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Epidemiology and prevention of pneumococcal disease

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Abstract

There are comparatively little data on the incidence and morbidity from pneumococcal disease in Australia and elsewhere. Available data suggest that the overall incidence of invasive pneumococcal disease in Australia is comparable with similar populations. Very high rates are reported in Central Australian Aborigines, similar to invasive Haemophilus influenzae type b (Hib) disease. Disease incidence is probably greatly underestimated by case ascertainment from sterile site isolates alone. New diagnostic methods, such as serology to detect components of the pneumococcal cell wall, promise to significantly enhance detection of pneumococci as a cause of pneumonia, especially in childhood, but are epidemiologic rather than clinical tools. Resistance to penicillin and other antibiotics is an increasing problem worldwide, promoted by excessive antibiotic use, especially in children. This has focused attention on vaccine prevention. Fortunately, antibiotic-resistant pneumococci appear to belong to a limited range of serotypes, those commonly colonising children, in all areas so far studied. If conjugate pneumococcal vaccines prove to eradicate carriage, in a similar fashion to conjugate Hib vaccines, vaccination may be the major weapon against the spread of antibiotic-resistant pneumococcal infection. Conjugate pneumococcal vaccines are now in large scale efficacy trials, with outcomes of bacteraemia (California) and otitis media (Finland). Results of these trials are eagerly awaited. *Comm Dis Intell* 1997;21:41-46.

Introduction

Streptococcus pneumoniae has been recognised as a major human pathogen since it was described by Pasteur in 1891. Two recent developments have brought preventative strategies for pneumococcal infection into prominence. First, penicillin-resistant and multi-resistant pneumococci have become more prevalent in many parts of the world[1]. Second, conjugate vaccine technology is now being applied to pneumococcal polysaccharides, making vaccines capable of protecting young children a possibility[2]. Recent evidence suggests that conjugate pneumococcal vaccines reduce nasopharyngeal carriage in the same manner as conjugate *Haemophilus influenzae* type b (Hib) vaccines[3,4]. As paediatric serotypes are over-represented among antibiotic-resistant strains, immunisation of infants and children may be the best approach to reducing the prevalence of serotypes of pneumococci associated with antibiotic resistance[5].

Incidence of pneumococcal disease

There are a number of difficulties in case ascertainment and estimation

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Table 1. Incidence of invasive pneumococcal disease in non-indigenous populations

Study	Incidence per 100,000 population	
	Children <5 years	Children <15 years
Sweden[13] (1970 to 1980)	25.8[a]	4.6[b]
New Zealand[29] (1984 to 1992)	36	13
Finland[18] (1985 to 1989)	24.2	8.9c
New York[44] (1985 to 1989)	90.6	25.2[b]
Central Australia[12] (1985 to 1990)	87	15
Alaska[23] (1986 to 1990)	73	22.2[b]
South Carolina[45] (1986 to 1987)	162[d]	Not available
Israel[19] (1988 to 1990)	42	19.9[e]
Victoria[14] (1994 to 1995)	63[d]	Not available
Sydney[f] (1991 to 1996)	32	11

a. under 1 year of age
b. under 19 years of age
c. under 16 years of age
d. under 2 years of age
e. under 13 years of age
f. manuscript in preparation: Liddle J, Davis C and McIntyre P

Table 2. Incidence of invasive pneumococcal disease in indigenous populations

Study	Incidence per 100,000 population	
	Children <5 years	Children <15 years
New Zealand[46] (1984 to 1992)	92	39
Central Australia[12] (1985 to 1990)	935	195
Alaska[22] (1986 to 1990)	327	88[a]
Apache[47] (1983 to 1990)	530	9.9[b]

a. under 19 years of age
b. under 13 years of age

of the incidence of pneumococcal disease.

Sterile site isolates

Unlike invasive *Haemophilus influenzae* disease, which is usually associated with bacteraemia and is predominantly due to one serotype (b), pneumococci have at least 80 different capsular types,and many significant pneumococcal infections, such as pneumonia, are uncommonly associated with bacteraemia[6]. Thus, pneumococcal isolates from sterile sites probably greatly underestimate the incidence of significant pneumococcal infection.

Respiratory isolates

Respiratory specimens are also problematic for case ascertainment because carriage of pneumococci in the respiratory tract is relatively common[7]. The significance of a pneumococcal isolate from sputum therefore depends on the clinical picture and the adequacy of the specimen. Sputum is not suitable for diagnosis of pneumonia in children below the age of ten years, because adequate sputum specimens are difficult to obtain.

Prior antibiotic therapy

In both adults and children with pneumonia, the apparent incidence of pneumococcal infection is further reduced by preceding antibiotic therapy. In a recent study from Adelaide, adult patients (mean age 60 years) hospitalised with pneumonia had evidence of pneumococcal infection in 44 cases (42%)[8]. Of these 44 cases, blood cultures were positive in 5% of those cases who had preceding antibiotic therapy compared with 19% of others.

Needle aspiration

Needle aspiration of the lung is probably the closest to a gold standard for bacteriologic diagnosis of pneumonia, but is limited to anatomically accessible sites. Published studies have demonstrated high rates of bacterial and pneumococcal pneumonia in the pre-antibiotic era and in developing countries with a more severe spectrum of disease, but needle aspiration is too invasive for routine use[9].

Serology

As pneumococcal pneumonia is associated with bacteraemia in 5% or fewer of childhood cases in industrialised countries, groups in Sweden and Finland have developed and promoted serologic diagnosis as a non-invasive method of improving case ascertainment[10]. An antibody response to pneumolysin was seen significantly more frequently in children with acute lower respiratory tract infection (12.4% overall and 9.0% below two years) than in controls (2.7% overall and 3.6 % below two years). In addition, the significantly higher rate of seropositivity in the presence of radiologic infiltrates (51%) compared with children with normal chest X rays (17%) supports the validity of serologic diagnosis[11].

Estimates of the incidence and age distribution of pneumococcal disease

Population-based incidence data from sterile site isolates in children in industrialised countries, including unpublished data from Sydney and Victoria, are summarised in Table 1. Recently, central Australian Aborigines have been reported to have the highest incidence of invasive pneumococcal disease yet described[12]. Population-based data from this and other indigenous populations are shown in Table 2. In all populations, the highest incidence of invasive pneumococcal disease is at the extremes of life (the first 12 months of life and over 70 years of age)[13,14].

Mortality and morbidity

Data on short- and long-term morbidity from childhood pneumococcal disease in Australia are sparse. In Sydney between 1981 and 1992, 26 children (6.6%) died, with underlying conditions present in 18 (69%)[15]. Long-term morbidity was largely limited to meningitis, where 35

of 104 surviving patients (34%) in Sydney had one or more neurologic deficits at discharge. These included hearing loss, which was the only deficit in 12 patients, and a range of other neurologic deficits in the other 23 surviving children. In Victoria between 1994 and 1995, the overall case fatality rate was 10%, with two-thirds of deaths occurring in patients over 60 years of age with pneumonia[14]. These findings are in accord with those from other studies, where the case fatality rate was related to extremes of age and the presence of underlying diseases[13,15].

Prevalent pneumococcal serotypes

There are now more than 80 serotypes of Streptococcus pneumoniae described. Their relative frequency, vitally important for vaccine policy, varies according to site of isolation, age, antibiotic resistance and geography, and over time. Five or six capsular types account for 60-70% of disease in most series from industrialised countries[6].

