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EMERGING SODIUM FUSIDATE RESISTANCE IN WESTERN AUSTRALIAN METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS*

Siranda Torvaldsen[1,2,3] *and Thomas Riley*[2,4]

Abstract

Methicillin-resistant *Staphylococcus aureus* (MRSA) continues to be a major cause of nosocomial infection in Australia. In Western Australia, a new type of MRSA (WA MRSA) appeared some years ago and has become endemic in the community. While initially susceptible to most antibiotics, WA MRSA has begun to acquire additional resistance determinants, including trimethoprim and mupirocin resistance, prompting a review of emerging resistance to other antibiotics. Resistance to sodium fusidate, which remained at around 1 - 2% of isolates for many years, rose to 3% in 1993, 5% in 1994 and 9% in 1995. These findings suggest that the use of sodium fusidate in both hospital and community medicine may require review. ***Comm Dis Intell* 1996;20:492-494.**

Introduction

Methicillin-resistant *Staphylococcus aureus* (MRSA) continues to be a major cause of nosocomial infection, often resulting in prolonged hospitalisation and increased morbidity. MRSA first emerged as a problem in eastern Australia in the early 1980s, and these strains are sometimes referred to as Eastern Australian MRSA (EA MRSA)[1]. EA MRSA is now endemic in hospitals in most States and Territories of Australia, with the notable exception of Western Australia, where these strains are referred to as imported MRSA[1,2,3,4]. The reason that imported MRSA has not become established in Western Australian hospitals is believed to be due to a combination of geographical isolation and the screening and control program implemented in 1982[1,3,5]. In the late 1980s a genetically different, less resistant strain of MRSA (now known as WA MRSA) was isolated from patients living in the Kimberley region of Western Australia[6,7]. WA MRSA has since spread to most areas of Western Australia and some strains have acquired additional resistance determinants including trimethoprim and high level mupirocin resistance[1,6,7].

Sodium fusidate is the salt of fusidic acid, a steroid antibiotic produced by the mould *Cephalosporium acremonium*[8]. Sodium fusidate exerts a high degree of antibacterial activity against Gram-positive bacteria, with *Staphylococcus aureus*, including MRSA, being particularly susceptible[8]. Sodium fusidate acts by inhibiting bacterial protein synthesis[8]. Resistance to sodium fusidate is readily generated in the laboratory by growing *Staphylococcus aureus* in increasing concentrations of antibiotic, and the emergence of resistance during treatment has been reported[8]. The development of resistance to sodium fusidate is due to the survival of a high proportion (10%) of the bacterial population after exposure to an inhibitory concentration of sodium fusidate, and a high mutation rate[9]. To help prevent the emergence of resistance, sodium fusidate is usually given in conjunction with another antibiotic, such as rifampicin, when administered orally or intravenously. Topical sodium fusidate has been used for the treatment of skin lesions and burns infected with staphylococci. However, topical use of sodium fusidate is no longer recommended as it encourages the emergence of resistant strains, thereby compromising its value for the treatment of systemic infections[8].

Recently an apparent increase in incidence of sodium fusidate resistance in WA MRSA has been noted. Topical sodium fusidate has been available for community use in Australia for several years. Whether its use in the community should be restricted or not, or whether widespread use of topical sodium fusidate promotes resistance in *Staphylococcus aureus* has been the subject of much debate in Western Australia. We therefore reviewed the emergence of resistance to sodium fusidate in MRSA isolated in Western Australia during the period 1986 to 1995.

Methods

Infection or colonisation with MRSA has been notifiable in Western Australia since 1985. All MRSA isolates in Western Australia are sent to the Infection Control Laboratory at the Western Australian Centre for Pathology and Medical Research, where their identity is confirmed by standard procedures, and antimicrobial resistance pattern determined. Case demographic details as well as details of the isolate are entered into a database.

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WA MRSA was defined on the basis of criteria used previously as MRSA susceptible to gentamicin and also to erythromycin and / or tetracycline[1,6,10]. Imported MRSA was defined as MRSA resistant to gentamicin and / or to both erythromycin and tetracycline.

Results

The Figure shows the total number of MRSA notifications in Western Australia for the period 1986 to 1995. MRSA notifications began to rise in 1991 and reached 204 in 1993, 327 in 1994, and 493 in 1995. The number of imported strains of MRSA has remained relatively stable over the past ten years, and the higher number of notifications is a result of the significant increase in WA MRSA. WA MRSA continues to make up an increasing proportion of all MRSA notifications - 14% in 1989, 78% in 1993, and 88% in 1995. There had been 355 MRSA notifications by the end of June 1996, 93% of which were classified as Western Australian strains.

Resistance to sodium fusidate in MRSA isolated in Western Australia remained around 1 - 2% until 1993. Since then resistance has risen from 3% of MRSA notifications in 1993 to 5% in 1994 and 9% in 1995 (Table). Preliminary analysis of the 1996 MRSA database indicates that 44 out of 355 (12%) isolates (January to June) are sodium fusidate resistant.

