With the wet season upon us, it’s time to remind health staff in the Top End of the need to be aware of melioidosis. The following message was recently sent to all Top End general practitioners (GPs).

### Diagnosis of melioidosis in the Top End

Melioidosis has been the most frequent cause of death from community-acquired pneumonia in the Top End of the Northern Territory (NT). Diagnosis is often difficult and should be suspected in patients with:

- **Mild to moderate pneumonia with risk factors** for example
  - Diabetes,
  - Renal disease,
  - Chronic lung disease (COPD, CLD),
  - Alcoholism or binge drinkers,
  - Past History of melioidosis,
  - Immunosuppressed patients whether from disease, infection or medication (e.g. prednisolone in high dose for more than 2 weeks),
  - Patients not responding to standard CARPA* treatment,

- **Severe pneumonia / suspected septicaemia** (all cases),

- **Wound infections not responding** to standard CARPA treatment and “suspicious” wounds on initial presentation.

*CARPA: Central Australian Rural Practitioners Standard Treatment Manual.

### Use of Blood Cultures

Blood cultures are often critical in identifying life threatening infectious diseases such as melioidosis.

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Blood cultures (and sputum if possible) should be taken before giving antibiotics in all patients at risk of melioidosis. This includes all patients with moderate and severe pneumonia as well as those with mild pneumonia plus risk factors. (Table 1).

The processing of blood cultures is machine dependent, and unfortunately the systems used at NT Department of Health & Community Services (DHCS) hospitals and Western Pathology are not compatible. Top End health centres must stock both BACTEC blood culture bottles which can be ordered from DHCS Stores Department (to be sent with the patient where antibiotics are given prior to evacuation) and BacT/Alert blood culture bottles to be sent to Westerns Pathology if the patient has mild pneumonia and risk factors or moderate pneumonia and is not evacuated.

Always label and pack specimens and request slip appropriately for air transport.

Use Of Ashdown's Broth

Ashdown’s selective broth is specific for the culture of *Burkholderia pseudomallei*, the organism that causes melioidosis disease. Throat (and occasionally rectal) swabs placed in Ashdown’s broth may be asked for by the District Medical Officer (DMO)/GP before antibiotics are given to patients requiring evacuation to hospital and these specimens should be labeled and sent with the patient. The DMO/GP may also request that swabs (Stewart’s & Ashdown broth) of wounds not responding to standard CARPA treatment, and “suspicious” wounds, be sent to pathology for testing. Ashdown’s broth can be ordered from your private pathology provider, usually Western Pathology in the Top End. “Starter” stocks have been ordered from Westerns Pathology for all remote Top End Community Health Centres east and north of Katherine.

**Main Points**

1. Follow CARPA guidelines for antibiotic administration.
2. **Risk factors**: diabetes, advanced renal disease, chronic lung disease, alcoholism, history of melioidosis, immunosuppression.
3. If a patient with moderate pneumonia and risk factors remains in the community (which is not the preferred option) they should remain on ceftriaxone until their culture and swab results are back. **Note**: If gentamicin is continued to cover other possible bacteria such as *Acinetobacter sp.*, then if the patient has any renal impairment consult with an Infectious Diseases physician after the first dose of gentamicin, otherwise discuss after the second dose.
4. The appropriate dose of ceftriaxone for suspected melioidosis or sepsicaemia is 2gm/day.
5. Once melioidosis is confirmed patients are changed to definitive treatment with ceftazidime or meropenem.
6. Other causes of pneumonia not responding to standard treatment include TB and “atypical” pneumonia (eg mycoplasma).
7. Post cyclone or flooding is a high-risk time for melioidosis. Aerosol inhalation from heavy rain on soil may be a mechanism for acquiring melioid pneumonia. To prevent skin entry of melioid bacteria, community members (especially those with risk factors) should be encouraged to wear closed footwear and to stay out of mud and standing water. Cuts and abrasions should be covered. Outdoor workers should wear protective gloves. **Prevention works!**

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**Table 1. Initial community therapy for community-acquired pneumonia in the wet.**

<table>
<thead>
<tr>
<th>Mild pneumonia</th>
<th>Mod pneumonia</th>
<th>Severe Pneumonia</th>
</tr>
</thead>
<tbody>
<tr>
<td>No risk factors</td>
<td>Penicillin</td>
<td>Blood culture, sputum and swabs, ceftriaxone, hospitalisation</td>
</tr>
<tr>
<td>Risk factors</td>
<td>Penicillin, blood culture, sputum</td>
<td>Blood culture, sputum and swabs, ceftriaxone, gentamicin, hospitalisation</td>
</tr>
</tbody>
</table>

Note: If gentamicin is continued to cover other possible bacteria such as *Acinetobacter sp.*, then if the patient has any renal impairment consult with an Infectious Diseases physician after the first dose of gentamicin, otherwise discuss after the second dose.
All immunisation providers should now be accessing and delivering the new vaccines that were introduced to the Northern Territory Childhood Vaccination Schedule on November 1 2005.

**Inactivated poliovirus vaccines (IPV)**

The transition from using oral poliomyelitis vaccine (OPV) to using IPV in combined vaccines has been simple and no vaccine errors have been reported. A monovalent dose of IPV is still available on request from regional pharmacies if required for catch up vaccination of infants who have not received the appropriate number of doses of polio vaccine.

- Infanrix Penta vaccine at 2, 4 and 6 months.
- Infanrix IPV at 4 years of age

**Varicella**

The introduction of varicella vaccine for all infants at 18 months of age continues to cause confusion among providers and many vaccines are being administered to children who were already aged 18 months or more on 1 November 2005. Funding for vaccine purchase is only available to the Northern Territory (NT) for the number of doses needed to vaccinate the target age groups. Continued delivery of funded vaccine to infants outside the program guidelines compromises the amount of vaccine available to those who are eligible for funded vaccine.

- Varicella vaccine ONLY for children born on or after May 1 2004

Varicella vaccine will be administered to students who have not already had varicella (chickenpox) in Year 8 in 2006 as part of a school program in urban areas. The majority of students will be 13 years old and require a single dose of vaccine. Consultation with school health nurses has occurred and the program is planned for early in Term 1 2006 in most NT schools.

- Varicella vaccine for Year 8 students in 2006
- No free varicella vaccine for children over 18 months of age until Year 8.

In some remote communities, health services will be offering the varicella catch-up program to students at age 10, as school attendance falls with increasing age in these communities.

**Hepatitis A**

Participation in the Hepatitis A vaccination program for all Indigenous infants between 12 months and 5 years has been steady in both the urban and rural areas. All infants who are due for dose 1 of this vaccine at 12 months appear on recall lists and care plans. Indigenous children up to 18 months of age on 1 November 2005 (i.e. born on or after 1 May 2004) also appear on recall lists and care plans. Opportunistic vaccination of other Indigenous children under 5 years of age should be encouraged.

- Hepatitis A vaccine for all Indigenous children between 12 months and under 5 years of age.
- Dose 2 should be given at least 6 months after dose 1.

Please contact the Immunisation Helpdesk on 89228893 or Immunisation Project Officer on 89228564 for queries relating to the new vaccination schedule.

***************
Hepatitis A outbreak in Central Australia

Rosalie Schultz, CDC, Alice Springs

Biology

Hepatitis A virus is an RNA virus, related to enteroviruses and rhinoviruses, but in its own genus. No non-human species carry hepatitis A virus, but the virus is resilient outside the body. It can remain infective for weeks at room temperature, and tolerate temperatures up to 60°C for 10 to 12 hours. Hepatitis A virus is stable in acidic solution (pH 3), solvents and detergents. To inactivate the virus, solution must be boiled for 5 minutes, sterilised with chlorine 2mg/L for 15 minutes or exposed to ultraviolet light.1

Epidemiology

Historically and in societies with limited access to clean water and sanitation, susceptible children are exposed to hepatitis A. Hepatitis A infection is asymptomatic or causes mild disease in children, and infection leads to lifelong immunity. If sanitation improves, people may be first exposed to the virus as adolescents or adults, when the virus is more likely to cause disease. In industrialised countries, the pattern of disease caused by hepatitis A virus has changed dramatically since the 1960’s. Increasing numbers of people are not exposed to hepatitis A as children, and remain vulnerable if they are exposed as adolescents or adults, often through travel to less developed countries or high-risk occupations (healthcare). Additionally in these societies, outbreaks can occur from food or water sources. Outbreaks have also occurred in Australia among men who have sex with men.2

Prevention

Hepatitis A vaccine has been available since 1992. It is safe and highly effective. Vaccination is recommended for:

- people intending to live in or frequently visit Aboriginal communities;
- childcare workers and preschool staff;
- health care workers, especially those who have contact with children or Aboriginal / Torres Strait Islander people;
- travellers to developing countries;
- men who have sex with men, and others whose sexual activities put them at risk
- people with liver disease from other causes;
- people with haemophilia who receive pooled plasma concentrates; and
- sewage workers;
- injecting drug users; and
- intellectually disabled and their carers.

The Australian Government does not fund the vaccine for these groups. Therefore those requiring vaccination must pay for the vaccine or if occupational exposure is likely their employers may fund vaccination. Immunisation requires 2 doses, given 6 to 12 months apart and provides at least 10 years protection, possibly longer. The cost is approximately $70 per adult dose and $45 per child dose (under 15 years). The vaccine prevents hepatitis A from 2 weeks after the first dose. Over 90% of people develop measurable antibody levels by 4 weeks after vaccination.2

Clinical features of hepatitis A

There is an incubation period of 2 to 8 weeks after exposure. Once infected, people begin to excrete the virus 2 weeks before they develop symptoms. Early symptoms include feeling unwell, fever and loss of appetite. After 1 to 2 days, nausea, vomiting and jaundice (dark urine, yellow skin and sclera and pale stools) may develop. Improvement usually occurs within 1 week, with complete recovery within 1 month. Most people excrete the virus for 1 week after the first symptoms. In asymptomatic cases the virus may still be excreted, and there is no way to determine when the case is infectious. Hepatitis A infection leads to lifetime immunity and protection against re-infection.

Severe hepatitis with liver failure occurs very rarely. Even after severe hepatitis A, most people recover. However, 6 deaths in Indigenous children have been reported of acute severe hepatitis A, 3 in Queensland between 1993 and 19983 and 3 in Western Australia since 1997.4

Unlike hepatitis B and C, people do not carry and spread hepatitis A for long periods. There is no chronic infection.
Public health management of hepatitis A.

Sanitation and hygiene measures protect most Australians from hepatitis A, and these are the most important means of public health management.

However, where the virus is in a community, protection by these means is difficult because the virus is resilient. Detergents do not destroy hepatitis A virus, and chlorine bleach requires 15 minutes contact to eliminate it. The virus can remain infective for many weeks at room temperature.

Normal Human Immunoglobulin (NHIG) injection before exposure or early in the incubation period provides immediate protection against hepatitis A. Therefore the CDC protocol recommends this for some household and/or sexual contacts, staff and children at a child care facility, food handlers in the same establishment and residents and staff at institutions of custodial care of a person with hepatitis A. The protection provided by immunoglobulin lasts for around 4 weeks, depending on the dose given.

Concerns with giving NHIG are:
- NHIG is derived from human plasma;
- The injection can be painful;
- Many people are unaware of their hepatitis A status and are already immune from exposure in childhood, so they receive no benefit; and
- Hepatitis A infection in young children is usually asymptomatic, and provides lifelong immunity. Administering immunoglobulin to young children may prevent them from developing immunity. If they are re-exposed when they are older, they may develop more serious disease from hepatitis A.

