

# ANNUAL SUMMARIES - 1999

## BACTERIOLOGY

### INVASIVE INFECTIONS

Numbers of isolates received from cases of invasive disease caused by *Haemophilus influenzae*, *Neisseria meningitidis*, *Streptococcus pneumoniae*, *Streptococcus pyogenes* (Group A), and *Streptococcus agalactiae* (Group B) January to December 1999 are shown in Table 1.

Table 1. Sterile site isolates, 1999

Organism	BC	CSF or CSF/BC	Other sterile site	Total
<i>H. influenzae</i>	40	4	0	44
<i>N. meningitidis</i>	166	73	1	240
<i>S. pneumoniae</i>	437	33	8	478
<i>S. pyogenes</i>	96	2	9	107
<i>S. agalactiae</i>	30	2	3	35

*H. influenzae*: includes 9 serotype b

The age profile of the patients from whom the isolates were obtained is given in Table 2.

Table 2. Age distribution of cases of invasive disease, 1999

Organism	<1m	1-11m	1y	2y	3y	4y	5-9y	10-24y	25-59y	≥60y
<i>H. influenzae</i> b	0	2	2	1	0	0	0	0	3	1
<i>H. influenzae</i> non b	1	4	0	1	0	1	2	3	13	10
<i>N. meningitidis</i>	1	47	43	18	14	15	23	50	23	6
<i>S. pneumoniae</i>	2	51	59	28	12	6	18	22	98	181
<i>S. pyogenes</i> <sup>1</sup>	1	9	0	1	1	2	4	11	33	43
<i>S. agalactiae</i> <sup>1</sup>	12	5	0	0	0	0	0	1	10	7

<sup>1</sup> Information on age was not provided with one isolate of *S. pneumoniae* and two isolates of *S. pyogenes*.

### *Haemophilus influenzae*

*Haemophilus influenzae* serotype b (Hib) is a notifiable disease. Since vaccination against this disease became available it has become particularly important to identify the serotypes of *H. influenzae* that are causing invasive disease since the notification is dependent on laboratory evidence. Laboratory data is matched with notification data to ensure that this is as accurate as possible.

Isolates were received from 44 cases of *H. influenzae* invasive disease in 1999. Nine of these isolates were serotype b, two were serotype e, five were serotype f, and the others were non-serotypable using serotype-specific antisera. This compares with 10 serotype b out of a total of 41 viable organisms in 1998.

All organisms that were non-serotypable were tested by PCR for the

presence of the serotype b specific *cap* gene and the *bexA* gene necessary for capsular expression. Only one of these isolates possessed the *bexA* gene and none the serotype b specific *cap* gene.

The antimicrobial susceptibilities of these isolates are reported in the Antibiotic Resistance section of this issue of LabLink.

### *Neisseria meningitidis*

Culture-confirmed cases of meningococcal disease are those from whom a meningococcus has been isolated from a sterile site. Meningococci received at ESR from cases are serogrouped and then serotyped and subtyped using monoclonal antibodies prepared against the following serotypes and subtypes:

serotype 1, 2a, 2b, 4, 14 and 15

subtypes P1.1, P1.2, P1.4, P1.5, P1.6, P1.7, P1.9, P1.10, P1.12, P1.13, P1.14, P1.15 and P 1.16.

Subtyping by amplification of the *porA* gene is undertaken on organisms which are not serosubtypable with monoclonal antibodies. The *porA* gene encodes subtype-specific antigens. Restriction digestion of the PCR product enables prediction of the subtype, which is then confirmed only for subtypes P1.2, P1.4, P1.7 and P1.16 by DNA-DNA hybridisation with sequence-specific probes.

Confirmation of meningococcal disease can also be made by demonstration of meningococcal DNA in specimens of blood, CSF or tissue aspirates. The same *porA* PCR test is used to detect meningococcal DNA directly in patient specimens. It should be noted that on meningococci, the P1.7 epitope is inaccessible to monoclonal antibodies and goes unrecognised whereas the sequence-specific probes are able to detect sequences encoding this additional epitope. Thus, the subtype P1.4 detected by monoclonal antibodies equates with the sequence-specific subtype P1.7, 4 detected by PCR in patient specimens.

A total of 240 isolates were received from culture-confirmed cases of meningococcal disease. One isolate was non-viable on receipt. Of the 240 isolates, 92.9 % (223/240) were serogroup B, 5.8 % (14/240) serogroup C and 3 were serogroup Y. This compares with 217 viable invasive isolates in 1998, 88 % of which were serogroup B. In addition, 16 isolates were received from non-invasive sites from notified cases.

Among the serogroup B isolates received, one strain type, B:4:P1.4, accounted for 73.0 % (162/222) and one subtype, B:P1.4, accounted for 90.6% (202/223). This compares with 69.1% and 88.0% respectively for 1998. Organisms with this serosubtype have been identified from the majority of cases of meningococcal disease since the beginning of the current epidemic in mid-1991. One non-viable organism was able to be serogrouped as a B and subtyped as P1.7,4 by PCR testing. The serotype was not determined. The serogroup Y isolates typed as Y:14:NST, Y:14:P1.2 and Y:14:P1.5,2

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Table 3. Serotypes and subtypes of invasive *N. meningitidis* isolates, 1999

Subtype	Serotype							Total
	1	2a	2b	4	14	15	NT	
<b>Serogroup B</b>								
P1.4	5			159 + 1*	10	2	20	197
P1.6				1				1
P1.7				1*				1
P1.7.4				2			1*	4#
P1.7.16	1					5	1	7
P1.14				2			1*	3
P1.16						3		3
NST	1			1	3		2	7
<b>Total</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>167</b>	<b>13</b>	<b>10</b>	<b>25</b>	<b>223#</b>
<b>Serogroup C</b>								
P1.2		1+1*	1+1*					4
P1.5.2			3					3
P1.6					1			1
P1.15	1						2	3
P1.16						1		1
NST						1	1	2
<b>Total</b>	<b>1</b>	<b>2</b>	<b>5</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>14</b>

NT - non typable

NST - non subtypable

\* subtype determined by *porA* PCR followed by restriction digestion and dot blot hybridisation

# includes one isolate that was non-viable on receipt but typed by PCR as serogroup B and subtype P1.4.

A total of 92 patient specimens were referred for testing. The *porA* PCR plus DNA-DNA hybridisation assay (as described above) was used to test for meningococcal DNA. Specimens from 69 cases were PCR-positive. Fifteen of these cases had also been culture positive: eight cases had been confirmed by isolation of a meningococcus from a normally sterile site; seven others had had a positive throat culture and were therefore unconfirmed cases of disease, according to the case definition. In all 15 instances the serotype of the culture, as determined using monoclonal antibodies, matched the subtype designation, determined using sequence-specific probes following *porA* PCR.