Industrialised countries

Among infants and children in four centres in the United States of America between 1957 and 1978, types 6, 18, 19, 23 and 14 were consistently among the five most common invasive isolates[16]. More recent data from the United States of America, based on 3,884 isolates, found the three most common serotypes to be 14, 6B and 19F, with little variation by age (less than two years versus two to six years) or geographic area[17]. There was variation by site, with serotypes 3, 9A and 23F significantly more frequent from the middle ear. Consequently, 85% of invasive isolate serotypes would be included in a putative heptavalent vaccine, compared with 65% of middle ear isolates. In contrast to the United States of America, population-based studies from Finland[18] and Israel[19] show important differences among prevalent serotypes by age, location and ethnic group. Types 6, 14 and 19 accounted for 53% of 365 strains in Finland but only 33% of 205 strains in Israel, with types 7, 18 and 23 causing 25% of disease in Finland and types 1, 5, 18 and 23 making up 47% of isolates in Israel.

Australia

There are few published Australian data on prevalent pneumococcal serotypes. Among 1,252 isolates in Sydney, including 96 from blood or cerebrospinal fluid (CSF), between 1965 and 1969, types 19, 23, 6, 3 and 9 accounted for 43%[20]. Other data are unpublished or in abstract form. Hansman has reported the most common serotypes from 588 invasive isolates in adults and children in five States between 1988 and 1993 as 19, 6, 14, 23 and 3[21]. The Australian Group on Antimicrobial Resistance (AGAR) serotyped all invasive or penicillin-resistant isolates received from participating laboratories in 1994 (J Bell, Australian Group on Antimicrobial Resistance, personal communication). Of 282 invasive isolates in children (<15 years), types 14 (40%), 6 (17%), 19 (14%) and 23 (10%) accounted for 81% of serotypes. Of 11 invasive penicillin-resistant isolates, nine were serogroup 6, and one each was type 14 and 23. In Victoria in 1994 to 1995, the most common serotypes among 445 sterile site isolates from patients of all ages were 14 (29%), 6 (12%), 19 (11%) 9 (9%), 23 (8%), 4 (7%) and 18 (6%), with these seven serotypes/groups accounting for 93% of infections in those under two years of age and 80% of infections in those over 60 years of age[14].

Less industrialised countries

The distribution of pneumococcal serotypes is much more diverse on a worldwide scale, making the formulation of a conjugate vaccine with a feasible number of serotypes suitable for use in all areas problematic. Workers from the United States of America Centers for Disease Control and Prevention, with collaborators from all continents, have recently summarised serotype data from sterile site isolates including transtracheal aspirates, pleural fluid and lung aspirates, from a number of developed and less developed countries, with special emphasis on pneumonia[22]. Serotypes 14, 6 and 19 were consistently important in all geographic areas, while type 18 was important only in developed countries and types 1 and 5 only in developing countries. A formulation containing types 6B, 14, 19F, 23F, 9V, 4 and 18C was thought most appropriate for developed countries. This covered from 65% (Spain) to more than 85% (Finland and United States of America) of isolates from developed countries, but less than 35% (Rwanda, Egypt and Papua New Guinea) to 59% (Gambia) for a range of developing countries. Their suggested formulation for developing countries substituted types 1 and 5 for 4 and 9V, giving significantly improved coverage (58 - 73%) except for some geographic areas, such as Papua New Guinea (42%) which have very diverse serotypes reported.

Indigenous populations in industrialised countries

In contrast, the serotype distribution among indigenous populations such as Alaskan native Americans[23] and Aborigines in central Australia[24] more closely resembles the industrialised countries to which they belong. In Alaska, seven serotypes (4, 6, 9, 14, 18, 19 and 23) which are included in one prototype conjugate vaccine, accounted for 85% of invasive strains from children less than two years old. Among persons older than 19 years, these serotypes accounted for only 40% of invasive strains, although 94% of isolates were covered in the 23-valent polysaccharide vaccine. In central Australia, types 14, 6B, 9V, 4, 18C and 19F accounted for 67% of isolates from children under five years old, while in adults, types 1, 7F, 3, 4, 12F and 8 were most common, accounting for 68% of isolates.

The available data, particularly from developing countries, are limited by lack of control for age and antibiotic and vaccine exposure. Controlled studies of larger size and over a longer time frame are needed from both industrialised and developing countries to judge the most appropriate vaccine formulations.

Epidemiology of antibiotic resistance

Streptococcus pneumoniae remained very sensitive to penicillin, with minimum inhibitory concentrations (MICs) less than 0.02 micrograms per mL, for many years. Although antibiotic resistance was recognised in vitro in the 1940s, it was first described as a clinical problem by Hansman and Bullen in 1967[25]. Initially isolates were only moderately resistant (MIC between 0.1 and 1.0 microgram per mL) but highly

resistant isolates (MIC >2 micrograms per mL) were then reported, first from Spain and South Africa and more recently from Eastern Europe and parts of the United States of America.

Resistance of *Streptococcus pneumoniae* to penicillin and other antibiotics is increasing in all areas of the world[26]. The pattern of resistance is notable for its uneven distribution both between countries and within countries. South Africa, Spain and Eastern Europe report rates of any (intermediate or high level) penicillin resistance of up to 50%[26], compared with less than 10% in most of Western Europe[26]. In the United States of America, high level penicillin resistance has steadily increased from 0.02% to 1.3% overall, but is concentrated in certain geographic areas[27].

In Australia antibiotic resistance is also increasing. In 1989, 31 (1.7%) of 1,822 isolates from major laboratories in all States were penicillin resistant, but no isolates showed high level resistance[28]. By 1994, of 2,181 pneumococci studied, 127 (5.8%) had intermediate sensitivity to penicillin, 14 (0.6%), including two blood culture isolates, were highly resistant and 8% of all isolates were multi-resistant, defined as resistance to three or more antibiotics[29]. Resistance to other antimicrobials was also significant, including approximately 10% to erythromycin and tetracycline, 6% to chloramphenicol and 40% to cotrimoxazole. Eight per cent of all isolates were multi-resistant[29].

In some Aboriginal communities, levels of antibiotic resistance among pneumococci are much higher. As early as 1981, a surveillance study using nasal swabs among Aboriginal children in central Australia found 27 of 174 (15.5%) of pneumococci isolated to be penicillin resistant[30]. In 1993 to 1994, a prospective study of antibiotic prophylaxis for otitis media in Aboriginal children in the Northern Territory found that the rate of isolation of multi-resistant pneumococci from the nasopharynx increased from 3/41 (7%) to 14/31 (45%) as the study progressed[31]. There was also evidence of transmission of multi-resistant strains from treated, older infants to untreated, younger infants. A study of children admitted to hospital in Darwin in 1994 to 1995 confirmed high colonisation rates in rural Aboriginal children, and penicillin-resistant strains in Aboriginal and non-Aboriginal children, with overall rates of penicillin resistance of 30%[32]. As observed in Israel in 1981[5] and elsewhere[26], a restricted group of serogroups generally associated with carriage in children (6, 9, 14, 19 and 23), were responsible for more than 80% of penicillin-resistant infections.

An important study from Iceland has provided convincing confirmation of the link between antibiotic usage and penicillin resistance in pneumococci33. Nasopharyngeal swabs for culture of pneumococci were obtained from a cross-sectional sample of children less than seven years of age attending day-care centres in five regions. The overall rate of pneumococcal carriage was 52.7%, with 47 (9.7%) of nasopharyngeal isolates penicillin resistant. Antibiotic usage was strongly associated with carriage of penicillin-resistant pneumococci, after correction for other variables in a multivariate model. Recent exposure was also important, as 1.8% of children who had no courses of antimicrobials in the previous year carried resistant strains, compared with 14% who had any courses and 61% of those who had received antimicrobials in the previous two to seven weeks[33].