Notifications of hepatitis A in Alice Springs

Hepatitis A is notifiable because of its potential for outbreaks, its association with poor sanitation, and because of the possibility for active prevention. The absolute number of notifications is small compared with many other diseases.

An outbreak occurred in 1992. Since 1992 notifications in children have been relatively stable, and notifications in adults variable but declining (Figure 1).

Children found to have hepatitis A are often in hospital for other reasons, and are undergoing a large number of diagnostic tests and hepatitis A is found incidentally (Unpublished data, Shellee Williams, CDC Darwin). Notifications in adults more often represent hepatitis A disease.

Notifications by indigenous status show a decline in non-Aboriginal notifications since 1992 (Figure 2). Notifications per year from 1991 to 2005 range from 0 to 64, with mean 11.8 and standard deviation 15.6. Notifications in Aboriginal people range from 0 to 19, with mean 6.2 and standard deviation 5.9.

Recent outbreak of hepatitis A in Alice Springs region

Notifications in Alice Springs from 1991 until 2005 have a mean of 1.6 notifications per month, or 0.4 notifications per week. Figure 3 shows the notifications in 2005 until 1 November. By June, it was clear that there was an outbreak of hepatitis A. These notifications came from a wide range of places and affected both Aboriginal and non-Aboriginal people. There was no point source of infection, nor a local focus of cases or other simple explanation.

Response

We made use of the Northern Territory Hepatitis A Vaccination Policy and Public Health Management Guidelines. The most important means to protect against hepatitis A is to improve hygiene and sanitation. Environmental Health colleagues used our notification reports to inform their community visits and inspects. We discussed hand washing and hygiene with contacts of cases, in the knowledge that the virus is quite resilient to normal cleaning.

Under Prophylaxis for contacts the guidelines say to “Consider the need for NHIG”. This contrasts with recommendations in The Australian Immunisation Handbook (p 143) that state “NHIG should be administered to close contacts of all cases of hepatitis A”.2

In the knowledge that many people are immune to hepatitis A, we offered urban contacts hepatitis A serology testing rather than immediate administration of immunoglobulin. This enabled people to find out whether they already had immunity to hepatitis A, or whether they may benefit from immunoglobulin injection.
Almost 80% of the cases were from Alice Springs urban area, so few remote community clinics were involved. Advice to remote clinics varied depending on the capacity and turnaround time for pathology specimens and immunisations, the number and age of contacts, the level of concern of staff and the capacity of staff to respond.

Most hepatitis A contacts in remote communities who had serology testing were already immune (or had asymptomatic hepatitis A at the time of testing). This justified our decision to offer observation or serology testing rather than immediately offering immunoglobulin. There were a number of cases who described symptoms of hepatitis A in contacts.
retrospectively; if these had been diagnosed and the contacts actively managed, the cases may have been prevented.

No cases of hepatitis A occurred because of delays in administering immunoglobulin for testing pre-existing immunity. However, a number of people when confirmed to be non-immune did not return for immunoglobulin. None subsequently developed hepatitis A. The current CDC protocol (prior to vaccination being funded in November 2005) has not recommended giving immunoglobulin to Aboriginal children under 5 years old. These children are unlikely to get symptoms of hepatitis A, and may benefit from exposure to hepatitis A virus if they develop immunity at an early age. They then have lifelong protection against hepatitis A. If we administer immunoglobulin, they may not develop immunity and may get hepatitis then at an older age and be much sicker. However, if they do not receive immunoglobulin, children may excrete the virus and be sources of infection for others even though they are not sick themselves. This is a dilemma in the management of hepatitis A in NT.

Hepatitis A introduction to childhood immunisation schedule

In June 2005, the Commonwealth Minister for Health and Ageing announced that the Australian Government would fund hepatitis A immunisation to all Indigenous children under 5 years of age living in the NT, Queensland, South Australia and Western Australia from November 1, 2005. This would provide children with long-term protection against hepatitis A without the potential for spread of disease to other people.

After this announcement, we began giving immunoglobulin to young Aboriginal children who were contacts of hepatitis A cases in the urban setting knowing that they would soon get long-term immunity via active immunisation with hepatitis A vaccine.

Response to hepatitis in Child Care Centres

We offered immunoglobulin (passive immunisation) to every child at a childcare centre, as per guidelines, in response to 2 parents of children at the centre developing hepatitis A. In total 24 children received immunoglobulin. No staff at the centre developed hepatitis A reflecting an excellent immunisation program for their staff.

From an institution describing itself as a Learning Centre, one staff member was hospitalised with hepatitis A. Learning Centres differ from Child Care Centres in that they have no system of accreditation. Accreditation of Child Care Centres requires assessment by Environmental Health. The Learning Centre had not been reviewed by Environmental Health officers and the staff had not been vaccinated against hepatitis A.

Conclusion

1. Hygiene and sanitation can protect populations from hepatitis A.
2. Administration of NHIG (passive immunisation) can provide immediate protection against hepatitis A, but is not necessarily indicated for every contact. Decisions about administration of immunoglobulin should take a range of factors into account.
3. Active immunisation programs in at risk populations will complement health hardware provision to protect health.

References

Hepatitis A


What is hepatitis A?

Hepatitis is a general term used to describe inflammation of the liver. A variety of viruses and other substances, such as alcohol, can cause hepatitis. The hepatitis A virus is the most common virus that causes hepatitis.

How is it spread?

This virus passes through the digestive system of people with the infection and is spread when something contaminated with infected faeces is swallowed. Only a small amount of virus is necessary to spread the infection. The virus can potentially survive on objects and in water for months.

The virus can be passed on:

- by food, drink, eating utensils, toys or other objects that have been handled by an infected person;
- after touching infected nappies, linen and towels or someone else’s hands that have been in contact with faeces;
- by oro-anal sex.

Outbreaks have also been reported as a result of drinking or bathing in water contaminated by sewage, or by eating shellfish, particularly oysters contaminated by sewage.

What are the symptoms?

The symptoms generally develop 1 month after infection but may develop from 2 weeks to 2 months after infection.

Hepatitis A is an acute illness, starting with fever, loss of appetite, nausea, tiredness, abdominal discomfort and feeling generally unwell. Urine may become dark in colour and faeces paler. The eyes and skin may then become a yellow colour (jaundice), however this is may be difficult to see in dark skinned people. The skin may also become itchy.

The symptoms are generally more severe in adults than children. Many children will not show any sign of the infection or have a mild illness without any jaundice.

The length and severity of illness varies but most people feel well within a month of onset. Complications are rare. Hepatitis A does not cause chronic liver disease and people do not become ‘carriers’, as can occur with hepatitis B or C. After a person has recovered from hepatitis A, they cannot get it again.

What is the infectious period?

Infected people can pass the virus to others from 2 weeks before feeling unwell, until 1 week after the appearance of jaundice.

Who is at risk?

Hepatitis A virus is worldwide and can affect anyone. People at higher risk of contracting the infection are:

- international travellers and residents of areas with inadequate waste disposal, contaminated water and/or poor hygiene;
- children and staff in day care centres, particularly if children are not toilet trained;
- household members and close contacts of an infected person.

What is the treatment?

There is no specific treatment for hepatitis A.

How can hepatitis A be prevented?

Good hygiene is the best way to prevent hepatitis A. In situations where good hygiene may be compromised hepatitis A vaccination is recommended.

To avoid faecal spread hands should be washed thoroughly with soap and warm running water for at least 10-15 seconds and thoroughly dried:

- after going to the toilet;
- before preparing or handling food;
- after every nappy change; and
- after changing soiled linen.
Other measures include:

- never change nappies or let children sit on tables or counters where food is prepared or eaten;
- wash change mat with warm soapy water (use disposable wash cloth or launder cloth after use);
- where the change mat is soiled with faeces wash as above then wipe with bleach and leave to dry;
- clean books, toys, equipment, furnishings, floors and toilets regularly (including toilet door handles); and
- avoid sharing drinks and eating utensils.

Child care centres should refer to the NHMRC publication “Staying Healthy in Child Care” for further advice on prevention in a child care centre.

**Hepatitis A vaccination**

Hepatitis A vaccine is available for both adults and children and is safe and effective in preventing disease.

Vaccination is recommended for adults in the following at risk groups:

- travellers to high risk countries;
- residents or frequent visitors to remote indigenous communities;
- child day care and preschool staff;
- intellectually disabled and their carers;
- health care providers;
- people who engage in oro-anal sex;
- injecting drug users;
- people with chronic liver disease;
- people with haemophilia who receive pooled plasma concentrates; and
- sewage workers.

A pre-vaccination blood test to determine pre-existing immunity is recommended to avoid unnecessary vaccination.

The recommended vaccination schedule is 1 injection, followed by a booster dose 6-12 months later. A combined hepatitis A and B vaccine is available if hepatitis B vaccination is also required. This is a series of 3 injections over a 6 month period.

These vaccinations are available on private prescription from a doctor. Some employers may fund hepatitis A vaccination for at risk workers.

As part of a national immunisation program free hepatitis A vaccine will be offered to all Indigenous infants in the NT, SA, WA & Qld from November 1 2005. In the NT this vaccine will be offered routinely at 12 and 18 months. A catch up program will be provided for all other Indigenous infants between 1 and 5 years. A program in North Qld that vaccinated young Aboriginal children against hepatitis A was associated with a reduction in hepatitis A in Indigenous and non–Indigenous adults and children.

**How is hepatitis A controlled?**

Good hygiene and appropriate vaccination are the best methods to control hepatitis A.

If hepatitis A does occur in a food handler or child care worker they should be excluded from work until 1 week after the onset of jaundice.

Children with hepatitis A should be excluded from school or child care until 1 week after the onset of jaundice or other symptoms.

Close contacts of an infected person may be offered immunoglobulin. Immunoglobulin is not a vaccine, but is an injection that will prevent or reduce the severity of infection if given within 2 weeks of contact. Because the contact person may be infectious, extra care should be given to hygiene for several weeks to protect others. The protection provided by immunoglobulin lasts only 2-3 months.

The NT Childhood Vaccination Schedule is available at:


For more information contact your nearest Centre for Disease Control or Clinic 34.

Darwin 8922 8044
Clinic 34 348999 2678
Alice Springs 8951 6907
Katherine 8973 9049
Nhulunbuy 8987 0359
Tennant Creek 8962 4259

November 2005
Hepatitis-A Alert

Media Release, 5 January 2006

The Department of Health and Community Services today issued a public health alert about Hepatitis-A after a few cases were found to be connected with a Darwin hotel.

“There appear to be 4 recent cases of Hepatitis-A discovered in people who had eaten at the Marrara (formerly Airport) Hotel in late November,” said Dr Vicki Krause, Director of the Centre for Disease Control.

“There was also a staff member at the Hotel who had Hepatitis-A at that time and it’s likely that transmission has taken place. With an incubation period of a least a month we’re only now starting to see the cases emerge”, she added.

“The vast majority of people completely recover from Hepatitis-A within 2-3 weeks. Patrons who had a meal at the Marrara Hotel between 18 November and 3 December 2005 and who are showing symptoms of Hepatitis A - should seek medical advice from their GP.” said Dr Krause.

Symptoms include - fever, feeling tired, loss of appetite and nausea and/or vomiting and people often become jaundiced which causes a yellowish coloration to the skin and eyes.

Hepatitis-A is a viral infection that causes inflammation of the liver and lasts about 2-3 weeks.

There are no long-term consequences or carrier state.