Of the 61 cases confirmed by PCR alone, including the seven with a throat isolate, the majority (80.3%; 49/61) had the P1.7, 4 subtype. Of the remaining 12 *porA* PCR positive specimens, five could not be assigned a subtype with the four probes used, three were subtype P1.7, 16, two were P1.2 and two were P1.7.

Overall, the proportion of all meningococcal disease cases, either culture-confirmed or *porA* PCR confirmed, that were infected with meningococci bearing the P1.7, 4 *porA* subtype was 83.4% (251/301). The continuing dominance of our epidemic strain (B : 4 : P1.4) is demonstrated by these results. The importance of the PCR test both for case confirmation and for providing information of public health value is emphasised.

The antimicrobial susceptibilities of these isolates are reported in the Antibiotic Resistance section of this issue of LabLink.

### *Streptococcus pneumoniae*

Serogrouping and serotyping of invasive isolates of *Streptococcus pneumoniae* is undertaken to monitor the types causing invasive disease and their vaccine coverage. A pneumococcal serotype represents a singular capsular antigen determined using factorised antisera, whereas a serogroup contains more than one antigenically related serotype.

The 23-valent vaccine, which has not been shown to be effective in children under 2 years, contains the following capsular types: 1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19A, 19F, 20, 22F, 23F and 33F. The following conjugate vaccines are being developed for paediatric use: a seven valent vaccine containing capsular types 4, 6B, 9V, 14, 18C, 19F and 23F; a nine valent vaccine containing the above types plus types 1 and 5; and an 11 valent vaccine containing the addition of types 3 and 7F.

Viable isolates were received from 475 cases of invasive disease caused by *Streptococcus pneumoniae* in 1999, compared with 376 in 1998. The three

most common serogroups/serotypes were 14, 9 and 19, with 92 isolates (19%), 59 isolates (12%), and 55 isolates (12%) respectively.

The percentages of the ten most common serogroups/serotypes in the 179 children under 15 years are shown in Figure 1, and in the 296 adults (≥ 15 years) in Figure 2. Assessing the 1999 paediatric isolates (n=179) against the three target vaccines, the 7-valent vaccine (containing serotypes 4, 6B, 9V, 14, 18C, 19F, 23F), the 9-valent vaccine (with additional types 1 and 5) and the 11-valent vaccine (with additional types 3 and 7F) they would have protected up to 78%, 80% and 84% respectively of paediatric cases.

The antimicrobial susceptibilities of these isolates are reported in the Antibiotic Resistance section of this issue of LabLink.

Figure 1. Serogroups/serotypes of *S. pneumoniae* in children under 15 years, 1999

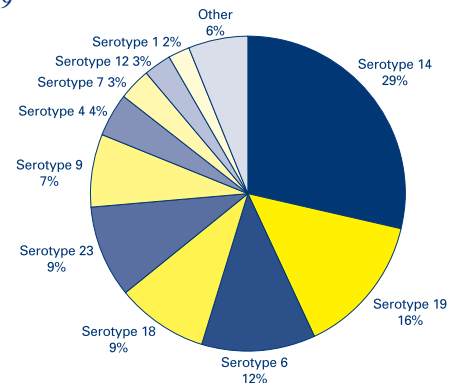
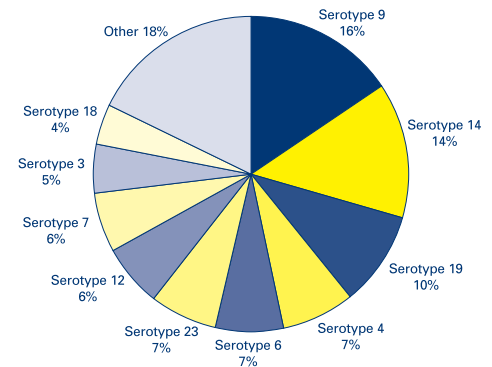


Figure 2. Serogroups / serotypes of *S. pneumoniae* in adults 15 years, 1999



### *Streptococcus pyogenes*

Isolates were received from sterile sites from 107 cases of invasive disease in 1999, compared with 96 in 1998. There were 96 isolates from blood culture, two from CSF, and nine from other sterile sites.

Molecular typing, based upon sequence identification of the *emm* gene in the region encoding the type-specificity of the M-protein, is used to determine the *emm* types of Group-A streptococci. The *emm* type equates to M type determined by using type-specific antisera. Fifty different *emm* and M types were identified, the most common being *emm*1 which occurred in 16% (17/107) of all cases. Most other types had fewer than five cases each.

### *Streptococcus agalactiae*

During 1999 isolates were received from 33 cases of invasive group B streptococcal disease. Seventeen isolates were from cases of neonatal sepsis of which 12 were early onset disease and five late onset disease. This compares with 11 cases of early onset disease among 16 cases of neonatal sepsis in 1998. Serotype III continues to be the most common serotype causing neonatal sepsis, accounting for 47% (8/17) of all cases. Table 4 shows the serotype distribution of invasive isolates for adult disease and neonatal sepsis.

