consent form and if they were under 16 a parent or guardian was asked to give their consent. Age and Indigenous status were noted. The women collected two self-administered low vaginal swabs. They were asked to go to the toilet and insert each swab 5cm into the vagina, rotate it several times, remove it and place it in the appropriate transport tube.
Queensland Medical Laboratories (QML) processed the samples. PCR was used for detection of *C. trachomatis* and *N. gonorrhoeae*. Samples were also cultured for *N. gonorrhoeae* to determine antibiotic susceptibility. Wet mount microscopy was used to detect *T. vaginalis*, but specimens were not cultured (the gold standard for diagnosis of *T. vaginalis*).

Part of the way through the study, the method for diagnosis of BV changed. The first 159 specimens were processed using the method usually used by QML which does not report “bacterial vaginosis” but culture for *Gardnerella vaginalis* and a description of the amount of various bacterial morphotypes seen. The subsequent 63 were processed using the Hay grading system. This system has been validated for diagnosing BV and uses Gram stained smears of vaginal discharge to study bacterial morphotypes. The figure for the prevalence of BV includes those cases diagnosed on the basis of *G. vaginalis* culture and those diagnosed on the basis of a Hay grade of 3 or a grade of 2 with Gram negative rods seen.

Results were faxed to the secure fax machine in Clinic 34 (the Darwin sexual health clinic on the hospital grounds) on the day of surgery. If a condition requiring treatment was detected, a clinic staff member visited the day theatre to arrange treatment and if necessary start the process of contact tracing. If *C. trachomatis*, *N. gonorrhoeae* or *T. vaginalis* were detected, follow up in the clinic was arranged.

Standard treatment protocols were followed using azithromycin 1g stat for chlamydia, amoxycillin 3g and probenecid 1g for gonorrhoea (if acquired in the NT) and tinidazole 2g for trichomoniasis and BV. If the woman had already had swabs taken by her referring doctor she was asked if she would give consent for the results to be used for this study. In this situation it was the responsibility of the referring clinician to treat any infections that were detected.

The target sample size was 500 women. It was calculated that this would result in a confidence interval of ±1.5% for an infection with a prevalence of 2.5% (possible prevalence of *C. trachomatis*) and a confidence interval of ±3% for a condition with a prevalence of 10% (possible prevalence of BV). These figures are based on a 95% confidence level.

Data was entered into a Microsoft Excel spreadsheet for analysis.

**Early termination of the study and ongoing data collection.**

After approximately one third of the data had been collected, the study was terminated and genital tract screening was offered routinely to all women presenting for a suction TOP. This was because of the high prevalence of BV found in the sample, relatively low recruitment levels due to the clinic activity and because the process of enrolling women in the study caused unacceptable disruptions to the running of the clinic. As a result it was considered unethical to continue the study because many women would be potentially disadvantaged by not being screened. Therefore it was terminated and the TEHREC informed.

**Results**

Results are presented for 222 women who had been screened by February 2002.

**Indigenous status**

Indigenous status was only recorded while the project was in its study phase. Of the women participating in the study, 14% (10/73) were Aboriginal, 85% (62/73) were non-Aboriginal/ Torres Strait islander and the Indigenous status of one woman was not recorded.

**Age Group**

The mean age of women having a termination was 24.9 years, the median age group was 20-24 years and the age range was 15-41 years (see Figure 1).

**Figure 1. Age of women having a termination of pregnancy**
Prevalence of each condition

Figure 2 shows the frequency of each diagnosis after testing 222 women. There were 38 cases (17%) of BV diagnosed, 9 cases (4%) of C. trachomatis and one case (0.5%) of N. gonorrhoeae. Thirteen percent (20/159) of the women were diagnosed with BV on the basis of G. vaginalis being cultured from a specimen of vaginal discharge and 18/63 (29%) were diagnosed on the basis of a Hay 3 smear or a Hay 2 smear with Gram negative rods.

Figure 2. Frequency of each diagnosis. Data points show absolute values and error bars show 95% confidence intervals.

Early termination of the study and ongoing data collection

After 73 women had been screened, two things became apparent. Firstly, testing revealed that 21% (15/73 CI ± 9.3) of the women had at least one condition that is associated with post abortal PID. Secondly it had become clear that the consent process was taking so much time that it was interfering with the operation of the clinic. Therefore only a proportion of the women were being asked to participate in the study; this ranged from 25 to 90% depending on how busy the clinic was. It was considered unethical to continue the study since many women would be disadvantaged by not being screened.

From that point screening was adopted as routine practice. The TEHREC was informed of the change to protocol. Women continued to be followed up by Clinic 34 staff and test results were recorded. All identifying data was removed from the database from this point.

Discussion

These results show a high prevalence of conditions associated with post-abortal PID. The vast majority of these diagnoses were BV. The frequency of detection of C. trachomatis in women going to TOP can be extrapolated to a prevalence of 4054/100,000; well above the rate from the notification data of 342/100,000 in 2001. The prevalence of N. gonorrhoeae in the study, 450/100,000 (though representing only one case) is above the notification incidence rate of 68/100,000.

Trichomonal infections are highly prevalent in the Darwin district (158 cases/100 000 in urban women aged 15-44 years). No cases were diagnosed in this group of women. This may reflect the relatively low sensitivity of microscopy in diagnosing this infection or be a true reflection of the prevalence of T. vaginalis in this group. There is little evidence to support screening this population for T. vaginalis to prevent upper genital tract infection.