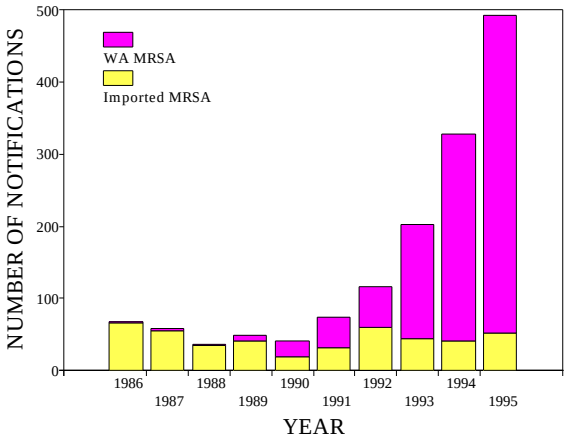
Discussion

In Australia, resistance to sodium fusidate has, until recently, been fairly stable at around 2% of all MRSA isolated. A survey of methicillin-susceptible *Staphylococcus aureus* and MRSA in Australian teaching hospitals between 1986 and 1994, found only 1.1% to 2.6% of isolates resistant to sodium fusidate[11]. The authors suggested that resistance to sodium fusidate developed less easily than was originally thought. These findings supported an earlier Danish study of 8,176 strains of *Staphylococcus aureus* recovered from blood cultures from 1963 to 1987. Sodium fusidate resistance never occurred in more than 1% of the Danish strains during the 24 year period investigated. The majority of sodium fusidate-resistant strains were hospital acquired, and the authors suggested that there were not a large number of sodium fusidate-resistant strains in the community[12]. During the same period the total Danish consumption of sodium fusidate increased from 0.008 to 0.029 defined daily doses / 1000 inhabitants / day. The authors concluded that the increased Danish consumption of sodium fusidate, either as systemic combination therapy or as local treatment with sodium fusidate alone, had not resulted in the development of resistance during the observation period. It should be noted however that the strains in this survey were isolated from cases of bacteraemia only and these findings may not reflect resistance patterns in the wider *Staphylococcus aureus* population. Of the 44 sodium fusidate-resistant MRSA isolated so far this year in Western Australia, only one (2.3%) was recovered from a bacteraemic patient.

Table. Sodium fusidate resistance in MRSA isolated in Western Australia, 1991 to 1995

Year	Number tested	Number resistant (%)
1991	73	1 (1)
1992	116	2 (2)
1993	203	5 (3)
1994	327	15 (5)
1995	493	43 (9)

Figure. Notifications of MRSA in Western Australia, 1986 to 1995



The emergence of sodium fusidate resistance in WA MRSA may be analogous to the earlier problem of mupirocin resistance[10]. The development of mupirocin resistance in WA MRSA was of particular concern as topical 2% mupirocin ointment is used very effectively for clearing nasal carriage of MRSA from hospital staff and patients. Mupirocin had been used empirically and frequently in the north of Western Australia to treat infected skin lesions, resulting in the emergence, selection, and amplification of a mupirocin-resistant strain of WA MRSA, which then spread throughout Western Australia[7,10]. Mupirocin resistance in Western Australia peaked in 1993, when 18% of WA MRSA isolates demonstrated high level mupirocin resistance[10]. As a result of this finding, the Health Department of Western Australia proposed guidelines recommending that mupirocin not be used without prior laboratory susceptibility testing; its use not exceed ten days; and at least one month elapse before a prescription is repeated for the same patient[10]. Since the implementation of these guidelines in 1993, mupirocin resistance (low level) fell to 6.9% of WA MRSA isolates in 1994, and 4.8% in 1995. Preliminary analysis of 1996 MRSA database indicates only 3% of MRSA isolates are mupirocin resistant. However, it is not clear whether this reduction in the prevalence of mupirocin resistance is due to the change in policy, and hence usage, or to other as yet undetermined factors.

The increase in sodium fusidate resistance in MRSA in Western Australia raises two important issues. The first of these is the possibility that increased resistance is related to increased usage, perhaps as a result of the implementa-

tion of guidelines to restrict the use of topical mupirocin. Gathering data on the usage of topical sodium fusidate in Western Australia over the last few years, in an effort to answer this question, has been difficult. A total of 435 fifteen-gram tubes of sodium fusidate ointment were supplied to pharmacies in Western Australia from May 1995 to May 1996 (L. Fry, Pharmaceutical Services, Health Department of Western Australia, personal communication). Previous usage figures are not currently available, and so no comparison with earlier years can be made. Although the total number of tubes supplied is apparently low, continued use in an area where fusidic acid-resistant MRSA are prevalent is likely to exacerbate the problem by maintaining selective pressure on these strains. The second issue concerns whether sodium fusidate resistance has emerged in a single clone that has spread, or has arisen independently in several communities. Genetic investigations are being undertaken to resolve this issue.

