

ANNUAL SUMMARIES - 2001

BACTERIOLOGY

INVASIVE INFECTIONS

Antimicrobial susceptibilities of these bacteria are reported in the Antibiotic Resistance section of this issue of Lablink.

Haemophilus influenzae

The introduction of Hib vaccine in 1994 has led to a 92% decline (95% CI=89-94%) in the hospitalisation rate of *Haemophilus influenzae* disease for those under 5 years of age (Wilson *et al.*, unpublished data). It is therefore important to identify serotypes of *H. influenzae* currently causing disease. Laboratory data and notification data are matched to ensure that all cases are represented in the notifiable disease dataset.

Isolates were received from 51 cases of *H. influenzae* invasive disease in 2001. Eight of these isolates were serotype b. One isolate was serotype c, one serotype e and three isolates serotype f. There were also 51 isolates received in 2000 of which 10 (19.6%) were *H. influenzae* serotype b. Isolates that were non-serotypable were tested by PCR for the presence of the serotype b specific *cap* gene and *bexA* gene necessary for capsular expression. One of the 10 serotype b isolates was autoagglutinating but had the gene for expression of the b serotype.

Neisseria meningitidis

Surveillance of meningococcal disease in New Zealand is based on a combination of notification and laboratory data. A total of 650 cases of meningococcal disease were recorded in 2001 giving a rate of disease of 17.4 per 100 000. This is the highest rate since the start of the epidemic and brings the total number of cases since its start in 1991 to 4195. Serogroup B meningococci with the PorA subtype P1.7b,4 continue to cause most disease. In 2001, 75.2% (489/650) of cases were laboratory-confirmed. This is the highest percentage of cases to be confirmed since 1994 when pre-hospital administration of antibiotics was actively promoted and led to a reduced chance of obtaining culture-positive meningococcal disease cases. Table 1 presents the basis of confirmation in a hierarchical system where each case is represented in the table only once, starting with the isolation of *N. meningitidis* from CSF, blood or other sterile site down to a positive result in the latex meningococcal antigen test. Recovery of meningococci from the throat provides presumptive evidence only and the case is therefore categorised as probable. In 2001, 159 cases (24.5%) of meningococcal disease, not confirmed by isolation of a meningococcus, were confirmed

by detection of meningococcal DNA from sterile site specimens. This is the highest percentage of cases confirmed by PCR to date (Table 1). Of the cases given antibiotics prior to admission to hospital 38.3% were PCR positive compared with 13.7% culture positive. These results affirm the value of PCR testing in cases when antibiotics have been given prior to sampling because of the difficulty of obtaining a viable culture after antibiotic treatment. The percentage of cases confirmed by culture was relatively consistent across the whole country. However, a case of meningococcal disease of any age was least likely to be confirmed by PCR if it occurred in the Northern Health Region.

Table 1. Meningococcal disease, basis for diagnosis, 1996-2001¹

Basis for diagnosis	1996		1997		1998		1999		2000		2001	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Isolation of <i>N. meningitidis</i> from blood and/or CSF or any other sterile site	266	56.2	315	51.5	221	50.2	243	48.2	256	53.3	319	49.1
PCR test	21	4.4	59	9.6	75	17.0	72	14.3	83	17.3	159	24.5
Gram-negative diplococci in CSF	28	5.9	40	6.5	6	1.4	17	3.4	8	1.7	11	1.7
Meningococcal antigen test	2	0.4	2	0.3	2	0.5	1	0.2	1	0.2	0	0.0
Confirmed - subtotal	317	66.9	416	68.0	304	69.1	333	66.1	348	72.5	489	75.2
Clinical criteria and a positive throat swab	6	1.3	9	1.3	6	1.4	7	1.4	2	0.4	4	0.6
Clinical criteria	150	31.7	188	30.7	130	29.5	164	32.5	130	27.1	157	24.2
Probable - subtotal	156	33.0	197	32.0	139	30.9	171	33.9	132	27.5	161	24.8
Total	473	100	613	100	440	100	504	100	480	100	650	100

¹ Each case is represented only once in the table.

As a proportion of the total isolates from cases of disease, serogroup B increased from the 1990 baseline level of 47.8% to 61.0% in 1991 at the start of the epidemic, and reached a peak of 94.1% (241/256) in 2000. Serogroup B isolates proportionately decreased in 2001 to 88.4% coincident with the increase that occurred in serogroup C disease. Thirty serogroup C isolates, representing 9.4% of the total isolates, were recovered in 2001 compared with only 10 (3.9%) in 2000. Fifty percent of the C isolates were from cases in the Southern Health Region and of these 15, nine were from the Otago Health District. Meningococci with the P1.4 PorA type were identified by serosubtyping only three times prior to 1991. Of the serogroup B isolates, those with the P1.4 PorA protein represented 92.9% (262/282) in 2001, which is an increase from 90.4% (217/240) recorded in 2000 (Figure 1).

PCR testing of patient specimens is used not only to confirm cases but also to identify the epitopes on the PorA protein, through sequence recognition. Of the 159 PCR positive cases, material was available to determine the PorA protein subtype of 143 (89.9%). Sequences encoding the P1.7b,4 PorA subtype were present in 76.2% (109/143) of specimens tested. In 2000, 52 out of 63 (82.5%) had DNA encoding the P1.7b,4 subtype. Combining the results for the serosubtyping of isolates (n=319) and for subtype definition

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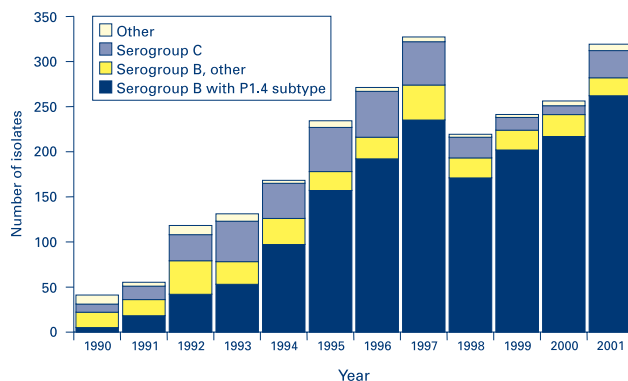
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using *porA* sequence recognition of DNA in patient specimens (n=143) it was shown that 80.5% (372/462) of the confirmed cases, able to be tested in this way, were caused by a meningococcus with the P1.7b,4 PorA protein. By comparison, in 2000, subtype P1.7b,4 was responsible for 84.6% (269/318) of cases.

Figure 1. Meningococcal disease isolates and dominant subtype 1990-2001



Streptococcal invasive disease

Reporting of streptococcal diseases, except for acute rheumatic fever, is not mandatory in New Zealand so surveillance depends on the voluntary referral of isolates to the Streptococcal Reference Laboratory at ESR. An isolate is not received from every disease case, therefore numbers under estimate the incidence of these diseases in New Zealand. Laboratory results give an indication of the distribution of organism types present.

Streptococcus pneumoniae

Serogrouping and serotyping of *Streptococcus pneumoniae* is undertaken to monitor the types causing invasive disease and the likely coverage by licensed or trial vaccines. In 2000 an audit of the major hospitals in New Zealand showed that referral of isolates from cases of invasive pneumococcal disease approximated 98% (except in Wellington) and thus the data accurately reflected the spectrum of serotypes encountered. It is likely the same applied in 2001. The 23-valent vaccine, used only for adult vaccinations, contains the following capsular antigen types: 1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19A, 19F, 20, 22F, 23F and 33. Among the pneumococci derived from cases over 14 years of age, 93.4% (299/320) belonged to serogroups/serotypes covered by the vaccine.

Conjugate vaccines developed for paediatric use deliver seven, nine or eleven capsular antigens. The seven-valent vaccine contains capsular types 4, 6B, 9V, 14, 18C, and 23F; the nine-valent vaccine additionally contains types 1 and 5; and the eleven-valent vaccine additionally contains types 3 and 7F. In 2001, invasive disease isolates were typed from 216 children under 15 years of age. By comparing the serotypes of the paediatric isolates against the three conjugate vaccines, seven-valent, nine-valent, and eleven-valent, it was predicted that 61.6%, 65.7% and 71.3% respectively of paediatric disease may have been prevented by use of these vaccines.

Streptococcus pyogenes (Group A Streptococcus)

Monitoring of *Streptococcus pyogenes* causing invasive and significant streptococcal disease is considered important. Of the isolates received in 2001 120 were from cases of invasive disease. Seven isolates referred were from cases of necrotising fasciitis (NF). No one *emm* type predominated. Not all NF isolates are referred. Of the 8 isolates from scarlet fever, 4 were *emm*12. Three of four isolates from post-streptococcal acute glomerulonephritis were *emm*49, a recognised nephritogenic type. Various *emm* types were identified from cases of rheumatic fever. Thirty-six distinct *M/emm* types occurred

among the invasive isolates indicating the wide range of types which can cause infection in New Zealand. The most common *M/emm* types were 1, 3, 28, 81, and 91.

Streptococcus agalactiae (Group B Streptococcus)

Serotyping of Group B streptococci is focussed on monitoring neonatal sepsis. During 2001 isolates were received from 99 cases of invasive group B streptococcal disease. Twenty-five cases were from neonatal sepsis of which 16 were early onset disease. Serotype III continued to be the most common serotype involved in neonatal sepsis accounting for 60% (15/25).

Bordetella pertussis

Following the epidemic of whooping cough in 2000 involving *B. pertussis* of serotype 1, 3 limited monitoring of isolates has continued. Isolates were received from 260 cases of *B. pertussis* in 2001. Serotyping was performed on 129 isolates of which 127 (98.5%) were serotype 1,3 and two were serotype 1,2.

LEGIONELLOSIS AND ENVIRONMENTAL LEGIONELLA ISOLATES

During 2001 there were 56 laboratory reported cases of legionellosis, of which 47 were confirmed and nine were probable. This compares with 41 confirmed and 15 probable cases in 2000.

All confirmed cases were identified by a clinically compatible illness and by the demonstration of an antibody seroconversion (17 cases), or the demonstration of two or more antibody titres at or above 512 (15 cases), or the demonstration of rising antibody titres to above 512 (7 cases) or by culture isolation of legionella organisms (6 cases). A further two cases were identified by the demonstration of an antibody seroconversion and culture isolation of legionella organisms (1 case), or both culture isolation and PCR positive from blood (1 case).

The nine probable cases were based on clinically compatible symptoms with the demonstration of a single high antibody titre (>512) (8 cases), or a positive urinary antigen test (1 case).

For laboratory-reported cases of legionellosis in 2001; the Waikato health district accounted for 14 cases, and Canterbury 9, Wellington 6, Central Auckland 5, Northland 4, Hutt and Northwest Auckland with 3 each, Otago and South Auckland with 2 each, and one case each in Tauranga, Taupo, Wanganui, Manawatu, Wairarapa, Nelson, South Canterbury and Southland health districts.

The majority of cases were male (59%) and 80% were people aged 50 years or over (Table 2).

In 2001, 36 (75%) of the confirmed cases were notified and 7 (87.5%) of the probable cases were notified. This compares with a notification rate of 80% for confirmed cases and 67% for probable cases in 2000. Notification data show 12 laboratory-confirmed cases and one probable case were not notified. Further, two cases were notified without laboratory investigation, with both being notified on clinical grounds alone. A further case was notified with stable antibody titres at 256, indicating probable exposure at some previous undetermined time. None of these three cases meet the case definition for legionellosis. Legionellosis is a notifiable disease and can be notified on suspicion. Legionellosis in cases of community acquired pneumonia and nosocomial pneumonia can only be distinguished from other causes of pneumonia by the appropriate laboratory testing.

Laboratory-reported cases of legionellosis peaked in spring (September-December) as in previous years with very few confirmed cases in winter. This observed seasonality of legionellosis may be associated with the fact that the prevalent strain causing disease is *L. longbeachae* serogroup 1, and this strain is commonly associated with compost and soils. Anecdotal evidence suggests gardening activity is reduced during winter months

with less use of composted material and potting mixes. There were two deaths caused by legionellosis in 2001. Both deaths followed infection with is *L. longbeachae* serogroup 1 from commercially prepared composted material. One death involved a 43-year-old immunosuppressed female while the other involved a previously healthy 70-year-old male. All laboratory-identified cases in 2001 were sporadic in nature with no outbreaks recognised.