“Further transmission can be prevented by early case detection, treatment and follow up. The incubation period for Hepatitis-A is usually 4 weeks but can be up to 7 weeks, so this advice applies until 22 January 2006”, Dr Krause said.

Dr Krause commended the Marrara Hotel for taking swift action and for working cooperatively with the Department of Health and Community Services.

“Management at the Marrara Hotel have complied with the recommendations by the Department. The staff member stopped work once the diagnosis was made and no longer works at the Hotel. The Hotel has been inspected and it is deemed to be in a safe and satisfactory condition.” she said.

Hotel Manager Stuart Johnston said, “We are surprised and shocked by this news. We are keen to make sure anyone else who might be unwell gets tested promptly and gets appropriate medical advice.”

Dr Krause added, “The transmission period occurred between 18 November and 3 December and there are no ongoing concerns about Marrara Hotel, but if anyone has any concerns please call the Centre for Disease Control.”

General Practitioners seeing patients who have eaten at the Marrara Hotel between 18 November and 3 December are encouraged to test those that are symptomatic and those that are food handlers or childcare workers regardless if they are symptomatic or not.

For information about Hepatitis-A please call the Centre for Disease control on 89 22 8044
Vibrios and liver disease are a dangerous combination.  
A case of fatal non-toxigenic *Vibrio cholerae*  

*Peter Markey, Surveillance, CDC Darwin*

**Introduction**

Bacteria from the genus Vibrio are recognized as environmental pathogens that can exist in aquatic environments worldwide. They have been isolated from fresh water sites but are particularly found in brackish salt-water environments. We report a case of fatal sepsis due to non-toxigenic *Vibrio cholerae* in a young immunocompromised woman.

**Case study**

In October 2005, a 19 year old woman from a remote gulf country community was evacuated to Royal Darwin Hospital following the acute onset of overwhelming sepsis. She had presented with abdominal pain, vomiting and fever that morning and later developed diarrhoea. There was a history of recent swimming in a nearby tidal river. She was significantly immunocompromised with a lifelong history of an autoimmune disease affecting her liver function and was at the time taking corticosteroids. She had clinical evidence of portal hypertension, ascites and cirrhosis previously documented.

Despite vigorous attempts to correct the septic process she died within 24 hours of becoming unwell. Later, a non-toxigenic strain of *Vibrio cholerae* was isolated from antemortum blood cultures.

**Discussion**

Usually we associate the bacteria *Vibrio cholerae* with epidemics of cholera in the developing world, where it causes the characteristic profuse watery diarrhoea, dehydration and in severe cases circulatory collapse. However, the pathogenesis of the disease cholera is due to the elaboration of an enterotoxin only from specific serogroups of *V. cholerae* - O1 and O139 - and in general the organism is non-invasive. Other serogroups of the same bacteria lack the enterotoxin but some can cause disease through invasion, either following ingestion or through a wound. They are recognized as causes of cellulitis, fasciitis and, in immunocompromised hosts, primary peritonitis and septicaemic disease. These non-O1 serogroups are also known to cause a spectrum of non-cholera gastroenteric illness from a mild diarrhoea to a dysenteric illness.

Chronic liver disease is a recognised risk factor for non-toxigenic *V. cholerae* septicaemia and peritonitis presumably through portosystemic shunting of blood. Other risk factors include haematopoietic malignancies and nephrotic syndrome. The case fatality rate for those cases of septicaemia with cirrhosis is high; 47% in one series and reported to be as high as 61.5%.

Although there have been reports of the disease caused by infection from an inland freshwater lake, the bacteria favour brackish water and cases have been clustered in sub-tropical regions particularly where tidal rivers flow from low-lying flood plains into large gulfs. It is interesting to note that, in one report, 10 of 14 cases of septicaemia caused by non-toxigenic *V. cholerae* were acquired in coastal states in the USA with most of these being from the states surrounding the Gulf of Mexico. It is likely that the geography and climate of the southern shores of Gulf of Carpentaria would be similar.

Other non-cholera Vibrios such as *V. fulnificus* also occupy this environment and can cause wound infections and sepsis in immunocompromised hosts. *V. parahaemolyticus* causes enteric food borne disease and is also found in coastal environments, with undercooked shellfish often being the vehicle of transmission. Other vibrios such as *V. hollisae*, *V. algolyticus* and *V. damsela* have also been associated with underlying liver disease and sepsis.

Serious infections caused by these non-cholera Vibrios have also been acquired from the shores around the Gulf of Carpentaria in people with liver disease (personal communication, Bart Currie) and it may be timely to warn those who are immunocompromised, particularly those with hepatic cirrhosis, of the risks associated with interaction with this particular aquatic environment.
**References**


**A Case of Plasmodium ovale**

*A Annie Whybourne, Paediatrician, Darwin Private Hospital*

DB is a healthy 52 year old man who was born in Tanzania, and subsequently spent most of his life there until the age of 19 years. He suffered from many episodes of presumed *Plasmodium falciparum* malaria during those years, including 1 episode of cerebral malaria. Microbiological studies were never performed. He was treated with either oral camoquine or quinine, with good response.

From 19 years to the present, DB had resided in Australia. He had had several episodes which he regarded as “mild malaria” recurrences, always associated with the ingestion of alcohol. These episodes were characterized by high fever, rigors, headache and weakness starting between 6 and 12 hours post alcohol ingestion. DB self medicated with Schweppes “Bitter Lemon” with total resolution of the symptoms several hours after taking 250-500mls! DB sought advice from several general practitioners but never presented during an acute episode. He was told that he probably had malarial organisms in his liver which could never be eradicated! DB’s current partner, a medical practitioner has never observed one of these episodes.

From April to September 2005, DB worked with a Medecins Sans Frontier (MSF) hospital project in Kailahun, near the eastern border of Sierra Leone, a well documented endemic *P. falciparum* area, with 70% resistance to chloroquine. *P. vivax* had not been identified in MSF drug efficacy studies during 2004 and 2005. DB took mefloquine as a prophylactic agent, with excellent compliance as enforced by his medical partner! He suffered from a severe episode of gastroenteritis while in Sierra Leone, thought to be due to giardiasis. He did not ever have any signs and symptoms to support a diagnosis of acute malaria. After departure from Sierra Leone in late September 2004, DB completed 4 weeks weekly therapy with mefloquine.

In October 2005, some 13 months after leaving Sierra Leone, DB developed high fevers, headache and fatigue, not associated with prior alcohol ingestion! These acute symptoms cleared completely after 8 hours. Seventy-two hours later and then 48 hours later again, DB developed the same symptoms, but worsening with each episode. The fevers were higher, more prolonged, and associated with rigors and profuse sweating. Examination was unremarkable. DB could not relate his symptoms to the malarial symptoms that he had suffered as an adolescent / young man. Indeed, DB emphatically rejected his medical partner’s suggestion that he could be suffering from acute malaria! FBE was normal, CRP was mildly raised and malarial thick and thin films revealed a low count of *P. ovale*. DB started treatment with chloroquine, suffering 1 further episode with similar severe symptoms 48 hours after the third episode. He completed the chloroquine therapy and a course of primaquine to achieve liver clearance. A follow-up FBE revealed mild anaemia only.

Subsequent alcohol challenges have not resulted in any adverse symptoms!
Australia is considered a malaria-free country and cases of malaria notified in Australia have acquired their disease overseas. In the Northern Territory (NT) there have been 456 cases of malaria over the past 10 years (see Table), ranging from 24 to 82 cases per year (1999-2001 influenced by activities in East Timor).

It is well recognised that there are 4 species of the malaria parasites that effect humans; Plasmodium falciparum, P vivax, P ovale and P malariae, and their distribution varies throughout the world. Although there are differences in their disease profile they are subtle and not clinically distinguishable. Speciation is important as clinical management of the species differs.

For the NT, in the years 1996 to 2002 P vivax was the commonest species reported but since 2002 there has been a shift to P falciparum being the most reported malaria type (see Table). This reflects a shift in national refugee/migrant policy to taking more people from the African region where P falciparum is by far the most common form of malaria and can also be the most deadly. In some African countries (eg Nigeria) P ovale is the second commonest malaria reported.¹

Of the 4 malaria species P vivax and P ovale have the potential for relapse from the hidden liver parasites (hypnozoites). Therefore relapse cases from P vivax or P ovale can occur even if the malaria prophylaxis is completed after leaving the malaria-endemic region, as in the case reported here. Such cases can be months or occasionally years after leaving the malaria-endemic area. However the belief that relapse is not preventable and that malaria cannot be eradicated from the individual is incorrect. Primaquine therapy eradicates the hypnozoites, usually with a single 2 week course, although with P vivax, primaquine sometimes initially fails, requiring treatment with higher doses.

Reference

Table. NT Malaria notifications by species 1996-2005

<table>
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<tr>
<th></th>
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<tr>
<td>P. falciparum</td>
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<td>11</td>
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<td></td>
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</tr>
<tr>
<td>P. ovale</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>P. species</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
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<td>69</td>
<td>82</td>
<td>63</td>
<td>24</td>
<td>40</td>
<td>41</td>
<td>48</td>
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</tbody>
</table>

***************
Compliance with post-splenectomy guidelines-An audit
Judith Sheridan, Flinders University Medical Student, CDC Selective

Abstract

Aims: To assess the compliance at Royal Darwin Hospital with recommended guidelines following splenectomy and to make further recommendations to help improve patient outcome.

Methods: Surgical lists for January 2003 – May 2005 searching for splenectomy ICD-10 code. Data such as age, reason for splenectomy, vaccination and antibiotic prophylaxis, patient education on increased infection risk were documented and assessed.

Results: Of 15 patients identified, patient notes were available for 10. Of the 10 patients, each received the following number of immunisations: 10 pneumococcal (7 documented), 8 meningococcal (6 documented), 9 Hib (5 documented), 3 influenza (all 3 documented). Only 1 patient received all 4 recommended vaccinations. Only 1 patient received a course of antibiotics longer than 1 week – no patients were placed on the recommended lifelong antibiotic prophylaxis. There was poor documentation of the need to follow up immunisations and discussion of increased infection risk.

Conclusions: Recommended guidelines for care of splenectomy patients are not routinely being followed at Royal Darwin Hospital. There is a need for a formal hospital protocol for the management of these at-risk patients – covering necessary patient education, immunisations and antibiotics. The creation of a splenectomy registry could assist in the long-term management of these patients, and allow for assessment of effectiveness of treatment protocol.

The spleen plays an important role in filtering the blood and removing bacteria through the process of phagocytosis. In patients who have undergone splenectomy or are “asplenic”, many studies have noted an increased rate of severe sepsis.1,2 Guidelines published in The Australian Immunisation Handbook3 and the 12th edition of the Therapeutic Guidelines: Antibiotic4 have been established to reduce these infection rates, however, compliance with these prophylactic measures are variable and when not followed may have a negative impact on the patient’s well being. It is essential for medical practitioners and patients to be educated about the potential risks and necessary immunisations associated with the splenectomy procedure. The purpose of this audit is to assess the compliance at Royal Darwin Hospital with these recommended guidelines following splenectomy and to make recommendations to help improve patient outcome.

Background

A literature search was performed to find the possible adverse events following a splenectomy procedure and to view the recommendations and guidelines available for post-splenectomy treatment. Articles discussing compliance rates with recommended guidelines were also found and used as a basis of comparison for the performance of the Royal Darwin Hospital (RDH). A Medline search was performed, using the search criteria of “splenectomy” plus either “prophylaxis” or “infection” or “immunisations” or combinations of the above items. Approximately 200 papers in English were located with this list further restricted to audits and guidelines of post-splenectomy treatment.