Strategies to promote accurate surveillance of penicillin-resistant isolates, appropriate use of pneumococcal vaccination and decreased inappropriate antibiotic use, especially in young children, are crucial to minimising the impact of antibiotic-resistant pneumococcal infections. Recommendations recently made by the Centers for Disease Control and Prevention are likely to be generally applicable in industrialised countries[34].

Risk factors for invasive pneumococcal disease in children

Risk factors for childhood pneumococcal disease among populations in industrialised countries have been examined in case-control studies in Finland[35] and California[36]. Day-care attendance was associated with significant risk only in children younger than two years in Finland (odds ratio (OR) = 36, 95% CI 5.7 - 233) while in California, the OR for children less than five years old was 2.6 (1.6 - 4.3). Recent otitis media was a significant risk factor in both studies (OR 1.6 to 5). Unlike invasive *Haemophilus influenzae* type b (Hib) disease, breast feeding was not found to be protective in either study. In California, an increased incidence of invasive pneumococcal disease was found in Afro-American children (OR 2.8) and, unlike Hib disease, in children of Asian descent (OR 2.5). Both these populations differ substantially from Australian urban populations in a number of demographic features, and similarly to Hib disease, risk factors may not be generalisable.

Pneumococcal vaccines

Polysaccharide vaccine

The currently available pneumococcal vaccine contains purified capsular polysaccharide antigens of 23 serotypes of S. pneumoniae (Danish types 1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19A, 19F, 20, 22F, 23F, 33F)[6]. Each 0.5ml dose of vaccine contains 25 micrograms of each polysaccharide antigen, compared with 50 micrograms of each in the 14-valent vaccine. Young adults have the strongest responses to pneumococcal polysaccharide vaccine and response is reduced at the extremes of age and in a range of underlying conditions[6]. Almost no response is seen in individuals with leukaemia, lymphoma or Hodgkins disease. Even infants below one year of age will respond to serotypes 3, 4, 8 and 9, but antibody does not persist. Children immunised at six months have similar antibody levels to controls at the age of two years, and demonstrate no boosting response[6,37]. Unfortunately, children below the age of five years show little response to the prevalent serotypes 6A, 14, 19F and 23F [6,37].

The high rates of invasive pneumococcal disease occurring early in life in developing countries, many of which already have maternal tetanus immunisation programs, makes maternal pneumococcal immunisation a potentially important intervention in this setting. A collaborative group of investigators from the United States of America and Bangladesh has studied

pneumococcal antibody in serum and breast milk in 36 maternal-infant pairs following pneumococcal polysaccharide vaccine at 30-34 weeks gestation, with meningococcal polysaccharide vaccine as the control[38]. Study infants had geometric mean titres (GMTs) two- to three-fold higher than controls. Despite this, rates of nasopharyngeal colonisation with pneumococci were high (50% by three months) and did not differ between study and control infants[38]. Whether these short-term differences in antibody would translate into disease reduction on a population basis or interfere with subsequent active infant immunisation with a conjugate vaccine is unknown.

Polysaccharide-protein conjugate vaccines

Following the success of protein conjugate vaccines in eliminating *Haemophilus influenzae* type b (Hib) disease in many areas of the world, largely through reduction in nasopharyngeal colonisation, studies of protein conjugate pneumococcal vaccines are of great interest. Each serotype essentially requires a separate vaccine, and probably limits any conjugate formulation to a maximum of 7 to 9 serotypes, although the number of serotypes included has steadily increased with ongoing vaccine development[39].

Data on conjugate pneumococcal vaccines are currently limited to immunogenicity studies, pending the results of efficacy trials in Finland and California with endpoints of otitis media and bacteraemia respectively. In contrast to the experience with the comparable Hib conjugates, a vaccine using the outer membrane of *Neisseria meningitidis* type b (OMP) as the conjugating protein gave responses which seem to depend largely on the nature of the pneumococcal polysaccharide[40]. After one dose, responses were seen only to serotypes 14 and 19F, with a response to 6B and 23F, known to be poorer immunogens, requiring two doses irrespective of whether vaccination began at two or four month of age. In a developing country setting, a vaccine using CRM_{197} as the conjugating protein in a 2,3,4 months schedule in Gambia gave significantly higher antibody responses than a control group who received Hib vaccine with the same protein conjugate. However, the GMT to all serotypes rose substantially in the control group, probably due to high early rates of colonisation with pneumococci in this population[41]. The vaccine in the Gambian study, which had a five-fold greater dose of polysaccharide than the Finnish vaccine, was associated with a higher rate of local reactions[40,41]. This is another possible limiting factor for increasing the number of serotypes in pneumococcal conjugate vaccines, as polysaccharide dose is an important determinant of response[40]. However, like conjugate Hib vaccines, conjugate pneumococcal vaccines provide immunologic priming, so natural boosting may occur[42]. Data suggest that mucosal colonisation with pneumococci may be reduced following conjugate pneumococcal vaccine[3] similar to Hib vaccines[4], but this may be serotype specific, with non-vaccine serotypes filling the ecological niche[43]. Conclusions must await the results of randomised controlled trials.

Conclusions

Invasive pneumococcal disease remains an important cause of morbidity and mortality in Australia, especially in the very young, the very old and other at-risk populations. The emergence of antibiotic-resistant pneumococci is an important development which will necessitate changes in laboratory and clinical practice. This development should also underline the need for prudent antibiotic use in the community, especially for young children, the great majority of whom have viral rather than bacterial respiratory tract infections. Vaccination with the current 23-valent vaccine (in at-risk adults) and with newly developed conjugate vaccines (in infants) may offer the best chance to control both pneumococcal disease and antibiotic-resistant strains.

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Hepatitis A outbreak in New South Wales

Over the past three weeks approximately 150 cases of hepatitis A have been reported in New South Wales. Cases have been notified from both regional and metropolitan areas. Two-thirds of those patients sampled to date reported eating oysters. Half of these originated from Wallis Lake on the State's mid-north coast. The New South Wales Health Department has urged people to avoid eating oysters from Wallis Lake.

Hepatitis A is a viral disease with an average incubation period of approximately 30 days. Symptoms include fever, malaise, nausea, anorexia and abdominal discomfort followed by jaundice. The illness usually lasts one to two weeks and occasionally requires hospitalisation.

Further person-to-person spread can be prevented by observing good hygiene practices including hand washing before meals. Household contacts of cases should be given immunoglobulin.

The New South Wales Health Department is continuing to investigate.

A case of human anthrax in Victoria

Rosemary Lester[1], Sheila Beaton[1], John Carnie[1], Diane Barbis[2] and Graham Rouch[1]

A human case of anthrax was identified through surveillance of knackery workers who had been exposed to infected cattle. The outbreak in cattle has affected 38 herds in the Stanhope/Tatura area of central northern Victoria. The human case, a 39 year old male, was treated in hospital and is recovering. Surveillance of other knackery workers has now been completed, and no other cases were found. Public health measures are in place to prevent further human cases. *Comm Dis Intell* 1997;21:47-48.

Background

Anthrax, caused by *Bacillus anthracis,* is primarily a disease of ruminants which occasionally infects humans. Cases in animals, particularly cattle, occur sporadically in Victoria across a wide area in the south of the State, and along the Goulburn and Murray rivers. The last cases of human anthrax in Victoria were two in 1980, two in 1975, and an outbreak of nine cases in 1971 in association with an outbreak in cattle. Six of these human cases were associated with a knackery.