Table 2. Legionellosis cases and environmental Legionella isolates, 2001

Legionella species and serogroups	Clinical Cases			Number of environmental isolates
	Confirmed	Probable	Total	
<i>L. anisa</i>				8
<i>L. bozemanii</i> serogroup 1				7
<i>L. bozemanii</i> serogroup 2				1
<i>L. bozemanii</i> serogroup unidentified				1
<i>L. dumoffii</i>	4	2	6	
<i>L. feeleii</i> serogroup 1				3
<i>L. feeleii</i> serogroup 2				2
<i>L. feeleii</i> serogroup unidentified				2
<i>L. gormanii</i>	3		3	
<i>L. longbeachae</i> serogroup 1	22	4	26	20
<i>L. longbeachae</i> serogroup 2				3
<i>L. longbeachae</i> serogroup unidentified	5		5	3
<i>L. micdadei</i>	2		2	4
<i>L. parisiensis</i>				1
<i>L. pneumophila</i> serogroup 1	1	1	2	40
<i>L. pneumophila</i> serogroup 2	1		1	2
<i>L. pneumophila</i> serogroup 3				4
<i>L. pneumophila</i> serogroup 5				7
<i>L. pneumophila</i> serogroup 6				20
<i>L. pneumophila</i> serogroup 8				2
<i>L. pneumophila</i> serogroup 10				2
<i>L. pneumophila</i> serogroup 11	1		1	
<i>L. pneumophila</i> serogroup 12	1		1	
<i>L. pneumophila</i> serogroup 13	2		2	
<i>L. pneumophila</i> serogroup unidentified	2		2	11
<i>L. taurinensis</i>				1
Non- <i>L. pneumophila</i> species	3		3	1
<i>Legionella</i> sp. unidentified		2	2	23
Total	47	9	56	168
Cases Notified	36	7	43	-

Table 3. Age and sex distribution of all laboratory confirmed legionellosis case, 2001

Age	30-39	40-49	50-59	60-69	70-79	80-89	Total	Ave age	Age range
male	2	2	9	12	5	3	33	61.9	34-86
female	2	5	5	6	3	2	23	58.8	32-83
total	4	7	14	18	8	5	56	60.6	32-86

LEPTOSPIROSIS

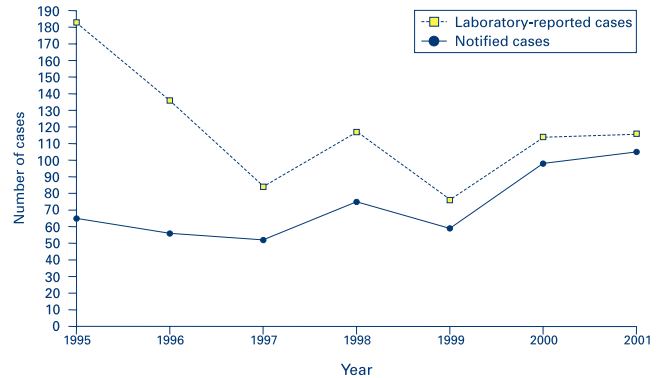
One hundred and five cases of leptospirosis were notified in 2001. Of these, 76 were recorded on EpiSurv as being confirmed cases. One hundred and sixteen cases were laboratory-reported in 2001¹. Matching of laboratory-reported and notified cases indicated that 83 cases were both notified and laboratory-reported during 2001; 21

cases were notified but not lab-reported and 33 cases were lab-reported but not notified².

The notification rate in 2001 (2.8 per 100,000) was similar to the rate in 2000 (2.7 per 100,000). Of the 82 cases for whom hospitalisation status was recorded, 45 (54.9%) were hospitalised.

The number of notified and laboratory-reported cases of leptospirosis recorded each year since 1995 is shown in Figure 2.

Figure 2. Leptospirosis laboratory-reported and notified cases by year 1995-2001



The rate of leptospirosis varied throughout the country. Rates higher than the national average were recorded in Gisborne (18.2 per 100,000), Northland (10.7), Hawkes Bay (9.8), South Canterbury (7.7), Waikato (7.1), Ruapehu (7.0), Tauranga (4.6), Manawatu (4.1), West Coast (3.3), Taupo (3.2), Rotorua (3.1) and Taranaki (2.9) health districts.

¹ Laboratory data is based on the date the specimen was received at ESR or other laboratory.
² Note that due to inevitable time lags between notification and specimen testing, a 100% match between notified and lab-reported cases in any set period, is never expected.

Table 4 shows the distribution cases of leptospirosis by age group and ethnicity. Gender was recorded for 101 (96.2%) of the 105 cases. Of these, 87 cases (86.1%) were male and fourteen (13.9%) were female.

Table 4. Leptospirosis notifications by age group and ethnicity, 2001.

Age group (years)	European		Maori		Pacific people		Other		Unknown	Total	
	Cases	Rate ¹	Cases	Rate ¹	Cases	Rate ¹	Cases	Rate ¹	Cases	Cases	Rate ¹
<1	0	0.0	0	0.0	0	0.0	0	0.0	0	0	0.0
1-4	0	0.0	0	0.0	0	0.0	0	0.0	0	0	0.0
5-9	1	0.6	0	0.0	0	0.0	0	0.0	0	1	0.3
10-14	0	0.0	0	0.0	0	0.0	0	0.0	0	0	0.0
15-19	1	0.6	0	0.0	0	0.0	0	0.0	1	2	0.8
20-29	10	3.3	2	2.4	2	5.9	1	2.3	5	20	4.1
30-39	16	4.0	4	5.2	1	3.2	1	2.2	9	31	5.4
40-49	17	4.3	1	1.7	0	0.0	0	0.0	4	22	4.1
50-59	13	3.9	1	3.0	0	0.0	0	0.0	9	23	5.5
60-69	6	2.6	0	0.0	0	0.0	0	0.0	0	6	2.1
70+	0	0.0	0	0.0	0	0.0	0	0.0	0	0	0.0
Unknown	0	-	0	-	0	-	0	-	0	0	-
Total	64	2.4	8	1.5	3	1.5	2	0.8	28	105	2.8

¹ Crude rate per 100,000, based on 2001 census

Occupation was recorded for 95 of the 105 notified cases. Of these, 85 cases had either recorded or implied occupational exposure to leptospirosis: 48 (50.0%) were farmers (dairy, pig, deer) or farm workers, and 31 (32.6%) were meat workers (freezing workers, butchers, or meat inspectors). There was also one stock agent, a trapper, a fisherman, a forestry worker, a horticultural worker, and a conservation worker. Three of the remaining 10 cases (who indicated no occupational exposure to leptospirosis) did however record other exposure to farm or wild animals in the twenty days preceding onset of illness.

The species distribution of laboratory-reported *Leptospira* over the last six years is shown in Table 5.

Table 5. Species/serovar distribution of laboratory-reported *Leptospira*, 1995-2001

Leptospira species / serovar	Year						
	1995 ¹	1996 ¹	1997 ¹	1998 ¹	1999 ¹	2000 ¹	2001
<i>L. interrogans</i> sv <i>australis</i>	0	0	0	2	1	2	1
<i>L. borgpetersenii</i> sv <i>ballum</i>	25	28	12	27	17	22	15
<i>L. interrogans</i> sv <i>bratislava</i>	17	13	0	5	0	0	0
<i>L. interrogans</i> sv <i>canicola</i>	1	0	1	0	0	1	1
<i>L. interrogans</i> sv <i>copenhageni</i>	6	3	4	8	7	2	1
<i>L. interrogans</i> sv <i>pomona</i>	29	21	22	20	11	27	46
<i>L. borgpetersenii</i> sv <i>tarassovi</i>	10	4	7	12	9	8	11
<i>L. borgpetersenii</i> sv <i>hardjo</i> ³	87	57	32	32	21	50	35
Unidentified <i>Leptospira</i> species	17	10	6	11	10	2	4
Total²	183	136	84	117	76	114	113

¹ Data source: Lablink Annual Summaries 1995-2000

² More than one serovar is recorded for some cases

³ Previously denoted as *L. interrogans* serovar *hardjo*

Note that because some of the results included in Table 5 are confirmed via serological techniques, rather than by isolation, they must be interpreted with caution due to the potential for cross-reaction among antibodies.

The *Leptospira* species/serovar was recorded on EpiSurv for 54 of the 105 notified cases: *L. borgpetersenii* sv *hardjo* (22 cases), *L. interrogans* sv *pomona* (17), *L. borgpetersenii* sv *tarassovi* (8), *L. borgpetersenii* sv *ballum* (7).

SPECIAL BACTERIOLOGY

Interesting Isolates received in the Special Bacteriology Laboratory during 2001

- *Corynebacterium coyleae* from urine of a female patient with a urinary tract infection. This new species was first described in 1997, after it had been isolated from blood or pleural fluid in six patients, five of whom had recent surgery. Distinguishing features of this non-lipophilic species are slow fermentation of glucose but not maltose and sucrose, and a strong positive CAMP reaction.
- *Corynebacterium riegliei* from CAPD fluid. This new species was first described in 1998, in a study of four isolates from urinary tract infections in female patients. Strong urease activity and the ability to slowly ferment maltose but not glucose are distinguishing features of this non-lipophilic coryneform bacterium.

These two isolates have been deposited in the New Zealand Reference Culture Collection, Medical Section, as representative New Zealand strains of these new species.

Blood culture isolates: *Actinobacillus actinomycetemcomitans* (3), *Brevibacterium* sp. (2), *Capnocytophaga* sp. (3), *Chryseobacterium meningosepticum* (1), *Corynebacterium afermentans* subsp. *lipophilum* (2), *Corynebacterium jeikeium* (2), *Erysipelothrix rhusiopathiae* (1), *Neisseria mucosa* (1), *Neisseria sicca* (1), *Pasteurella multocida* (1), *Rothia dentocariosa* (1).

Corynebacterium diphtheriae

Three isolates of *Corynebacterium diphtheriae* were received for toxigenicity testing, typing and surveillance purposes in 2001. The isolates were from leg wounds (2), and an infected tattoo (1), and all were non-toxicogenic strains. Toxigenicity was determined by PCR detection of the toxin gene.

These isolations correspond to the pattern of sporadic cases of infection with non-toxicogenic strains of *C. diphtheriae* in New Zealand. The last case of diphtheria (toxigenic strain) occurred in 1998¹. The distribution of isolates received over the ten-year period 1992-2001 is shown in Table 6.

¹ NZPHR 1998; 5: 73-6.

Table 6. *Corynebacterium diphtheriae* isolations, 1992-2001

Year	Health district	Sex/Age	Source	Biovar
1992 – no isolates received				
1993	Wellington Waikato Wellington Wellington	M 12y M 78y F 20y M 41y	cutaneous respiratory cutaneous cutaneous	<i>mitis</i> <i>mitis</i> <i>mitis</i> <i>mitis</i>
1994	Central Auckland	M 27y	blood	<i>gravis</i>
1995	Wellington Wellington	M 38y M 22y	cutaneous cutaneous	<i>gravis</i> <i>mitis</i>
1996	Central Auckland Central Auckland Wellington	M 58y F 12y F 22y	respiratory blood cutaneous	<i>mitis</i> <i>gravis</i> <i>gravis</i>
1998	Canterbury Central Auckland	M 21y M 2y	cutaneous respiratory	<i>mitis</i> <i>intermedius</i> ¹
1999	Central Auckland Waikato Central Auckland South Auckland	F 18y F 16y F 29y F 49y	respiratory blood cutaneous respiratory	<i>mitis</i> <i>gravis</i> <i>gravis</i> <i>mitis</i>
2000	Central Auckland Central Auckland Wellington Central Auckland Central Auckland	M 23 y M 17y M 61y M 32y M 11y	cutaneous cutaneous cutaneous cutaneous cutaneous	<i>mitis</i> <i>gravis</i> <i>mitis</i> <i>mitis</i> <i>mitis</i>
2001	Central Auckland Central Auckland Wellington	F 9y F 35y M 13y	cutaneous cutaneous cutaneous	<i>mitis</i> <i>mitis</i> <i>gravis</i>

¹ toxigenic strain.

Listeria monocytogenes

Isolates from 19 cases of listeriosis were received for typing and surveillance purposes in 2001 (Table 7) compared with 22 cases in 2000.

Three (16%) of the 19 cases were perinatal and one foetal death was recorded. All but one of the 16 non-perinatal cases had an underlying illness and/or were elderly; the one case (F 10y) where no risk factors were identified had been well prior to her listeria infection.

The serotype distribution of the 19 isolates was:

- Serotype 01/2 10 (53%)
- Serotype 04 9 (47%)

Table 7. *Listeria monocytogenes* from human cases, 2001

Month isolated or of onset	Health district	Sex/Age	Specimen source	O antigen serotype
Perinatal Cases				
January	Central Auckland	F 34 y	BC	1/2
August	Taranaki	F 42y	BC	4
October	Wellington	F 27y ¹	BC	4
Non-perinatal Cases				
January	Canterbury	M 86y	BC	1/2
January	Central Auckland	M 71y	BC	1/2
March	South Canterbury	M 77y	BC	1/2
March	Central Auckland	F 10y	CSF	4
May	Central Auckland	F 70y	BC	1/2
May	South Auckland	F 7y	CSF	1/2
July	Taranaki	F 67y	BC	4
August	Gisborne	M 78y	BC	4
September	Central Auckland	M 67y	BC	4
September	Otago	F 90y	BC	4
October	Central Auckland	M 76y	BC	4
October	Tauranga	F 75y	BC	1/2
November	Canterbury	F 52y	BC	1/2
November	Tauranga	M 90y	BC	1/2
November	Otago	M 79y	BC	4
December	North West Auckland	M 87y	BC	1/2

¹ Foetal death

ENTERIC PATHOGENS

SALMONELLA

There were 2,605 human isolates serotyped in 2001 compared with 1,982 in 2000. The distribution of serotypes is shown in Table 10 and percentage totals of serotypes and phage types are shown in Figures 3 and 4.