In an effort to include material pertinent to Australia (though not necessarily the Northern Territory), a search for articles published by Melbourne infectious diseases physician, Denis Spelman, an expert in this field, was performed and 2 editorials were obtained relating to prevention of post-splenectomy infection.

Risks following splenectomy

Following a splenectomy procedure, the patient has less ability to filter encapsulated bacteria from the circulation. Overwhelming post-splenectomy infection (OPSI). OPSI is a significant risk to those who have undergone a splenectomy procedure. Patients have less ability to filter encapsulated bacteria such as Streptococcus pneumoniae, Haemophilus
influenzae or Neisseria meningitidis from the circulation. This increases the risk of developing OPSI to 600 times the rate in the general population with an estimated lifetime risk of developing OPSI of 5%.1,2

OPSI was first described in 1952, and presents with meningitis or pneumonia symptoms in approximately half of the cases. For many patients, no specific site of infection can be found. Initially, patients experience mild, flu-like symptoms with associated fever, malaise, myalgia, headache and gastrointestinal complaints. They then undergo a rapid deterioration to bacteremic septic shock, hypotension and disseminated intravascular coagulation.5,6 Despite vigorous attempts at intervention after presentation to health care centres, OPSI mortality rates are as high as 70%.5 There is disagreement in the literature over the time period associated with increased risk of OPSI as Holdsworth states that 3.3% cases developed bacteraemia during the first month following surgery with a significantly lower rate of sepsis after this period7 while Waghorn found that the time interval between splenectomy and OPSI ranged from 24 days to 65 years.2 These findings may have an influence on the physician’s perception on the required duration of prophylactic antibiotics following discharge.

Pathogens

The commonest infecting pathogen following splenectomy is S. pneumoniae, accounting for 50-90% of isolates in blood cultures.5,8 Waghorn found S. pneumoniae in 67 of 77 OPSI patients.2 Other important pathogens are H. influenzae type b (Hib), N. meningitidis and Group A streptococcus, together accounting for approximately 25% of OPSI cases.5 Less commonly involved, but important to recognise as potential infective agents, are Escherichia coli, Salmonella species, malaria, Babesia microti (transmitted by ticks) and Capnocytophaga canimorsus following dog bites.5

Of these pathogens, immunisation is possible against Hib and some serotypes of S. pneumoniae and N. meningitidis. The 23-valent polysaccharide pneumococcal vaccine (Pneumovax®) covers ~73% of the strains causing OPSI 2 and a conjugate 7-valent pneumococcal vaccine became available in 2001 for children. Polysaccharide meningococcal vaccines are available to cover A, C, Y and W-135 strains and conjugate vaccines are available for meningococcal C. Hib vaccines in Australia were introduced in 1992.3

Prevention

Recommended guidelines for prevention of post-splenectomy infection included immunisations, prophylactic antibiotics and patient education.

Immunisations: While a specific guideline concerning splenectomy patients has not been produced in the NT there is the NT Adult and Special Groups Vaccination Schedule.9 These NT recommendations reflect the national guidelines published in The Australian Immunisation Handbook3 that describe specific recommendations for anatomic or functional asplenic patients. These are summarised in Table 1.

<table>
<thead>
<tr>
<th>Vaccine:</th>
<th>Repeat doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumococcal conjugate (7vPCV) – children &lt; 5 yrs*</td>
<td>Nil</td>
</tr>
<tr>
<td>Pneumococcal polysaccharide (23vPPV)</td>
<td>5 years following initial †</td>
</tr>
<tr>
<td>Influenza</td>
<td>Yearly</td>
</tr>
<tr>
<td><strong>Haemophilus influenzae</strong> type b (Hib)†</td>
<td>Nil</td>
</tr>
<tr>
<td>Meningococcal: conjugate</td>
<td>Nil</td>
</tr>
<tr>
<td>Meningococcal: polysaccharide 2wks after conjugate vaccine§</td>
<td>Repeat 3-5 yearly</td>
</tr>
</tbody>
</table>

* See NT childhood vaccination guidelines for children under 5 years with underlying medical conditions.10
† refer to NT pneumococcal polysaccharide adult vaccination recommendations for subsequent doses.
‡ Only for patients who have contact with children < 5 years of age.
§ It is important to give them in this order as in reverse there a 6 month interval is recommended.

Under ideal conditions, the vaccines should be given 14 days before the splenectomy, or as soon as possible after surgery if a non-elective procedure. While it is essential that patients in
this high risk category be given the recommended immunisations, it is important to remember that immunisation does not guarantee total protection from infection by those specific bacteria. This illustrates the need for appropriate antibiotic coverage and for health care providers and splenectomised patients to respond quickly to any signs of infection. Repeat immunisations must be given, to ensure the most effective prophylaxis.5

Education: Prior to discharge from hospital after a splenectomy procedure, patients should be advised about their increased risk of infection and precautions that they must take which include for travel, especially in malaria affected regions, and treatment for dog and tick bites. The need for early presentation to a health care provider with the onset of fevers, malaise, or other systemic symptoms should be discussed. Brigden reports that studies have shown that 11-50% of patients remain unaware of their increased risk of serious infection at time of discharge. They reveal that 100% of surgeons interviewed believed they had adequately explained risks of being immunocompromised following splenectomy, while only 16-40% patients were aware of health precautions.5

Medic alert bracelets or identification cards stating the patient’s asplenic status are an additional item that can be discussed with the patients prior to their discharge from hospital. While not mandatory, such measures would assist medical staff treating the patient in an emergency situation.

Chemoprophylaxis: There is substantial variation in the recommendations concerning antibiotics following splenectomy. Several papers have stated that the increased risk of OPSI is lifelong, with the greatest risk in the first 2 years.8 Spelman reports one study that found 52% of cases of OPSI in the first 2 years following splenectomy.12 However, Spelman also comments that results have indicated 33% of post-splenectomy pneumococcal infections and 42% of OPSI occur more than 5 years after surgery.12 Wagorn agrees that there is evidence of an increased lifelong risk of OPSI, with the same number of cases reported 40 years after surgery as in the first 4 years following surgery.2 The risk of OPSI is highest in children and the immunocompromised, and that the risk remains lifelong.4 The provision of antibiotics must be performed through a risk assessment for each patient: highest risk associated with children under 5 years especially those with sickle cell anaemia and during the first 2 years after surgery.

Amoxycillin is the recommended antibiotic:
- for children under 2 years, the recommended dose is 20mg/kg orally, daily
- for older children and adults, recommended dose is 250mg orally, daily.4

British guidelines from 2001 recommend lifelong antibiotic prophylaxis,1 and when lifelong prophylaxis is not possible, special emphasis should be placed on children up to 16 years, the first 2 years following surgery and any individuals with reduced immune function. Studies have also mentioned the use of “stand-by” antibiotics that the patient self-administers upon onset of respiratory or systemic symptoms5,13 however Spelman commented in a response to Wagorn’s paper that only 2 of a possible 62 patients held such antibiotics.2,12

Review of compliance

Several audits of post-splenectomy prophylaxis have been done at various international sites. These audits evaluate the effectiveness of local recommendations for post-splenectomy patients and the degree to which treating doctors at various hospitals follow these guidelines. Their results are summarised in Table 2.

None of the studies assessed the rates of immunisation with influenza vaccine.

These studies illustrate a similar trend of higher rates of pneumococcal immunisation than meningococcal or Hib. However, none of the studies demonstrate complete coverage of these high risk patients, and some reveal very little or no immunisation coverage with the Hib and meningococcal vaccines. This may reflect the availability of these vaccines in the various locations. The discussion sections of the papers all commented on the low rates of immunisation coverage and the need for further education of medical staff caring for post-splenectomy patients. Ensuring appropriate antibiotic cover and immunisations can significantly reduce the rates of infection.
Table 2. Results from audits - literature review of vaccines and prophylactic antibiotics given to study patients as directed by specific local recommendations for post-splenectomy patients.

<table>
<thead>
<tr>
<th>Study</th>
<th>Pneumococcal vaccine</th>
<th>Hib vaccine</th>
<th>Meningococcal vaccine</th>
<th>Antibiotics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number Vaccinated</td>
<td>%</td>
<td>Number Vaccinated</td>
<td>%</td>
</tr>
<tr>
<td>Ramachandra, England. 76 cases</td>
<td>55</td>
<td>72%</td>
<td>45</td>
<td>60%</td>
</tr>
<tr>
<td>Waghorn, U.K. 77 cases</td>
<td>22</td>
<td>29%</td>
<td>9</td>
<td>1%</td>
</tr>
<tr>
<td>Kyaw, Scotland 13 *variable case denominators</td>
<td>622/708*</td>
<td>88%</td>
<td>468/664*</td>
<td>70%</td>
</tr>
<tr>
<td>Deodhar, India. 56 cases</td>
<td>36</td>
<td>64%</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

Kyaw’s study comments that 35% of all cases received the pneumococcal, meningococcal and Hib immunisations along with the prophylactic antibiotics. This was despite the Scottish guidelines at the hospital stating that the meningococcal vaccine was not required – therefore, 52% of cases met the recommended guidelines of the time.13

Antibiotic coverage was varied with 2 studies1,13 demonstrating coverage of more than 60% while 2 studies2,14 failed to treat more than a quarter of the participants in the study. Only 2 participants were noted to have been provided with standby antibiotics.

**Aims**

The primary goal of this audit of splenectomised patients was to assess the degree that recommended standards of care concerning immunisations aimed at the prevention of infection were followed at RDH. The recommended immunisations for functional or anatomic asplenia are detailed on the 2005 NT Immunisation Guidelines for Special Population Groups,9 based on national guidelines (Table 1).

These immunisations should be given to the patient ideally more than 2 weeks prior to elective surgery, or before discharge in non-elective patients. In the case of emergency surgery, the immunisations should be given to the patient when they are stable or have recovered from surgery.

The goal of this audit was to assess the compliance to recommended standards by those involved in the care of splenectomised patients. Information gained was to be used to guide the education of health care providers at RDH and splenectomy patients concerning post-splenectomy care and improving patient health outcomes.

A secondary goal was to assess the prescription and length of treatment with prophylactic antibiotics both as in-patients and after discharge. Data was also to be collected on the documentation in case notes of discussions with patients concerning increased risk of infections, the need for rapid treatment if systemic symptoms of infection develop and distribution of information on medic alert cards/bracelets. Continuity of patient care depends on communication between treating medical professionals, so contact with the patient’s local GP was also analysed.

**Methods**

In order to obtain the necessary information on patients who had undergone a splenectomy in the past 2 years at RDH, the Morbidity Data Collection staff was contacted. As they were unable to assist at the current time due to their workload, the Surgical Secretary was contacted. A report was run on the surgical lists for the past 2 years (2003 and 2004): limits were surgery performed at RDH and the International Classification of Disease, 10th Revision (ICD 10)
code (30597-00) for splenectomy – the result was 15 cases of splenectomy. All ages of patients were included in the audit and there were no limits placed on the reasoning behind the splenectomy procedure. Additional reports were run using alternative codes for partial and laparoscopic splenectomy procedures, but no further cases were identified. The Oncology specialist was also consulted about potential cases, but stated the surgical lists would cover all cases. Several additional potential cases were located by searching CareSys (RDH Production Patient Management System) records for the past 4 months.

Individual cases were reviewed for the following data:
- Demographics: sex, age at time of surgery, Indigenous status;
- Splenectomy: elective or non-elective, reason for surgery;
- Immunisations:
  - given as inpatient = type, name, method, date
  - sticker in front of chart?
- Antibiotics given at discharge: lifelong? or utilisation of the “standby” method?
- Patient education: documented in charts?
- Contact with local GP: documented in charts or discharge summary?