The study has highlighted the problems of research in a busy clinical setting. There is a single public termination clinic in the Darwin region and this is always overbooked. It was therefore necessary to conduct the trial in such a way that it would have as little impact as possible on the running of the clinic; using self-administered instead of clinician directed swabs for example. Despite the best efforts of the clinician, there was insufficient time for women to be counselled individually and to give informed consent for the study. For this reason recruitment was poor and many women were not screened. When the study ended and screening was presented as the norm, recruitment improved, but even so it was found that explaining the use of the swabs took an unacceptably long time. The procedure has been further refined and now women are given an information sheet and the swabs when they present to the receptionist. They take the samples while waiting to be seen, causing minimal impact to the running of the clinic.

Self-administered low vaginal swabs were used because they save time, and are less invasive than a speculum examination and collection of cervical specimens. They have been shown to give reliable results which compare well with
specimens collected by clinicians. Tampon specimens were not used because microscopy and culture are not performed on them and self-administered low vaginal swabs appear as acceptable as self tampon testing.

It is widely recognised that culture of *G. vaginalis* has a poor specificity for the diagnosis of BV as it is part of the normal vaginal flora. It may fail to diagnose BV in women with a BV where *G. vaginalis* is not the dominant micro-organism (rather, for example, a *Mobiluncus spp*-dominant BV). However, it was felt important to use tests that would be available when the study ended, should the results suggest that continued screening was necessary. Part way through the study a new concern was expressed that basing the diagnosis purely on *G. vaginalis* was perhaps giving an inaccurate view of the prevalence of BV. QML agreed to start reporting using the Hay grading system. It is unfortunate that a consistent method was not used for the diagnosis of BV. Despite there being a strong correlation between culture of *G. vaginalis* and a diagnosis of BV using the Hay grading system, (correlation coefficient 0.74) figure 3 suggests that using the Hay system throughout the study may have detected a higher prevalence of bacterial vaginosis. This is presumably because *G. vaginalis* culture wasn’t picking up the earlier cases of BV which did not feature this organism. QML has continued to report using the Hay grading system for the purposes of screening prior to TOP but uses *G. vaginalis* culture otherwise. If the Hay system is used as the gold standard for the diagnosis of BV, then culture of *G. vaginalis* has a sensitivity of 63%, a specificity and positive predictive value of 100% and a negative predictive value 86%.

### Figure 3. A comparison of the two methods for diagnosing BV

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<td>0</td>
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<tr>
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Ideally treatment should be given preoperatively but it is still effective in preventing PID if it is given after the operation although the delay should be as short as possible. Because of the short interval between screening and surgery (48 hours) it is possible that under some circumstances results would be reported postoperatively and treatment could be delayed. For this reason it is best if women are screened by the referring doctor so that the results are available well before surgery.

### Conclusion

This study has demonstrated that a significant proportion of women who have a TOP in Darwin have a pre-existing genital infection or condition which could increase their risk of PID. The results provide us with some local evidence on which to base clinical practice.

On the basis of these findings our current recommendations are as follows:

1. Where possible swabs should be sent for screening for *C. trachomatis*, *N. gonorrhoeae*, and bacterial vaginosis by the referring doctor prior to referral to the TOP clinic. Specimen collection should include a swab for microscopy and culture for gonorrhoea to enable antibiotic sensitivity to be determined. Women should be offered serological testing for syphilis and HIV.

2. If a sexually acquired infection is detected, all women should be offered comprehensive STI screening including an HIV test if it has not been done already, and contact tracing should be performed.

3. Infections should be treated by the referring practitioner before the TOP is performed, according to current antibiotic guidelines. (If locally acquired gonorrhoea and penicillin sensitive use amoxycillin and probenecid).

If women have not been tested according to these guidelines when they present to the TOP clinic, they will be offered screening at the initial consultation with the clinician, using self-administered vaginal swabs. Treatment at the time of operation, and follow up will be arranged by Clinic 34, Block 4, RDH campus, Darwin.
Acknowledgments

The staff of Clinic 34, particularly Sue Dubow, Carol Whittles and Peter Knibbs. Wayne Pederick and his colleagues at Queensland Medical Laboratories and the receptionist staff at Darwin Private Hospital Specialist Suite.

References

An investigation of the sudden increase in breast cancer deaths in the Northern Territory in 1999

Yuejen Zhao, Tarun Weeramanthri, Maxene Woods, Sudarshan Selva-Nayagam, Ofra Fried, John Condon, NT Department of Health and Community Services

Summary

In 1999 there were 25 deaths from breast cancer in the Northern Territory (NT), approximately three times as many deaths as occurred in each of the several preceding years, and more than would have been expected due to random variation in the number of breast cancer deaths in any one year. The high number of breast cancer deaths in 1999 appears to be at least partially explained by an increase in the incidence of breast cancer in Aboriginal women (who have, on average, very short survival time) in the preceding three years, and ‘delayed’ deaths of non-Aboriginal women in the three years before 1999 which resulted in a larger number of deaths in 1999. A clinical audit of breast cancer treatment for women who died during 1999 did not reveal any pattern of cancer occurrence or treatment, which could explain the high number of deaths in that year.

Breast cancer deaths and death rates in the NT

In 1999, there were 25 deaths from breast cancer in the NT, a three-fold increase from 8 deaths in both 1998 and 1997. All 25 deaths had a history of breast cancer confirmed by histopathology.