The increasing incidence of sodium fusidate resistance in WA MRSA has sparked discussion in Western Australia over whether the availability of topical sodium fusidate in the general community should be controlled. Emergence of resistance to topical antimicrobials has been clearly documented for almost every agent used during outbreaks of MRSA infection[13]. We have seen a significant increase in sodium fusidate resistance in MRSA in Western Australia over the past three years, and perhaps it would be prudent to review the issue of restricting the use of topical sodium fusidate in the community.

Acknowledgements

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NOTICES TO READERS

ASPREN needs GPs

The Australian Sentinel General Practitioner Network (ASPREN) is a national network of sentinel general practitioners (GPs) coordinated by the Research and Health Promotion Unit of the Royal Australian College of General Practitioners (RACGP). The network was established in 1991 to record data on certain medical conditions. The aim of ASPREN is to provide an indicator of the burden of disease in the primary health care setting and to detect trends in consultation rates. Data for communicable diseases are published fortnightly in *Communicable Diseases Intelligence* (*CDI*). In addition, information is also made available to the World Health Organization Centre for Influenza Reference and Research and to other organisations and individuals. The list of conditions is reviewed annually by the ASPREN management committee.

ASPREN currently has 99 participating GPs in all States and Territories (Table). Seventy-two of these are in metropolitan areas and 27 are rural based. Approximately 7,000 consultations are recorded each week. For 1996, 12 conditions are being monitored. These include influenza, rubella, measles, chickenpox, pertussis, gastroenteritis, paediatric asthma, paediatric asthma treated with inhaled steroids, injury or illness during or immediately following overseas travel, dementia, hepatitis C inquiry and hepatitis C consultation.

ASPREN would like to increase the number of general practitioners in its network. In order to improve the national coverage of the scheme, those in New South Wales, Queensland, Victoria and Western Australia are particularly encouraged to apply. The work is not onerous or difficult. Participants are required to record the number of consultations for the nominated conditions each week according to clinical case definitions. In addition the number of consultations is recorded for the week, thus enabling consultation rates to be calculated. Data are submitted by mail on a weekly basis to the Research and Health Promotion Unit. In addition to the information published in *CDI*, participants also receive a copy of ASPREN's annual report.

If you would like to become an ASPREN contributor or would like further information, please contact Julia Rudd at the Research and Health Promotion Unit, telephone (08) 8362 9954, fax (08) 8362 0320.

Table. Geographical locations of ASPREN participating GPs, 1996

State or Territory	Number of GPs
Australian Capital Territory	2
New South Wales	23
Northern Territory	1
Queensland	13
South Australia	31
Tasmania	6
Victoria	18
Western Australia	5
TOTAL	99

Enhancement of the *CDI* Home Page of the Department of Health and Family Services Web Site

To reduce the loading time, *CDI* contents pages have been split into two separate pages.

CDI last three issues page is:
http://www.health.gov.au/hfs/pubs/cdi/cdicur3.htm
and *CDI* old issues page is:
http://www.health. gov.au/hfs/pubs/cdi/cdiold.htm

Starting from Volume 20 Number 19 (16 September 1996), readers can select the whole issue to be down loaded as a single file, or an individual article.

OVERSEAS BRIEFS

Source: World Health Organization

Dengue/dengue haemorrhagic fever, India

The National Institute of Communicable Diseases in Delhi has reported 7,427 cases of dengue and dengue haemorrhagic fever to 29 October. Of these 297 (4%) have died. Dengue type 2 has been isolated from five cases by the All India Institute of Medical Sciences, New Delhi, and the National Institute of Virology, Pune.

Dengue is a mosquito-borne infection which in recent years has become a major international public health concern. Dengue is found in tropical regions around the world, predominately in urban and peri-urban areas. A frequently lethal complication, dengue haemorrhagic fever was first recognized during the 1950s and is today a leading cause of childhood death in many countries. There are four distinct viruses which cause dengue, and infection by one does not offer protection against subsequent infection by the other three. The major mosquito vector of dengue is *Aedes aegypti*.

As there is no commercially available vaccine to prevent dengue, protection from mosquito bites is important to prevent infection. Covering exposed areas of the body

with insect repellent and sleeping under bed nets is effective personal protection. Longer-term protection can be accomplished by eliminating the mosquito breeding sites such as small collections of water in objects like broken bottles, standing water, and even plants which collect and contain rain water.

Ebola haemorrhagic fever, Gabon

The surveillance and follow-up of all cases of suspected Ebola haemorrhagic fever in Gabon have resulted in the identification of additional cases. As at 30 October, the total number of cases reported since the outbreak started was 25, of which 17 have died. Seventy-five contacts were being followed up.

Yellow fever, Benin

There have been 86 cases with 65 deaths of yellow fever in the outbreak in the Department of Atakora, Benin, which began in July. Yellow fever vaccine donated by various agencies has been distributed to 115,000 of the population at risk. A further 500,000 doses are still required. Médecins Sans Frontières has sent a team to the area to assist in the control of the outbreak.