Isolates were received from 26 cases of *S. Typhi* compared with 20 cases in 2000. Phage types isolated were as follows:

A (2), B1 (2)*, E1a (7), E2 (1), E7 (6), E11 (1), D2 (1), 43 (1), 56 (1), Untypable (4)

*One case, recent travel India, the other, a laboratory technician working with specimens from the case.

New serotypes/phage types isolated in 2001 include:

- S. Kingston* 1, 4, 12, 27 : g,s,t : Z43 no details
- S. Othmarschen* 6, 7 : gm : - recent travel Fiji
- S. Typhimurium* phage type 192 recent travel Africa
- S. Typhimurium* phage type 4 Two cases same Health district, no known contact with each other
- S. Uganda* 15+ 3, 15 : 1, z13 : 1, 5 this isolate was from a dairy farmer. The serotype was also isolated from cattle and animal feed on his property.

Table 8. Significant outbreaks/clusters, 2001

Serotype	Phage type	Month	Health District	No. of cases	Comment
Infantis		January	CA	12	No common source proven
Typhimurium	1	January	NL	12	No common source proven
Typhimurium	135	February	TK	14	Associated with a Stratford bakery
Typhimurium	160	March	CA, SA	36	Food poisoning following an umu. Also isolated from potato salad and chicken served at the umu
Brandenburg		April	RU	8	2 cases hospitalised after function at a service club
Enteritidis	6	June	CA, SA, TG, CB	4	Members of a travel group returning from Bali
Heidelberg		July		41	See note below ¹
Typhimurium	160	July		46	See note below ²
Brandenburg		September	OT, SO	26	Spring peak associated with sheep and cattle abortion

1 *S. Heidelberg*: There was a significant increase in isolates of this serotype in June (6) and July (35), with the highest number of isolates being received from Auckland, Waikato, Rotorua and Otago. Cases were interviewed using a case control study questionnaire but no common risk factors were found.

2 *S. Typhimurium* phage type 160: This phage type continued to be isolated in high numbers, as well as in the outbreak noted above. In 2000 it represented 9% of total isolates and this increased to 30% in 2001. A case control study of 119 cases and 235 controls was conducted between 28 April and 31 August, covering 18 of the 24 Health Districts. Statistically significant risk factors determined were:

- contact with wild birds.
- consumption of takeaway foods.
- contact with a person with diarrhoea and vomiting.

Unusual Isolates

- There were a number of unusual site isolates during 2001:
- S. Brandenburg* from a lumber disc aspirate, a gall bladder aspirate, a hip aspirate, a wound swab, and from cerebrospinal fluid.
- S. Heidelberg* from a foot aspirate.
- S. Typhimurium* phage type 1 from cerebrospinal fluid.
- S. Typhimurium* phage type 160 from pleural fluid.

Figure 3. *S. Typhimurium* isolates by phage type, 2001

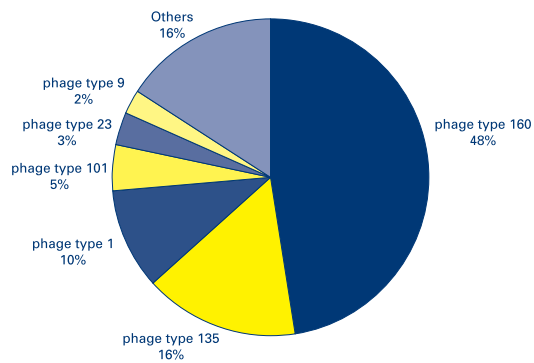
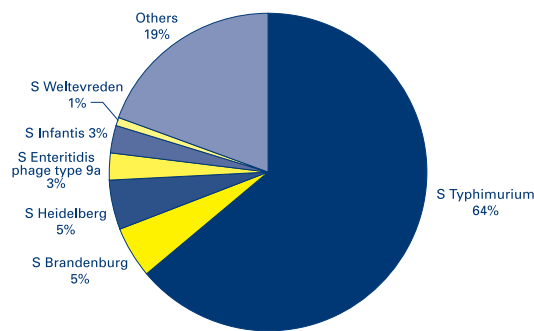


Figure 4. Human Salmonella isolates, 2001



NON-HUMAN SALMONELLA

There were 2,117 non-human isolates typed in 2001 compared with 1,989 in 2000. The distribution of serotypes is shown in Table 11.

Poultry Isolates

There were a total of 623 poultry isolates compared with 482 in 2000. *S. Typhimurium* phage type 135 and phage type 160 were the predominant strains isolated (Table 9).

Table 9. Predominant poultry isolates 1999-2001

Serotype	1999	2000	2001
<i>S. Typhimurium</i> 135	18.5%	9.5%	31.9%
<i>S. Typhimurium</i> 160	Not isolated	10.5%	17.6%
<i>S. Infantis</i>	6.8%	8.9%	8.3%
<i>S. Agona</i>	4.4%	13.4%	4.3%

Animal Isolations

The predominant isolate in animals was *S. Brandenburg* (83% of sheep and 42% of cattle). This is a similar proportion to 2000 although confirmed cases of the serotype on sheep farms has decreased to 216 (331 in 2000) and remained relatively stable on cattle farms, 73 (70 in 2000).

Isolations of *S. Typhimurium* phage type 160 have risen dramatically from 88 in 2000 to 187 in 2001. This increase is shown particularly among cats increasing from 7 in 2000 to 53 in 2001. The phage type continued to cause mortality in sparrows, diarrhoea in other animals, although a number of bone abscesses were reported in foals.

Table 11. *Salmonella* serotypes, non-human isolates, 2001

SEROTYPE	ANIMALS													Meat/bone meal	Environmental	Food	Shellfish	Not specified	POULTRY					TOTAL	
	Alpaca	Avian	Bovine	Canine	Caprine	Cervine	Equine	Feline	Monkey	Other	Ovine	Porcine	Rabbit						Sealion	Neckflap	Caecae	Feed	Environmental		Miscellaneous including product
Adelaide																		3					3		
Agona																		2	3		17	7	29		
Anatum			4											8								12			
Anatum 15+																			1	2		3			
Bangkok																		1				1			
Birkenhead				1																		1			
Bovismorbificans																					1	1			
Brandenburg		1	137	5	1	5	1	3		344	1			20	14	22		22	1	14	3	594			
Cubana														5	1					1	1	8			
Derby															3			1				4			
Emek															1							1			
Enteritidis phage type 1												1							4			5			
4																			5			5			
9a			3				1	2			1				3			1				11			
Untypable																	1					1			
Havana				1										2					2			5			
Hindmarsh			15	1		2	2	1		90	1					4		3				119			
Idikan																			1		2	3			
Infantis		1	2	1						2				22	5			6	5	1	30	4	91		
Isangi																				1		1			
Kentucky			3											10						1		14			
Kiambu			30												3					4		37			
Krefeld																		1				1			
Lexington 15+			1																			1			
Lille																				2		2			
London			1																4		3	9			
London 15+																				2		3			
Mbandaka														1				1		11	3	1	17		
Mississippi																		1				1			
Montevideo														1								1			
Muenster														3				1		8		12			
Newport			1																			1			
Ohlstedt																				1		1			
Oranienburg					1														4			5			
Orientalis																			1			1			
Orion				2															1			3			
Orion 15+														4								4			
Oslo																	2	2				4			
Papua																					1	1			
Paratyphi B var Java																2	1					3			
Ruiri																					1	1			
Saintpaul			1				1			3						1					1	7			
Schwarzengrund																		1				1			
Senftenberg			1											2						4	6	1	14		
Tennessee											1									23	4	6	34		
Thompson				1												3				4	2	11	21		
Typhimurium		1	1															3				5			
Typhimurium phage type 1			35			2				1					2	1			5	4		63			
6			1																			1			
8			8							1												9			
9		2	10	1			1	1		3			1		1							20			
12a			13								1							3		5	1	2	25		
23		2	11					1													1	15			
26			4																			4			
36			1																			1			
41														11								11			
42			11				2							16	1		1		1	2	2	36			
42 variant															1				3	1	1	6			
42a			4											5					1			10			
60			4																			4			
101			28							1				1	1	1		1	1	3		2	39		
130																						1	1		
135		6	31	2			2	4						2				8	40	2	12	101	44	254	
135 variant				1																				1	
154			3				7																10		
155			6											1				3		1			11		
156		1	34	3		1	5											3		1	1	1	50		
160	1	74	28	11		2	13	53	1	1		2	1	25	3	3	7	16	1	8	49	36	335		
205																	1						1		
206			1	1						1													3		
RDNC		1	10		1		3	2									1		1	2	3	3	27		
Rough			5							1						1							7		
Untypable			2																1		1	1	5		
Uganda 15+			11																	1			17		
Weltvreden																			1	2			3		
Westhampton																				2			4		
Group B 4,12 :- : 1,2			2				1																3		
Group B 4,5,12 :- : 1,2			2																				2		
Group B 4, 5,12 :- :- (non motile)										1								1				1	7		
Group C 6,7 : k :-																				1	2	11	14		
Group C 6,7 :- : 1,5																			1				2		
Group C 6,7 :- :- (non motile)																				2			2		
Group E 3,10 :- :-								1															1		
Group E 3,19 :- :-																						5	5		
Rough : f : 1,2		1	1																		1	2	5		
Rough : r : 1,5																							1		
TOTAL	1	90	466	31	3	10	41	68	1	1	448	8	1	1	75	105	42	9	93	79	7	182	211	144	2117

S. Typhimurium 954
 Other serotypes 1163
 Poultry isolates 623
 Animal isolates 1170

SHIGELLA

There were 190 isolates of *Shigella* during 2001 compared with 132 in 2000. There was an outbreak of *Shigella* Sonnei Biotype a in the Auckland region. This outbreak involved eight confirmed cases from a childrens health camp and three from a rest home. The only potential common source identified was a fruit shop where apples were packed by hand into plastic bags. The mother of the index case from the health camp and a staff member from the rest home purchased apples from this shop.

Table 12. *Shigella* isolates, 2001

Species	Type	Number	Comment
S. Sonnei	Biotype a	51	9 overseas travellers
	Biotype f	2	1 overseas traveller
	Biotype g	41	15 overseas travellers
S. Flexneri	1	1	-
	1a	1	Overseas traveller
	1b	3	3 Immigration
	2a	55	6 overseas travellers
	2b	2	1 overseas traveller
	3a	7	1 overseas traveller
	6	12	6 overseas travel
	6 (Manchester)	1	-
	Species	3	1 overseas traveller
	S. Boydii	1	1
2		1	Immigration
4		3	1 overseas traveller
13		4	1 overseas traveller
14		1	Overseas traveller
S. Dysenteriae	7	1	Overseas traveller

VEROCYTOTOXIN-PRODUCING ESCHERICHIA COLI (VTEC/STEC)

There were 73 laboratory-confirmed isolations of *E. coli* O157 during 2001 (Table 13) compared with 69 in 2000.

Also confirmed were three non-human isolates, two from non-reticulated water supplies in the South Auckland area and the first New Zealand isolate from raw milk from the Canterbury district.

There were two non-O157 isolates:

ONT:H8, HUS, Tauranga

ONT:H2, no details, Otago

Table 13. *E. coli* O157 isolates by health district, 2001

Clinical Data	NL	NM	CA	WK	TG	BE	RO	GS	HB	TK	WG	MN	WN	NM	CB	OT	SO	Total
HUS				2														2
Bloody diarrhoea	1		4	4	4	2	1		2				1	2		2		23
Diarrhoea / vomiting		1		4							1	1		1		1		11
Asymptomatic / contacts				6				1							1		1	9
No details given			2	10	3			1		1					4	5	2	28
Total	1	1	6	26	7	2	3	2	2	1	1	2	2	1	7	6	3	73

ANTIBIOTIC RESISTANCE

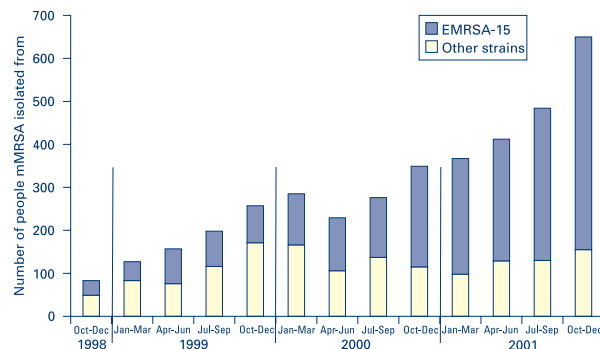
ANTIBIOTIC-RESISTANT BACTERIA MONITORING SCHEME

Multiresistant methicillin-resistant *Staphylococcus aureus*

During 2001, multiresistant methicillin-resistant *Staphylococcus aureus* (mMRSA) from 1710 people, 1594 patients and 116 healthcare workers, were referred to ESR. mMRSA are resistant to two or more

classes of antibiotics in addition to β -lactams. The incidence of mMRSA increased 65.3% in 2001; from an annual rate of 27.7 per 100,000 in 2000 to 45.8 per 100,000 (Figure 5). Information on whether mMRSA was causing infection or colonising was reported for 1237 of the people from whom mMRSA was isolated; 76.8% were infected and 23.2% were colonised.