This increase is statistically significant (\( u=6.01, P<0.001 \), assuming a Poisson distribution) (Figure 1).

The age-adjusted breast cancer death rate fluctuated around 20 per 100,000 per year for the period 1985-1998 for both Aboriginal and non-Aboriginal women (Figure 2). There was considerable fluctuation because of the small number of deaths in any one year. In 1999 the age-adjusted mortality rate was 3 times higher for Aboriginal women and 2 times higher for non-Aboriginal women.

Figure 2. Breast cancer age-adjusted death rates in the Northern Territory, 1985-1999

Source ABS deaths dataset

Source: Epidemiology Branch, from ABS deaths dataset
Comparison with national breast cancer mortality
Nationally there were 5% fewer breast cancer deaths in 1999 than in 1998 (2433 compared to 2560), although the number of breast cancer deaths increased in two other states, Tasmania by 31% and WA by 9%, between 1998 and 1999 (Table 1). Over the period between 1989 and 1998, there was a 15% decline in the breast cancer death rate nationally.1

The number of deaths that would have been expected in the NT population from 1989 to 1999 can be calculated by applying the age-specific breast cancer mortality rates for the total Australian female population to the NT female population in each year. This assumes that breast cancer mortality should be the same among NT women as among Australian women generally. This is a reasonable assumption for non-Aboriginal women – their health status and use

Table 1. Number of breast cancer deaths in each State/Territory, 1985-1999

<table>
<thead>
<tr>
<th>Year of Death</th>
<th>NSW</th>
<th>VIC</th>
<th>QLD</th>
<th>SA</th>
<th>WA</th>
<th>TAS</th>
<th>NT</th>
<th>ACT</th>
<th>AUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>760</td>
<td>656</td>
<td>300</td>
<td>213</td>
<td>180</td>
<td>58</td>
<td>3</td>
<td>26</td>
<td>2196</td>
</tr>
<tr>
<td>1986</td>
<td>743</td>
<td>609</td>
<td>314</td>
<td>211</td>
<td>187</td>
<td>63</td>
<td>8</td>
<td>29</td>
<td>2165</td>
</tr>
<tr>
<td>1987</td>
<td>849</td>
<td>653</td>
<td>328</td>
<td>181</td>
<td>172</td>
<td>70</td>
<td>7</td>
<td>33</td>
<td>2293</td>
</tr>
<tr>
<td>1988</td>
<td>842</td>
<td>651</td>
<td>333</td>
<td>232</td>
<td>211</td>
<td>70</td>
<td>5</td>
<td>16</td>
<td>2361</td>
</tr>
<tr>
<td>1989</td>
<td>882</td>
<td>687</td>
<td>347</td>
<td>230</td>
<td>212</td>
<td>59</td>
<td>7</td>
<td>24</td>
<td>2449</td>
</tr>
<tr>
<td>1990</td>
<td>856</td>
<td>697</td>
<td>352</td>
<td>204</td>
<td>199</td>
<td>73</td>
<td>5</td>
<td>35</td>
<td>2422</td>
</tr>
<tr>
<td>1991</td>
<td>882</td>
<td>738</td>
<td>365</td>
<td>238</td>
<td>188</td>
<td>56</td>
<td>11</td>
<td>47</td>
<td>2526</td>
</tr>
<tr>
<td>1992</td>
<td>849</td>
<td>672</td>
<td>381</td>
<td>216</td>
<td>217</td>
<td>67</td>
<td>10</td>
<td>22</td>
<td>2428</td>
</tr>
<tr>
<td>1993</td>
<td>877</td>
<td>735</td>
<td>413</td>
<td>262</td>
<td>211</td>
<td>66</td>
<td>7</td>
<td>22</td>
<td>2428</td>
</tr>
<tr>
<td>1994</td>
<td>899</td>
<td>775</td>
<td>430</td>
<td>230</td>
<td>231</td>
<td>70</td>
<td>3</td>
<td>27</td>
<td>2669</td>
</tr>
<tr>
<td>1995</td>
<td>885</td>
<td>708</td>
<td>435</td>
<td>238</td>
<td>239</td>
<td>79</td>
<td>9</td>
<td>41</td>
<td>2635</td>
</tr>
<tr>
<td>1996</td>
<td>885</td>
<td>716</td>
<td>425</td>
<td>271</td>
<td>215</td>
<td>58</td>
<td>9</td>
<td>39</td>
<td>2621</td>
</tr>
<tr>
<td>1997</td>
<td>900</td>
<td>734</td>
<td>431</td>
<td>216</td>
<td>227</td>
<td>59</td>
<td>8</td>
<td>41</td>
<td>2622</td>
</tr>
<tr>
<td>1998</td>
<td>863</td>
<td>698</td>
<td>430</td>
<td>244</td>
<td>212</td>
<td>64</td>
<td>8</td>
<td>36</td>
<td>2560</td>
</tr>
<tr>
<td>1999</td>
<td>790</td>
<td>671</td>
<td>401</td>
<td>190</td>
<td>232</td>
<td>84</td>
<td>25</td>
<td>34</td>
<td>2433</td>
</tr>
</tbody>
</table>

Source: ABS deaths dataset

Figure 3 NT breast cancer deaths compared with expected deaths (and 95% confidence intervals), 1989-1999

Source: ABS deaths dataset
of health services are very similar to that of Australian women overall (with the exception of higher smoking prevalence).