Outbreak in cattle

Anthrax was detected on two adjoining dairy farms in the Stanhope/Tatura area in central northern Victoria on Sunday, 26 January 1997. The number of affected properties remained low until the weekend of 8 - 9 February, when the number of affected properties and cattle began to escalate rapidly. Up to 14 February, 38 herds had been affected, including both milking and non-milking dairy herds. The number of cattle confirmed with anthrax was 80. The affected properties are confined to an irregular area approximately 15 kilometres by three kilometres, except for one outlying property which is located approximately 15 kilometres away close to a knackery.

Thirteen cattle died in the period 10 January to 26 January before the diagnosis of anthrax was made. Eight of the carcasses had been sent to a local knackery for disposal. Meat from these carcasses was sold as pet food from a shop at the knackery, and hides were sent to a tannery in Melbourne.

Immediate control measures taken by the Department of Human Services following identification of the outbreak of anthrax in cattle were:

- we requested that the local medical officer of health undertake surveillance of workers at the knackery;
- similar surveillance was instituted at the tannery;
- a public recall of all pet food sold through the knackery was initiated;
- local doctors were advised of the outbreak, provided with a fact sheet, and advised what steps to take if they saw a suspected case.

Measures taken by the Department of Natural Resources and the Environment were:

- the knackery was closed and disinfected;
- all infected cattle are being collected in sealed trucks and transported to burn sites for disposal. Burn sites are being carefully selected away from areas with a high water table;
- disinfection of sites where cattle have died and disinfection of burn sites;
- immunisation of cattle on all affected properties and all adjoining properties has been carried out, along with penicillin treatment of cattle.

Three persons with suspicious lesions were examined by a physician between 31 January and 3 February and specimens were sent to the Victorian Infectious Diseases Reference Laboratory (VIDRL). All were negative for anthrax.

Human case

On 8 February the Infectious Diseases Unit was informed that the medical officer who was conducting surveillance on the knackery workers had seen one of these men, who had worked only on 26 January skinning and gutting cattle. The 39 year old man had seen a local GP on 26 January prior to the organised surveillance commencing. The GP administered 1.5 gm cilicaine penicillin IM and amoxycillin 500 mg TDS for five days. As part of the surveillance, the man was examined on 7 February and stated he had remained well until 5 February when he noticed an elevated skin lesion on the lower right forearm which he thought was enlarging. On examination he had a one centimetre elevated reddish papular lesion but no axillary lymphadenopathy. An isolate from a swab of the lesion was presumptively identified as *Bacillus anthracis* by the local laboratory on 8 February, and was confirmed by VIDRL on 11 February. The man was admitted to the local hospital on 8 February and was commenced on benzyl penicillin, 600 mg IV. The following day he became pyrexial, complained of a headache and joint pains and the dosage was increased to 1.2 gm IV 4 hourly. By 10 February the skin lesion on the forearm had developed a blackened centre surrounded by small vesicles with increasing oedema of the forearm and tender axillary lymphadenopathy. On 11 February he was transferred to the Goulburn Valley Base Hospital in Shepparton, where he is recovering.

Further public health measures

Surveillance of the other knackery workers has now been completed, and no other cases were found. An information sheet advising the public in the area of the symptoms of anthrax and the procedure to follow if they have a suspicious lesion, was distributed through the local media

1. Infectious Diseases Unit, Department of Human Services, Level One (South), 115 Victoria Pde, Fitzroy Victoria 3065.
2. Department of Human Services, Loddon Mallee Region, Victoria.

and delivered directly to the affected farms.

Further measures taken during the week of 10-14 February, after the escalation of the number of affected properties, were:

- an information sheet was produced and distributed to all families on affected properties;
- penicillin prophylaxis and surveillance of the laboratory workers by the local medical officer of health was instituted;
- public meetings organised by the Department of Natural Resources and the Environment were attended by public health officers, and human health information was presented at these meetings.

On 14 February, there were no new cattle deaths, and immunisation of all cattle in the affected area was almost completed.

Notices to readers

The Pacific Public Health Surveillance Network

The Pacific Public Health Surveillance Network (PPHS Network) is an affiliation of member countries and territories of the South Pacific Commission and other official bodies such as regional organisations and universities. The aim of the Network is to enhance public health surveillance and response capabilities among Pacific island nations. It was formally established at the Pacific Island Meeting on Public Health Surveillance in Noumea, New Caledonia in December 1996.

The PPHS Network has a Coordinating Body presently composed of representatives from five Pacific island countries and territories (Federated States of Micronesia, Fiji, New Caledonia, Solomon Islands and Western Samoa) and five international, regional and training institutions (Australian National University/ National Centre for Epidemiology and Population Health, South Pacific Commission, United Nations International Children's Emergency Fund, University of Hawaii and World Health Organization Regional Office for the Western Pacific). The current focal point of the Coordinating Body is at the South Pacific Commission Community Health Programme. Its immediate objective is to establish a supportive framework for Pacific island countries to enhance their public health surveillance capabilities. Among other strategies, this includes the development of an early warning system for outbreaks of disease and ensuring a national response and international collaboration to control outbreaks.

For further information on the PPHS Network contact Dr Yvan Souares, Epidemiologist, or Dr Tom Kiedrynski, Notifiable Disease Specialist, both at the South Pacific Commission, Noumea, New Caledonia. Telephone (687) 260143, Facsimile (687) 263818 or email: Yvan@spc.org.nc or Tom@spc.org.nc.

WHO International Travel and Health Vaccination Requirements and Health Advice, 1997 Edition

The 1997 edition of International Travel and Health has just been published by the World Health Organization in English and French. This booklet is intended for national health administrations, practising physicians, tourist agencies, shipping companies, airline operators, and other bodies who are called upon to give health advice to travellers.

In addition to summarising the vaccination requirements of individual countries, the booklet indicates the main areas where malaria transmission occurs and where *Plasmodium falciparum* is resistant to drugs. The recommended chemoprophylactic regimen is also given for each country with malarious areas.

Other chapters cover certain health hazards to which the traveller may be exposed, and indicate the areas in which these hazards are most likely to occur. The booklet also recommends a number of precautions that travellers should take when visiting unfamiliar places.

World Health Organization, 1997; 106 pages (available in English and French); ISBN 92 4 158022 4; Order No. 1189700.

Pertussis epidemic

In the last six months, pertussis has claimed the lives of four children: three in New South Wales (Mr Rob Menzies, New South Wales Health Department, personal communication) and one in Victoria (Dr Graham Tallis, Victorian Department of Human Services, personal communication). All were children under three months of age.

Pertussis is a serious, highly infectious disease that kills about one in every 200 children under six months of age who become infected. The causative organism, *Bordetella pertussis*, is localised to the respiratory tract and transmission is believed to occur by aerosol droplet following a cough or sneeze. Because transmission requires close contact, parents and older siblings are considered to be an important source of infection. Symptoms can include severe coughing spasms followed by a gasp for breath resulting in the typical 'whoop' sound. Not all children 'whoop' and it is relatively uncommon among adults with pertussis. Vomiting often follows the coughing spasm.

Pertussis has been epidemic in Australia since 1993 and it appeared the epidemic was declining. However, since September 1996, there has been a substantial resurgence (Figure 1). There have been 1,911 notifications with onset dates from October to December 1996 compared with 1,154 for the same period in 1995 and 1,584 in 1994. As further notifications are received, the number with onset dates in the most recent period is likely to increase, particularly those with onset in January 1997.