Figure 5. Multiresistant MRSA isolations, October 1998-December 2001



Over three-quarters (76.0%) of the 1594 patients with mMRSA were reported to be hospital patients. Patients were classified as hospital patients if they either were in a healthcare facility (including long-term care facility) when MRSA was isolated or had been in a healthcare facility in the three months before MRSA was isolated. Among the 116 healthcare workers, 76 had patient contact at the time mMRSA was isolated from them. mMRSA was isolated during pre-employment screening of the other 40 healthcare workers.

The mMRSA strains that were predominant in 2001 are shown in Table 14. Three-quarters of mMRSA isolated in 2001 were the EMRSA-15 strain; an increase from a proportion of 55% in 2000. Among the patients with EMRSA-15, 81.3% were reported to be hospital patients. The number of hospitals and other healthcare facilities in which EMRSA-15 was isolated increased in 2001, although many of the isolations appeared to be sporadic with only a small number (<5) of isolations in many of the facilities (Table 15, footnote 1). While EMRSA-15 continued to be most frequently isolated from healthcare facilities in the Auckland area, there was a large outbreak in Hawkes Bay Hospital and an increase in isolations in Waikato and Tauranga Hospitals.

Table 14. Most commonly isolated multiresistant MRSA strains, 2001¹

Strain (origin) ²	Number of people the strain isolated from (% of all mMRSA isolations)
EMRSA-15 (Britain)	1283 (75.0)
WR/AK1	87 (5.1)
AKMH1 (Australia)	59 (3.5)
TANS2 (Australia)	43 (2.5)
WSPP1 (Western Samoa)	22 (1.3)

¹ Includes strains isolated from more than 20 people.

² For a description of the EMRSA-15 and WR/AK1 strains see LabLink 2000; 7 (1): 8-9. For a description of the TANS2 strain see LabLink 2001; 8 (3): 31-2. The AKMH1 strain was first recognised in early 2001 from patients in Middlemore Hospital. Its phage pattern and antibiogram indicate that it is typical of multiresistant MRSA isolated in Australia. It cannot be reliably distinguished by phage typing from the TANS2 strain and another multiresistant strain isolated in the Auckland area, AKAH2. These three strains variously react with phages 83A, 84 and 85. Therefore, they are now being described collectively as AKH4 MRSA. They can be distinguished by PFGE typing.

As has been noted in previous years, compared with other mMRSA strains, EMRSA-15 is more frequently isolated from older patients and less frequently isolated from younger patients (Figure 6). This age distribution is consistent with the fact that patients with EMRSA-15 were more likely to be hospital patients than patients with other strains (81.3% vs 62.1%). In addition, many of the private healthcare facilities in which EMRSA-15 was isolated were long-term care facilities for the elderly.

Table 15. Healthcare facilities with patients and staff with EMRSA-15, 2001

Healthcare facility ¹	Number of people EMRSA-15 isolated from (% of all EMRSA-15 isolations in healthcare facilities, n=1206 ²)
Whangarei Hospital	11 (0.9)
North Shore Hospital	109 (9.0)
Waitakere Hospital	26 (2.2)
Auckland Hospital	127 (10.5)
Middlemore Hospital	172 (14.3)
Greenlane Hospital	12 (1.0)
Other Auckland HCFs ³	351 (29.1)
Waikato Hospital	42 (3.5)
Other Hamilton HCFs ³	19 (1.6)
Thames Hospital	7 (0.6)
Tauranga Hospital	51 (4.2)
Other Tauranga HCFs ³	16 (1.3)
Whakatane Hospital	7 (0.6)
Rotorua Hospital	5 (0.4)
Hawkes Bay Hospital	91 (7.5)
Other Hawkes Bay HCFs ³	15 (1.2)
Hutt Hospital	9 (0.7)
Wellington Hospital	28 (2.3)
Kenepuru Hospital	28 (2.3)
Other Wellington HCFs ³	25 (2.1)
Timaru Hospital	17 (1.4)

¹ Hospitals and other healthcare facilities (HCFs) with ≥ 5 patients or staff with EMRSA-15 are listed in the table. EMRSA-15 was also isolated from people in the Bay of Islands Hospital (2 patients or staff), Whangarei HCFs (2), Dargaville Hospital (2), Starship Children's Hospital (2), National Women's Hospital (1), Whakatane HCFs (2), Rotorua HCFs (4), Te Kuiti Hospital (4), Te Kuiti HCF (1), Wairoa Hospital (1), Palmerston North Hospital (2), Feilding HCF (1), Masterton Hospital (1), Lower Hutt HCFs (4), Blenheim Hospital (2), Christchurch Hospital (3), Burwood Hospital (1), Princess Margaret Hospital (1), Christchurch HCF (1), Timaru HCF (1), and Southland Hospital (1). In this list, private HCFs are not named, as many have withheld publication of their name.

² The same person may be recorded in more than one healthcare facility.

³ An aggregated total for private healthcare facilities in the area, many of whom have withheld publication of their name.

EMRSA-15 is usually multiresistant to erythromycin, ciprofloxacin and β -lactams. The above data describe the incidence of multiresistant EMRSA-15 only. In addition, to the 1283 isolations of multiresistant EMRSA-15, non-multiresistant isolates of EMRSA-15 from 114 people were referred to ESR during 2001. These non-multiresistant isolates are only resistant to ciprofloxacin and β -lactams, but they are indistinguishable by phage and molecular typing from multiresistant EMRSA-15, and appear to be equally transmissible.

The geographic distribution of mMRSA in 2001 displayed the usual pattern, with the highest rate in the Auckland area (Figure 7). The next

Figure 6. Multiresistant MRSA isolations by patient age, 2001

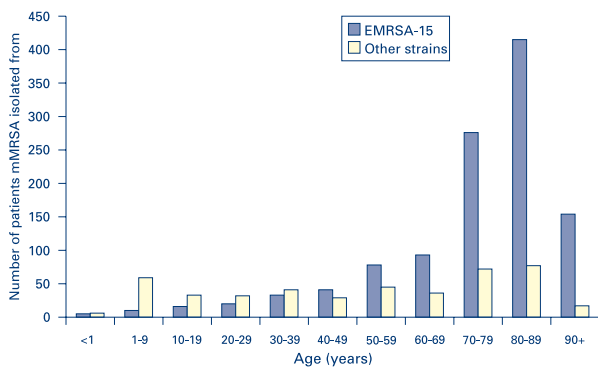
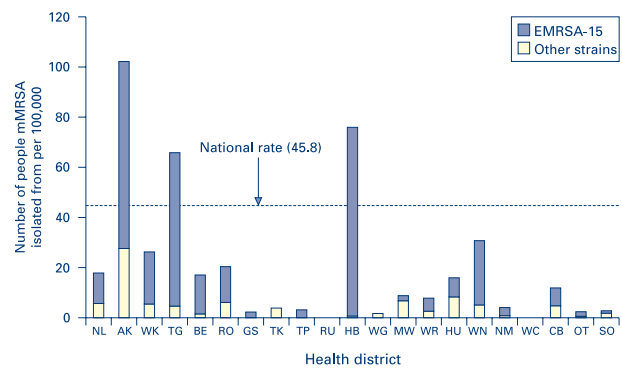


Figure 7. Incidence of multiresistant MRSA by health district, 2001



highest rates were in the Hawkes Bay and Tauranga Health Districts and were comprised predominantly of EMRSA-15 isolations. Compared with 2000, there was a notable decrease in rates in the Wellington and Hutt Health Districts following a decrease in EMRSA-15 isolations in the hospitals in these districts and the control of an outbreak of the WGWHL mMRSA strain, which was prevalent in 1999-2000.

The susceptibility of a representative sample of mMRSA to an extended range of antibiotics was tested and the resistance among each predominant strain is shown in Table 16. The typical antibiogram for EMRSA-15 is ciprofloxacin and erythromycin resistance, although, as noted above, there are also non-multiresistant EMRSA-15 which are erythromycin susceptible. The WR/AK1 strain is characteristically resistant to high-level mupirocin (MIC >1024 mg/L) and fusidic acid. The AKMH1 and TANS2 strains have the same antibiogram: ciprofloxacin, clindamycin, co-trimoxazole, erythromycin, gentamicin and tetracycline resistance.

MRSA isolates showing heterogeneous vancomycin intermediate resistance (hVISA) were identified for the first time in New Zealand in 2001. hVISA were isolated from two patients who were not responding to vancomycin treatment (S Roberts. Personal communication, 2001).

Table 16. Resistance among multiresistant MRSA strains, 2001

Antimicrobial agent (resistance breakpoint, mg/L)	Percent resistance				
	EMRSA-15 (n=372)	WR/AK1 (n=85)	AKMH1 (n=59)	TANS2 (n=37)	Other strains (n=255)
Chloramphenicol (MIC ≥ 32)	0.3	0	0	0	5.1
Ciprofloxacin (MIC ≥ 4)	100	0	100	100	58.7
Clindamycin (MIC ≥ 4)	9.1 ¹	0	100	100	64.5
Co-trimoxazole (MIC $\geq 4/76$)	0	0	98.3	100	40.6
Erythromycin (MIC ≥ 8)	100 ²	3.5	100	100	91.3
Fusidic acid (MIC ≥ 2)	2.4	100	0	0	15.2
Gentamicin (MIC ≥ 16)	0.3	0	100	91.9	47.8
Mupirocin (MIC ≥ 8) ³	1.3	100	0	0	26.1
High-level mupirocin (MIC ≥ 512)	1.1	100	0	0	15.9
Rifampicin (MIC ≥ 4)	0.8	0	1.7	13.5	9.1
Tetracycline (MIC ≥ 16)	1.1	1.2	98.3	100	61.6
Vancomycin (MIC ≥ 32)	0	0	0	0	0

¹ EMRSA-15 demonstrates inducible clindamycin resistance by the disc diffusion induction test.

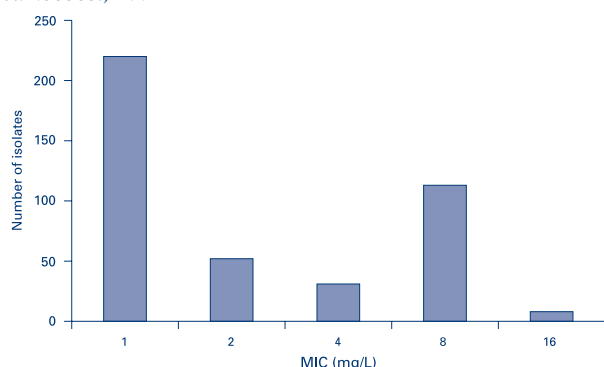
² There is variation in macrolide sensitivity among EMRSA-15, with some isolates being susceptible to erythromycin. These isolates are not categorised as multiresistant and are therefore not included in this analysis of mMRSA.

³ Includes low-level (MIC 8-256 mg/L) and high-level (MIC ≥ 512 mg/L) mupirocin resistance.

Cefotaxime/ceftriaxone-nonsusceptible *Streptococcus pneumoniae*

In January 2001, the previous surveillance of penicillin-nonsusceptible pneumococci was changed to include only cefotaxime/ceftriaxone-resistant pneumococci. During 2001, 424 cefotaxime/ceftriaxone-nonsusceptible pneumococci (MIC ≥ 1 mg/L) were referred to ESR. The cefotaxime MIC distribution of these isolates is shown in Figure 8. Just over half (51.9%) had intermediate resistance (MIC 1.0 mg/L) and 48.1% were resistant (MIC ≥ 2 mg/L). As expected, all cefotaxime-nonsusceptible isolates were penicillin nonsusceptible (penicillin MIC ≥ 0.12 mg/L).