Crimean-Congo haemorrhagic fever, South Africa

An outbreak of Crimean-Congo haemorrhagic fever has been reported in Oudtshoorn, Western Cape Province, by the National Institute of Virology, Sandringham, among workers at an ostrich farm and slaughterhouse. There has recently been an increase in tick bites among these workers and 32 have been hospitalised with symptoms of the disease. One case has died. Investigations were started on 4 November.

COMMUNICABLE DISEASES SURVEILLANCE

National Notifiable Diseases Surveillance System

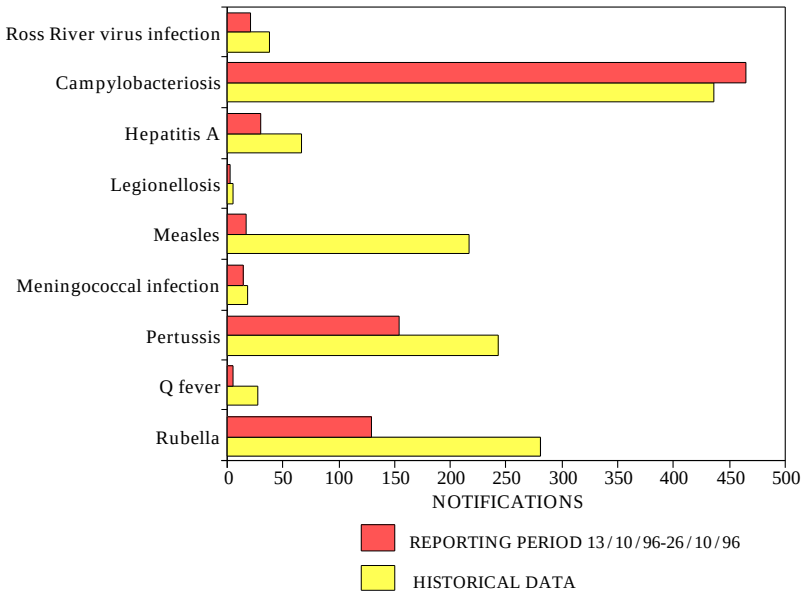
The NNDSS is conducted under the auspices of the Communicable Diseases Network Australia New Zealand. The system coordinates the national surveillance of more than 40 communicable diseases or disease groups endorsed by the National Health and Medical Research Council (NHMRC). Notifications of these diseases 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 1996;20:9-10.

Reporting period 13 to 26 October 1996

There were 1,778 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 1).

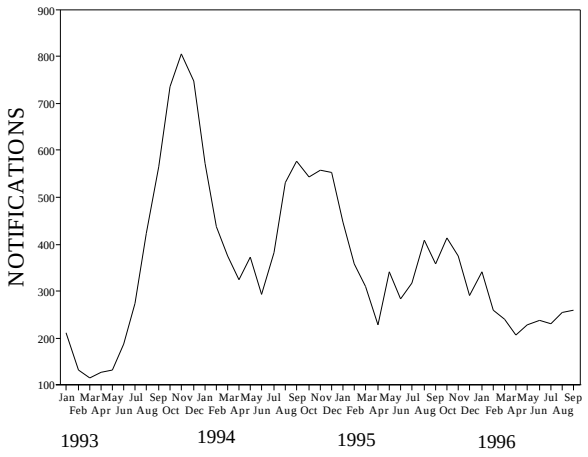
A total of 45 notifications of ***Haemophilus influenzae* type b infection** with onset in 1996 has been received so far. Of

Figure 1. 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.

Figure 2. Pertussis notifications, 1993 to 1996, by month of onset



these, 23 (51%) were for children under the age of 5 years. The number of reports remains low.

Seventeen notifications of **measles** were received this reporting period. The number of reports remains below that recorded for the same period in recent years.

Pertussis was notified for 154 persons this period, fewer than for the same period last year (Figure 2). A total of 2,461 notifications with onset in 1996 has been received of which 758 (31%) were for children under the age of 10 years.

One hundred and twenty-nine cases of **rubella** were reported this period. A total of 229 notifications was received for the month of September which is the lowest number of notifications recorded for this month since 1991.

The number of cases of **meningococcal disease** remained stable through the months of August and September (Figure 3) after peaking in July. Thirty-one per cent of the reports received with 1996 onset dates were from New South Wales. For the year to date 37% of notifications were for the under 5 years age group (Figure 4).