Table 4. Serotypes of *S. agalactiae* invasive disease isolates, 1999

Serotype	All isolates	Neonatal isolates
Ia	5	1
Ib	1	2
Ic	1	1
Ia/c	0	2
Ib/c	1	1
II	0	1
III	7	2
III - R	1	0
V	0	5
Non-typable	1	1
<b>Total</b>	<b>17</b>	<b>16</b>

## BORDETELLA PERTUSSIS

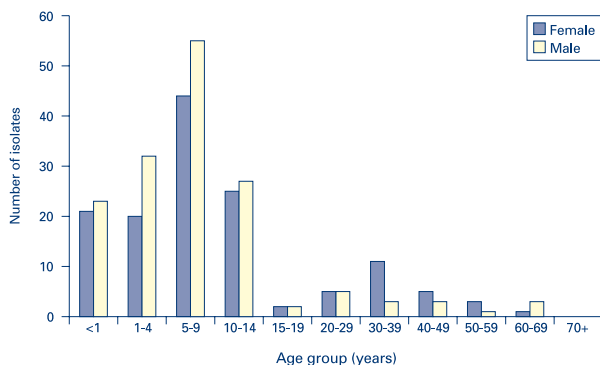
In 1999, 300 viable isolates of *Bordetella pertussis* were received for surveillance, compared with 29 in 1998. The distribution of cases by age group and gender is shown in figure 3, for the 291 cases for whom information on both age and gender was provided. Of the 294 cases for whom age was given, 83.7% (246/294) were old enough to have been fully vaccinated. The recommended ages for vaccination against *B. pertussis* in New Zealand are at six weeks, three months, five months and 15 months.

The serotype distribution of the isolates was:

- serotype 1,3 292 (97.3%)
- serotype 1,2 7 (2.3%)
- serotype 1,2,3 1 (0.3%)

As in recent years, serotype 1,3 continues to be the dominant serotype.

Figure 3. *B. pertussis* cases by age group and gender 1999



## LEPTOSPIROSIS

During 1999, a total of 76 cases of leptospirosis were laboratory-confirmed, and a further 7 cases were notified based on clinical grounds only. Fifty-two (68%) of the laboratory confirmed cases were notified. This compares with 117 cases in 1998 with a 64% notification rate. The incidence rate in 1999 was 2.3/100,000 compared with 3.2/100,000 in 1998. The following health districts continue to have incidence rates per 100 000 above the national incidence rate: Northland (8.0), Hawkes Bay (6.3), West Coast (6.2), Manawatu (6.0), Waikato (5.6), South Canterbury (5.0), Gisborne (4.4), Taranaki (3.7), and Taupo (3.3). The majority of cases (75%) were reported from the North Island health districts, with the largest proportions coming from Waikato (20%), Northland (13%), Hawkes Bay (11%), Manawatu (11%) and the remaining 20% came from the other health districts in the North Island. Twenty five percent of cases came from the South Island with the majority coming from Canterbury (11%).

*Leptospira interrogans* serovar *hardjo* remains the most frequently diagnosed serovar, followed closely by *L. borgpetersenii* serovar *ballum* and *L. interrogans* serovar *pomona*.

Table 5. *Leptospira* species and serovars identified in laboratory-confirmed cases, 1999

<i>Leptospira</i> species / serovar	Number of isolates
<i>L. interrogans</i> serovar <i>australis</i>	1
<i>L. borgpetersenii</i> serovar <i>ballum</i>	17
<i>L. interrogans</i> serovar <i>copenhageni</i>	7
<i>L. interrogans</i> serovar <i>hardjo</i>	21
<i>L. interrogans</i> serovar <i>pomona</i>	11
<i>L. borgpetersenii</i> serovar <i>tarassovi</i>	9
Unidentified	10
<b>Total</b>	<b>76</b>

The age and sex distribution (Table 6) for all cases showed that the majority of cases were male (94%) and 71% were aged 20-49 years.

Table 6. Age and sex distribution of laboratory-confirmed leptospirosis cases, 1999

Sex	<20y	20-29y	30-39y	40-49y	50-59y	60-69y	>70y	Unknown	Total
Female	0	0	3	1	1	0	0	0	5
Male	3	19	17	19	14	4	1	1	78
<b>Total</b>	<b>3</b>	<b>19</b>	<b>20</b>	<b>20</b>	<b>15</b>	<b>4</b>	<b>1</b>	<b>1</b>	<b>83</b>

The occupation was known for 51 (61%) cases. Of these 47% were farmers and 25.5% were associated with the meat work industry (Table 7).

Table 7. *Leptospirosis* cases by occupation, 1999

Occupation	Total	Percent
Dairy Farmer / Farmer / Sharemilker	24	47.0
Freezing Worker / Abattoir Worker / Butcher	13	25.5
Agricultural / Forestry	4	7.8
Sewerage Worker	1	2.0
Stock Buyer	1	2.0
Other Occupations	8	15.7
<b>Total</b>	<b>51</b>	<b>100%</b>

## LEGIONELLOSIS AND ENVIRONMENTAL LEGIONELLA ISOLATES

During 1999, a total of 30 cases were confirmed either by isolation or seroconversion. A further 35 cases were regarded as probable, based on a single high titre ( $\geq 512$ ) in a single serum sample, and 9 cases were notified based on clinical grounds (Table 8). Twenty-three (76%) of the 30 confirmed cases were notified and 20 (57%) of the probable cases were notified. This compares with a notification of 56% for confirmed cases and 21% for probable cases in 1998. Both the probable and confirmed cases increased in the second half of the year (Figure 4). The Waikato health district accounted for 25% cases followed by Canterbury 22%, Tauranga 9%, Hutt 7%, and Wairarapa and Wellington 5%. The national incidence rate was 2.0, the following health districts had higher incidence rates; Wairarapa (10.1), Tauranga (6.2), Ruapehu (6.0), Waikato (5.9), Canterbury (4.1), Hutt (3.8), and Taupo (3.3). The cases were nearly evenly distributed between males (46%) and females (54%), and 75% of the cases were aged over 50 years (Table 9).

In 61 of the 65 cases, the infecting *Legionella* species could be identified serologically or by isolation. The *Legionella pneumophila* serogroup could not be confirmed in two cases due to cross reactivity between the serogroups or a dual infection by more than one serogroup. The *Legionella longbeachae* serogroup could not be confirmed in 22 cases. Again this could be due to the cross reaction between the serogroups or a dual infection. The infecting *Legionella* species could not be identified in four cases.