Of the 15 cases identified, only 10 of the charts were located by RDH Medical Records. Further attempts to locate these remaining 5 charts were unsuccessful. These missing charts did not have computer generated discharge summaries completed, so there was no opportunity to obtain any data for these patients.

**Analysis**

The size of the group included in the audit limits the amount of statistical analysis that can be performed on the data, however, it is possible to determine vaccination rates and the degree of compliance with the recommended guidelines.

**Baseline data**
- The average age of patients was 37 years.
- There were 7 males and 3 females.
- 8 (80%) of the patients were Indigenous.
- 2 (20%) of the patients were non-Indigenous

**Reasons for splenectomy**
- Rupture was cited as the need for surgery in 8 (80%) of the patients.
- Haematoma was noted for 2 (20%) of the patients.

**Pneumococcal Vaccination**
All 10 patients received pneumococcal vaccine; 3 in the pre-operative period and 7 post surgery. Of those given before surgery, 2 were more than 14 days prior to surgery (20 days and 36 days) while the third was given 3 days pre-operatively. Of the 7 given following surgery, all were given within 6 days post-operatively. Immunisation stickers were on the front cover of the hospital records of 7 patients (70%). Only 1 patient had the need for repeat immunisations documented in the notes.

**Meningococcal Vaccination**
Meningococcal vaccine was given to 8 (80%) patients. Those receiving it before surgery were the same 3 patients who received their pneumococcal vaccine in the pre-operative stage. One patient received 2 doses of meningococcal vaccine: one at 20 days and a repeat dose at 3 days before surgery. Of the 8 who were given the immunisation, 6 had a sticker placed in the front of the hospital record. Only 2 of the patients (25%) had the need for a dose of polysaccharide meningococcal vaccine 2 weeks following initial vaccination documented in their notes or discharge summary.

**Hib Vaccination**
The Hib vaccine was given to 9 (90%) patients. Only one patient received the vaccine before surgery – and this patient was given the immunisation twice, 20 days and 3 days prior to surgery. Of the 9, 5 patients’ medical records (56%) had the sticker documenting the vaccine on the front cover.

**Influenza Vaccination**
Only 3 of the 10 patients (30%) received the recommended influenza vaccination – all of which had the sticker in the front of the patient
records. One patient had the need for the vaccination documented, but the vaccine was not given.

These results are summarised in Table 3 and Figure 1.

**Antibiotics**

Two patients (20%) were discharged from RDH with a short course of antibiotics (one given 7 days of cephalaxin and the other 7 days erythromycin). One patient (10%) was placed on a 6 month course of amoxycillin following an Infectious Diseases team review as an inpatient. No documentation was made of the recommended life-long prophylaxis antibiotic cover or of the “standby” antibiotic prophylaxis method for any patient.

**Discussion of Increased Risks**

One patient (10%) had documentation of increased risk of infection and the need for prophylaxis when travelling to countries with malaria. This documentation was written by an Infectious Disease registrar.

**Adverse Outcomes**

One patient (10%) aged 32 years died as an inpatient from a complication secondary to a cerebrovascular accident, unrelated to the splenectomy procedure.

**General Practitioner contact**

Discharge summaries were forwarded to 9 (90%) of the patients’ GPs.

**Overall vaccines provided to RDH patients**

- 1 patient (10%) received all 4 vaccines as recommended in the guidelines
- 8 patients (80%) received 3 of the 4 recommended vaccines:
  - 6 patients were not given the influenza vaccine
  - 1 patient was not given the Hib vaccine
  - 1 patient was not given the meningococcal vaccine
- 1 patient (10%) was given 2 of the 4 recommended vaccines (not given meningococcal or Hib vaccine).

**Discussion**

Although there are only 10 patients included in this audit, wide variation in vaccines offered given prior to discharge from RDH following a splenectomy surgery suggests a significant lack of understanding about the special immunisation needs for this at-risk population. There are no

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**Table 3. Vaccination results and documentation/instruction from Royal Darwin Hospital post-splenectomy audit**

<table>
<thead>
<tr>
<th></th>
<th>Pre-op</th>
<th>Post-op</th>
<th>Sticker Documentation</th>
<th>Repeat noted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumococcal 100%</td>
<td>3</td>
<td>7</td>
<td>7/10 (70%)</td>
<td>1/10 (10%)</td>
</tr>
<tr>
<td>coverage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcal 80%</td>
<td>3</td>
<td>5</td>
<td>6/8 (75%)</td>
<td>2/8 (25%)</td>
</tr>
<tr>
<td>coverage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hib 90% coverage</td>
<td>1</td>
<td>8</td>
<td>5/9 (56%)</td>
<td>n/a</td>
</tr>
<tr>
<td>Influenza 30%</td>
<td>0</td>
<td>3</td>
<td>3/3 (100%)</td>
<td>0</td>
</tr>
</tbody>
</table>

**Figure 1. Recommended vaccinations provided to post-splenectomy patients**

![Graph showing recommended vaccinations](image_url)
official RDH guidelines on the treatment of post-splenectomy patients, but there are published guidelines Australian Immunisation Handbook and in the Therapeutic Guidelines: Antibiotic to help medical staff ensure patients are treated appropriately. Additionally the NT Adult and Special Groups Vaccination Schedule identifies the recommended vaccines to be given for anatomic or functional asplenia.

Pneumococcal immunisations were given to 100% of the patients. Repeat immunisation is recommended in 3-5 years; however only one patient who had been reviewed by the Infectious Diseases team had this instruction documented in their notes.

The need for repeat immunisations was also poorly documented for meningococcal vaccine. A polysaccharide vaccine should be given more than 2 weeks after the conjugate vaccine - a need only documented in 2 of the patients’ hospital notes or in their discharge summary. Only 80% of the patients reviewed were given the conjugate meningococcal vaccine while inpatients.

Hib was received by 90% of patients.

Influenzæ vaccines were only given to 30% of the patients despite its recommendation in the Australian Immunisation Handbook and the NT Special Groups vaccination recommendations.9

Two patients received immunisation more than 2 weeks prior to surgery. In 1 case this was due to a patient absconding prior to surgery and representing a month later. In the other case, the patient had been given the conjugate meningococcal and Hib vaccines on admission – the splenectomy procedure only became necessary 3 weeks later. This patient received repeat conjugate meningococcal (without administration of the polysaccharide) and Hib immunisations 3 days prior to the surgery despite documentation of the initial vaccinations in the hospital notes.

None of the patients reviewed were placed on lifelong antibiotics – the longest time prescribed was 6 months. This is a substantial deviation from recommended guidelines which state that the highest risk of infection is in the 2 years immediately following the surgery, but that lifelong antibiotic cover is preferred. No use of the “stand by” method of antibiotic prophylaxis was documented in the hospital notes.

This audit did not have the ability to monitor the health of the splenectomised patients following their procedure – the focus of any future audit should be to assess the number of presentations to local GPs or hospital with infections, the prescribing of any antibiotics and any incidences of OPSI.

Only 1 patient had documentation of a discussion of the increased risk of infection and need for early presentation to a health care provider if infection was suspected. Additionally, the need for special precautions when travelling or specifically dealing with dog and tick bites should be mentioned. These simple steps can help patients take greater responsibility for their health and seek treatment early if they feel they are becoming sick. This will result in improved health outcomes.

**Limitations**

Time limits restricted this study to medical charts that were readily available in RDH’s Medical Records Department. After speaking to the Medical Records staff, it was determined that only patient charts from admissions within the previous 2 years would be easily accessible. Splenectomy patients were identified by running a search through the surgical office, and results were dependent on a ICD-10 code for splenectomy being assigned to the patient at time of discharge. This is a source of error and incorrect coding may have resulted in fewer numbers of patients being identified during the search. It was not possible to record any details of 5 hospital records as these charts could not be located by the end of the selective placement – the patients also did not have a computer generated discharge summary completed. It is possible that these 5 patients received all of the recommended immunisations and antibiotic cover. However, it seems unlikely that their treatment significantly differed from the 10 patients included in this audit.

**Recommendations**

This audit highlighted a need for increased education of health providers working on the surgical units or with patients who have had a splenectomy for medical reasons such as cancer.
staging, idiopathic thrombocytopenic purpura (ITP) or anaemia. While guidelines are available in immunisation and antibiotic guidelines, these resources appear to be underutilised in providing care for post-splenectomy patients – putting these patients at risk of more frequent and more severe infections. Likewise management plans should be created to assist local GPs caring for post-splenectomy patients, and information sheets for patients should be developed. Therefore RDH – or ideally NT wide hospitals – should have standard treatment management plans for splenectomy patients readily available. Staff need to be informed of the new treatment protocol, and the information must be readily available to medical officers, i.e. posted on the surgical and medical unit intranet sites. A standard or modifiable letter to send to go GPs for ongoing care-plans should be made available.

Acknowledgements

Thanks go to Vicki Krause for proposing this audit and giving guidance along the way and to Chris Nagy for attending to and getting all the vaccine recommendations right!

References


What is environmental *Salmonella*?

*Shellee Williams, MAE, CDC Darwin*

We are familiar with the notion that salmonellosis can be acquired by eating contaminated food, such as undercooked meat and eggs. However, we may be less familiar with the idea that it can be acquired without eating and, in fact, that salmonellae might be present in amounts sufficient to cause disease on raw fruits and vegetables, kitchen surfaces, in some water sources and in fertilized garden soil.

There is a need to raise community awareness regarding the ubiquitous nature of these bacteria, given recent changes in agronomic and processing practices, an increase in per capita consumption of raw or minimally processed fruits and vegetables, increased international trade and distribution and an increase in the number of immuno-compromised consumers. A need also exists for the scientific community to gain a greater understanding of the opportunistic movements of *Salmonella* through the environment.

The genus *Salmonella* is composed of over 2500 different serovariants (serovars). More than 99.5% of the *Salmonella* serovars isolated from humans and other warm-blooded animals are capable of causing disease in humans and are from the species *Salmonella enterica* subspecies *enterica*. Most of these are zoonotic in origin. They reside in the intestinal tract of various animal species and are thought to circulate through the environment, and into new hosts, via faecal contamination of water, soil, food surfaces and other fomites. In this setting, these are considered to be environmental serovars of *Salmonella*. Only the serovars *S. Typhi* and *S. Paratyphi* from the above subspecies are thought to be host specific and not zoonotic, only colonising humans. Most serovars can be ‘environmental’ when viewed in this way. A serovar is often described as ‘environmental’ if its usual source is not foodborne or the distribution of cases suggests a source other than food. Nevertheless, most environmental serovars can contaminate and be transmitted through food under the right circumstances.

* The uncommon serovar, *S. Paratyphi B var java* defies this rule. It has been associated with fish and alfalfa sprouts and occurs rarely in the NT.6,23-24

**Salmonella in the NT**

In the Northern Territory (NT), salmonellosis is one of the most common notifiable diseases each year. The NT notification rate for 2004 was 192.6/100,000 nearly 5 times the 38.9/100,000 national rate. In the NT, the majority of cases are sporadic in nature and point source outbreaks are rare.

Between 1995 and 2004 there were 3704 notified cases of salmonellosis in the NT. Of these, 2436 (66%) occurred in children aged 0-4 years and 1018 (27%) in children less than 12 months of age. Conversely, only 362 (9.8%) of notified cases were in those aged over 13 years. In the context of infants, where food is less likely a source of contamination, and young children, where exploratory behaviour may lead to ingestion of various substances, environmental sources and familial contact should be considered as potential modes of transmission. It should be noted that neonates and young infants are also at greater risk of infection due to relative achlorhydria and frequent milk feeding that increase gastric pH.