Since 1991, there have been more females than males notified in each age group. The male:female ratio for notifications with onset in 1996 was 1:1.3. Females have significantly higher attack rates, morbidity and mortality from pertussis than males, although the reason for this is not known.

During the epidemic period 1993 to 1996, attack rates have consistently been highest among children under 15 years of age and there has been a smaller secondary peak among adults 30 - 49 years of age (Figure 2). The recent outbreak has seen markedly increased notification rates per 100,000 population in South Australia and Victoria (Figure 3). Although notification rates in Queensland and New South Wales appear to be declining, outbreaks occurred in both States during the last quarter of 1996. The rates for pertussis notifications with onset in 1996 were moderate in the other States and Territories: Australian Capital Territory (12 per 100,000 population); Western Australia (10); Northern Territory (8); and Tasmania (7).

Figure 1. Pertussis notifications by month of onset, January 1991 to January 1997

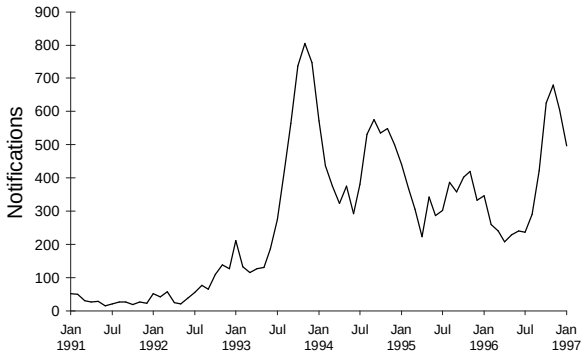


Figure 2. Pertussis notification rates by age group and year of onset, 1993 to 1996

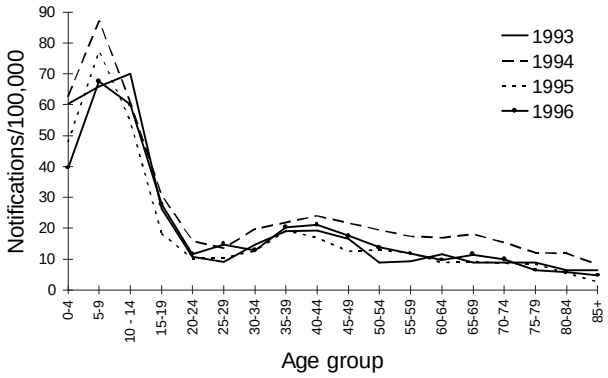
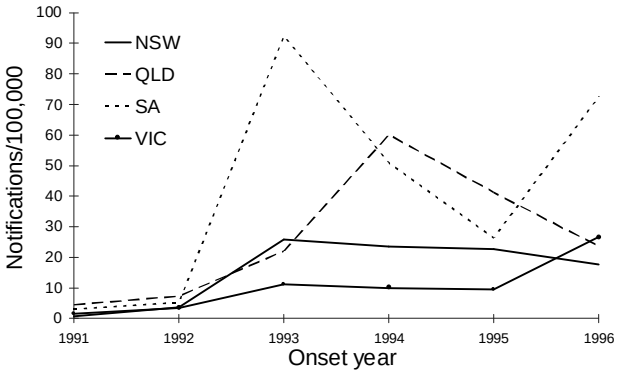


Figure 3. Pertussis notification rates by selected States and year of onset, 1991 to 1996



Hepatitis A notifications

There were 60 notifications of hepatitis A infection received in the National Notifiable Diseases Surveillance System for this period. High numbers of notifications have been seen at this time of year in 1995 and 1996 (Figure 4), but the present data do not indicate an increase in notifications. Twenty-eight of the reports (47%) were from New South Wales, with an outbreak currently occurring in this State (see page 46).

There was a sharp increase in notifications of hepatitis A to the *CDI* Virology and Serology Reporting Scheme (LabVISE) in December 1996 (Figure 5). In the most recent reporting period reports were received from all States and Territories except Queensland and Tasmania (Table 7).

Forty-seven per cent of reports to the National Notifiable Diseases Surveillance System for this period were for the 20 - 34 years age group and this reflects the age distribution seen for notifications in 1996 (Figure 6).

National Notifiable Diseases Surveillance System

The NNDSS is conducted under the auspices of the Communicable Diseases Network Australia New Zealand. The system coordinates the national surveillance of more than 40 communicable diseases or disease groups endorsed by the National Health and Medical Research Council (NHMRC). Notifications of these diseases are made to State and Territory health authorities under the provisions of their respective public health legislations. De-identified core unit data are supplied fortnightly for collation, analysis and dissemination. For further information, see CDI 1997;21:5.

Reporting period 22 January to 4 February 1997

There were 1,984 notifications received for this two-week period (Tables 1, 2 and 3). The numbers of reports for selected diseases have been compared with average data for this period in the previous three years (Figure 7).

The number of notifications of campylobacteriosis decreased this period, with 371 reports received. This is consistent with previous years when notifications started to decline in late summer. The 0 - 4 years age group accounted for 79 of the notifications, with 109 notifications in the 20 - 34 years age range.

Ross River virus infection notifications continue to increase, with 202 reports received for this period. The majority of notifications were reported from Queensland (67) and Victoria (62). Fifty per cent of reports were for the 30 - 49 years age range.

Salmonellosis was reported for 226 persons this period. One hundred and one of the cases were in the 0 - 4 years age group. Included were apparent clusters of 3 or more cases in postcode regions of South Australia (4) and Queensland (3).

Figure 4. Hepatitis A notifications to the National Notifiable Diseases Surveillance System, 1995 to January 1997, by month of onset

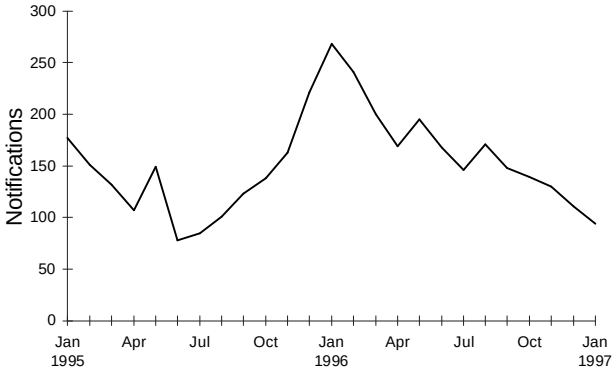


Figure 5. Hepatitis A laboratory reports to LabVISE, 1995 to 1996, by month of specimen collection

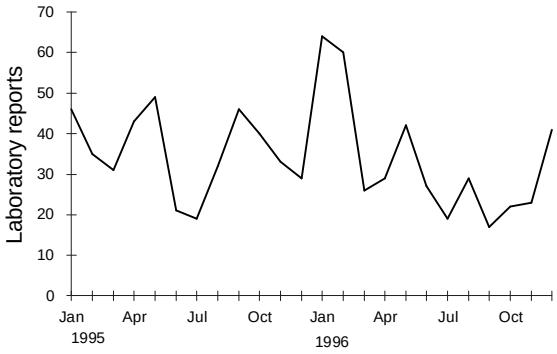


Figure 6. Hepatitis A infection notifications, to the National Notifiable Diseases Surveillance System, by age and sex, 1996