The most common species causing infection was *L. longbeachae* followed by *L. pneumophila* and *L. micdadei*. This is in contrast with previous years where *L. pneumophila* has been responsible for the majority of cases. *L.*

*longbeachae* was identified in 52% of cases, compared with 12% in 1998. *L. pneumophila* was identified in 18% of cases compared with 63% in 1998.

Table 8. Legionellosis cases and Environmental Legionella Isolates during 1999

Legionella spp.	Clinical Cases			Number of environmental isolates
	Confirmed	Probable	Total	
<i>L. pneumophila</i> serogroup 1	2	2	4	51
<i>L. pneumophila</i> serogroup 3	0	0	0	6
<i>L. pneumophila</i> serogroup 5	0	2	2	39
<i>L. pneumophila</i> serogroup 6	0	0	0	32
<i>L. pneumophila</i> serogroup 7	0	0	0	1
<i>L. pneumophila</i> serogroup 8	0	0	0	8
<i>L. pneumophila</i> serogroup 12	1	3	4	1
<i>L. pneumophila</i> serogroup 13	1	0	1	12
<i>L. pneumophila</i> unidentified <sup>1</sup>	0	2	2	15
<i>L. anisa</i>	0	0	0	1
<i>L. bozemanii</i> serogroup 1	1	0	1	0
<i>L. bozemanii</i> serogroup 2	0	1	1	0
<i>L. bozemanii</i> serogroup unidentified	0	0	0	8
<i>L. dumoffii</i>	1	1	2	6
<i>L. feeleyi</i> serogroup 2	0	0	0	1
<i>L. gormanii</i>	0	2	2	0
<i>L. jordanis</i>	1	1	2	0
<i>L. longbeachae</i> serogroup 1	6	5	11	11
<i>L. longbeachae</i> serogroup 2	0	1	1	2
<i>L. longbeachae</i> unidentified <sup>2</sup>	10	12	22	23
<i>L. micdadei</i>	4	2	6	5
<i>Legionella</i> sp. <sup>3</sup>	3	1	4	81
<b>Total</b>	<b>30</b>	<b>35</b>	<b>65</b>	<b>303</b>
Number Notified	23	20	43	-

<sup>1</sup> The serogroup could not be identified due to cross-reactivity or a dual infection.

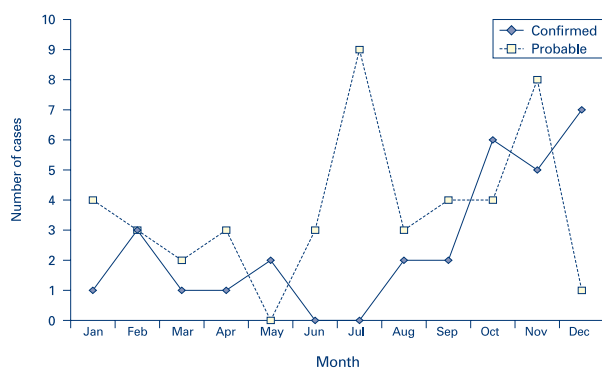
<sup>2</sup> The serogroup could not be identified due to cross reactions between *L. longbeachae* serogroup 1 and 2 or a dual infection.

<sup>3</sup> The primary infecting species and serogroup could not be identified due to cross reaction, a positive reaction to more than one species or a dual infection.

Table 9. Age and sex distribution of all legionellosis cases, 1999

Sex	20-29y	30-39y	40-49y	50-59y	60-69y	70-79y	>80y	Unknown	Total
Male	2	2	4	4	7	13	1	1	34
Female	2	1	6	6	14	6	1	4	40
<b>Total</b>	<b>4</b>	<b>3</b>	<b>10</b>	<b>10</b>	<b>21</b>	<b>19</b>	<b>2</b>	<b>5</b>	<b>74</b>

Figure 4. Legionellosis cases per month during 1999



In 1999, 373 presumptive environmental *Legionella* isolates were received from other laboratories or were isolated by ESR from cooling towers, potable water, and potting mix during case investigations. Of these, 303 (81%) were identified as *Legionella* species of which 176 (58%) could be identified to species and serogroup level (Table 8).

The distribution of isolates shows that a variety of different species and serogroups are present in the environment and are routinely isolated from environmental sources.

## LISTERIA MONOCYTOGENES

Isolates from 18 cases of listeriosis were received for typing and surveillance purposes in 1999 (Table 10) compared with isolates from 17 cases in 1998.

Five (28%) of the 1999 cases were perinatal; two foetal deaths were recorded. All of the 13 non-perinatal cases had an underlying illness or were elderly.

The serotype distribution of the 18 isolates was:

- serotype O1/2 7 (39%)
- serotype O4 11 (61%)

All of the cases were sporadic with no specific food source implicated.

Table 10. *Listeria monocytogenes* from human cases, 1999

Month isolated or of onset	Health district	Sex/Age	Specimen source	O antigen serotype
<b>Perinatal Cases</b>				
February	WN	F 43y	BC	1/2
June	NL	F 17y	placenta	4
July	SA	M foetus <sup>1</sup>	BC	1/2
September	CA	F 31y <sup>1</sup>	BC	4
September	RO	F 30y	BC	4
<b>Non-perinatal Cases</b>				
January	WK	M 76y	CSF	1/2
February	CA	M 64y	BC	4
March	WK	M 81y	BC	1/2
March	CA	M 72y	peritoneal ascites	4
May	NW	M 35y	BC	4
June	CB	F 36y	BC	4
June	SA	M 68y	BC, CSF	4
July	CA	F 56y	BC	1/2
August	SA	F 35y	BC	4
September	CA	F 28y	BC, CSF	1/2
October	CB	M 70y	BC	4
December	NM	F 85y	BC	1/2
December	NW	F 72y	BC	4

<sup>1</sup> Foetal deaths

## SPECIAL BACTERIOLOGY

### Interesting Isolates Received in the Special Bacteriology Laboratory During 1999

- *Burkholderia pseudomallei*, the causative organism of melioidosis, from sputum of patient who was apparently colonised with this species.
- *Neisseria gonorrhoeae*, vancomycin-susceptible, which failed to grow on Thayer Martin or modified Thayer Martin.
- Blood culture isolates: *Aureobacterium* sp. (1), *Bergeyella zoohelcum* (1), *Dermabacter hominis* (1), *Capnocytophaga canimorsus* (1), *Capnocytophaga* sp. gp DF-1 (3), *Erysipelothrix rhusiopathiae* (1), *Methylobacterium* sp. (2), *Roseomonas* sp. (1), *Stomatococcus mucilaginosus* (2).