Figure 8. Cefotaxime MIC distribution among nonsusceptible pneumococci, 2001



Among the 424 cefotaxime/ceftriaxone-nonsusceptible pneumococci, 81.4% were multiresistant to ≥ 3 non- β -lactam antibiotics, most commonly erythromycin, co-trimoxazole and tetracycline. The prevalence of multiresistance rose to 97.1% among the cefotaxime-resistant isolates. Most (83.7%) cefotaxime/ceftriaxone-nonsusceptible pneumococci remain susceptible to chloramphenicol and, as expected, all isolates were vancomycin susceptible. The above analysis uses the NCCLS MIC breakpoints for pneumococcal susceptibility to cefotaxime/ceftriaxone that were current in 2001. There was a change to these breakpoints in the NCCLS interpretative standards issued in January 2002. There are now two sets of breakpoints (Table 17). The new meningitis breakpoints are the same as the previous interpretative standards and the new non-meningitis breakpoints are one twofold concentration higher. The NCCLS advise reporting only the meningitis interpretation for CSF isolates, but both the meningitis and non-meningitis interpretations for other isolates. The penicillin MIC breakpoints have not changed.

Table 17. New NCCLS interpretative standards for pneumococcal susceptibility to cefotaxime/ceftriaxone¹

MIC (mg/L)	Meningitis breakpoints	Non-meningitis breakpoints
≤ 0.5	Susceptible	
1.0	Intermediate	Susceptible
2.0	Resistant	Intermediate
≥ 4.0	Resistant	

¹ Reference: Performance standards for antimicrobial susceptibility testing: informational supplement. Wayne (PA): NCCLS; 2002 Jan. Document M100-S12.

Penicillinase-producing *Neisseria gonorrhoeae*

Penicillinase-producing *Neisseria gonorrhoeae* (PPNG) from 32 patients were confirmed in 2001 by LabPlus, Auckland Hospital, or ESR. Based on the laboratory in which the PPNG was isolated, most patients were from Auckland (71.9%) or Christchurch (15.6%). Information on where the gonococcal infection was acquired was provided for 12 patients, 7 (58.3%) of whom most likely acquired their infection overseas. All isolates were ceftriaxone susceptible and 46.9% (15) were ciprofloxacin resistant.

High-level gentamicin-resistant enterococci

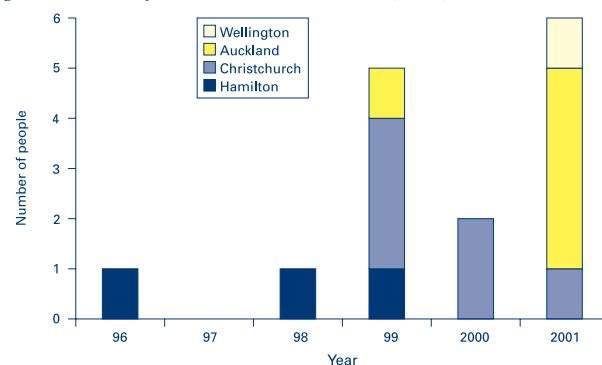
Thirty-five high-level gentamicin-resistant (HLGR) enterococci, including 13 from blood cultures, were referred in 2001. One of the HLGR enterococci was vancomycin resistant, and three, including two blood culture isolates, were ampicillin resistant. Over two-thirds (68.6%) of the HLGR enterococci were ciprofloxacin resistant.

Vancomycin-resistant enterococci

Vancomycin-resistant enterococci (VRE) were isolated from six people in 2001. Five of the isolates were *Enterococcus faecalis* and one *E. faecium*. All six isolates possessed the *vanA* gene and had vancomycin MICs >256 mg/L. The five *E. faecalis* isolates also had high teicoplanin MICs of >256 mg/L, but the *E. faecium* isolate had a teicoplanin MIC of 16 mg/L. Four of the six VRE were isolated in Auckland, one in Wellington, and one in Christchurch.

Since the first reported isolation in New Zealand in 1996, VRE have been isolated from a total of 15 people (Figure 9 and Table 18). *E. faecalis* has

Figure 9. Vancomycin-resistant enterococci (VRE) isolations, 1996-2001



predominated (Table 18). Although the cases appear to be sporadic, the majority of isolates have demonstrated a similar DNA macrorestriction pattern (profile A) after digestion with *Sma*I and pulsed-field gel electrophoresis (PFGE). VRE with this pattern have been isolated in each of the four centres in which VRE has been isolated to date.

Table 18. Vancomycin-resistant enterococci (VRE) isolated in New Zealand, 1996-2001

Species	Van gene	PFGE pattern	Years isolated	Area ¹	Number of patients ²
<i>E. faecalis</i>	VanA	A	1996, 1999, 2000 and 2001	Hamilton Christchurch Auckland Wellington	11 ³
		B	1999	Christchurch	1 ³
		E	2001	Christchurch	1
	VanB	Z	1999	Christchurch	1
<i>E. faecium</i>	VanA	C	1998 and 2001	Hamilton Auckland	2 ⁴
		D	2001	Auckland	1 ⁴

¹ In chronological order of place of first isolation.

² Repeat isolations from the same patient excluded, unless the isolates differed (see footnotes 3 and 4).

³ Isolates with PFGE patterns A and B were isolated from the same patient.

⁴ Isolates with PFGE patterns C and D were isolated from the same patient.

Extended-spectrum β -lactamase-producing Enterobacteriaceae

In 2001, extended-spectrum β -lactamase-producing (ESBL) *Enterobacteriaceae* from 83 patients were confirmed on the basis of the NCCLS phenotypic confirmatory test. The majority were *E. coli* (Table 19). There was a prolonged outbreak of a strain of an ESBL-positive *E. coli* in Hawkes Bay Hospital during the year (see LabLink 2001; 8(4): 36). This strain was isolated from 40 patients in the Hawkes Bay area, mainly Hawkes Bay Hospital patients, during 2001.

The phenotypic confirmatory disc test compares the inhibition zones obtained with cefotaxime and ceftazidime discs alone and in combination with clavulanic acid. It is important to use both cefotaxime and ceftazidime. Among the ESBL-producing isolates confirmed in 2001, 7 (8.4%) of the

Table 19. Confirmed extended-spectrum β -lactamase (ESBL) producing isolates, 1996-2001

	Year					
	2001	2000	1999	1998	1997	1996
Number confirmed isolates	83	27	15	16	15	35
Species						
<i>Escherichia coli</i>	64	12	9	7	9	8
<i>Klebsiella pneumoniae</i>	5	6	2	3	5	6
<i>K. oxytoca</i> ¹		3	1			18
<i>Klebsiella</i> spp				5		1
<i>Enterobacter</i> spp	10	5	3			1
Other <i>Enterobacteriaceae</i>	4	1		1	1	1
Site						na ²
urine	38	14	9	7	11	
blood/CSF	7	4	2	0	0	
other	38	9	4	9	4	

¹ Some *K. oxytoca* isolates may hyperproduce chromosomal K1 β -lactamase rather than ESBL.

² Site data not available.

83 isolates would have been missed if only cefotaxime discs were used and 8 (9.6%) would have been missed if only ceftazidime discs were used. A summary of the ESBL-producing isolates that have been confirmed since surveillance commenced in 1996 is shown in Table 19.

ANTIBIOTIC SUSCEPTIBILITIES OF SALMONELLA

In 2001, the antimicrobial susceptibility of a representative sample of 728 non-typhoidal *Salmonella* from isolates routinely referred to ESR for serotyping was tested. The sample comprised 391 human and 337 animal/environmental isolates.

Resistance to each of the seven antimicrobials tested is shown in Table 20. Antimicrobial resistance among *Salmonella* remains relatively low, with 94% fully susceptible to all seven antimicrobials.

Table 20. Antimicrobial resistance among non-typhoidal salmonella, 2001

Antimicrobial	Percent resistance		
	All isolates n=728	Human isolates n=391	Animal/environmental isolates n=337
Ampicillin	3.3	3.8	2.7
Cephalothin	0.8	0.5	1.2
Chloramphenicol	1.0	1.8	0
Ciprofloxacin	0	0	0
Gentamicin	0.1	0	0.3
Streptomycin	3.2	4.1	2.1
Tetracycline	4.3	5.6	2.7

In 2001, 26 *Salmonella* Typhi isolates were referred to ESR. They were tested for susceptibility to the same seven antimicrobials as the non-typhoidal *Salmonella* (Table 20). One isolate, from a young child who had been in India, was multiresistant to ampicillin, chloramphenicol and tetracycline. All other *S. Typhi* isolates were fully susceptible.

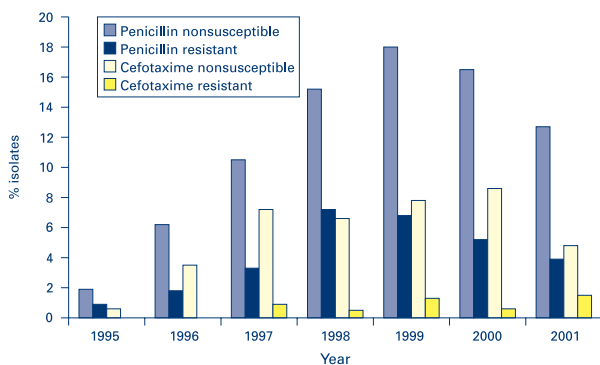
ANTIBIOTIC SUSCEPTIBILITIES OF INVASIVE PATHOGENS

These data on the antimicrobial susceptibility of isolates recovered from cases of pneumococcal, meningococcal, and *Haemophilus influenzae* invasive disease are based on isolates referred to ESR as part of the laboratory-based surveillance of these diseases. The antimicrobial susceptibility of all invasive isolates of these three organisms referred in 2001 was tested.

Streptococcus pneumoniae

Among the 537 invasive pneumococcal isolates tested in 2001, 12.7% (68) were categorised as penicillin nonsusceptible (MIC ≥ 0.12 mg/L): 3.9% (21) as resistant (MIC ≥ 2 mg/L) and 8.8% (47) as intermediate (MIC 0.12-1.0 mg/L). The rate of penicillin nonsusceptibility has decreased over the last two years, mainly due to the decrease in the proportion of resistant isolates - from 6.8% in 1999 to 3.9% in 2001 (Figure 10).

Figure 10. Penicillin and cefotaxime nonsusceptibility among pneumococci from invasive disease, 1995-2001



Cefotaxime nonsusceptibility (MIC ≥ 1 mg/L) was recorded for 4.8% (26) of the 537 isolates in 2001: 1.5% (8) were resistant (MIC ≥ 2 mg/L) and 3.4% (18) had intermediate resistance (MIC 1 mg/L). Cefotaxime nonsusceptibility decreased in 2001. However, in contrast to the situation for penicillin, the decrease was mainly due to a decrease in intermediate resistance (Figure 10). This analysis is based on the NCCLS MIC breakpoints for pneumococcal susceptibility to cefotaxime/ceftriaxone that were current in 2001 (see above section on *Cefotaxime/ceftriaxone-nonsusceptible Streptococcus pneumoniae* for details of the new breakpoints published in January 2002).

The rates of resistance to other antibiotics tested in 2001 included 1.3% chloramphenicol resistance, 5.4% erythromycin resistance, 31.3% cotrimoxazole resistance, and 5.0% tetracycline resistance. All isolates were vancomycin susceptible.

The majority of the penicillin-nonsusceptible isolates belonged to the capsular types usually associated with penicillin resistance (Table 21). Notably, all 14 penicillin-resistant 19F isolates were multiresistant, with cefotaxime nonsusceptibility, and erythromycin, co-trimoxazole and tetracycline resistance.

Table 21. Distribution of capsular types among penicillin-nonsusceptible and cefotaxime-nonsusceptible invasive pneumococcal isolates, 2001

Capsular type	Number (%) isolates			
	Penicillin		Cefotaxime	
	Nonsusceptible MIC ≥ 0.12 mg/L	Resistant MIC ≥ 2 mg/L	Nonsusceptible MIC ≥ 1 mg/L	Resistant MIC ≥ 2 mg/L
9V	23 (33.8)	4 (19.1)	6 (23.1)	0
19F	15 (22.1)	14 (66.7)	14 (53.8)	7 (87.5)
6B	9 (13.2)	1 (4.8)	3 (11.5)	0
19A	7 (10.3)	0	0	0
14	4 (5.9)	1 (4.8)	1 (3.8)	0
23F	4 (5.9)	1 (4.8)	1 (3.8)	0
Others	6 (8.8)	0	1 (3.8)	1 ² (12.5)
Total	68 (100)	21 (100)	26 (100)	8 (100)

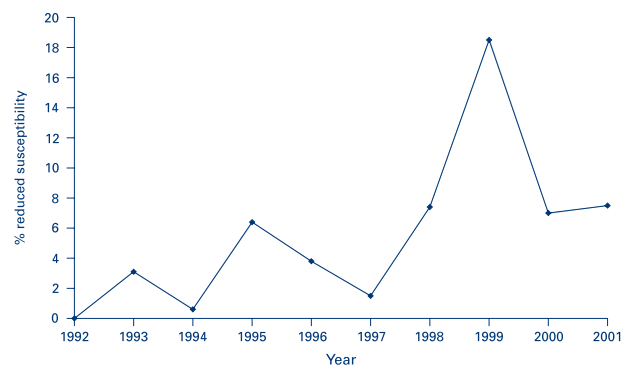
¹ Percentage of the nonsusceptible or resistant isolates.