However, most NT Aboriginal women have a very different health status and use of health services than most other Australian women – it cannot therefore be expected that they will have the same breast cancer mortality rates as Australian women overall. The expected number of breast cancer deaths for Aboriginal women, based on total Australian mortality rates, is for illustrative purposes only.

In 1989, 8 breast cancer deaths would have been expected in NT non-Aboriginal women, rising to 9 expected deaths in 1999 (Figure 3). Interestingly, the actual number of breast cancer deaths was about 30% below the expected number of deaths between 1996 and 1998, and twice as high as the expected number in 1999. There were approximately 9 fewer deaths than expected in the period 1996 to 1998, and 8 more than expected in 1999.

**Age, Aboriginality and district**

The breast cancer deaths in 1999 were distributed across all ages, and the increase from the previous 2 years was evident in both Aboriginal and non-Aboriginal patients (Table 2). Deaths were distributed across the NT geographic regions consistent with the population distribution, although there were no breast cancer deaths reported in Alice Springs Rural District between 1997 and 1999 (Table 3).

**Table 2 Number of breast cancer deaths by age and Aboriginality, NT 1997-1999**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>35-39</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-44</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45-49</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-54</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55-59</td>
<td>1</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-64</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-69</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70-74</td>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 75</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>8</td>
<td>17</td>
</tr>
</tbody>
</table>

**Table 3. Number of breast cancer deaths by district, NT, 1997-1999**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Darwin Urban</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Darwin Rural</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Katherine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>East Arnhem</td>
<td>1</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barkly</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alice Springs Urban</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>8</td>
<td>17</td>
</tr>
</tbody>
</table>

**Deaths from other cancers in the NT**

The total number of cancer deaths in the NT in 1999 was 162, compared with 147 in 1998 (a 10% increase). No other type of cancer showed a significant rise in mortality akin to the rise seen for breast cancer (Table 4).

**Table 4. Most common cancer sites in NT. Number of deaths, 1997-1999**

<table>
<thead>
<tr>
<th>Cancer site</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung</td>
<td>42</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>Breast</td>
<td>8</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>Colon and rectum</td>
<td>13</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>Oesophagus and stomach</td>
<td>7</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Pancreas</td>
<td>7</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Liver and intrahepatic bile ducts</td>
<td>5</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Cervix</td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Melanoma of skin</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Prostate</td>
<td>8</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Brain</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Others</td>
<td>60</td>
<td>60</td>
<td>42</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>155</td>
<td>147</td>
<td>162</td>
</tr>
</tbody>
</table>

Source: Tables 2, 3 & 4: ABS Mortality Database
Breast cancer incidence

For non-Aboriginal women, the number of cases of breast cancer diagnosed remained relatively constant over the period 1991 to 1999. For Aboriginal women, there was a sustained increase in the number of cases diagnosed each year after 1995 (Figure 4). In the early 1990s the age-adjusted incidence rate for Aboriginal women was approximately half that of non-Aboriginal women, but the Aboriginal incidence increased after 1995 to be approximately the same as in non-Aboriginal women by 1999 (Figure 5).

A mammographic screening program (BreastScreen NT) was introduced into the NT in 1995, but the great proportion of cancers detected by BreastScreen have been in-situ cancers which are not included as invasive cancers in cancer incidence rates. BreastScreen NT data shows that the number of screen-detected cancers rose from 6 in 1997 to 22 in 1998, even though the total number of women screened remained fairly constant. The detection of such early cancers is likely to reduce rather than increase breast cancer mortality after about a 5-10 year lag period. Well Women’s Screening has also been promoted more widely in remote communities since the mid-1990’s (Beth Amega, personal communication). This may have led to enhanced detection and hence a rise in incident cases, but is less likely to explain the mortality trend.

Figure 4. Breast cancer new cases in the Northern Territory, 1990-1999

![Breast cancer new cases in the Northern Territory, 1990-1999](image)

Source: NT Cancer Register

Coding of cause of death

Coding of cause of death is performed by the Australian Bureau of Statistics (ABS). Though there was a change in the ABS mortality coding system between 1998 and 1999 from ICD-9 to ICD-10, there has been no change in the relevant coding rules that apply to breast cancer. Since 1997, ABS have recorded both the underlying cause of death and up to 12 secondary causes of death. Table 5 shows the number of deaths where the breast cancer code appeared anywhere on the death certificate. It is evident that the increase in breast cancer deaths in 1999 was not caused by changing practice in defining underlying cause of deaths.

Clinical audit

A clinical audit of the 1999 breast cancer deaths to assess adequacy of treatment was conducted in August 2001 (by TW in Darwin and OF in Alice Springs). A questionnaire was drafted by Epidemiology Branch in consultation with clinicians. A total of 24 cases were audited.

One third of breast cancer deaths in 1999 (8/24) had been diagnosed before 1990. Only 2 out of 24 cases were detected by BreastScreen. The majority of patients (91%) underwent surgical
treatment, 94% of patients received radiotherapy interstate, 89% of patients were reviewed by a specialist oncologist and 84% were seen by the palliative care team. Overall, there was no evidence that patients had received anything other than optimal care.