### *Corynebacterium diphtheriae*

Four non-toxicogenic isolates of *C. diphtheriae* were received in 1999, from atrophic rhinitis (2), blood (1), and foot biopsy (1).

Sporadic cases of infection with non-toxicogenic *C. diphtheriae* occur during most years in New Zealand. The most recent case of diphtheria (toxicogenic strain) occurred in 1998<sup>1</sup>. Prior to this, no isolates from infections fitting the case definition of diphtheria had been received since the last notified case in 1979.

Isolates received in the ten year period 1990–1999 are shown in Table 11.

Table 11. *Corynebacterium diphtheriae* isolations, 1990-1999

Year	Health District	Sex/Age	Source <sup>1</sup>	Biovar
1990	CA	M 3y	c	<i>gravis</i>
1991	VN	F 4y	c	<i>intermedius</i>
1991	VN	F 13y	c	<i>intermedius</i>
1991	WK	M 36y	c	<i>gravis</i>
1993	VN	M 12y	c	<i>mitis</i>
1993	WK	M 78y	r	<i>mitis</i>
1993	VN	F 20y	c	<i>mitis</i>
1993	VN	M 41y	c	<i>mitis</i>
1994	CA	M 27y	b	<i>gravis</i>
1995	VN	M 38y	c	<i>gravis</i>
1995	VN	M 22y	c	<i>mitis</i>
1996	CA	M 58y	r	<i>mitis</i>
1996	CA	F 12y	b	<i>gravis</i>
1996	VN	F 22y	c	<i>gravis</i>
1998	CB	M 21y	c	<i>mitis</i>
1998	CA	M 2y	r	<i>intermedius</i> <sup>2</sup>
1999	CA	F 18y	r	<i>mitis</i>
1999	WK	F 16y	b	<i>gravis</i>
1999	CA	F 29y	c	<i>gravis</i>
1999	SA	F 49y	r	<i>mitis</i>

<sup>1</sup> b - blood; c - cutaneous; r - respiratory

<sup>2</sup> toxigenic strain

<sup>1</sup> NZ Public Health Rep. 1998 5: 73-6

Isolates were received from 11 cases of *S. Typhi* compared with 29 cases in 1998. Phage types isolated were as follows: E1 (3); E1a (2); E7 (3); E7 variant (1); D2 (1); untypable (2).

- New Zealand had one confirmed case of typhoid from a cruise ship visiting Papua New Guinea. Several Australian passengers were also infected (phage type D2).
- Two members of one family each had a mixed infection of phage types E1a and E7.

New serotypes or phage types isolated in 1999 include:

- S. Concord* 6,7 : 1, v : 1,2 No details
- S. Menston* 6,7 : g,s,[t] : [1,6] Recent travel Somalia
- S. Dakar* 28 : a : 1,6 Immigration
- S. Bispebjerg* 1,4,12 : a : e,n,x Recent travel Middle East

There were 11 instances of mixed infections of different serotypes or phage types and one of *Vibrio cholerae* O1 Biotype El Tor subtype Ogawa and *S. Virchow*. The latter case had recently been in Fiji.

There were 126 isolates of *S. Enteritidis* phage type 9a and 71 of phage type 4, compared with 89 and 61 in 1998. Phage type 4 was isolated predominantly from returning overseas travellers (40 isolates).

Significant outbreaks or clusters are shown in Table 13. The rise in numbers of isolations of *S. Typhimurium* phage type 135 has continued. This phage type accounted for 9.2% of isolates in 1997, 14.6% in 1998, and 23.3% in 1999. Isolations of *S. Brandenburg* in Canterbury, South Canterbury and Southland have remained at similar levels to 1998 following an epidemic among sheep and lambs but have doubled in the Otago district.

Table 13. Significant outbreaks / clusters, 1999

Serotype	Phage type	Month	Health District	No. of cases	Comment
Infantis		February	South Auckland	7	After severe flooding.
Typhimurium	6	March	North West, Central and South Auckland	24	Café which also provided a mobile catering service. Includes 3 food handlers.
Enteritidis	9a	April	North West, Central and South Auckland	45	Doner kebabs implicated but not proven.
Typhimurium	156	June	Waikato	4	Food fair.
Typhimurium	135	August	Canterbury	3	Butchery also isolated from small goods made by the butchery.
Infantis		September	Manawatu	18	Associated with a bakery.
Typhimurium	156	October	Wellington	13	Includes 2 food handlers from a residential camp.
Agona		November	North West, Central and South Auckland	9	Poultry implicated.

Isolations of *S. Virchow* and *S. Weltevreden* have increased. These serotypes are usually associated with overseas travel and 21 of the 44 *S. Virchow* isolates indicate this. In contrast only 8 of the 49 *S. Weltevreden* indicated overseas travel. In January there were 26 cases of *S. Weltevreden* across New Zealand but no food source was proven.

## ENTERIC PATHOGENS

### SALMONELLA

There were 2,304 isolates serotyped in 1999 compared with 2,228 in 1998. The distribution of serotypes is shown in Table 12 and percentage totals of serotypes and phage types are shown in Figures 5 and 6.