Figure 3. Meningococcal disease notifications, 1993 to 1996, by month of onset

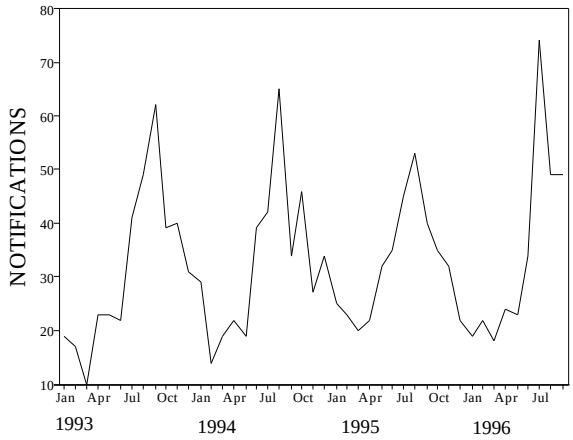


Figure 4. Meningococcal disease notifications, 1996, by age group and sex

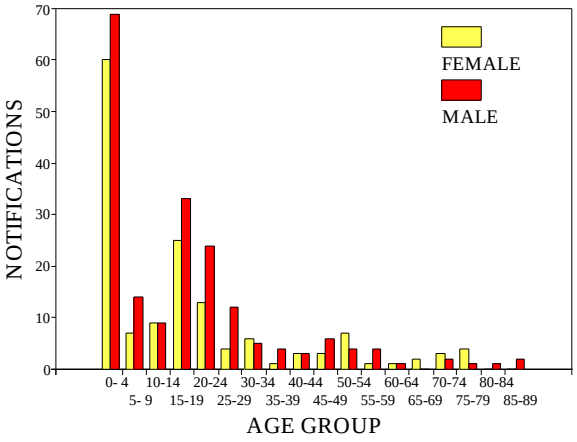


Table 1. Notifications of diseases preventable by vaccines recommended by the NHMRC for routine childhood immunisation, received by State and Territory health authorities in the period 13 to 26 October 1996

DISEASE[1]	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	TOTALS FOR AUSTRALIA[2] This period 1996	This period 1995	Year to date 1996	Year to date 1995
Diphtheria	0	0	1	0	0	0	0	0	1	0	1	0
Haemophilus influenzae b infection	0	0	0	1	0	0	0	0	1	2	47	57
Measles	0	1	2	3	7	1	2	1	17	38	383	1157
Mumps	0	0	0	NN	1	0	3	3	7	11	102	129
Pertussis	1	4	0	33	61	1	48	6	154	182	2663	3475
Rubella	5	0	0	53	34	0	21	16	129	342	2042	2943
Tetanus	0	0	0	0	0	0	0	0	0	0	1	3

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 13 to 26 October 1996

DISEASE[1]	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	TOTALS FOR AUSTRALIA[2]			
									This period 1996	This period 1995	Year to date 1996	Year to date 1995
Arbovirus Infection (NEC)[3,4]	0	0	2	0	0	0	0	1	3	4	90	64
Barmah Forest virus infection	0	0	-	11	0	0	0	-	11	15	721	675
Ross River virus infection	0	0	1	15	0	0	0	5	21	31	7520	2447
Dengue	0	0	0	0	0	-	0	0	0	0	30	25
Campylobacteriosis[5]	9	-	2	165	117	19	86	67	465	491	9567	8613
Chlamydial infection (NEC)[6]	12	NN	20	99	0	8	46	43	228	285	5996	5149
Donovanosis	0	NN	1	0	NN	0	0	1	2	6	40	66
Gonococcal infection[7]	2	1	19	18	0	0	9	48	97	125	3087	2569
Hepatitis A	0	2	4	8	0	0	16	0	30	66	1823	1260
Hepatitis B incident	0	0	0	1	0	0	0	2	3	7	172	265
Hepatitis C incident	0	0	1	-	0	-	-	-	1	0	25	63
Hepatitis C unspecified	8	NN	17	152	NN	6	40	33	256	418	7512	7933
Hepatitis (NEC)	0	0	0	0	0	0	0	NN	0	0	17	10
Legionellosis	0	0	0	1	0	0	1	0	2	1	145	138
Leptospirosis	0	0	0	2	0	2	14	0	18	15	192	110
Listeriosis	0	0	0	1	0	0	0	0	1	0	57	49
Malaria	0	2	4	23	0	0	4	0	33	10	713	523
Meningococcal infection	2	0	0	4	2	1	4	1	14	20	345	327
Ornithosis	0	NN	0	0	0	0	0	0	0	3	56	99
Q fever	0	0	0	4	0	0	1	0	5	22	417	382
Salmonellosis (NEC)	3	8	18	49	13	6	12	18	127	182	4608	4959
Shigellosis[5]	0	-	1	5	0	1	0	2	9	29	535	635
Syphilis	0	2	8	14	0	0	0	2	26	68	1209	1567
Tuberculosis	0	3	1	3	0	1	12	4	24	42	869	841
Typhoid[8]	0	0	0	12	6	0	1	0	19	1	72	60
Yersiniosis (NEC)[5]	0	-	0	0	0	0	0	0	0	9	217	265

1. For HIV and AIDS, see *CDI* 1996;20:486. 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.

Table 3. Notifications of rare[1] diseases received by State and Territory health authorities in the period 13 to 26 October 1996

DISEASE[2]	Total this period	Reporting States or Territories	Year to date 1996
Brucellosis	5	Qld 4, Vic 1	30
Chancroid	0		1
Cholera	0		4
Hydatid infection	2	ACT 1, NSW 1	34
Leprosy	0		9

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

Australian Sentinel Practice Research Network

The Australian Sentinel Practice Research Network (ASPREN) comprises 99 sentinel general practitioners from throughout the country. A total of approximately 9,000 consultations are recorded each week for 12 conditions. Of these, CDI reports the consultation rate for influenza, rubella, measles, chickenpox, pertussis and gastroenteritis. For further information including case definitions see CDI 1996;20:98-99.