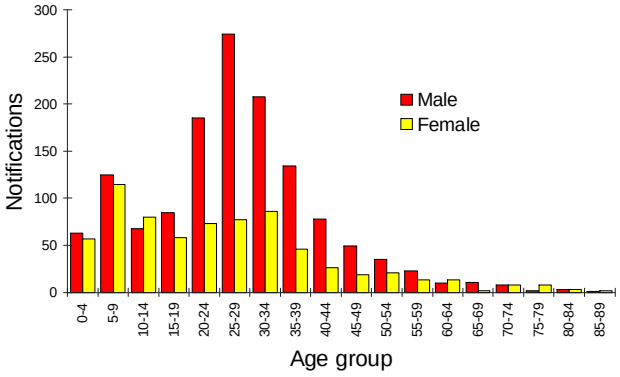


Table 1. Notifications of diseases preventable by vaccines recommended by the NHMRC for routine childhood immunisation, received by State and Territory health authorities in the period 22 January to 4 February 1997

Disease[1,2]	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	This period 1997	This period 1996	Year to date 1997	Year to date 1996
Diphtheria	0	0	0	0	0	0	0	0	0	0	0	0
Haemophilus influenzae type B	0	0	0	0	1	0	0	0	1	1	8	6
Measles	0	2	0	8	0	0	6	0	16	14	43	61
Mumps	1	2	0	NN	1	0	2	0	6	5	16	14
Pertussis	4	73	0	36	92	5	74	23	307	121	764	384
Rubella	0	2	0	29	8	1	4	4	48	117	209	426
Tetanus	0	0	0	0	0	0	0	0	0	1	1	1

NN Not Notifiable.

1. No notifications of poliomyelitis have been reported since 1986.
2. Totals comprise data from all States and Territories. Cumulative figures are subject to retrospective revision, so there may be discrepancies between the number of new notifications and the increment in the cumulative figure from the previous period.

Table 2. Notifications of other diseases received by State and Territory health authorities in the period 22 January to 4 February 1997

Disease[1,2]	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	This period 1997	This period 1996	Year to date 1997	Year to date 1996
Arbovirus Infection (NEC)[3,4]	0	1	1	0	0	0	13	1	16	7	28	12
Barmah Forest virus infection	1	0	0	15	1	0	0	-	17	23	61	43
Campylobacteriosis[5]	7	-	11	134	84	13	73	49	371	454	1227	1191
Chlamydial infection (NEC)[6]	3	NN	19	130	0	10	46	35	243	280	679	660
Dengue	0	0	0	1	0	-	0	0	1	1	56	4
Donovanosis	0	NN	0	0	NN	0	0	0	0	3	1	6
Gonococcal infection[7]	0	5	28	34	0	1	13	19	100	119	250	312
Hepatitis A	0	28	5	11	4	0	5	7	60	103	147	284
Hepatitis B incident	0	1	0	0	0	0	0	5	6	8	16	25
Hepatitis C incident	0	0	0	-	0	0	-	-	0	2	2	4
Hepatitis C unspecified	4	NN	21	79	NN	8	32	17	161	333	644	820
Hepatitis (NEC)	0	2	0	0	0	0	0	NN	2	2	4	3
Legionellosis	1	0	1	0	1	0	0	1	4	5	19	17
Leptospirosis	0	0	0	0	0	0	1	0	1	6	14	25
Listeriosis	0	0	0	2	0	0	2	2	6	2	11	7
Malaria	2	4	0	0	2	0	4	0	12	36	72	70
Meningococcal infection	0	1	0	4	2	1	0	0	8	7	34	25
Ornithosis	0	NN	0	0	0	0	0	0	0	4	4	9
Q Fever	0	2	0	4	1	0	0	0	7	7	43	40
Ross River virus infection	0	24	7	67	30	0	62	12	202	208	452	303
Salmonellosis (NEC)	3	16	13	78	68	5	23	20	226	299	733	731
Shigellosis[5]	0	-	6	7	3	0	1	5	22	24	77	68
Syphilis	0	6	10	8	0	0	0	1	25	36	83	106
Tuberculosis	0	4	1	2	1	0	13	0	21	35	77	107
Typhoid[8]	0	1	1	0	0	0	1	1	4	7	6	15
Yersiniosis (NEC)[5]	0	-	0	10	3	0	0	0	13	11	42	29

1. For HIV and AIDS, see Tables 4 and 5. For rarely notified diseases, see Table 3.
2. Totals comprise data from all States and Territories. Cumulative figures are subject to retrospective revision so there may be discrepancies between the number of new notifications and the increment in the cumulative figure from the previous period.
3. Tas: includes Ross River virus and dengue.
4. NT, Vic and WA: includes Barmah Forest virus.
5. NSW: only as 'foodborne disease' or 'gastroenteritis in an institution'.
6. WA: genital only.
7. NT, Qld, SA and Vic: includes gonococcal neonatal ophthalmia.
8. NSW, Vic: includes paratyphoid.

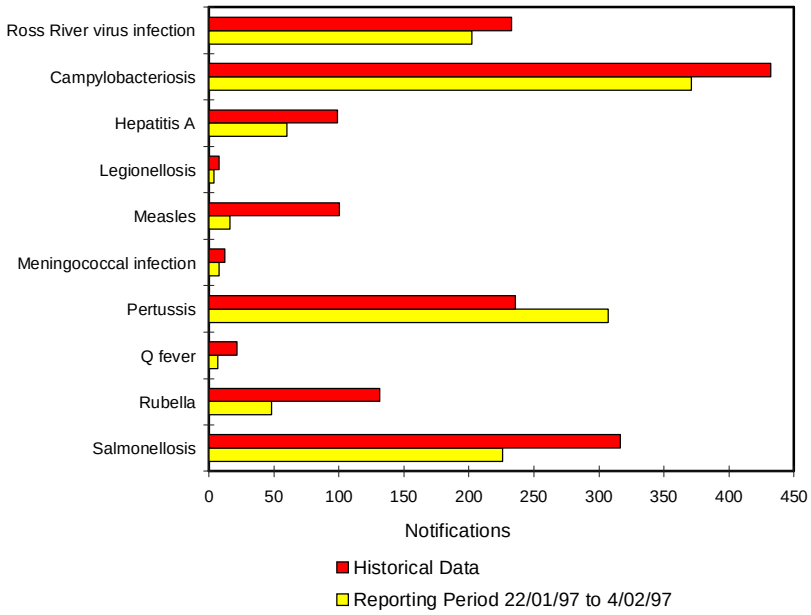
NN Not Notifiable.
NEC Not Elsewhere Classified.
- Elsewhere Classified.

Table 3. Notifications of rare[1] diseases received by State and Territory health authorities in the period 22 January to 4 February 1997

Disease[2]	Total this period	Reporting States or Territories	Total notifications 1997
Brucellosis	2	Qld	7
Cholera			1
Hydatid infection			2

1. Fewer than 60 cases of each of these diseases were notified each year during the period 1988 to 1995.
2. No notifications were received during 1996 for the following rare diseases: botulism; chancroid; leprosy; lymphogranuloma venereum; plague; rabies; yellow fever; or other viral haemorrhagic fevers.

Figure 7. Selected National Notifiable Diseases Surveillance System reports, and historical data[1]



1. The historical data are the averages of the number of notifications in 9 previous 2-week reporting periods: the corresponding periods of the last 3 years and the periods immediately preceding and following those.