**Table 5. Deaths where breast cancer was recorded anywhere on the certificate, NT, 1997-1999**

<table>
<thead>
<tr>
<th>ICD10</th>
<th>Underlying Cause of Death</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>C24</td>
<td>Malignant neoplasm of biliary tract</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>C50</td>
<td>Malignant neoplasm of breast</td>
<td>8</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>E14</td>
<td>Unspecified diabetes mellitus</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>I12</td>
<td>Hypertensive renal disease</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I25</td>
<td>Chronic ischaemic heart disease</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>K70</td>
<td>Alcoholic liver disease</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>11</td>
<td>8</td>
<td>27</td>
</tr>
</tbody>
</table>

**Survival time**

The average survival time of women who died of breast cancer in 1999 was longer than for those who died in previous years, particularly for Aboriginal women (Table 6). However, 7 of the 25 cases in 1999 died within 2 years of diagnosis (Table 7). Aboriginal women dying with breast cancer had a much shorter average survival time than non-Aboriginal women.

**Table 6. Average survival time (in years) of women who died of breast cancer in the NT, by period**

<table>
<thead>
<tr>
<th>Period of death</th>
<th>Aboriginal</th>
<th>Non-Aboriginal</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of deaths</td>
<td>Ave. survival</td>
<td>No. of deaths</td>
</tr>
<tr>
<td>1991-94</td>
<td>4</td>
<td>1.7</td>
</tr>
<tr>
<td>1995-98</td>
<td>8</td>
<td>0.9</td>
</tr>
<tr>
<td>1999</td>
<td>8</td>
<td>3.6</td>
</tr>
</tbody>
</table>

**Table 7. Breast cancer deaths by years of survival and average survival time, NT 1999**

<table>
<thead>
<tr>
<th>Survival Time (years)</th>
<th>Aboriginal</th>
<th>Non-Aboriginal</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>2-3</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>4-5</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6-7</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8-9</td>
<td>1</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>17</td>
<td>25</td>
</tr>
</tbody>
</table>

Relative survival analysis was undertaken for all breast cancer cases recorded between 1990 and 2000 in the NT Cancer Registry. Figure 6 shows that the survival rate of breast cancer after 1995 has improved slightly for non-Aboriginal people. Overall five-year survival for non-Aboriginal people was about 82%, comparable with the national figure of 79%. In contrast, the five-year survival rate for Aboriginal people was below 50%, becoming worse in recent years.

**Figure 6. Breast cancer survival rate by diagnosis year and Aboriginality, NT, 1990-2000**
Discussion

There appear to be different reasons between Aboriginal and non-Aboriginal women for the sudden increase in breast cancer deaths in 1999. For Aboriginal women, there was a rapid increase in breast cancer incidence after 1995 which, combined with their short average survival time, may have led to a high number of deaths in 1999. If this is the case, it would be expected that the number of Aboriginal women dying of breast cancer each year will remain higher than in previous years.

For non-Aboriginal women, there was no change in breast cancer incidence. However, the number of breast cancer deaths in the NT in the years before 1999 was lower than would be expected when compared to national mortality rates and two-thirds of non-Aboriginal women who died in 1999 had been diagnosed ten or more years previously. It may be that some of the women who died in 1999 had survived longer than ‘expected’.

Previous studies have shown that an improvement in staging and treatment for breast cancer in the 1980’s led to a levelling off or decline in breast cancer mortality in the 1990’s in most developed countries including Australia. This raises the possibility that the introduction of new cancer treatment methods and services in the 1990s prolonged patients’ lives without providing an ultimate cure. A resident medical oncology service was available at RDH from 1993 onwards, but the referral pattern to this service was not fully established till 1995 or 1996. Chemotherapy has been available for some time, but prior to the oncology service being established, many decisions as to when to start treatment were made interstate. Radiotherapy services have never been available in the NT, though specialist opinions have been available via regular teleconferences since 1996, and a radiotherapist has been visiting RDH on a two monthly basis to assess patients since 2001. Unfortunately linking of possible improvements in cancer treatment services to patient outcomes between the 1980s and 1990s is not possible because the NT Cancer Register is incomplete before 1991 (approximately 30% of cancer cases were not registered) and the Register does not contain details of cancer treatment.

The 1999 figures may then represent, at least for NT non-Aboriginal women, a delayed mortality effect. An alternative explanation for their lower than expected breast cancer deaths prior to 1999 may be that non-Aboriginal women moved interstate after being diagnosed with breast cancer for treatment and to be in closer contact with their extended family. The sudden increase in breast cancer deaths in 1999 could not be explained by changes in coding practice, nor by any failing of the screening, treatment or palliative care services.

Future monitoring and research

1. This project has not investigated possible delays in diagnosis that may be associated with lower survival. Although there does not appear to be any particular deficiency in treatment of women who died of breast cancer in 1999, the survival of Aboriginal people with cancer, including breast cancer, is much less than that of non-Aboriginal people. The reasons for this, including possibly diagnosis at a later stage, are currently being investigated by a research project conducted jointly by NT Cancer Register and the Menzies School of Health Research, through the Cooperative Research Centre for Aboriginal and Tropical Health, and funded by the National Cancer Control Initiative.

2. The apparent increase in the incidence of breast cancer in Aboriginal women in the late 1990s should be further investigated and confirmed. If this increased incidence is sustained, research should be undertaken to investigate possible causes for this sudden rise, including any possible links between smoking rates, overall rates of breast cancer and the subgroup of aggressive cancers. The decision not to currently target remote area Aboriginal women in the BreastScreen NT program should also be reviewed.