Figure 5. Human *Salmonella* isolates, 1999

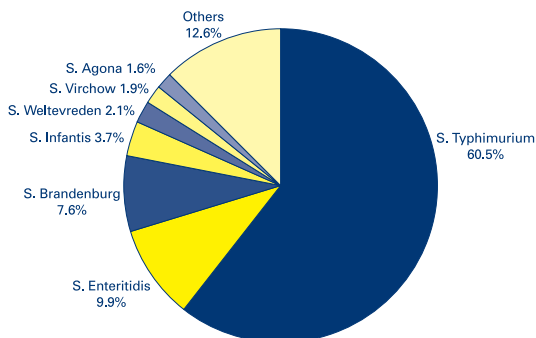
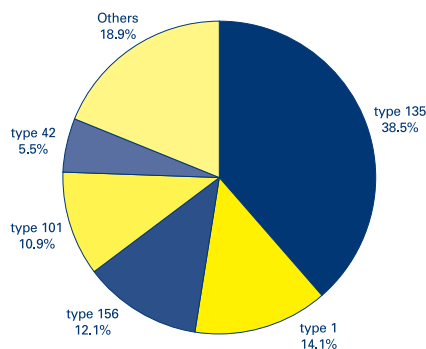


Figure 6. *S. Typhimurium* isolates by phage type, 1999



### NON-HUMAN SALMONELLA

A total of 1,802 isolates were serotyped in 1999 compared with 1,479 in 1998. The distribution of serotypes is shown in Table 14. *S. Brandenburg* isolates accounted for 70% of isolates from sheep compared with 52.4% in 1998.

#### *Poultry Isolates*

There were a total of 673 isolates compared with 663 in 1998. *S. Typhimurium* phage type 135 and *S. Infantis* were the predominant serotypes isolated.

Table 15. Predominant poultry isolates 1997-1999

Serotype	1997	1998	1999
<i>S. Typhimurium</i> 135	26.7%	23.9%	18.5%
<i>S. Infantis</i>	4.4%	4.5%	6.8%
<i>S. Agona</i>	7.4%	18.5%	4.4%
<i>S. Typhimurium</i> 101	3.5%	14.9%	3.8%

Table 12. Salmonella human serotypes, 1999

Serotypes	HEALTH DISTRICTS																								Total	
	NL	NW	CA*	SA	WK	TG	BE	GS	FO	TP	FU	HB	TK	WG	MW	WR	WN	HU	NM	WC	CB	SC	OT	SO		
Agona	1	8	12	7	3		1		1			1			1		1			2					38	
Alachua		1																							1	
Albany			1									1													2	
Anatum			1	2																					3	
Anatum 15+			1																			1			2	
Barilly																					1				1	
Birkenhead		1																1							1	
Bispebjerg																									1	
Blockley			1	2								1													4	
Bovismorbificans			2	2												1	1								6	
Brandenburg		7	4	3	2		1				1		1			2		13	8	1	17	23	45	48	176	
Charly					1																				1	
Concord																									1	
Cubana																	1								1	
Dakar			1																	1					1	
Derby			1																1						2	
Dublin			1																						1	
Eastbourne			1														2	1					1		5	
Emek					1																2				3	
Enteritidis phage type	1			2	3							1					3								9	
4		2	6	12	4	8	2		2	1		3	2		7		3	3			3	1	5	1	71	
5b				1																					1	
6					1								1												2	
8		1			1													1						1	4	
9a		8	24	26	8	22	5			1	1	1	4	1	1		5	4	2		10		3		126	
13			1											1											2	
13a		1																							1	
22			1			1																			2	
25																			1						1	
26																			1						1	
RDNC						1			1		1														3	
Untypable		1		1	1														1		1				5	
Gaminara																									1	
Haarlem			1		1																				2	
Hadar		1	8	1	4	1		1	1								4				1	1			23	
Hab			1																						1	
Heidelberg			1		1																				5	
Hindmarsh					1							1								2				1	6	
Hvittingvoss			1	2	1																2				8	
Ibadan		1			1													1	1			2			6	
Infantis		5	8	14	12	4	2	1		2		1			21		4	3			3	1	4		85	
Istanbul				1			1																		2	
Javiana																									3	
Kentucky				1																					1	
Kiambu					1																				1	
Krefeld						1																			1	
Lexington																									1	
London		1			2	1																			5	
Mbandaka			1							1												1			4	
Meleagridis						1																			1	
Menston				2																					2	
Mikavisiima																								3	3	
Mississippi		1			2										1	1		2			3				11	
Montevideo				3	1	1											2	1	2		1				9	
Muenchen					1							1					1						1	1	5	
Muenster					1																				1	
Newport			2	1		3											3								9	
Oranienburg																									1	
Orientalis				1																					1	
Orion 15+																									1	
Oslo				1	2							1						1							6	
Panama						1																			2	
Paratyphi A						1												1							4	
Paratyphi B		1	1		1	1										1		1							4	
Paratyphi B var. Java			1						1			1							1				3	1	8	
Pensacola						1																			1	
Potsdam						1																			2	
Reading				3	3																				11	
Rissen				2																					3	
Saintpaul			1	2								2			1	1									34	
Sandiego				1														1		2		7	2	13	2	34
Schwarzengrund				1																					3	
Senftenberg					1																				4	
Singapore				1																					1	
Stanley			2	1	2	1									2				1		2			1	12	
Thompson																									1	
Typhi		1	2	1	1	1			1																6	
Typhimurium phage type	1	11	20	22	9	25	5		8	5	1	1	7	13	2	7	4	12	9	9	1	13	2	10	166	
2																									1	
6			7	13	5	1						1	1		1		1	3			1				34	
8				1	2																				13	
9				1	2								3												4	
10																									1	
12a			1	2																					3	
23		2	3	3	1	4	1		8	3	1		3		1	1		2		2	1	11	2		20	
26			2	5	2	1	2																		13	
29						2																			3	
35																									1	
36																									4	
41			2																						6	
42			1																						1	
42a			7	5	3	6	1					1	3		2		3	1	4	3	5	18	6	5	76	
49																									2	
64																									1	
93																									3	
101			2	5	4	20	3	2		2	1		3	4	3	4		4	3	15	5	54	10	7	1	152
104																										3
135		8	56	60	32	43	11	3		6	3	1	23	7	8	59	5	87	50	9		48	2	11	5	537