Data for weeks 42 and 43 ending 20 and 27 October respectively are included in this issue of *CDI* (Table 4). The consultation rate for influenza-like illnesses is now at very low levels. There has been little change in the rate for gastroenteritis since July. Consultation rates for chickenpox have been steady during the last two months. Very small numbers of cases of rubella, measles and pertussis continue to be reported.

Table 4. Australian Sentinel Practice Research Network reports, weeks 42 and 43, 1996

Condition	Week 42, to 20 October 1996		Week 43, to 27 October 1996	
	Reports	Rate per 1,000 encounters	Reports	Rate per 1,000 encounters
Influenza	18	2.8	26	4.0
Rubella	1	0.2	3	0.5
Measles	0	0	0	0
Chickenpox	14	2.2	12	1.8
Pertussis	0	0	1	0.2
Gastroenteritis	105	16.6	104	15.9

Gonococcal surveillance

John Tapsall, The Prince of Wales Hospital, High Street, Randwick, NSW, 2031 for the Australian Gonococcal Surveillance Programme

The Australian Gonococcal Surveillance Programme (AGSP) reference laboratories in the various States and Territories report data on sensitivity to an agreed 'core' group of antimicrobial agents quarterly. The antibiotics which are currently routinely surveyed are the penicillins, ceftriaxone, ciprofloxacin and spectinomycin, all of which are administered as single dose regimens. When in vitro resistance to a recommended agent is demonstrated in 5% or more of isolates, it is usual to reconsider the inclusion of that agent in current treatment schedules. Additional data are also provided on other antibiotics from time to time. At present all laboratories also test isolates for the presence of high level resistance to the tetracyclines. Tetracyclines are however not a recommended therapy for gonorrhoea. Comparability of data is achieved by means of a standardised system of testing and a programme-specific quality assurance process. Because of the substantial geographic differences in susceptibility patterns in Australia, regional as well as aggregated data are presented.

Reporting period 1 January to 31 March 1996

The AGSP laboratories examined 727 isolates of *Neisseria gonorrhoeae* for sensitivity to the penicillins, ceftriaxone, quinolones and spectinomycin and for high level resistance to the tetracyclines in the March quarter of 1996.

Penicillins

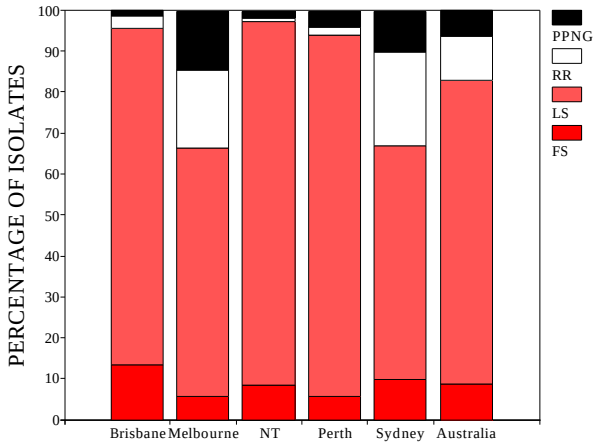
The usefulness of this group of antibiotics is progressively reducing and is least effective in Sydney and Melbourne where about 30% of isolates are resistant by one or more mechanisms. Figure 5 shows the proportion of isolates fully sensitive, less sensitive or relatively resistant to the penicillins by chromosomal mechanisms and the proportion of penicillinase-producing gonococci (PPNG) in different regions and as aggregated data for Australia. PPNG and relatively resistant isolates usually fail to respond to therapy with the penicillins.

There were 47 PPNG identified in this reporting period (6% of all isolates). These were found in all centres with 20 PPNG reported from Sydney, 16 from Melbourne, 6 from Perth and lower numbers in the other centres. Infections with PPNG were acquired locally, and in Hong Kong, Indonesia, the Philippines and Western Samoa. Seventy-seven (11%) of all isolates were resistant by chromosomal mechanisms, and these so called CMRNG were prominent in Sydney (47 isolates, 23% of the total there) and Melbourne (21 isolates, 19%).

Ceftriaxone and spectinomycin.

All isolates from all parts of Australia were sensitive to these injectable agents. It should be noted that spectinomycin is still available in Australia, contrary to some recent reports.