3. The recommendations of the recent review of the NT Cancer Registry to improve data quality and timeliness, which are currently being implemented, should be completed as soon as possible to allow more timely and accurate monitoring of cancer incidence, mortality and survival.
Postscript

Data that has subsequently become available shows that the number of breast cancer deaths was 16 in 2000, still much higher than expected (u=2.83, P<0.01) but the number had fallen again to 6 in 2001. Epidemiology Branch will continue to monitor the situation, well aware of the pitfalls of interpreting variations in small numbers.

References


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TRACHOMA - Report from Working Group

Keith N. Edwards, Community Paediatrician and Chair of the Trachoma Working Group.

In the last issue of the Bulletin, Dr Barbara Paterson discussed the current concerns regarding an apparent upsurge in the prevalence of trachoma in children in the Northern Territory (NT). Since then, a Working Group, comprising members from central and regional CDC, The Menzies School of Health Research, Environmental Health, Specialist Ophthalmologists and some invited non-government agencies; e.g., The Fred Hollows Foundation, has met on a monthly basis to discuss the issues and determine possible strategies to deal with this problem.

At this point in time, the key issues identified by the working group and some of the activities to address them are:

Data Gathering:

• A survey is being conducted to look at chlamydial subtypes in PCR positive eye swabs and genital swabs in selected communities. The results should be available later this year.

• The Healthy School Aged Kids (HSAK) database is being reviewed to obtain prevalence figures for communities over-time where possible.

• A review of the published and unpublished literature is being made in order to present a historical perspective of trachoma in the NT.

Environmental Health:

• Swimming pools have been shown to have beneficial effects on skin infections in communities in other parts of Australia and this probably includes mucosal disease such as trachoma. Studies that have looked at the benefits are being sought. In addition, play fountains have been suggested as a possible cheaper alternative and the literature is being searched for evidence of benefit.

• In the long term, improvement in small community water supplies is likely to have a beneficial effect on the prevalence of trachoma and requires urgent attention from community authorities, Power and Water authorities and the Territory Government.

• A review of current health education initiatives is required to ensure that messages about hygiene and trachoma are consistent and materials are up-to-date and culturally appropriate.

• A combined “Health Week” approach is being explored as a possible vehicle for the efficient delivery of azithromycin if mass-treatment policy is accepted as the most cost-effective control measure. There has already been some considerable success in annual Healthy Skin Week programs in some communities.
**Policy Issues:**

- Current policy is to be revised to ensure that surveillance is ongoing even when rates appear to have fallen and any new initiatives that arise out of this review will be incorporated.

**Personnel Issues:**

- Training: Ophthalmologists have agreed to teach community health staff how to examine children’s eyes for trachoma. Trachoma screening will also be incorporated into paediatric introductory and in-service courses.
- Volunteers: a database of volunteers who could assist with future community school screening for trachoma will be developed.

**Materials:**

- The availability of current materials useful in the detection and health education aspects of trachoma management will be surveyed and those clinics that are lacking will be supplied with missing items.

The Working Group has sought input from the Office of Aboriginal and Torres Strait Islander Health (OATSIH), the Fred Hollows Foundation and the NT Eye Committees. The ophthalmologists who chair the eye committees are concerned that there are more important and under-funded eye problems that are presently affecting community-based people at this point in time. They expressed the concern that more focus on trachoma might further undermine the existing ophthalmological service. They do support on-going routine surveillance and treatment of cases and their close contacts. There is a need for a cost-benefit analysis on various control measures and the Working Group will attempt to have this addressed.

It has been generally agreed that there is a need for a clear, evidence based rationale for a control program for trachoma. There may be more than one option which is cost-effective and in view of the up-coming Health Zone “roll-out”, options need to be clearly defined and weighted so that the overall Territory control program is functional and effective. The Working Group plans to further review these key issues at the CDC Conference in Alice Springs in October.

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**Varicella vaccination**

*Chris Nagy, A/Immunisation Project Officer CDC, Darwin.*

Varicella (chickenpox) is a highly contagious infection that is caused by the varicella-zoster virus. The disease is usually mild and of short duration in healthy children. It is more severe in adults and can cause serious and even fatal illness in immunosuppressed subjects of any age. It has an average incubation period of 14–15 days (range 10-21 days), is spread by droplet infection and is characterised by 1-2 days of malaise followed by the formation of fluid filled vesicular lesions, that form a crusty scab after 3-4 days. Most lesions are found on the trunk but they may occur on the scalp, on mucous membranes of the mouth, upper respiratory tract, vagina, conjunctiva and cornea. The lesions appear in successive crops, so that there are several stages of maturity present at one time.

Herpes Zoster (shingles) is a painful localised vesicular rash which results from the re-activation of the latent varicella zoster virus in the dorsal root ganglia. It can be a serious illness in older people, and about 30% of elderly people will develop painful post-herpetic neuralgia.

In an unimmunised population approximately 75% of children will have had varicella by the age of 12 years. Zoster (shingles) is uncommon in this age group with most reported cases (81%) occurring in those over 40 years.

There are currently 2 vaccines licensed for use in Australia that provide protection against the varicella virus, Varilrix® (Glaxo Smith Kline) and Varivax II® (CSL/Merck Sharp Dohme). Both are live virus vaccines and storage temperature requirements are critical to their potency.

Varilrix® should be stored at 2 – 8°C and has a shelf life of 2 years.