**Where is *Salmonella* found?**

The preferred environment of *Salmonella* is in the intestinal tract of animals. In Australia various serovars have been isolated from a large number of animal species including marsupials, mammals, birds, reptiles and amphibians. A study conducted in the tropical Kimberley region of Western Australia (WA) demonstrated a higher prevalence and higher numbers of *Salmonella* serovars in carnivores highest in the hierarchy of predation, both reptilian and marsupial. This may reflect its ubiquitous presence in the ‘food chain’. Some serovars display a geographic propensity. In the NT *S. Ball* has become the dominant serovar over the last 5 years (12% of all notified serovars 2001-2004) and occurs rarely in the rest of Australia. A study conducted in the tropical Kimberley region of WA also found evidence indicating that a serovar may spread through the resident fauna once that serovar is introduced.

Most *Salmonella* species lack special host adaptations and are capable of colonising a wide variety of macro-organisms. This enables a
cyclic lifestyle consisting of passage through an animal host into the environment via faecal material and back into a new host via ingestion. This lack of host adaptation is supported by fauna surveys and the association of salmonellosis with reptilian pet ownership and a variety of contaminated food products. These products include undercooked meats, seafood and eggs, and fresh fruits and vegetables contaminated by infected fertiliser.

Salmonella transmission and survival

Three different models of transmission of Salmonella have been proposed as most probable in different age groups:

- passive contact for infants, such as exposure to dust aerosols in the home,
- active contact for older children, such as playing with infected animals and
- accidental contact in adults, such as food poisoning.

It is recognised however, that a mixture of these models of transmission are possible. The faecal-oral route of transmission is the generally accepted mode of transmission, however the respiratory route in humans by inhalation of aerosolised water droplets or dust particles containing Salmonella has been postulated.

Relevant to the NT is a study showing that the viability of S. Typhimurium 5 minutes after aerosolization was increased from 4% to 24.8% relative to its initial value when relative humidity increased from 32% to 72%. This was shown to infect mice and calves via airborne transmission. S. Typhimurium represented 6.7% of all Salmonella infections in the NT from 1995-2004.

Even though Salmonella do not multiply significantly in the natural environment, or outside digestive tracts, they can survive in several alternative environments if conditions of temperature, humidity and pH are favourable. Conversely, they are inactivated by UV-C radiation or direct exposure to sunlight. Survival in fertilised soil and transmission to crops is correlated with warm, moist summer conditions (average daily temperature >20°C).

Again, this is particularly relevant to the climatic conditions of the NT. Salmonella can be present on surfaces of fruit and vegetables, entering their tissues via surface breakage by insects or mechanical abuse. They have also been shown to enter tomato plants via flowers, stems or fruit, leading to colonisation of plant tissues.

Salmonella and other bacteria, yeasts and moulds can survive on plant surfaces, protected within biofilms. The pH range for survival is 4.1-9.0 (opt 6.5-7.5) and the minimum pH is influenced by the presence of other nutrients. Salmonella can be widely disseminated in soil and sediment in the absence of active fertilisation due to water currents, underground springs and rain runoff carrying contaminated material. Importantly, they can survive and multiply for at least 1 year in soil.

Infection of wild bird and adult muscoid flies (including the common housefly, Musca domestica) is correlated with proximity to farms. Salmonella survives in flies for up to 4 weeks and flies are capable of acting as vectors by defecating on foods or other surfaces. They can survive for 10-15 days in a septic system and have high survival rates in freshwater aquatic environments, even when salinity is increased eg. tolerance is demonstrated in brackish freshwater mixed with effluent causing an increase in salinity. Evidence regarding the ability of seawater to inactivate Salmonella under all circumstances is conflicting. A review from 2003 states that its presence in marine environments does not vary seasonally and is independent of water temperature; at the same time it states that it is inactivated by seawater. A more recent article cites a number of studies looking at the presence of Salmonella in marine environments and points out 2 main observations: a small but constant number of serovars (17-20) have been found in these environments and, in most cases, these do not coincide with the main zoonotic serovars identified in the surrounding areas. Salmonella’s survivability in conditions of high salinity appears to vary with serovar, salt concentration, the presence of indigenous bacteria and temperature: in the context of purifying oysters using seawater, S. Charity has been shown to die at 32-47% salinity at 18-22°C, but remain viable with 32-36% salinity at 13-

# Biofilms are a matrix structure formed on plant surfaces by exopolysaccharides secreted by bacteria.
17°C or 16-20% salinity at 18-22°C. The ability of these bacteria to survive in so many ecosystems provides the bacterium with an increased probability of infecting a new host.

While it is generally accepted that salmonellosis results from ingestion of *Salmonella* in sufficient quantity via food contamination, other transmission vehicles should be considered when investigating sporadic cases of salmonellosis, particularly in infants.

NT Centre for Disease Control is currently planning a 2-year case-control study of the behavioural and environmental risk factors for salmonellosis in urban Darwin 0-4 year olds. This is scheduled to run from 2006-2008.

References

8. Suressh Benedict, Berrimah Veterinary Laboratory and Joan Powling, National Enteric Pathogen Surveillance Scheme [Personal communication, 2005].
Is it a good move?
A review of Darwin Clinic 34’s attendance data and client profile in relation to relocation to the CBD
Peter Knibbs, Jiunn-yih Su & Kevin Sesnan, Sexual Health and BBV Unit, CDC, Darwin

Background

The location of a sexual health clinic can impact greatly on attendance and services provided for people at risk of sexually transmitted infections (STIs). Darwin Clinic 34, the clinical arm of the Sexual Health/Blood Borne Viruses Unit, had been located in the Royal Darwin Hospital (RDH) campus (about 15 kilometres from Darwin CBD) since its establishment 2 decades ago. This location was not ideal for a sexual health clinic, because of poor access by public transport, lack of car parking and difficulty finding the clinic. Clinic 34 staff had been lobbying to relocate the clinic to a more central location for some time.

Client attendance was stagnant in contrast to rates of STIs, which continued their upward spiral in the NT.

Approval was given in late 2003 for Clinic 34 to relocate from the RDH campus to Health House located in the Darwin CBD, a location made available due to the closure of the Darwin Community Care Centre. This building is located on a busy CBD street with easy public transport access. The clinic re-opened in the city location on 31 May 2004.

A client survey conducted in September 2004, about 4 months after the relocation had shown the new location was generally well accepted by clients.1 As a year had past since the clinic re-opened in the city location on 31 May 2004, it was decided to review the statistics of the attendance and client demographic data to retrospectively evaluate whether the relocation has indeed provided the benefits expected compared with the previous location.

Methods

Clinical information and demographic data for the period 2002 to 2005 were retrieved from the computerised program, Sexual Health Information Program (SHIP), which has been used by Clinic 34 staff to record day-to-day clinic attendance data from 2002. Before 2002, a simple Microsoft Access database was used to record clinical data, and therefore only limited data can be retrieved for the period 2000-2001.

Although the Clinic re-opened on 31 of May 2004, before the end of the financial year 2004/5, it was thought that the change in the first month after the re-opening was insignificant. Therefore the comparisons were proposed using the attendance data for the period 2000-2003 and the 2003/4 financial year as the before relocation data and the 2004/5 financial year as the post-relocation data.

The specific variables compared included overall clinic attendance numbers and the number of diagnoses of gonorrhoea and chlamydia that included breakdown by sex and specific client groups.

The attendance rates for various client groups were calculated by dividing the number of attendances in each group by the corresponding population for the Darwin Urban area for 2003 and 20042 and then converting the statistics as number of attendances per 1000 population. The reason for choosing Darwin Urban population was that it represented the vast majority of the clients serviced by Clinic 34 (those aged under 10 years were excluded as they were unlikely to be clients at Clinic 34).

The introduction of the new Hepatitis Clinic into Clinic 34 Darwin late in 2004 led to a considerable increase in attendances for hepatitis C consultation. Therefore all consultations in regard to hepatitis C were excluded from this

*There are 5 Clinic 34’s throughout the Northern Territory. For the purpose of this article only, Darwin Clinic 34 will be referred to as ‘Clinic 34’ or Clinic.
evaluation in order to minimise possible biases in the comparison.

All statistical analyses were performed using STATA for Windows (Version 9.1). Only differences with a P value < 0.05 are deemed significant.

**Results**

The average annual number of attendances for the period 2000-2003 was 2939 (range 2566-3177). This figure was very similar to the 3025 attendances of 2003/04 (pre-location) and because the 2003/04 data was more complete this dataset only is used for analysis hereafter.

When comparing the 2003/4 and 2004/5 data, the total attendances increased by 1040 (34.4%, Table 1) with a significant increase in attendance rate of 10.39 per 1000 population (95% confidence interval = 10.33-10.44, p<0.01). The numbers of attendances for males, females and new clients had all increased by nearly 30% or more, and the corresponding rate increases were also significant. The female rate increase was 30% and the increase in female attendance number was about 15% greater than that for males. The increase in number of attendances for youths aged under 25 years was 20% with a significant rate increase of 5.71 per 1000 population.

Table 2 provides a summary of the change in attendance by various client groups. The increase for females was invariably greater than that for males, particularly in the group of youths aged under 25 years with female attendance

### Table 1. Numbers and rates of attendances, Clinic 34, 2003/4 – 2004/5

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<tr>
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<td></td>
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<tr>
<td>Indigenous</td>
<td>244</td>
<td>30.4</td>
</tr>
</tbody>
</table>

* 10-24 year olds

### Table 2: Number of attendances, Clinic 34, by sex and client groups, 2003/4 and 2004/5

<table>
<thead>
<tr>
<th>Client group</th>
<th>2003/04</th>
<th>2004/05</th>
<th>Increase</th>
<th>% Increase</th>
</tr>
</thead>
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<tr>
<td>Total attendances (M/F)</td>
<td>3025 (1668/1357)</td>
<td>4065 (2151/1914)</td>
<td>1040</td>
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<td>New clients (M/F)</td>
<td>1032 (528/504)</td>
<td>1336 (664/672)</td>
<td>304</td>
<td>29.5 25.8 33.3</td>
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<tr>
<td>Youth &lt;25 (M/F)</td>
<td>692 (259/433)</td>
<td>832 (286/546)</td>
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<tr>
<td>Indigenous (M/F)</td>
<td>244 (111/133)</td>
<td>246 (103/143)</td>
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<td>0.8 -7.2 7.5</td>
</tr>
<tr>
<td>IDU-current &amp; past (M/F)</td>
<td>22 (13/9)</td>
<td>42 (24/18)</td>
<td>20</td>
<td>90.9 84.6 100</td>
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<tr>
<td>MSM</td>
<td>101</td>
<td>92</td>
<td>-9</td>
<td>-8.9</td>
</tr>
<tr>
<td>SIW (M/F)</td>
<td>25 (4/21)</td>
<td>37 (4/33)</td>
<td>12</td>
<td>48.0 0.0 57.1</td>
</tr>
</tbody>
</table>

M/F: Male/Female; IDU: Injection Drug Users; MSM: Men who have sex with men; SIW: Sexual Industry Workers
increasing more than twice that of male attendance. There was also a considerable increase in the number of attendances by injecting drug users and female sex industry workers (90% and 57% respectively), although actual numbers of increase in these groups were small. There was no significant increase in either the number of attendances or the attendance rate for Indigenous clients. It is worth noting that, while the male to female ratio is greater than 1 in total attendance, the opposite was true for youths aged under 25 years.