Table 14. *Salmonella* serotypes, non-human isolates, 1999

SEROTYPE	ANIMALS											Meat/bone meal	Environmental	Food	Spice	Not Specified	POULTRY					TOTAL		
	Avian	Bovine	Canine	Caprine	Cervine	Equine	Feline	Guinea Pig	Ovine	Porcine	Reptile						Neckflap	Caecae	Feed	Environmental	Miscellaneous including product			
Abony														1									2	
Adelaide														1		1							2	
Agona														9	1			5	6		11	12	15	59
Anatum														1	2					2			5	
Anatum 15+														1	2							1	4	
Blockley																1							1	
Bovismorbificans																						1	1	
Brandenburg	2	47	3		1	1	1		403	1			22	34	3		8	2		45	9	5	587	
Cerro										1									12				13	
Choleraesuis var Kunzendorf										1													1	
Cubana																1				3			4	
Derby																	15				1		17	
Enteritidis phage type 9a		2	1			1			2				1	1						1	1	1	11	
RDNC									1				1							3			5	
Rough									1														1	
Hadar																			1				3	
Havana									3				17	7				1	1	8	1		38	
Heidelberg														1									1	
Hindmarsh		7	1						75				2	1			5						91	
Infantis									19				2	5			3	7	4	24	21	12	97	
Kentucky																1				2			3	
Lexington														5									5	
Lille									2				5							4	3		14	
London												3	1				1			1	1	1	8	
Mbandaka												2				1				19		5	27	
Mississippi																					1		1	
Montevideo																							2	
Newport																				1			2	
Oranienburg				1																		2	7	
Orion									3											1		2	3	
Orion 15+													7	12									20	
Ruiru																				1	1	2	4	
Saintpaul		1							2				2	1			1			1	1		9	
Sandiego																					1	1	2	
Senftenberg		1							2				6							3	7	5	24	
Tennessee												1								11	5	11	28	
Thompson																					1	1	2	
Typhimurium phage type 1	1	17				1	3	1	8		1	2	2	4					12	3	14	5	74	
8		1							2			1								1			5	
9		16				2		1	11				1										35	
12a		2							1				1	2						1	2	9	18	
23		3					1																5	
29																							1	
41		1																				1	2	
42		6				1	2		9				7	2						1	4	23	57	
42a		1																					2	
101		23	3			5	4		3				2					17	1	8	12	27	105	
104		1											1										2	
135	1	20				2	2		13			1	4	5			22	80	22	2	27	54	255	
150		1																					1	
154		1																					1	
155						1						1		1						1			5	
156		19				1			4			1	1	3						2		5	57	
199									1														1	
205		1				1								1									3	
206		1																					1	
RDNC		3							1	2											2	3	12	
Rough		1							1											1	1		6	
Untypable		1																2				1	4	
Urbana														4	2								6	
Victoria						1																	1	
Virchow			1																				1	
Waltvedren																							2	
Worthington																							1	
Group B 4,12 :- :- (non motile)																						1	1	
Group B 4,12 :- :- 1,2														1									1	
Group C 6,7 :- :- (non motile)																						1	2	
Group C 6,7 : k :-																						1	1	
Group C 6,7 : z10 :-																					2		2	
Group C 6,7 :- :- 1,5																				1	1	1	3	
Group C 6,8 : k :-																1							1	
Group C 8 : r :-									1														1	
Group E 3,15 : y :-												3											3	
Group E 3,19 :- :- (non motile)												1								3	1		5	
Group H 6,14,25 :- :- (non motile)																							1	
Rough : f :-												1											1	
Rough : f,s :-		1																				1	2	
Rough : i : 1,2																						1	1	
Rough : lv : e,n, z15									1					1									2	
Rough : r : 1,5																				1	2	2	5	
Rough : z4,z23 :-																						1	1	
<b>TOTAL</b>	<b>4</b>	<b>178</b>	<b>9</b>	<b>1</b>	<b>2</b>	<b>16</b>	<b>13</b>	<b>2</b>	<b>569</b>	<b>7</b>	<b>1</b>	<b>83</b>	<b>104</b>	<b>40</b>	<b>5</b>	<b>95</b>	<b>128</b>	<b>29</b>	<b>182</b>	<b>136</b>	<b>198</b>	<b>1802</b>		

Salmonella Typhimurium 654  
Other 1148  
Poultry isolates 673

**Animal Isolates**

A significant feature of 1999 was, again, the number of isolations of *S. Brandenburg* from sheep during the lambing season. This serotype continues to cause sheep abortions and ewe deaths in the Canterbury, South Canterbury, Otago and Southland areas. The same strain has also been isolated from meat (lamb and beef), poultry, and animal feeds.

Table 16 shows the number of sheep farms affected by *S. Brandenburg* (cattle farms in brackets).

Table 16. Number of sheep farms affected by *S. Brandenburg*

Region	1996	1997	1998	1999
Canterbury	1	17	31	45 (5)
Otago	-	1	55 (2)	71 (6)
Southland	-	1	67	162 (10)

**SHIGELLA**

There were 178 *Shigella* isolates confirmed in 1999 compared with 164 in 1998. Isolations of *Shigella flexneri* 2a, which is endemic in New Zealand, have fallen to 13.5% of all *Shigella* isolations from 23% in 1998.

Table 17. *Shigella* isolates, 1999

Species	Type	Number	Comment
<i>S. sonnei</i>	Biotype a	84	16 overseas travellers
	Biotype g	38	13 overseas travellers
<i>S. flexneri</i>	1b	2	Immigration
	2a	24	4 overseas travellers
	2b	1	Immigration
	3a	9	1 overseas traveller
	4a	1	Overseas traveller
	6	3	Overseas travellers
	Y variant	1	
	X variant	1	
	species	1	
<i>S. boydii</i>	2	1	Overseas traveller
	4	2	1 overseas traveller
	9	1	
	10	2	Immigration
	11	1	
	13	1	
	14	1	Overseas traveller
<i>S. dysenteriae</i>	2	1	Immigration
	9	2	Overseas travellers

**VEROCYTOTOXIN-PRODUCING ESCHERICHIA COLI (STEC)**

There were 80 isolates of STEC confirmed in 1999, of which 74 were either *E. coli* O157:H7 or *E. coli* O157:H non-motile. This compares with 54 isolates of STEC confirmed in 1998, of which 49 were either *E. coli* O157:H7 or *E. coli* O157:H non-motile. There were six non-O157 isolates confirmed in 1999. The non-O157 isolates were the following serotypes:

- O untypable:H6, O untypable H-, O rough:H-, O113:H21, O145:H- and O128:H-

Diarrhoea and bloody diarrhoea were the most common symptoms associated with STEC infection. One case of HUS was reported, but no clinical details were supplied with 26 isolates so these figures are indicative only.