VarivaxII® can be frozen or stored at 2 – 8°C for 90 days.
The vaccine can be given at the same time as other vaccines (including MMR, DTPa and hepatitis B) using separate syringes and injection sites. If varicella vaccine is not administered simultaneously with another live virus vaccine, the vaccines should be given a month apart.4

Children aged 12 months to 13 years should receive a single dose of vaccine (0.5ml) while those aged 14 years and over should receive 2 doses at least 1 month apart.

Non-immune health care workers are recommended to have this vaccine, as they are at an increased risk of exposure to varicella-zoster virus and may also be at risk of transmitting the virus to a person who is immunocompromised.

Anyone with a reliable history of varicella should be considered immune. Many adults who have no known history of disease are also immune and therefore serological testing prior to vaccination is considered a cost-effective measure.

The Royal Darwin Hospital infection control committee agreed to commence a 2-phase vaccination policy for its staff which included:

**First phase.** In August 2000, varicella vaccination was offered and provided to all staff with patient contact in maternal and child health areas including antenatal clinic and the intensive care unit. Vaccination was only offered to those who reported no history of disease and were shown by blood examination to be non-immune. Serological testing was carried out either by the hospital laboratory or a private GP. Vaccine and testing was funded at the ward level.

**Second phase.** As of July 2001, varicella vaccination has been offered to all staff with patient contact regardless of where they work and the same guidelines for defining those non-immune are followed as for the first phase.

All staff who commence work within RDH receive a staff health screening assessment form which highlights the recommended immunisation requirements. This form is discussed with staff as they attend for compulsory tuberculosis screening at Block 4. At this visit, the need for investigation of staff member’s varicella status or the need for immunisation is determined. Vaccination is available from the staff vaccination clinic on the ground floor Area 2 in Accident and Emergency. For further information phone 89228699.

**References**

2. NHMRC Immunisation handbook draft 2001. 8th Edition

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The AIDS/STD Program is working to improve its web section on the Department of Health and Community Services (DHCS) website at http://www.nt.gov.au/health/cdc. The site should attract people, be easily accessible, educational and clearly refer those who use it to related links and services across the Territory and elsewhere. Our target groups will never never know if they never never go to the site.

Staff are updating and extending the basic information in the website and improving the linkages to other relevant sites. A priority is to make this site attractive to one of the main target groups, that being 15 to 24 year olds with the highest rate of STIs in the NT.

A competition is seen as a way of achieving this and has a number of benefits including making
The Northern Territory Disease Control Bulletin Vol 9, No.3, Sept 2002

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Erratum: Dates, damned dates and statistics!! A final word on reporting dates, with apologies to Katherine CDC.

Peter Markey, CDC Darwin.

The June 2002 edition of the Bulletin marked the first time CDC reported disease notifications by onset date of the condition as distinct from reporting date when reporting nationally, which was the previous practise. The reporting date was the date the notification arrived at CDC and was entered into the system which was often quite arbitrary and dependent on the workload and availability of the person responsible for data entry. Moving to using onset date reflects a national trend and, more importantly, makes more epidemiological sense. Knowledge of the onset date can lead to more accurate calculation of the time when the disease was acquired (which is not absolutely ‘knowable’ but in theory is an incubation period before the onset of disease).

For laboratory notifications however, we use specimen collection date as a proxy for onset date simply because it appears on all laboratory notifications and is closest to the true onset date. A problem arises however, with diseases which are not notified by laboratories and have a long period between symptom development and diagnosis. In these cases, the onset date can be sought from the patient, but it might be very indistinct or a long time in the past, so it would make more sense to also use specimen collection date as a proxy, being the date on which the first specimen which contributed to the diagnosis was taken. Otherwise, some cases with dates of onset in the distant past will go unreported.

We were aware of this difficulty with diseases like TB and leprosy, but in our attempt to set the trend did not make the necessary adjustments in the June Bulletin, hence there were some misleading results with TB, particularly for Katherine District. Due to a combination of onset of disease being in the distant past and last years notification being entered late, we reported no cases of TB for the Katherine District for the first quarter of 2002. If we had not changed the reporting method there would have been 7 TB cases! One can imagine the mortification of Katherine staff who have spent a good deal of their time coping with a TB outbreak (including screening an entire community) in 2001-02 to read of no cases for the first quarter of 2002!! Apologies to the Katherine team. As an aside they have had 7 more cases since then making 14 for this year compared to 6 for the whole of 2001.

We will continue to report by onset date (as defined above) for all diseases, but readers should be aware that for the majority of notifications this will mean specimen collection date. For rare cases where onset date is not appropriate and specimen date is not available (e.g. smear/culture negative TB) the reporting date will be used. The idea is that this way of reporting better reflects the ‘reality’ of disease transmission.

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the target group aware of the site’s existence, gleaning creative ideas that are attractive to and engage the target group. To develop this we will work in conjunction with the Department’s Public Affairs section.

The re-vitalised AIDS/STD site will include pop-ups and mobile banners with pertinent and educational material. The effectiveness of the revitalised site will be evaluated by measuring the number of site hits.

The site will include such content as:
- Testing and treatment guidelines;
- Program activities and services;
- The NT AIDS/STD Surveillance Report;
- Fact sheets;
- Contact details of all 5 Disease Control Centres in the NT;
- Links to other relevant sites.

Among other ideas under discussion are the use of our Turtle Logo, the use of Quiz techniques and FAQ (frequently asked questions) sheets. Before opening each link, the reader will be given a brief description of what each link contains.