² Capsular type 35.

Neisseria meningitidis

In 2001, 318 isolates from cases of invasive meningococcal disease were tested and all were susceptible to penicillin, ceftriaxone, ciprofloxacin, and rifampicin. However, 7.5% (24/318) had reduced penicillin susceptibility, with MICs of 0.12-0.25 mg/L. The proportion of isolates with reduced penicillin susceptibility has increased significantly over the last 10 years, varying from a low of 0% in 1992 to a high of 18.5% in 1999 (Figure 11).

Figure 11. Reduced susceptibility to penicillin among meningococci from invasive disease, 1992-2001



Haemophilus influenzae

Among the 51 invasive *H. influenzae* isolates tested in 2001, 15.7% (8) were ampicillin resistant. All ampicillin resistance was due to β -lactamase production. All isolates were sensitive to cefotaxime, chloramphenicol, and rifampicin.

VIROLOGY

Table 22 summarises viral identification and mycoplasma infections in New Zealand in 2001. The information is based on weekly data collated from the virology laboratories of Auckland Healthcare, Healthcare Waikato, Canterbury Health Laboratories, Health Otago, Capital Coast Health, and ESR.

Table 22. Summary of virus identification and mycoplasma infections, 2001

Year 2001	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Influenza A(not subtyped)	2	1	1	1	1	5	19	12	2	1	0	0	45
Influenza A H3N2	0	0	0	5	3	5	14	17	3	0	1	0	48
Influenza A H1N1	1	0	0	1	15	206	84	23	1	0	0	0	331
Influenza B	1	1	7	0	4	32	49	105	27	3	0	1	230
Parainflunza 1	0	0	0	0	0	0	0	0	0	0	0	0	0
Parainflunza 2	0	0	0	0	0	0	0	0	1	0	1	0	2
Parainflunza 3	1	3	1	1	2	3	12	25	23	9	1	2	83
RSV	1	1	2	2	2	26	116	270	113	21	7	4	565
Rhino	1	4	4	2	2	6	7	7	0	12	5	0	50
Measles	4	0	0	1	1	1	0	2	4	3	5	4	25
Mumps	0	1	0	2	1	3	2	5	4	1	1	2	22
Rubella	0	0	0	0	0	0	0	0	0	1	0	2	3
HSV	6	27	23	10	15	17	20	19	13	18	33	19	220
HSV-1	134	142	123	64	69	143	124	121	85	112	139	98	1354
HSV-2	106	120	153	63	83	123	129	123	85	100	152	123	1360
Varicella Zoster	14	22	29	13	14	23	20	25	19	22	30	28	259
EBV	12	9	1	0	14	6	6	8	1	4	6	7	74
CMV	19	15	11	4	9	11	10	6	6	3	3	2	99
HHV6	0	2	0	0	0	0	0	0	0	0	0	0	2
Rotavirus	3	0	2	1	3	7	33	48	11	14	12	0	134
BK virus	1	0	0	0	0	0	0	0	0	0	0	0	1
Mycoplasma	19	11	7	15	18	40	39	42	41	29	40	48	349
Adenoviruses	30	11	10	11	20	15	10	17	13	27	29	23	216
Adeno type 1	0	2	5	0	0	1	2	1	2	1	2	1	16
Adeno type 2	3	1	1	0	0	0	4	1	2	1	0	0	13
Adeno type 3	0	6	2	0	0	0	0	3	2	0	4	4	21
Adeno type 4	0	2	0	0	0	0	0	0	0	1	1	1	5
Adeno type 5	0	0	0	0	0	0	0	0	0	1	0	0	1
Adeno type 6	0	0	0	0	0	0	0	0	0	0	1	0	1
Adeno type 7	0	0	0	0	0	0	0	4	0	1	1	4	10
Adeno type 8	1	0	0	0	0	0	0	0	2	0	1	0	4
Adeno type 11	0	0	0	0	0	0	0	1	1	0	1	1	4
Adeno type 13	0	0	0	0	0	0	0	2	1	0	0	0	3
Adeno type 19	0	18	5	0	0	0	0	0	0	0	1	0	24
Adeno type 21	0	0	0	0	0	0	1	1	2	6	11	4	25
Adeno type 22	1	0	1	0	0	0	0	5	2	0	0	0	9
untypable adeno	0	0	0	0	0	0	1	3	5	6	3	18	38
Enterovirus	29	16	42	25	10	18	12	10	14	29	94	82	381
Polio 1	0	3	4	0	0	0	0	1	2	0	5	1	16
Polio 2	0	1	2	0	0	0	0	2	3	0	2	1	11
Polio 3	0	1	1	0	0	0	0	2	3	0	1	2	10
Coxsackie B1	0	1	0	0	0	0	0	0	0	0	2	1	4
Coxsackie B3	0	0	0	0	0	0	0	0	0	0	0	1	1
Coxsackie B4	0	1	0	0	0	0	0	0	0	0	3	2	6
Coxsackie B5	4	4	6	0	0	0	0	0	0	0	1	0	15
Coxsackie A8	0	0	0	0	0	0	0	1	0	1	0	0	2
Coxsackie A9	0	0	0	0	0	0	0	1	0	0	1	4	6
Coxsackie A16	1	1	4	0	0	0	0	1	0	1	0	1	9
Coxsackie A17	0	1	0	0	0	0	0	0	0	0	0	0	1
Echo 3	0	0	0	0	0	0	0	0	0	0	0	1	1
Echo 7	0	6	4	0	0	0	0	1	0	1	1	1	14
Echo 11	0	0	0	0	0	0	0	1	0	1	0	0	2
Echo13	0	0	2	1	0	0	0	0	3	11	50	38	105
Echo14	0	1	0	0	0	0	0	0	0	0	0	0	1
Echo 15	0	0	0	0	0	0	1	0	0	0	0	0	1
Echo 22	0	0	0	0	0	0	1	0	0	0	0	0	1
Echo 27	0	0	0	0	0	0	0	2	0	0	0	0	2
Echo 30	2	0	2	0	0	0	0	0	0	0	6	22	32
entero 71	0	0	2	0	0	0	0	0	1	1	0	0	4
Untypable entero	0	0	0	0	0	0	4	3	1	0	4	1	13

RESPIRATORY VIRUSES

Influenza virus

Influenza activity during January to December 2001 was low to moderate (Figures 12 & 13). A total of 654 influenza isolates from sentinel and non-sentinel surveillance were identified in 2001 by 5 virology labs (Auckland, Christchurch, Waikato, Dunedin and ESR). As usual, most isolations (636) occurred during the period of May to September from the sentinel surveillance (313) and non-sentinel surveillance (323) (Lablink 2001; 8(4): 39).

Figure 12. Influenza isolates, 1997-2001

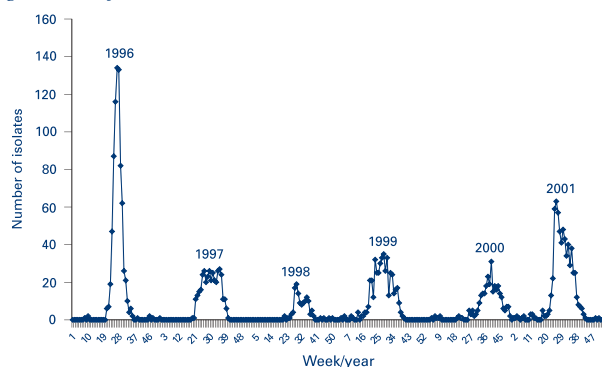
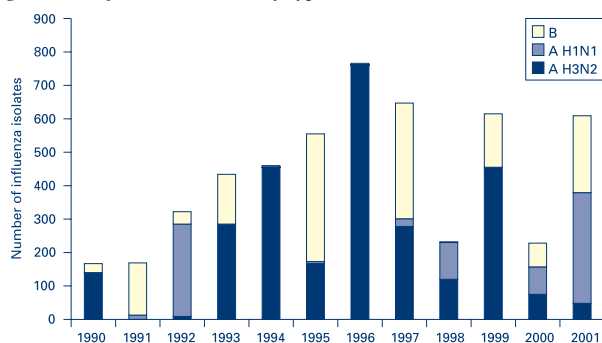


Figure 13. Influenza isolates by types, 1990-2001



Influenza A(H1N1)

In 2001, influenza A(H1N1) was the predominant strain. There were 331 A(H1N1) isolates which represents 54% of typed and subtyped isolates (609) and 51% of all influenza isolates (654). There are two antigenically distinct lines of influenza A(H1N1) circulating around the world in recent years and the current reference strains for these are A/New Caledonia/20/99 and A/Bayern/7/95. Influenza A(H1N1) viruses predominated in most regions world-wide during the previous 12 months. Viruses of the A/New Caledonia/20/99 lineage have continued to progressively replace A/Bayern/7/99-like strains.

The Australian WHO Collaborating Centre showed that most A(H1N1) isolates from the Southern Hemisphere in 2001, including New Zealand, were A/New Caledonia/20/99. Based on the global data, the WHO Consultative Group concluded that there was no need to change the vaccine strain from an A/New Caledonia/20/99-like virus. Two factors still remain true for the recommendation of A/New Caledonia/20/99-like virus for the year 2002 vaccine formulation:

- Increasing incidence of viruses of this type, and
- The demonstration that, in humans, vaccines containing viruses of this lineage induce similar antibody responses against both the homologous virus and A/Bayern-like strains whereas the converse was not true.

Influenza A(H3N2)

A total of 48 influenza A(H3N2) isolations (8% of typed and subtyped isolates and 7% of all isolates) were obtained in 2001. Influenza A(H3N2) has been frequently associated with severe disease and excess mortality in high-risk groups. This subtype has also shown the greatest tendency for antigenic drift as illustrated by the frequency of vaccine formulation changes recommended by the WHO and the AIVC. Influenza A(H3N2) viruses around the world were less prominent than influenza A(H1N1) or influenza B during the previous 12 months. The circulating viruses in this subtype fall into a single lineage, however, a degree of antigenic heterogeneity is often observed.

The Australian WHO Collaborating Centre showed that most A(H3N2) isolates from the Southern Hemisphere including New Zealand remain closely related to the A/Moscow/10/99 reference strain and A/Panama/2007/99 vaccine virus. There is evidence of antigenic heterogeneity among the isolates with no single evolutionary lineage at this time. Based on the global data, the WHO Consultative Group concluded that there was currently no pressing need to change from a recommendation for an A/Moscow/10/99-like virus as the A(H3N2) vaccine component for 2002 and there is no obvious new candidate reference strain.

Influenza B

There were 230 isolations of influenza B (38% of typed and sub-typed isolates and 35% of all isolates) in 2001. There were two distinct lines of influenza B circulating in recent years. This dates back to 1990 when the B/Panama/45/90 variant of influenza B arose whilst strains of the previous B/Victoria /2/87-like viruses continued to circulate in Asia. Further variation of the B/Panama/45/90 line gave rise to the B/Beijing/184/93-like viruses. Meanwhile in Asia, independent antigenic evolution of the B/Victoria/2/87-like virus continued and gave rise to the B/Shangdong/7/97-like strains that were prominent in a number of parts of Asia during 1998-9. During the previous 12 months, influenza B viruses co-circulated with influenza A in most parts of the world although levels have been variable. Viruses of the B/Sichuan/379/99 lineage have predominated with only small numbers of isolates from the B/Shangdong/7/97 lineage. For the first time, however, B/Shangdong/7/97 lineage viruses have spread beyond Asia with a number of isolates in Hawaii.

The Australian WHO Collaborating Centre showed that all viruses from the Southern Hemisphere in 2001 including New Zealand were B/Sichuan/379/99 lineage viruses, with the exception of a single B/Shangdong/7/97 lineage virus received from Taiwan. Based on the global data, the WHO consultation group concluded that vaccines containing a B/Sichuan/379/99-like strain remained appropriate. These vaccines would be expected to offer little protection against current viruses of the B/Shangdong lineage, however, these are neither sufficiently numerous nor widespread at the moment to consider inclusion of a strain of this type in the vaccine.