Table 4. New diagnoses of HIV infection, new diagnoses of AIDS and deaths following AIDS occurring in the period 1 to 30 September 1996, by sex and State or Territory of diagnosis

										Totals for Australia			
		ACT	NSW	NT	Qld	SA	Tas	Vic	WA	This period 1996	This period 1995	Year to date 1996	Year to date 1995
HIV diagnoses	Female	0	5	0	0	0	0	0	1	6	3	56	63
	Male	3	31	0	18	3	0	11	6	72	61	588	587
	Sex not reported	0	1	0	0	0	0	0	0	1	0	5	8
	Total[1]	3	37	0	18	3	0	11	7	79	64	650	660
AIDS diagnoses	Female	0	1	0	0	0	0	0	0	1	1	17	25
	Male	0	20	0	0	0	0	0	2	22	53	328	542
	Total[1]	0	21	0	0	0	0	0	2	23	54	345	568
AIDS deaths	Female	0	0	0	0	0	0	0	0	0	1	14	29
	Male	0	15	0	0	0	0	0	0	15	31	306	449
	Total[1]	0	15	0	0	0	0	0	0	15	32	320	479

1. Persons whose sex was reported as transsexual are included in the totals.

Table 5. Cumulative diagnoses of HIV infection, AIDS and deaths following AIDS since the introduction of HIV antibody testing to 30 September 1996, by sex and State or Territory

		ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Australia
HIV diagnoses	Female	15	529	3	102	45	4	169	77	944
	Male	174	10207	84	1665	585	76	3448	784	17023
	Sex not reported	0	2049	0	0	0	0	42	0	2091
	Total[1]	189	12799	87	1772	630	80	3668	863	20088
AIDS diagnoses	Female	7	142	0	30	18	2	48	18	265
	Male	76	3985	26	670	284	32	1373	301	6747
	Total[1]	83	4137	26	702	302	34	1428	321	7033
AIDS deaths	Female	2	105	0	24	13	2	37	11	194
	Male	50	2842	21	470	197	21	1084	222	4907
	Total[1]	52	2953	21	496	210	23	1127	234	5116

1. Persons whose sex was reported as transsexual are included in the totals.

HIV and AIDS Surveillance

National surveillance for HIV disease is coordinated by the National Centre in HIV Epidemiology and Clinical Research (NCHECR), in collaboration with State and Territory health authorities and the Commonwealth of Australia. Cases of HIV infection are notified to the National HIV Database on the first occasion of diagnosis in Australia, by either the diagnosing laboratory (ACT, New South Wales, Tasmania, Victoria) or by a combination of laboratory and doctor sources (Northern Territory, Queensland, South Australia, Western Australia). Cases of AIDS are notified through the State and Territory health authorities to the National AIDS Registry.

Tabulations of diagnoses of HIV infection and AIDS are based on data available three months after the end of the reporting interval indicated, to allow for reporting delay and to incorporate newly available information. More detailed information on diagnoses of HIV infection and AIDS is published in the quarterly Australian HIV Surveillance Report, available from the National Centre in HIV Epidemiology and Clinical Research, 376 Victoria Street, Darlinghurst NSW 2010. Telephone: (02) 332 4648 Facsimile: (02) 332 1837.

HIV and AIDS diagnoses and deaths following AIDS reported for September 1996, as reported to 31 December 1996, are included in this issue of *CDI* (Tables 4 and 5).

Australian Sentinel Practice Research Network

The Australian Sentinel Practice Research Network (ASPREN) comprises 99 sentinel general practitioners from throughout the country. Approximately 9,000 consultations are recorded each week for 12 conditions. Of these, CDI reports the consultation rates for chickenpox, HIV testing (doctor initiated), HIV testing (patient initiated), influenza, measles, pertussis, Ross River virus infection, rubella and gastroenteritis. For further information including case definitions see CDI 1997;21:6.

Data for weeks 4 and 5 ending 26 January and 2 February respectively are included in this issue of *CDI* (Table 6). The consultation rate for influenza-like illness has remained at low levels since the beginning of October. The consultation rate for gastroenteritis has been much lower during the last 4 reporting weeks than over recent months (Figure 8). The consultation rate for chickenpox has declined from the higher rate reported during December 1996. The numbers of reported cases of measles, rubella and pertussis have remained low. HIV testing, being reported for the first time this year, currently accounts for 3 per 1,000 consultations, two-thirds of these tests being patient initiated. Consultation rates for Ross River virus infection remain low at present.

Figure 8. Australian Sentinel Practice Research Network consultation rate for gastroenteritis, 1996 to January 1997

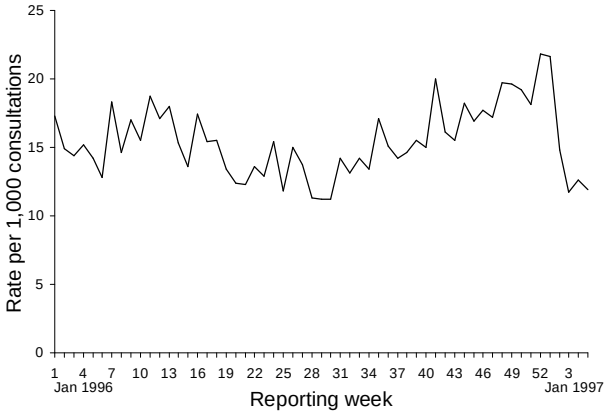


Table 6. Australian Sentinel Practice Research Network reports, weeks 4 and 5, 1997

Condition	*Week 4, to 26 January 1997*		*Week 5, to 2 February 1997*	
	Reports	Rate per 1,000 encounters	Reports	Rate per 1,000 encounters
Chickenpox	26	3.5	22	3.8
Gastroenteritis	93	12.6	68	11.9
HIV testing (doctor initiated)	7	1.0	4	0.7
HIV testing (patient initiated)	17	2.3	13	2.3
Influenza	10	1.4	10	1.7
Measles	0	0.0	0	0.0
Pertussis	2	0.3	4	0.7
Ross River virus infection	7	1.0	1	0.2
Rubella	5	0.7	1	0.2

LabVISE

The Virology and Serology Laboratory Reporting Scheme, LabVISE, is a sentinel reporting scheme. Twenty-one laboratories contribute data on the laboratory identification of viruses and other organisms. Data are collated and published in Communicable Diseases Intelligence each fortnight. These data should be interpreted with caution as the number and type of reports received is subject to a number of biases. For further information, see CDI 1997;21:8-9.

There were 621 reports received in the *CDI* Virology and Serology Reporting Scheme this period (Tables 7 and 8).

Parvovirus was reported for 15 patients this period including 10 from Victoria. A total of 268 reports with specimen collection dates in 1996 have been received so far. This is the highest annual total recorded by this scheme.

Chlamydia trachomatis was reported for 107 patients this period. The male:female ratio was 1:1.7 and 94% of patients were in the 15 - 44 years age group. More laboratory reports (3,766) were received for 1996 than for any previous year.

Fifty-three reports of *Mycoplasma pneumoniae* were received this fortnight. The male:female ratio was 1:1.3 and 47% of patients were in the 5 - 14 years age group. The number of reports rose in the latter half of 1996 (Figure 9). In December the number of reports was the highest recorded by this scheme since September 1993.

Q fever was reported for 9 patients this period, 7 of whom were from New South Wales. All were in the 18 - 48 years age group and all but one were male.