We have begun, but have a ways to go. Input would be most welcome and can be directed to:

Damien Dempsey, phone 89228097
damiendempsey@nt.gov.au.
NOTIFIED CASES OF VACCINE PREVENTABLE DISEASES IN THE NT
BY ONSET DATE 1 APRIL TO 30 JUNE 2002 AND 2001

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* Mumps is largely under-reported.

NT WIDE NOTIFIABLE DISEASES
1 APRIL TO 30 JUNE 2002 AND 2001

Rate per 100 000

Rates <10/100,000 not listed
NT est resid. Pop. - 195,905 supplied by Epidemiology & Statistical Branch, DHCS
## NT NOTIFICATIONS OF DISEASES BY ONSET DATE & DISTRICTS

### 1 APRIL TO 30 JUNE 2002 AND 2001

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Points to note regarding NT notifications on page 34

Amoebiasis, Anthrax, Murray Valley Encephalitis, Kokobera, Botulism, Brucellosis, Chancroid, Cholera, Congenital Rubella Syndrome, Diphtheria, Gastroenteritis, Gonococcal Ophthalmic Neonatal, Haemolytic Uraemic Syndrome, Hepatitis C (incidence), Hepatitis D & E, Hydatid Disease, Leprosy, Listeriosis, Lymphogranuloma venereum, Measles, Orthitosis, Plague, Poliomyelitis, Q Fever, Rabies, Rubella, Tetanus, Typhus, Vibrio Food Poisoning, Viral Haemorrhagic Fever, Yellow Fever and Yersiniosis are all notifiable but had "0" notifications in this period.

Campylobacter infections, which have been increasing in recent years, showed a decrease in all districts in this quarter compared to 2001.

Cases of laboratory diagnosed (i.e. PCR positive) chlamydia conjunctivitis (trachoma) were found on school screening in East Arnhem this quarter signifying a marked increase from recent years. This led to further screening and more clinically diagnosed cases which are not notifiable as presently only laboratory cases are captured by the notification system.

The difference in cryptosporidiosis cases in 2002 compared to 2001 highlights the outbreak of 2001 in that quarter.

Pertussis cases are down this quarter compared to last year which was an epidemic year and the first since 1995.

Pneumococcal cases show a decrease across all age groups in this quarter of 2002 and therefore can not be attributed to the introduction of the conjugated pneumococcal vaccine in June 2001 which targeted ‘at risk’ infants and children under 5 years.

Syphilis notifications increased almost 3 fold in Darwin in this 2002 quarter. Darwin is the only district without a syphilis database. Verifying past serology and/or treatment is sometimes difficult and staff changes and practices may influence notification numbers.

***************

Letters to the editor are welcomed and should be addressed to Dr Vicki Krause, CDC, PO Box 40596 Casuarina, NT, 0811 or email vicki.krause@nt.gov.au.
Disease Control Staff Updates

Darwin

Lyn Barclay, TB/Leprosy Clinical Nurse Consultant of 14 years retires at the end of October. She has contributed to both the TB/Leprosy Program and other surveillance programs within Disease Control. She will be missed by both her client group as well as many staff members who have seen her as a mentor.

Sue Dubow has resigned from her position as Clinical Nurse Consultant with the AIDS/STD Program. Sue has worked in the Program since 1986. She has implemented many education programs and been instrumental in developing resources for them. We wish her well for the future.

Damien Dempsey has spent the last twelve years working in the HIV Sector and comes to the AIDS/STD Darwin Program from working in the Positive Living Centre in Adelaide. Damien’s current role is that of Policy Development Officer for the Program.

Danielle Bament has joined the AIDS/STD Program as a Project Officer for NSP/HCV/IDU. Danielle was previously from the South Australian Community Health Research Unit located at Flinders Medical Centre in Adelaide where she worked as a project officer.

Mark Di Francesco, TB/Leprosy nurse at CDC for four years left this month to commence employment with Primary Care Information Systems (PCIS) in Darwin. Mark had previously spent a lot of time in the Maningrida area and had been a lecturer at Batchelor College.

Belinda Farmer previously of TB in Alice Springs has moved to Darwin with family and has commenced a 3 month temporary contract in TB/Leprosy at CDC.

Angela Salter has recommenced work at CDC after several years absence. She has filled the position vacated by Kim Rose last month and returned as the administrative assistant to the community paediatrician, physician and child health team.

Kim Rose has left as administrative assistant to the community paediatrician, physician and child health team to work with Centrelink.

Sue Reid, previous Public Health Nurse and Bulletin editor added a new daughter, Laura Grace to her family in August. Congratulations.

Frank Bowden, former Head of the AIDS/STD Program CDC Darwin, has been appointed the first Chair of Medicine at the Australian National University’s new medical school due to have its first intake in 2004. Professor Bowden is currently working at Canberra Hospital.

Alice Springs

Dyan Kelaart is the a new public health nurse to replace Helen Tindal.

Tennant Creek

Kirsty Jones, TB/Leprosy nurse in Tennant Creek since October 2001 resigned and has moved to Darwin. John Turhui is assisting in CDC until the end of October.

Katherine

Greg Henschke, AIDS/STI Educator is now firmly entrenched at CDC in Katherine until June 2004

Nhulunbuy

Kim Machin, Sexual Health RN has commenced maternity leave.

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