In summary, Australia Influenza Vaccine Committee, with representatives from New Zealand, Australia and South Africa, agreed to adopt the recommendations made by the WHO consultation group. The recommended composition was:

- A(H1N1) an A/New Caledonia/20/99-like strain
- A(H3N2) an A/Moscow/10/99-like strain
- B a B/Sichuan/379/99-like strain

Respiratory Syncytial Virus (RSV)

The 2001 RSV activity was at the moderate level (565 cases) based on laboratory-confirmed RSV cases reported to ESR during 1990 to 2001 (Figure 14 & 15). The highest RSV activity occurred in 1999 with 858 cases reported. RSV activity peaked in August, 5 weeks later than the peak in 2000. It remained at the high level till early September. Since then, the number of reported RSV cases has rapidly declined.

Figure 14. Annual Laboratory-confirmed RSV cases, 1990-2001

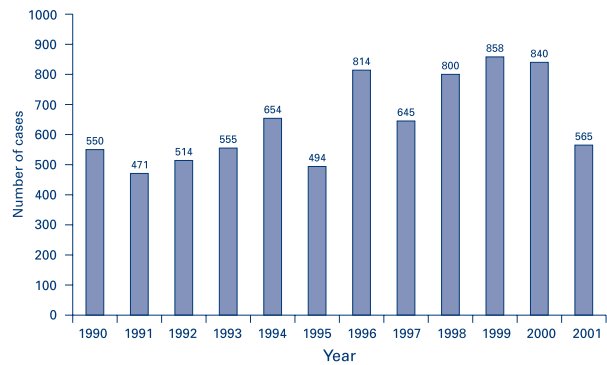
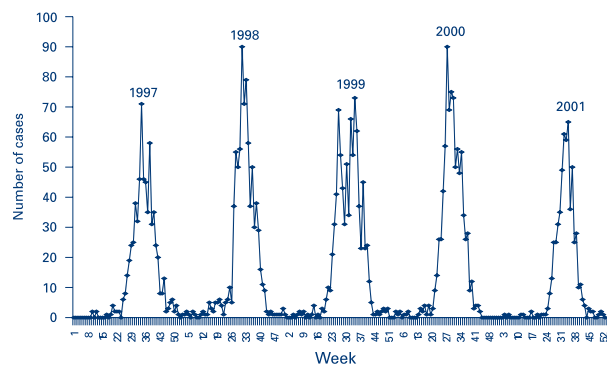


Figure 15. RSV laboratory-confirmed cases by week, 1997-2001



ENTEROVIRUSES

The New Zealand enterovirus laboratory network comprises five laboratories: one public health virology laboratory (ESR, Wellington) and four hospital virology laboratories in Auckland, Christchurch, Waikato and Dunedin. These five virology laboratories cover 100% of the population and all geographical areas of the country. The enterovirus surveillance is a year-round routine diagnostic surveillance for hospital in-patients and outpatients. Hospital laboratories report all enterovirus isolations and/or typing results weekly to ESR and this data is then available nationally. Untyped or untypable enteroviruses are referred to ESR for identification.

There were a total of 381 enterovirus isolations in 2001, compared with 203 in 2000. Echovirus type 13 was the most predominant serotype (105 isolates, 27.6%). There were 32 isolations of Echovirus type 30 (8.4%), compared with 11 in 2000 (5.4%). A total of 15 Coxsackie B type 5 isolations were reported in 2001, compared with nil reported in 2000.

Echovirus type 13

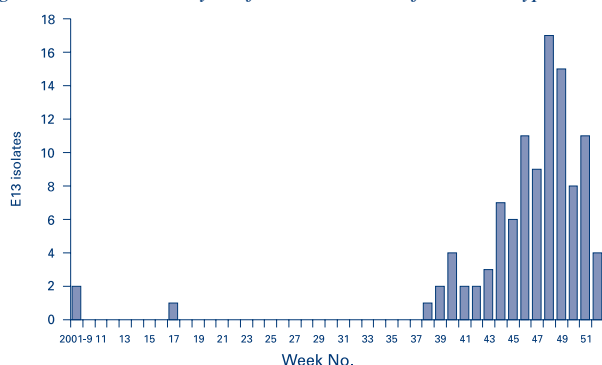
Echovirus type 13 (E13) is an enterovirus that rarely has been detected world-wide. An historical review of echovirus isolations by ESR revealed no E13 isolations during the period between 1975 and 2000. However, an outbreak of E13 occurred in 2001, during which time a total of 105 isolations were obtained. Symptoms included rash, fever, photophobia and viral meningitis. The index case was a two-month old boy from Waikato presenting with meningitis, whose specimen was taken in February 2001. The E13 isolates (105) were identified from Waikato (59), Auckland (17), and Wellington (19), Christchurch (4), Dunedin (2), Manawatu (2), Taranaki (1) and Wairarapa (1). Patients ranged in age from 10 days to 39 years (average 8.6 years). Male (64) to female (41) ratio was 1.6:1. Symptoms included rash, fever, photophobia and viral meningitis.

In 2001, the United States experienced a viral meningitis outbreak caused by E13. Echovirus type 13 has rarely been detected in the United States, accounting for only 65 of approximately 45,000 enterovirus isolates reported to CDC during the period 1970 to 2000, and no associated outbreaks have been reported. As of 14 Aug 2001, E13 has been isolated in specimens from 76 patients in 13 states, most associated with aseptic meningitis (1). Increased E13 activity was also reported in Europe during 2000, when E13 was, for the first time, associated with outbreaks of aseptic meningitis in England, Wales, and Germany (2,3). Increased E13 activity has also been reported in Western Australia (4) and Singapore (personal communications). Because E13 has rarely been isolated, the spectrum of disease symptoms associated with the virus has not been well established. Conditions previously associated with E13 are typical of enterovirus infections and include asymptomatic carriage, mild febrile illness, aseptic meningitis, respiratory diseases (e.g., coryza, pharyngitis, bronchitis, and bronchiolitis), poliomyelitis-like illness, diarrhoea with fever, rash, encephalitis, and enteroviral sepsis. Aseptic meningitis is the predominant illness associated with the current E13 activity in the United States and with echovirus activity reported in Europe in 2000.

Although the New Zealand E13 outbreak appears to have peaked in November 2001, it is still ongoing, with specimens continuing to be forwarded to the ESR Virology Lab during 2002.

Figure 16 shows the number of isolations of E13 each week during 2001.

Figure 16. The laboratory-confirmed isolations of echovirus type 13 in 2001



1. The Morbidity and Mortality Weekly Report, Fri 14 Sep 2001, 50(36):777-780
2. Communicable Disease Surveillance Centre. Viral meningitis associated with increase in echovirus type 13. *Commun Dis Rep CDR Wkly* 2000;10:277,280.
3. Twisselmann B. Cluster of cases of viral meningitis caused by echovirus type 13 in Germany. *Eurosurveillance Weekly* 2000;4.
4. Peter McInns. Meningitis, echovirus 13 & 30 Australia *Promed* 20010914.2219

MEASLES, MUMPS AND RUBELLA

Measles

A total of 25 laboratory-confirmed measles cases were reported from Auckland (3), Christchurch (11), Otago (3), Hawkes Bay (1), Tauranga (1), Waikato (1), Tanaraki (1), Southland (1) and Wellington (3). Patients ranged in age from 19 days to 33 years (average 16 years). Measles IgM was positive in 24 cases and measles virus was isolated by tissue culture from a 19-day old boy with extensive pneumonic changes.

Mumps

A total of 22 laboratory-confirmed mumps cases were reported from Auckland (1), Christchurch (8), Otago (5), Hawkes Bay (5), Rotorua (1), Waikato (1) and Wellington (1). Patients ranged in age from 0 day to 84 years (average 22 years). Mumps IgM was positive in 21 cases and mumps virus was isolated by tissue culture from one case with intrauterine death.

Rubella

A total of 3 laboratory-confirmed rubella cases were reported in 2001. A 17-month boy from Hawkes Bay was positive for rubella IgM due to the recent vaccination. A 15-month boy from Christchurch was positive for rubella IgM, possibly due to the recent vaccination. A 32-year man from Wellington was positive with rubella IgM. His clinical presentation included rash, arthritis and conjunctivitis. Neither recent overseas travel nor recent rubella vaccination was reported for this patient. There had been no laboratory-confirmed rubella cases reported in New Zealand in the period 1999-2000.

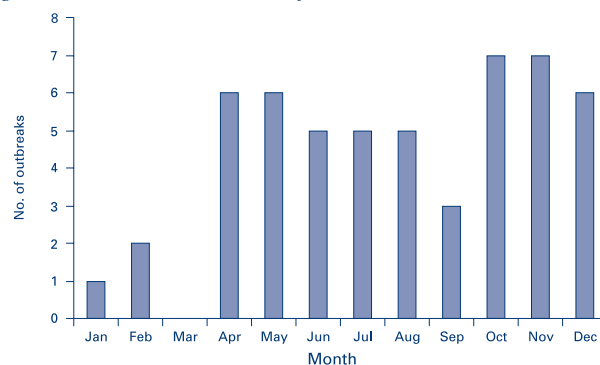
ADENOVIRUSES

There were a total of 216 adenovirus isolations in 2001, compared with 153 in 2000. The predominant serotypes in 2001 were adenovirus type 21 (25 isolates, 11.6%), adenovirus type 19 (24 isolates, 11.1%), adenovirus type 3 (21 isolates, 9.7%), adenovirus type 1 (16 isolates, 7.4%), adenovirus type 2 (13 isolates, 6.0%) and adenovirus type 7 (10 isolates, 4.6%). By comparison, in 2000 there were 5 isolations of adenovirus type 21 (3.3%), 5 of adenovirus type 19 (3.3%), 17 of adenovirus type 3 (11.1%), 18 of adenovirus type 1 (11.8%), 11 of adenovirus type 2 (7.2%) and 1 isolation of adenovirus type 7 (0.7%).

NORWALK-LIKE VIRUS

Fifty-three laboratory-confirmed Norwalk-like virus (NLV) outbreaks were recorded by health authorities during 2001. Most of these outbreaks were associated with person-to-person transmission or food-borne disease and occurred in restaurants, takeaway outlets or catered event settings. There were seven reported outbreaks in hospitals and rest homes. Three outbreaks at commercial children's party / play centres were reported. The seasonal distribution of NLV outbreaks was different from previous years (Figure 17). Unlike previous years, outbreaks occurred throughout the year rather than mainly between October and March. This may be due to either a higher reporting level or a change in seasonality of the disease.

Figure 17. Seasonal distribution of New Zealand NLV outbreaks in 2001



In 2001, both Genogroup I and II strains were prevalent throughout the country. The predominant NLV genotypes were GII/1,4 (17/56, 30%), the 'global strain' cluster, GII/6,7,9 (12/56, 21%), and GI/3 (11/56, 20%) (Table 23). Strains belonging to Genogroups I/1 (Norwalk virus) and II/5 (1c) have been identified for the first time in New Zealand. In one food-associated outbreak, a food-handler and several cases were all infected with identical NLV GI/3 strains, indicating a common source of infection. Oysters again were associated with several outbreaks, and a major Northland growing area has been closed indefinitely because of the risk from NLV contamination. For one oyster-associated outbreak, four distinct NLV strains have been identified in faecal samples from family members. No NLV was detected in oyster samples from this outbreak, although NLV was identified in oysters linked to another outbreak. Strains identified in oyster-related outbreaks belonged to genotypes GI/4, GI/3, GII/6,7,9 and GII/5 (1c), a

new strain in New Zealand. Seven NLV strains have not been definitively identified as yet although five of these appear to belong to Genogroup II.

Table 23. NLV Genotypes occurring in 2001.

NLV Strain	Genotype	Number (%)
Norwalk virus	GI/1	1 (2)
Desert Shield virus	GI/3	11 (20)
Chiba virus & 'cruise ship' virus	GI/4,5	7 (12.5)
Lordsdale virus 'Global strain' cluster	GII/1,4,8	17 (30)
Florida/Gwynedd/Idaho Falls virus cluster & Napier virus	GII/6,7,9	12 (21)
Not identified	GII/5 (1c)	1 (2)
Total		56 (100)

ARBOVIRUS SCREENING

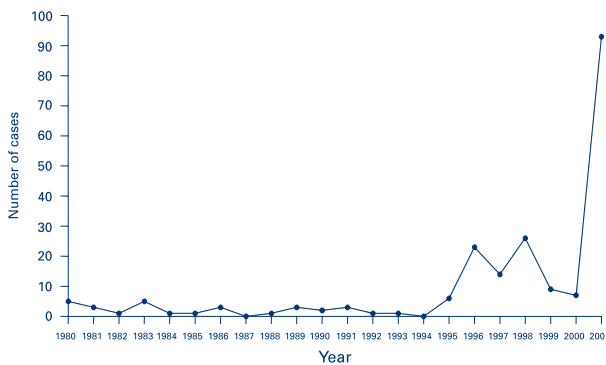
Dengue fever

Ninety-three cases of dengue fever were notified in 2001. This is the highest number of notifications reported in any single year since dengue fever was listed as a notifiable disease in 1980. The 2001 rate of 2.5 per 100,000 was significantly higher than the 2000 rate of 0.2.