Figure 9. *Mycoplasma pneumoniae* laboratory reports, 1992 to 1996, by month of specimen collection

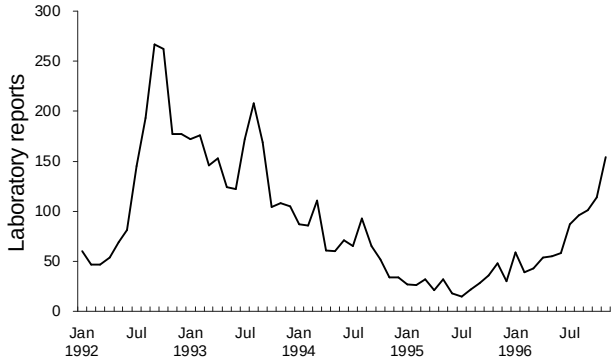


Table 7. Virology and serology laboratory reports by State or Territory[1] for the reporting period 16 to 29 January 1997, historical data[2], and total reports for the year

	State or Territory[1]							Total this fortnight	Historical data[2]	Total reported in *CDI* in 1997
	ACT	NSW	NT	Qld	SA	Vic	WA			
Measles, mumps, rubella										
Measles virus	1							1	16.3	9
Rubella virus		1			3			4	27.2	218
Hepatitis viruses										
Hepatitis A virus	6	1	1		4	3	4	19	18.3	87
Hepatitis D virus				1				1	.5	6
Arboviruses										
Ross River virus			5		20	5	8	38	55.7	180
Barmah Forest virus							2	2	4.5	41
Flavivirus (unspecified)						1		1	1.0	5
Adenoviruses										
Adenovirus type 3						2		2	3.0	10
Adenovirus type 4						1		1	.2	1
Adenovirus type 8						1		1	.3	5
Adenovirus type 26						1		1	.0	1
Adenovirus type 40						1		1	.0	6
Adenovirus not typed/pending	1	1			8	3	5	18	32.2	178
Herpes viruses										
Cytomegalovirus	10	10		4	1	11	2	38	36.0	183
Varicella-zoster virus	2	2			11	16	1	32	42.7	260
Epstein-Barr virus		13			20	3	10	46	68.7	502
Other DNA viruses										
Parvovirus		1			4	10		15	6.2	93

Table 7. Virology and serology laboratory reports by State or Territory[1] for the reporting period 16 to 29 January 1997, historical data[2], and total reports for the year, continued

	State or Territory[1]							Total this fortnight	Historical data[2]	Total reported in *CDI* in 1997
	ACT	NSW	NT	Qld	SA	Vic	WA			
Picornavirus family										
Coxsackievirus A16						3		3	.0	6
Coxsackievirus B2						1		1	.3	8
Coxsackievirus B3		1						1	.7	2
Coxsackievirus B5					1			1	.5	3
Echovirus type 5	1							1	.0	2
Echovirus type 7		1				1		2	.2	13
Poliovirus type 1 (uncharacterised)		1						1	.3	3
Rhinovirus (all types)				13	3	1		17	11.0	140
Enterovirus not typed/pending				3				3	22.5	136
Ortho/Paramyxoviruses										
Influenza A virus	3						1	4	8.5	89
Influenza B virus	1				2	4	1	8	1.5	49
Influenza virus - typing pending					15			15	.0	40
Parainfluenza virus type 1	1							1	1.2	17
Parainfluenza virus type 3	4	6		5	1	1	3	20	14.8	261
Parainfluenza virus typing pending					19			19	.7	39
Respiratory syncytial virus	68	16				1		85	15.5	131
Other RNA viruses										
Rotavirus		1			14	1	3	19	20.5	157
Astrovirus							1	1	.0	2
Norwalk agent						7		7	.0	36
Other										
Chlamydia trachomatis not typed	37	5	19		22	4	20	107	98.5	784
Chlamydia psittaci		1				1		2	5.2	20
Chlamydia species		1						1	4.5	4
Mycoplasma pneumoniae	9	22	1		6	5	10	53	14.7	351
Coxiella burnetii (Q fever)		7				2		9	5.7	62
Bordetella pertussis						17		17	26.8	356
Cryptococcus species	1					1		2	.7	3
TOTAL	145	91	26	26	154	108	71	621	566.8	4,499

1. State or Territory of postcode, if reported, otherwise State or Territory of reporting laboratory.
2. The historical data are the averages of the numbers of reports in 6 previous 2 week reporting periods: the corresponding periods of the last 2 years and the periods immediately preceding and following those.

Table 8. Virology and serology laboratory reports by contributing laboratories for the reporting period 16 to 29 January 1997

State or Territory	Laboratory	Reports
Australian Capital Territory	Woden Valley Hospital, Canberra	171
New South Wales	Institute of Clinical Pathology & Medical Research, Westmead	41
	Royal Prince Alfred Hospital, Camperdown	4
	South West Area Pathology Service, Liverpool	20
Queensland	State Health Laboratory, Brisbane	26
South Australia	Institute of Medical and Veterinary Science, Adelaide	154
Victoria	Microbiological Diagnostic Unit, University of Melbourne	4
	Monash Medical Centre, Melbourne	16
	Royal Children's Hospital, Melbourne	21
	Victorian Infectious Diseases Reference Laboratory, Fairfield Hospital	68
Western Australia	Princess Margaret Hospital, Perth	14
	Royal Perth Hospital	6
	Western Diagnostic Pathology	76
TOTAL		621

Overseas briefs

Source: World Health Organization (WHO)

Bubonic plague, Zambia

As at 3 February 1997, 267 cases of bubonic plague had been reported in Namwala District in the Southern Province of Zambia. Among these, 26 (10%) died and 25 patients were still under treatment. All reported deaths occurred before 26 January. The clinical diagnosis established by the South West Regional Office has been confirmed by a team of experts from the University Teaching Hospital in Lusaka. The strain of *Yersinia pestis* which has been isolated has been shown to be sensitive to tetracycline and streptomycin.The outbreak could be linked to heavy rain and flooding causing rats to invade inhabited areas. Fleas are also abundant. The first human cases presented with inguinal, axillary and cervical abscesses in December and deaths began to occur in early January.

When the first reports of an unusual disease outbreak were received on 24 January, health authorities established treatment centres in the outbreak focus in Kantengwa and satellite centres in Makobo, Chilala and Kabulamwanda. Drugs, medical supplies and protective material have been dispatched to the affected area. All patient contacts are followed up and treated, infected households are disinfected and rodents and fleas destroyed. A team of health workers monitors the situation and intervenes when needed. Movements in and out of the area are also monitored.

Plague is endemic in many countries in southern Africa where natural foci still exist, including Angola, Malawi, Mozambique, Tanzania, Zimbabwe, Madagascar, Namibia and South Africa. The cases reported in Zambia are bubonic plague which is not an airborne infection as is the pulmonary form of plague. There are no restrictions for travellers visiting Zambia, or to transit in airports in the country.

Meningitis

Togo. An outbreak of meningitis started in November 1996 in Togo, with 1,235 cases and 151 deaths reported up to 3 February. A team including an epidemiologist from the WHO Office for the Africa region is investigating the outbreak to assess the epidemiology of the outbreak and speed up laboratory confirmation. The work of this team will be further supported by technical experts and materials from non-government organisations. WHO is sending an additional 100,000 doses of vaccine and injection material.

On 7 February, an interagency appeal was issued to raise over US$ 6 million needed to respond to the threat of epidemic meningitis in countries at risk in the African continent. The agencies behind the appeal are WHO, United Nations International Children's Emergency Fund, Médecins Sans Frontières, and the Federation of the Red Cross and Red Crescent Societies. The appeal is to establish a fund that will ensure the purchase and distribution of vaccine, antibiotics and autodestructible injection material for treatment during the 1997 meningitis season in Africa. WHO has advanced US$ 1 million to ensure the availability of vaccine pending the outcome of the appeal.

Burkina Faso. As at 28 January, 461 cases with 64 (14%) deaths have been reported. Vaccine is available to start a vaccination campaign. Last year a large epidemic of meningococcal meningitis occurred in Burkina Faso with over 42,000 cases reported.

Other countries having reported cases of meningitis are **Ghana** (181 cases, 17 deaths) and **Mali** (180 cases, 26 deaths).

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