Figure 5. Penicillin resistance of gonococcal isolates for Australia and by region, 1 January to 31 March 1996



FS Fully sensitive to penicillin, MIC ≤ 0.03mg / L
LS Less sensitive to penicillin, MIC 0.06 - 0.5 mg / L
RR Relatively resistant to penicillin, MIC ≥ 1 mg / L
PPNG Penicillinase-producing *Neisseria gonorrhoeae*

Quinolone antibiotics

Twenty isolates (3%) had altered resistance to this group of antibiotics (ciprofloxacin, norfloxacin and enoxacin) with 9 showing high level resistance. Eleven quinolone-resistant gonococci (QRNG) were detected in Sydney (6%), 5 in Melbourne (5%) two in Perth and a single QRNG was present in Adelaide and Brisbane. Eight of the 9 strains with high level resistance were detected in Sydney and the other in Perth. Most infections with QRNG were acquired overseas with China and the Philippines identified most often as countries of acquisition.

High level tetracycline resistance

Thirty-two tetracycline resistance *Neisseria gonorrhoeae* (TRNG) were detected throughout Australia with isolates of this type present in all centres. The highest proportion of TRNG was found in Melbourne where the 8 TRNG represented 7% of all isolates. TRNG were also prominent in Sydney (13 isolates, 7%) and Perth (7 isolates, 5%). Overseas sources of the isolates were identified as Vietnam, Cambodia and Indonesia. Local acquisition was also recorded.

LabVISE

The Virology and Serology 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 1996;20:9-12.

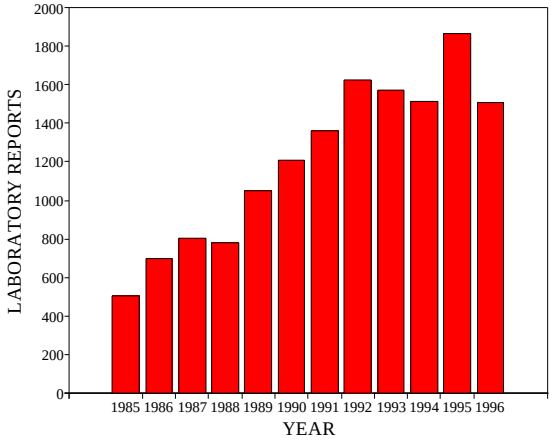
There were 1,090 reports received in the *CDI* Virology and Serology Reporting Scheme during this period (Tables 5 and 6).

In the last fortnight, 143 reports of **Epstein-Barr virus** were received with diagnosis by IgM detection (109), single high titre (32), four-fold rise in titre (1) and nucleic acid detection (1). The number of laboratory reports for 1996 to date are equivalent to the total number reported in 1994 (Figure 6). There is no apparent seasonal pattern to laboratory reports of Epstein-Barr virus.

Reports of **parainfluenza virus type 3** have continued to increase and could increase further as data for October may be incomplete. There have been 92 reports with specimen collection in October, but this remains well below the peak in August 1995 (Figure 7). In the last fortnight, 74 reports were received with diagnosis by virus isolation (44), antigen detection (28) and single high titre (2). Parainfluenza virus type 3 is most commonly reported in the first 12 months of life. Bronchiolitis and pneumonia are the most common clinical syndromes.

In the last fortnight, 14 reports of **rhinovirus** were received. The number of laboratory reports is currently below the numbers reported for the same period in 1994 and 1995 (Figure 8).

Figure 6. Epstein-Barr virus laboratory reports, 1985 to September 1996, by year of specimen collection[1]



1. 1996 laboratory reports include specimen collection until 30 September

Figure 7. Parainfluenza virus type 3 laboratory reports, 1994, 1995 and 1996, by month of specimen collection

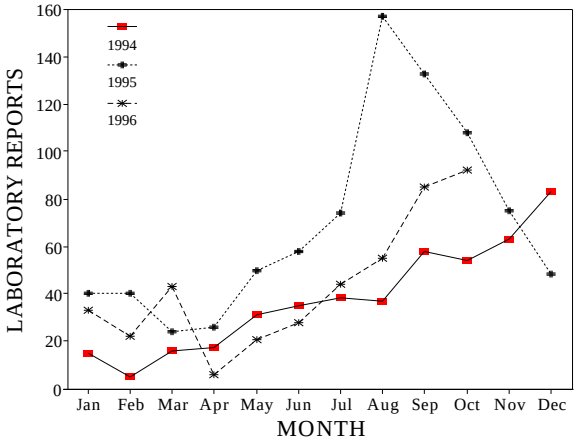


Figure 8. Rhinovirus laboratory reports, 1994, 1995 and 1996, by month of specimen collection

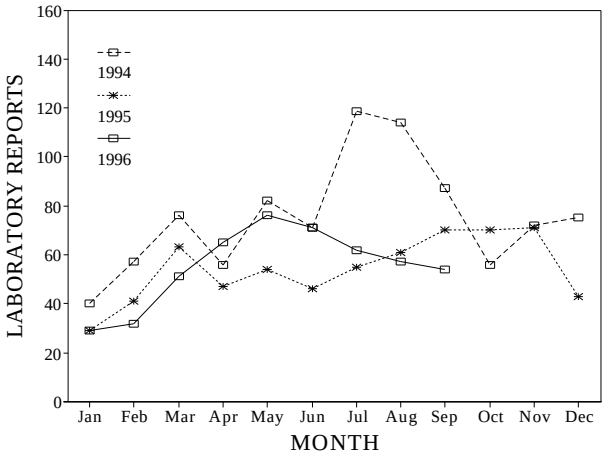


Table 5. Virology and serology laboratory reports by State or Territory[1] for the reporting period 17 to 30 October 1996, historical data[2], and total reports for the year