Hospitalisation status was recorded for 84 cases and of these, 25.0% (21/84) were hospitalised. Forty-one cases (44.1%) were male and fifty-two (55.9%) were female. Ethnicity was recorded for 83 cases: forty-eight were European, twenty-nine Pacific Island, four of 'Other' ethnicity and two were Maori.

The following graph shows dengue fever notifications by year since 1980.

Figure 18. Dengue fever notifications by year, 1980 -2001



The reason for travel was recorded for 92.5% (86/93) of the cases. Of these, 78 cases were New Zealanders travelling overseas on business or holiday³, and eight were overseas visitors to New Zealand. Travel information was recorded for seven of the eight overseas visitors. Four had been in Samoa, two reported travel to French Polynesia, and one to Thailand.

The following table shows rates of dengue among New Zealanders travelling overseas on business or holiday, and the country/region where the disease was most probably acquired.

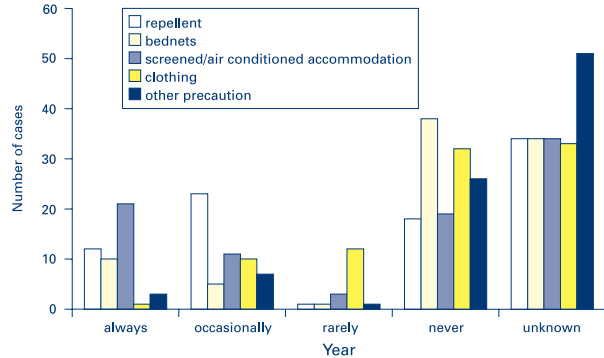
³ Three of the 78 cases had been overseas for more than a year.

Table 24. Rates of dengue and country/region where infection probably acquired: New Zealanders travelling overseas on holiday and business, 2001

Country / region	Cases	Travellers	Rate (per 100 000 visits)
Pacific Islands			
Cook Islands	1	19909	5.0
French Polynesia	6	4075	147.2
Fiji	1	63078	1.6
Samoa	52	14866	349.8
Tokelau	3	194	1546.4
South East Asia			
East Timor	3	928	323.3
Indonesia	5	16740	29.9
India	1	8959	11.2
Philippines	2	4068	49.2
Sri Lanka	1	1928	51.9
Thailand	3	18046	16.6
Total	78	152791	51.1

Information on precautionary measures (including use of insect repellent, bed nets, screened or air conditioned accommodation, wearing of long sleeved shirts and trousers) was recorded for 58.1% (54/93) of cases. The following graph shows the use of precautionary measures among dengue fever cases notified during 2001.

Figure 19. Reported use of protective measures among dengue fever cases notified in 2001



HEPATITIS LABORATORY

Three thousand, eight hundred and eighty-seven samples for HBV, HCV and HDV testing were processed in the ESR Hepatitis Laboratory during 2001.

Hepatitis B DNA Testing

There were 748 samples tested for HBV DNA. A qualitative in-house nested PCR assay was performed on 320 clinical samples of which 145 (45%) showed the presence of HBV DNA. With the increased availability of Lamivudine for treating hepatitis B, the need for the use of a quantitative assay to aid in monitoring treatment has increased significantly. A total of 428 samples were tested using the Roche quantitative assay kit. With the introduction of Roche Cobas machine in October 2001, all HBV DNA samples submitted to the laboratory are now tested using the quantitative assay.

Hepatitis C RNA Testing

A qualitative HCV RNA assay is used to detect HCV virus. A total of 1,832 samples were tested for HCV, of which 1,461 were from clinical patients. Eight hundred and thirty-eight (57%) of these showed the presence of HCV RNA. Three hundred and sixty-two blood donor samples were examined, and 43 (12%) showed the presence of HCV RNA.

HCV genotyping was performed on 385 samples (Table 25). Genotyping is important as it is linked to the efficacy of anti viral treatment.

Table 25. Range of genotypes detected during 2001

Genotype/Sub type	Number
1a	61
1b	37
1a/1b	30
1 non subtypable	55
2a/2c	9
2b	13
2 non subtypable	1
1 + 2	1
3a	120
4a	1
4 non typable	5
Samples unable to be typed	52

MYCOLOGY

Table 26. Biannual summary of opportunistic mycoses in New Zealand, July-December 2001

Organism	No. of cases	Site	Clinical data
Filamentous fungi			
<i>Acremonium killense</i>	1	Foot abscess	DE+, past history gout.
<i>Alternaria</i> species (MCR A. <i>alternata</i>)	2	Calf biopsy (1)	DE+, post renal transplant.
		Joint fluid from index finger (1)	DE 1 st specimen -ve (Gram), next 2 specimens DE+. Foreign object (splinter) on X-ray. Follow up after treatment no fungi isolated.
<i>Aspergillus</i> species	1	Vitreous & AC tap	DE-, post eye surgery. Vitreous biopsy no growth.
<i>Aspergillus fumigatus</i>	6	Lung & brain pus (1)	DE+, ALL. Rx: amphotericin B. Deceased.
		Tracheal aspirate (1)	Thyroid biopsy fungal elements seen in histology - not sent for culture. Deceased.
		FNA lung (1)	DE+, post-renal transplant.
		Sternal wound (1)	Post-repair TOF mediastinitis. Responded well to surgical debridement & amphotericin B.
		Post mortem tissue (1)	BMT patient.
		Back & calf lesions (1)	DE+ ?B cell lymphoma. Rx: amphotericin B.
<i>Fusarium solani</i>	1	Corneal ulcer	DE+, trauma. Rx: natamycin.
<i>Mucor</i> species resembling <i>Mucor ramosissimus</i>	1	Nasal tissue	DE+, ALL, immunosuppressed.
<i>Paecilomyces lilacinus</i>	1	Corneal ulcer	DE+, contact lens wearer.
<i>Phialophora richardsiae</i>	1	Foot nodules	DE+, post-renal transplant (1 month). Rx: surgical debridement & amphotericin B. Recurrence of nodules 8 months later.
<i>Ochroconis gallopavum</i>	1	BAL	DE- (gram stain only). NR
<i>Rhizopus microsporus</i>	1	Appendix abscess	DE+, appendicitis, ALL. Rx: liposomal amphotericin B.
<i>Rhizopus oryzae</i>	1	Tissue from hard palate	DE yeast cells & hyphae seen. 90y old diabetic. Rx: amphotericin B. Deceased.
<i>Saksæna vasiformis</i>	1	Leg tissue	DE+, graze from oyster shells & wound also contaminated with salt water, sand & mud. Rx: itraconazole, amphotericin B, surgical debridement & eventually amputation.
<i>Scedosporium apiospermum</i>	4	Peritonsillar tissue (1)	DE-, AML, myelodysplastic anaemia. Rx: amphotericin B & fluconazole. Discharged.
		Ulcer swab (2)	NR
		Eye aspirate (1)	Keratitis post-bamboo stick injury. Rx: voriconazole & natamycin.
<i>Scedosporium prolificans</i>	1	Corneal ulcer	No DE, repeat scraping DE- & no growth.
Yeasts			
<i>Candida albicans</i>	37	Blood culture (25)	Line sepsis (4), on TPN with line sepsis (3) B cell lymphoma (1), pancreatic abscess (1), germ cell teratoma (1), diverticulitis with perforated small bowel (1), post-AAA (1), duodenal ulcer (2), diabetic with reoccurring health events (1), burns patient from Tahiti - deceased (1), septic following hernia repair, hemicolectomy & ileostomy (1), generally unwell (1), pancreatitis, lines in-situ (1), MVA with abdominal perforations. Rx: amphotericin B, ongoing problems. Also isolated from laparotomy fluid with <i>Candida krusei</i> (1), CABG with prosthetic device (1), burns (also isolated from burn tissue [DE+]). Rx: amphotericin B & fluconazole, deceased (1), ICU patient (1), NR (2)
		CAPD (7)	ESRF (5), ESRF, also isolated with <i>E. coli</i> , <i>K. pneumoniae</i> & <i>Enterococcus</i> sp. (1), NR (1)
		Pleural fluid (2)	DE+, ESRF on CAPD, peritonitis. Tension pneumothorax, CVL & chest drains in-situ. Deceased (1), ICU patient (1)
		Subphrenic abscess aspirate (1)	DE+, pancreatitis. Rx: fluconazole.
		Knee aspirate (1)	+ve blood cultures in June 2001 ?seeded to knee.
		Pericardial fluid (1)	Post-op, liver metastases.

Organism	No. of cases	Site	Clinical data
<i>Candida dubliniensis</i>	1	Blood culture	NR
<i>Candida glabrata</i>	2	Blood culture	Ca bowel, ?line sepsis (1), post-surgery (1)
<i>Candida lusitanae</i>	2	Fluid from kidney (1)	Post-ureteric stents & nephrostomy tubes.
		Abdominal abscess (1)	Abscess.
<i>Candida parapsilosis</i>	17	Blood culture (10)	SOB (1), line sepsis, past IV-drug abuser, deceased (1), short gut syndrome with line sepsis (1), Ca bowel, post-op. on TPN, line in-situ (1), Ca (1), diabetes mellitus (1), pneumomediastinum, line in-situ, on TPN. Rx: fluconazole (1), post ?meningococcal disease (1), NR (2)
		Pleural fluid (1)	DE-, ESRF on haemodialysis.
		Subphrenic collection (1)	NR
		CSF (1)	DE-, encephalitis, Reiter's disease.
		CAPD (3)	ESRF (1), ESRF; also fungal infection of groin (1), ESRF, also isolated with mixed coagulase -ve staphylococci (1)
		Knee aspirate (1)	DE-, swollen knee. Prosthetic heart valve.
<i>Candida tropicalis</i>	4	Blood culture (2)	EVD in-situ, 1 month prior Ca bicicans isolated from blood (1), splenectomy, nephrectomy & laparotomy post-MVA. Also isolated from atrium aspirate (DE+). Rx: amphotericin B followed by fluconazole (1)
		CAPD (2)	ESRF, <i>E. faecium</i> also isolated (1), ESRF, <i>C. glabrata</i> also isolated from tenckhoff catheter tip (1)
<i>Cryptococcus neoformans</i> var <i>neoformans</i>	2	Blood culture (1)	HIV+
		CSF (1)	HIV+, relapse, LA 1:512
<i>Rhodotorula mucilaginosa</i>	1	CAPD fluid	ESRF
<i>Pneumocystis carinii</i>	10	Induced sputum (2)	ALL, febrile (1), SLE, nephritis on prednisone, increasing SOB (1)
		BAL (6)	Post-renal transplant (1), lymphoma (1), T cell lymphoma (1), post-lung transplant ?rejection, increasing SOB (1), ALL (1), severe combined immunodeficiency requiring BMT (1)
		Sputum (2)	HIV+
Aerobic Actinomycetes			
<i>Nocardia asteroides</i> complex	2	Sputum	Past history TB 20 years ago, isolated twice (1), NR(1)
<i>Nocardia farcinica</i>	1	Post-mortem cerebellum	DE+, basal meningitis, on steroids. Microabscesses in brain.
<i>Nocardia nova</i>	8	Sputum (3)	Pneumonia ?TB (1), chronic cough (1), NR (1)
		Maxillary antrum (1)	DE-ve, post-septoplasty.
		Hand abscess (1)	NR
		Knee tissue (1)	Abscess & cellulitis, runs a bird sanctuary.
		Ankle (1)	DE+, no history of trauma.
		No site (1)	NR
<i>Nocardia paucivorans</i>	1	Bronchial wash	Identified by 16S sequencing. DE+. Non-resolving pneumonia, asthmatic on steroids. Presented with infiltrate.
<i>Nocardia veterana</i>	1	Sputum	Identified by 16S sequencing. NR.
<i>Dermatophilus congolensis</i>	1	Leg	Recurring lesions.
<i>Gordonia bronchialis</i>	1	CAPD	ESRF, peritonitis. Identity confirmed by 16S sequencing.

KEY:

AAA	Aortic abdomen aneurysm	FNA	Fine needle aspirate
ALL	Acute lymphoblastic leukaemia	IV	Intravenous
AML	Acute myeloid leukaemia	HIV	Human immunodeficiency virus
BMT	Bone marrow transplant	ICU	Intensive care unit
Ca	Carcinoma	LA	Latex agglutination
CABG	Coronary artery bypass graft	MCR	Most closely resembles
CAPD	Continuous ambulatory peritoneal dialysis	MVA	Motor vehicle accident
CRF	Chronic renal failure	NR	Clinical data not received
CVL	Central venous line	Rx	Treatment
DE	Direct examination	SOB	Shortness of breath
ESRF	End stage renal failure	TPN	Total parenteral nutrition
EVD	Extra-ventricular drain		

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