There was a nearly 30 % increase in the number of chlamydia diagnoses while the increase in gonorrhoea diagnoses was 12.1 % (Table 3). As with the situation of number of attendances, the increase in diagnoses in the group of youths under 25 years was much smaller than that for the total diagnoses.

**Discussion**

The numbers of attendances to Clinic 34 had been relatively stable over the 4 years before the relocation at around 3000 attendances per year. With virtually no change in staffing, significant increases in both the number and rate of attendances per year for total, male and female attendances have been recorded after the relocation when comparing the data of 2002/2003 and 2004/2005. This suggests that the new CBD location, being closer to the targeted clients, has indeed attracted more clients.

However, the increase in attendances has not happened in a uniform way across all target client groups. There were only moderate increases in the number of attendances by injecting drug users and sex industry workers with virtually no increase in Indigenous attendance.

Reassuringly there has been a modest increase (12%) in Indigenous client’s attendances for the first 6 months of 2005 (334 attendances) compared to the same time in 2004 (298 attendances).

The reason for such poor uptake by these groups is unclear. It is disappointing that the new location failed to attract more Indigenous clients in this audit. With large numbers of Indigenous people living in public housing close to the city, it was hoped that Clinic 34 would be better utilised by this client group after the relocation, particularly as the Indigenous population has high notification rates of STIs. This identifies the need to increase the publicity of Clinic 34 and awareness of sexual health issues in Indigenous communities in the downtown Darwin area. Effort is also being made to employ on-site Aboriginal Health Workers with the intent to make Clinic 34 more acceptable or ‘user-friendly’ to Indigenous clients. Consideration has also been given to increasing outreach services to Indigenous communities.

| Table 3: Number of diagnoses of chlamydia and gonorrhoea, Clinic 34, by client groups, 2003/2004 and 2004/2005 |
|--------------------------------------------------|------------------------------------------------------------------|
| **Client group** | **Chlamydia** | **Gonorrhoea** |
|                  | 2003/4 | 2004/5 | Increase (%) | 2003/4 | 2004/5 | Increase (%) |
| Annual number of diagnoses | 147 | 191 | 44 (29.9) | 66 | 74 | 8 (12.1) |
| Youth <25 M/F | 99 | 115 | 16 (16.2) | 28 | 29 | 1 (3.6) |
| Indigenous | 34 | 38 | 4 (11.8) | 30 | 24 | -6 (20) |
| IDU | 7 | 6 | -1 (-14.3) | 2 | 6 | 4 (200) |
| MSM | 14 | 16 | 2 (14.3) | 7 | 12 | 5 (71.4) |
| SIW | 0 | 3 | 3 (-) | 0 | 1 | 1 (-) |
more needs to be done to encourage younger people with STI-related problems to access the services provided by Clinic 34.

As this is only the first year after the move, the full impact of the new location may not yet be reflected in the clinical data. Therefore, a further evaluation in the future will be needed. It is intended that each year there will be both a client survey and a key stakeholders survey to determine whether the service is meeting their needs. These surveys will feed into the recently recommended and approved accreditation cycle for all the Clinic 34’s across the NT.

A broader scope of outcome indicators is being considered for future evaluations, including key performance indicators relating to contact tracing, sentinel testing, and outreach services. A more client-friendly clinic redesign is also being considered.

There have been concerns raised that the physical separation of Clinic 34 from the policy and public health arm of the Sexual Health Unit and the major hospital in the Territory has meant the interface, support and assistance to the hospital and Sexual Health Unit and vice versa (e.g. access to tests and medical imaging) has had an impact which is currently being explored.

In terms of client attendance and the increase in notifications of chlamydia and gonorrhoea the relocation of Clinic 34 to the CBD has been a success. However as the data demonstrates, work needs to be done to attract particular client groups such as Indigenous men and women and males under 25. Continuous promotion of Clinic 34 is needed to maintain its public profile. A more systematic approach to publicising and advertising than is currently undertaken is required. The burgeoning epidemic of chlamydia worldwide and the well recognised high NT STI rates demand a continuous proactive approach to STI control.

References:
2. Population data provided by Health Gains Planning, DHCS NT.

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**Rheumatic Fever Video (DVD) launch at Oenpelli on the 12th of Dec 2005.**

The day was a great success for all, clients, staff and visitors. Staff at this centre decided to make it a priority to improve the problem of poor compliance of Long Acting Bicillin (LAB) and service delivery, and there has been a dramatic improvement from low rates 2-3 years ago to high rates, e.g. now there is a 97% compliance rate. The nurse coordinating the Rheumatic Heart Disease (RHD) program, Paula Harrison, along with her colleagues are to be congratulated for all the energy and effort put in to making the RHD program as well as the launch such a huge success. Paula in particular for her enthusiasm and support for the Rheumatic Heart Disease Program and also for her continuing dedication and involvement to the Gunbalanya (Oenpelli) community. The Northern Territory Government, Department of Health and Community Services praised and presented Paula with a specially printed shirt depicting the new Rheumatic Fever DVD.

Lunch consisted of a BBQ with accompanying salads and fresh fruit supplied and provided by the Dept of Health and Community services and was enjoyed heartily by the Darwin visitors representing the Rheumatic Heart Disease program Darwin, NT Cardiac, The National Heart Foundation, Menzies School of Health Research, the Oenpelli Community Health Centre staff along with the Gunbalanya community.

The highlight of the day was that following their echocardiographs and according to RHD Guidelines 2 long term clients were assessed by Dr Malcolm McDonald and told they were no longer required to have an LA Bicillin injection every 4 weeks. They were delighted and so was everyone there for them. The Darwinites returned to Darwin by charter plane that evening weary but rewarded by the whole exhilarating experience.

For information about The Rheumatic Fever DVD contact Maureen Egan at the Centre for Disease Control, Darwin. Ph 89227932.
Sexually Transmitted Infections in Those Under 16 Years of Age in the Northern Territory

Jiunn-yih Su, Steven Skov, Kevin Sesnan/ Sexual Health and BBV Unit, CDC Darwin

The Northern Territory (NT) rates of the notifiable sexually transmitted infections (STIs) have for many years been the highest in the country.1 Gonorrhoea and chlamydia have been consistently increasing whereas syphilis, although still significantly higher than national rates, has shown some indication of a decrease in the last 3 years.2

In recent years there has been concern about the large numbers of STIs occurring in young people under the age of 16 years. This not only is a significant public health and social problem but has also posed difficulties to health care providers in properly assessing these cases and arranging appropriate follow-up. The Department of Health and Community Services (DHCS) currently has a working group looking at guidelines for the management of STIs in young people in the NT.

A particular aspect of these guidelines focuses on the legislative requirements for reporting of STIs in young people. Briefly these may be summarised as:

- Maltreatment, which might include a broad range of abuse or harm of a person under the age of 18 years, must be reported to the Police or Family and Community Services (FACS) under the Community Welfare Act.
- Under the Law Reform (Gender, Sexuality and De Facto Relationships) Act sexual activity is illegal in persons under the age of 16 years although there is no active requirement to report such activity (in the absence of maltreatment) to the police.
- While a person under 18 years may legally consent to medical treatment without their parents’ knowledge, if a medical practitioner diagnoses an STI in a person under 16 years, The NT Notifiable Diseases Act obliges him/her to inform the parents of that person.

There are many issues requiring consideration by busy primary care practitioners when managing a case or suspected case of an STI in a child including as to whether maltreatment has taken place. In order to reduce the likelihood of maltreatment being missed, the working group is considering recommending a policy that those DHCS employees primarily responsible for the diagnosis and management of an STI, in a person 13 years of age and under, report the cases to FACS in all instances.

This paper presents data on STIs in persons under the age of 18 years with further breakdowns for those under 16 and 14 years during the period 1995-2004 in order to inform the discussions of the working group. As another indication of the burden of disease in these age groups the paper also includes hospital admission data concerning pelvic inflammatory disease in persons under the age of 18 years during the period 1999-2004.*

* These data may include small numbers of cases gonococcal or chlamydia conjunctivitis misclassified as genital infections particularly in children in the 0-4 years age group.

Figure 1: Number of notifications of gonorrhoea by age group, NT, 1995-2004
Table 1: Number of notifications of gonorrhoea by year and age group, NT, 1995-2004

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Table 2: Number of notifications of chlamydia by year and age group, NT, 1995-2004

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Table 3: Number of notifications of syphilis by year and age group, NT, 1995-2004

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<td>189</td>
<td>295</td>
<td>529</td>
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Gonorrhoea
In the last 10 years, there were 11,667 notifications of gonorrhoea. Among them, 199 (1.7%) were in persons under 14 years old, including 152 (76.4%) females and 47 (23.6%) males with a female to male ratio of 3.2 to 1. The majority (66.3%) of these cases were in the 12-13 years age group (Table 1). From 2001 onwards, there have been around 20 to 30 gonorrhoea notifications aged under 14 years each year (Table 1) which translate into rates of approximately 43 to 65 per 100,000 population.* In contrast, the national rates of gonorrhoea notifications for all ages in the past 5 years have been between 30.3 to 35.6 per 100,000 population.1

Chlamydia
A total of 10,293 notifications of chlamydia were recorded in the last 10 years and among them 150 (1.5%) were in under 14 year olds (Table 2). Out of these, 122 (81.3%) were female and 28 (18.7%) were male with a female to male ratio of 4.4 to 1. The majority (60.7%) of them were in the 12-13 years age group (Table 2). There have been in excess of 20 chlamydia notifications per year aged under 14 years from 2002 onwards (Table 2), giving a rate of at least 43 per 100,000 population in the last 3 years, compared with the national rate for all age groups in the range of 87-179 per 100,000 population in the last 5 years.1

* The under 14 years population for the NT was calculated to be 46,216.3

Syphilis
There were in total 3,248 syphilis notifications in the NT from 1995 to 2004. Of these, 45 (1.4%) persons were under 14 years of age (Table 3), 31 (68.9%) were female and 14 (31.1%) were male with a female to male ratio of 2.2 to 1. Over half of the syphilis notifications aged under 14 years were recorded in the 12-13 year age group.

STIs in under 14 year olds
Table 4 gives a summary of the number of notifications of STIs in the under 14 years age group in the NT in the past ten years. There were no data for trichomoniasis before 1999 because it was not notifiable before that year.

Table 4: Notifications of STIs in the under 14 years age group, NT, 1995-2004

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<th>Chlamydia</th>
<th>Gonorrhoea</th>
<th>Syphilis</th>
<th>Trichomoniasis</th>
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<tr>
<td>Total</td>
<td>150</td>
<td>199</td>
<td>45</td>
<td>61</td>
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</table>

Figure 2: Number of notifications of chlamydia by year and age group, NT, 1995-2004
Hospital admissions for pelvic inflammatory disease (PID)

The Hospital Morbidity Database was searched for admissions due to pelvic inflammatory disease (PID) among those under the age of 18 during the period 1999 to 2004. The data presented only relates to diagnoses of PID where a diagnosis of infection with either gonorrhoea or chlamydia was also made. This will underestimate the full amount of long-term complications of these infections. A first episode of PID due to gonorrhoea or chlamydia can damage the upper genital tract and make it susceptible to infection by organisms which would not ordinarily do so. Therefore, recurrent attacks of PID may occur where no gonorrhoea or chlamydia is detected but where the original damage was due to these organisms. It may also occur that these organisms are present in the upper genital tract but are not detected at the endocervix where specimens are taken.\(^4,5\)

From 1999 to 2004, there were 176 hospital admissions involving 83 individuals in persons under 18 years of age for PID recorded in the 5 NT public hospitals (Table 5). Just over half of these separations were recorded in Alice Springs Hospital while nearly 30% of them were from Royal Darwin Hospital.