	State or Territory[1]								Total this fortnight	Historical data[2]	Total reported this year
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA			
MEASLES, MUMPS, RUBELLA											
Measles virus					1			1	2	23.8	46
Mumps virus					2				2	2.7	35
Rubella virus		4		27	19		1	4	55	95.5	532
HEPATITIS VIRUSES											
Hepatitis A virus			2	3	1			3	9	16.2	361
Hepatitis D virus				3	2				5	1.2	18
ARBOVIRUSES											
Ross River virus			3	12				5	20	15.5	3,113
Barmah Forest virus			3	2				2	7	6.0	194
ADENOVIRUSES											
Adenovirus type 1					3				3	1.3	19
Adenovirus type 2					4				4	3.8	28
Adenovirus type 3							2		2	1.2	66
Adenovirus type 5					3				3	.8	8
Adenovirus type 7					1				1	1.3	24
Adenovirus type 8							1		1	.8	6
Adenovirus type 40							1		1	.0	30
Adenovirus not typed / pending		3		21	6		8	20	58	43.3	1,229
HERPES VIRUSES											
Cytomegalovirus		3		16	5	1	2	28	55	64.7	1,383
Varicella-zoster virus		2		10	12	1	9	2	36	43.0	1,032
Epstein-Barr virus		6	2	56	52		6	21	143	81.0	1,768
OTHER DNA VIRUSES											
Poxvirus group not typed							1		1	.3	4
Parvovirus	1			5	3		8		17	3.0	182
PICORNA VIRUS FAMILY											
Coxsackievirus B2						3			3	1.0	10
Coxsackievirus B5							3		3	.0	11
Echovirus type 5							1		1	.0	1
Rhinovirus (all types)				7	7				14	27.8	632
Enterovirus not typed / pending				21					21	31.7	762
ORTHO / PARAMYXOVIRUSES											
Influenza A virus		1		12	7		2		22	10.3	1,468
Influenza A virus H3N2				2					2	1.3	70
Influenza B virus				1					1	6.7	52
Parainfluenza virus type 1					2		1		3	.0	303
Parainfluenza virus type 2					4				4	1.5	69
Parainfluenza virus type 3		7	1	30	7		15	14	74	33.0	599
Parainfluenza virus typing pending								1	1	1.3	19
Respiratory syncytial virus		6		8	34	5	37	8	98	59.0	4,027
Paramyxovirus (unspecified)							5		5	.8	23
OTHER RNA VIRUSES											
Rotavirus		26			13	19	19	11	88	108.8	1,467
Small virus (like) particle							1		1	1.8	15
OTHER											
Chlamydia trachomatis not typed		1	74	24	35	3	5	46	188	94.0	3,267
Chlamydia species				3					3	4.8	71
Mycoplasma pneumoniae		9		9	5	4	13	14	54	21.7	688
Coxiella burnetii (Q fever)		2		3			3		8	9.7	163
Bordetella pertussis							47		47	29.2	552
Bordetella species		2		13					15	17.7	250
Cryptococcus species				1				1	2	.2	10
Leptospira hardjo				1	1				2	.0	19
Leptospira species				4					4	.8	57
Schistosoma species							1		1	5.5	229
TOTAL	1	72	85	294	229	36	192	181	1,090	874.2	24,912

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 6. Virology and serology laboratory reports by contributing laboratories for the reporting period 17 to 30 October 1996

STATE OR TERRITORY	LABORATORY	REPORTS
New South Wales	Institute of Clinical Pathology & Medical Research, Westmead	14
	Royal Alexandra Hospital for Children, Camperdown	16
	South West Area Pathology Service, Liverpool	27
Queensland	Queensland Medical Laboratory, West End	170
	State Health Laboratory, Brisbane	144
South Australia	Institute of Medical and Veterinary Science, Adelaide	228
Tasmania	Northern Tasmanian Pathology Service, Launceston	12
	Royal Hobart Hospital, Hobart	23
Victoria	Microbiological Diagnostic Unit, University of Melbourne	3
	Monash Medical Centre, Melbourne	22
	Royal Children's Hospital, Melbourne	116
	Victorian Infectious Diseases Reference Laboratory, Fairfield Hospital	55
Western Australia	Princess Margaret Hospital, Perth	47
	Royal Perth Hospital	43
	Western Diagnostic Pathology	170
TOTAL		1090

Contributions covering any aspects of communicable disease are invited. Instructions to authors can be found in *CDI* 1996;20:13.

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