Among these separations, 147 (83.5%) were Aboriginal and 29 (16.5%) were non-Aboriginal patients (Table 5). There were 20 patients admitted, all of whom were Aboriginal, when they were less than 14 years of age.

Table 5: Hospital separations for PID in those under the age of 18 years by hospital, NT, 1999-2004

<table>
<thead>
<tr>
<th>Hospital</th>
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<th>%</th>
<th>Number of individuals</th>
<th>%</th>
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<td>51.1%</td>
<td>32</td>
<td>38.6%</td>
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<td>Gove</td>
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<td>3.6%</td>
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<td>Royal Darwin</td>
<td>50</td>
<td>28.4%</td>
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<td>36.1%</td>
</tr>
<tr>
<td>Tennant Creek</td>
<td>23</td>
<td>13.1%</td>
<td>12</td>
<td>14.5%</td>
</tr>
<tr>
<td>Total</td>
<td>176</td>
<td>83</td>
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The annual numbers of these separations has shown fluctuations over the last 6 years, with over 50 separations in both 2002 and 2004 (Figure 3).

Discussion

The high rates of notifiable STIs in the NT are well documented.\(^2\) As is the case nationally and internationally, the 15-24 years age group in both males and females in the NT are consistently known to have the highest age-specific rates of gonorrhoea and chlamydia.

However, as illustrated in the above analysis, the NT rates for those under 14 years of age are extremely high, and for gonorrhoea, even higher than the national rate for all ages. In keeping with high rates of gonorrhoea and chlamydia, there are
also disturbing numbers of hospital admissions for pelvic inflammatory disease including some in very young girls.

Over the past 10 years notifications of gonorrhoea and chlamydia have been steadily increasing both in the NT and the rest of Australia. It is considered that a great deal of this increase is due to increased testing since non-invasive tests with nucleic acid amplification tests became available. In the NT the numbers of notifications of gonorrhoea and chlamydia in those under 16 years of age have on average represented 8% and 7% of notifications of all ages in last 10 years, respectively. However, the increases in the 14-15 and 16-17 years age groups from 1997 to 2004 were considerably greater than the increases in the total notifications during the same period of time for both gonorrhoea (2.9 times for 14-15 years and 2.3 times for 16-17 years versus 1.6 times for the total) and chlamydia (3.7 times for 14-15 years and 2.7 times for 16-17 years versus 2.6 times for the total).

While this increase in these younger age groups may be partly related to increased access to testing it is unlikely to account for the entire increase. We have very little information in the NT about the sexual activity of young people. We know little about the age at which young people in the NT generally become sexually active or of the numbers who became sexually active at very young ages. We do not know how much of the sexual activity (or STIs) of young people is influenced by drug or alcohol use, how much is genuinely consensual or how much may be coercive or indicative of abuse.

In conclusion, these data should be of concern to all in the NT and support the need for the management guidelines of STIs in young people. They also point to a need for broader and more in-depth review and discussion of the many and complex underlying causes for STIs within society in the NT.

References:

2. Sexual Health and Blood Borne Viruses Unit Surveillance Update, Department of Health and Community Services, NT, 2004; Vol. 5, No. 2

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World AIDS Day

World Aids Day Activities included a very successful breakfast organised by the Northern Territory AIDS Council (NTAC) in Darwin and a Cocktail Party at Parliament House. Evening activities concluded the day at Battery Hill.

Alice Springs held a World AIDS Day vigil and provided education and a barbeque in the mall. A presentation was given by Kath Fethers in Tennant Creek at an evening Barbeque.

Nhulunbuy CDC staff, including Mary Fleming from Administration support and Ivor Alexander set up an AIDS information stall located outside of the QANTAS office in the town centre on World AIDS Day. It was decorated with Ivor's collection of past World AIDS Day T-shirts. A total of $388 was raised from Red Ribbon sales thanks to the generosity of the Nhulunbuy residents and the support of the QANTAS team.

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Alcan/G3: expansion & contraction

Ivor Alexander, CDC Nhulunbuy

Alcan Gove Pty Ltd operates the bauxite mine and alumina refinery near the town of Nhulunbuy, East Arnhem Region, Northern Territory.

In September 2004 an announcement was made that Alcan would undertake a major expansion to increase production from 2 million to 3.8 million tonnes of alumina annually by 2007. This expansion was named G3. The original construction, circa 1970, was G1 and an expansion in 1990 was G2, hence the present G3.

To facilitate the expansion an accommodation village to house about 1700 people was constructed and includes an Internet café and a mess hall and has expanded to include a licensed tavern for G3 residents and their guests located nearby. The majority of village occupants have been recruited on a “fly in-fly out” basis. Staff have been recruited from overseas as well as all Australian jurisdictions. When the project is completed the majority of staff will leave the community.

Centre for Disease Control (CDC) Nhulunbuy was approached by Alcan Community Affairs staff and asked to have health input into the G3 induction program on a daily basis. I was invited to do a presentation to the senior staff trainer and the Environment Health and Safety (EHS) manager of the village. Following this I was allocated a 40-minute time slot, which is flexible, depending on the size of the group. These sessions commenced on the 16 March and are continuing on a daily basis.

Newly recruited staff were dependent upon the routine am and pm flights from Cairns and Darwin, so limited seat availability as well as limited residence has affected the expansion program as well as local residents. Now, however G3 has its own charter flights in and out, as well as routine flights.

Our program has grown to meet the needs and enquiries of the new workers.

We provide an overview of CDC, it’s membership, location/s role and function including services offered.

The topics covered include:
- STI’s, including services offered by Clinic 34
- Mosquito borne diseases
- Melioidosis
- Ciguatera toxin
- Hepatitis A & B
- Irikandji syndrome

We have recently expanded with the inclusion of:
- Australian bat lyssavirus
- Water buffalo attacks on humans

CDC handouts are provided at all the sessions and a DVD of the presentation is provided to the G3 training staff if CDC staff are, on occasion, unable to attend. There is progressive evaluation of the sessions by G3 evaluators. Since the commencement of our input some 1080 G3 staff have attended the sessions.

This program has allowed for better liaison between CDC and the G3 project. All of the major contracting companies have their own EHS managers and we have provided briefing sessions to the EHS staff on hepatitis and influenza vaccination recommendations.

Any large congregation of people in a military camp style setting, or boarding school model, has the potential for communicable disease outbreaks and CDC is well positioned to provide and support interventions in the case of such outbreaks.

What I have found interesting in discussions with the new workers were the number of inductees who had had prior exposure to, and suffered from, a wide range of mosquito borne diseases, hepatitis of various types and Ciguatera toxin poisoning.

A consultant was engaged to evaluate the G3 induction program some 2 months after we commenced our sessions. Some thought was given to reducing our sessions, however when a reviewer’s family member came down with Ross River virus while on-site, the need for introductory information and guidance was reinforced.
### NT NOTIFICATIONS OF DISEASES BY ONSET DATE & DISTRICTS

1 July—30 September 2005 and 2004

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Ratio of the number of notifications in the 3rd quarter 2005 compared to the mean of the 3rd quarter for the previous 4 years: sexually transmitted infections and blood borne diseases

![Graph showing ratios of notifications for various diseases such as Hepatitis B, HTLV1, Chlamydia, Gonococcal infection, and Trichomoniasis.]

Ratio of the number of notifications in the 3rd quarter 2005 compared to the mean of the 3rd quarter for the previous 4 years: selected diseases

![Graph showing ratios of notifications for various diseases such as Hepatitis A, Shigellosis, Pertussis, and Meningococcal infection.]

Beyond 2SD of mean of previous years
Comments on disease notifications with significant changes (p 35)

**Acute post-streptococcal glomerulonephritis**

Cases of APSGN decreased significantly in the third quarter from the high number associated with outbreaks in the first 2 quarters but were still significantly higher than the mean for the previous 4 years (14 vs 3.5).

**Shigella**

The high rates of shigellosis reported in the first 2 quarters from Central Australia continued into the third quarter together with a cluster of 17 cases of a mannitol negative variant of *S. flexneri* 4a in the Centre.

**Hepatitis A**

The rates in the third quarter reflected the outbreak in Central Australia which has been reported elsewhere.

**Hepatitis C**

Notifications of hepatitis C were above the 4 year mean in the third quarter but the absolute change was small (62 vs 54). Previous increases in notifications were investigated and thought to be due to increase in testing. More information about Hepatitis C epidemiology will be available with enhanced surveillance in 2006.

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**NT Malaria notifications July - September 2005**

*Merv Fairley, CDC, Darwin*

Ten notifications of malaria were received for the third quarter of 2005. The following table provides details about where the infection was thought to be acquired, the infecting agent and whether chemoprophylaxis was used.

<table>
<thead>
<tr>
<th>Number of cases</th>
<th>Origin of infection</th>
<th>Reason exposed</th>
<th>Agent</th>
<th>Chemoprophylaxis</th>
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<td>Resident</td>
<td><em>P. vivax</em></td>
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<td><em>P. vivax</em></td>
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<td>Indonesia</td>
<td>Resident</td>
<td><em>P. falciparum</em></td>
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<tr>
<td>1</td>
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<td>Brazil</td>
<td>Holiday</td>
<td><em>P. vivax</em></td>
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**************
Disease Control staff updates

Immunisation

Maryanne Sharp left us in October to have a bouncing baby girl, named Bridget on 24/11/2005. Both Mum and Baby are very happy and healthy.

Charles Roberts returned to CDC to fill Maryanne’s Part-time Immunisation Data Entry place while she is on Maternity Leave. Charles worked with the Hepatitis C Program previously. Charles has recently chosen to move into the full time temporary position with the Adult Immunisation database from 15/12/2005 until June 2006. His knowledge and experience is a welcome addition to the immunisation team.

Mary Fleming has commenced working part time as Admin Nhulunbuy, Mary previously worked in a GP clinic, dental, and more recently in an executive secretarial position with Alcan.

Medical entomology

Stacey Barkworth has moved to a new contract TO2 position in MEB Darwin (formerly TO1 Aedes aegypti program Tennant Creek). Nadine Graham, commenced as TO1 based in MEB Darwin for Aedes aegypti program Tennant Creek. Jeff Kennedy, TO3 Aedes aegypti program Tennant Creek leaves and Colin O’Donnel and John Toomey have commenced with the Aedes aegypti program Tennant Creek

Environmental Health

Rachel Sheppard departs from Central Australia. Rachael Gaffney commences 12 months leave from Darwin Urban. Kelly Nunn and Chris Luthy have both started short term contracts with Darwin Urban

SH&BBV

Dr Kevin Sesnan and Dr Brian Hughes have resigned and in the interim Dr Russell Waddell is providing specialist sessions on a visiting basis from Adelaide.

Claudia Rayne and Jade Neave have both completed their Indigenous Education contract positions. New positions will be filled in 2006. Mr Shaun Tatipata will be commencing in January as Urban male AHW.

Micheal Moriarty will be filling Autumn Goodall’s position as Autumn has commenced maternity leave.

Dear Editor

This building was a priority to better service our illegal fishers, situated in the yard of CDC Nhulunbuy. It also serves as Hartley’s personalised cyclone shelter and place of refuge/sanctuary to escape from the rest of the team (his quiet place perhaps, or perhaps not!!).