Contaminated untreated drinking water was linked to two episodes of infection, affecting a total of three people. One case of infection was attributed to contact with a calf. Macrorestriction digestion using the restriction enzyme *Xba*1 has identified over twenty different molecular types, but apart from family clusters no outbreaks have been detected. This testing is not routinely done on isolates at the present time, but is carried out on apparent clusters.

Table 18 shows the distribution of the *E. coli* O157 isolates by health districts.

Table 18. *E. coli* O157 isolates by health district, 1999

Clinical Data	CA*	SA	WK	TG	GS	RO	TK	MW	WN	HU	CB	OT	Total
HUS										1			1
Bloody diarrhoea			7				1	1	1	1			11
Diarrhoea/±vomiting	2		14	4	1	1			3		1	1	27
Asymptomatic/contacts		1	4	1							3		9
No details given		1	11	3			2			1	6	2	26
Total	2	2	36	8	1	1	3	1	4	2	11	3	74

**VIBRIO CHOLERAE**

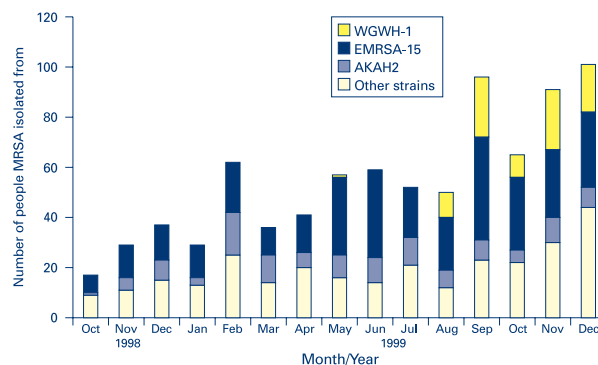
There was one isolate of *Vibrio cholerae* serogroup O1 biotype E1 Tor subtype Ogawa from a 28 year old male who had recently returned from Fiji.

**ANTIBIOTIC RESISTANCE**

**EPIDEMIOLOGY OF MULTIRESISTANT METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS**

Since October 1998, the national surveillance of methicillin-resistant *Staphylococcus aureus* (MRSA) undertaken by ESR has routinely included only multiresistant MRSA, which are defined as MRSA resistant to two or more classes of antibiotics in addition to β-lactams. In 1999, multiresistant MRSA from 648 people, 560 patients and 88 healthcare workers, were referred to ESR. This number of referrals equates to an annual incidence rate of 17.9 per 100,000 population. During 1999, there was a clear trend of an increasing incidence of multiresistant MRSA (Figure 7).

Figure 7. Multiresistant MRSA October 1998 – December 1999



The majority (76.6%) of the 560 patients with multiresistant MRSA were hospital patients. Hospital patients either were in hospital when MRSA was isolated or had been in hospital in the three months before MRSA was isolated, whereas community patients had not been in hospital in the three months preceding the isolation of MRSA. Among the 88 healthcare workers, 78 had patient contact at the time multiresistant MRSA was isolated from them. Multiresistant MRSA was isolated during pre-employment swabbing of the other ten healthcare workers.

Information on whether multiresistant MRSA was causing infection or colonising was reported for 427 people from whom a multiresistant MRSA was isolated: 68.9% were infected and 31.1% were colonised. In previous years, when all MRSA were monitored and up to 70% of MRSA were isolated from community patients, the proportion of people infected has usually been ≥90%. The higher proportion of people colonised in 1999 is probably due to

multiresistant MRSA being predominantly isolated from hospitalised patients, and the detection of colonised patient and staff contacts during screening undertaken as part of control measures in hospitals.

Among the multiresistant MRSA isolated in 1999, 118 strains were identified, with five strains being predominant:

1 EMRSA-15, one of the epidemic MRSA strains currently predominant in Britain, was isolated from 259 people; and therefore accounted for 40.0% of all multiresistant MRSA isolated. This strain has been introduced into New Zealand hospitals, through patients or staff from British hospitals, on several occasions since at least 1995. Between 1995 and 1998, there were several episodes of EMRSA-15 spreading in and between hospitals in New Zealand: Waikato Hospital in 1995-6, with spread to long-term care facilities in Hamilton, Tauranga Hospital and Taupo Hospital; Christchurch Hospital in 1996-7; Tauranga Hospital and long-term care facilities in Tauranga in 1998; and a Taupo long-term care facility in 1998. These outbreaks appeared to be controlled. However, late in 1998, EMRSA-15 began to be isolated from several Auckland hospitals.

This trend continued in 1999, with EMRSA-15 being isolated from an increasing number of hospitals and long-term care facilities in Auckland (Table 19). In addition, there was an outbreak of EMRSA-15 in Wellington Hospital, which spread to Kenepuru Hospital. During the year, there were nine known repeat introductions of this strain into New Zealand by people from England and Scotland.

2 A strain designated WGWH1 was isolated from 83 people. This strain was first identified in Wanganui Hospital in August 1999. Its phage pattern (85) is typical of multiresistant MRSA isolated along the eastern seaboard of Australia. The index case was a patient who had been in a Sydney hospital. The strain spread, via patient transfer, to other hospitals in the lower North Island, and caused large outbreaks in Wanganui Hospital (where it was isolated from 16 people), Palmerston North Hospital (27 people), Wellington Hospital (28 people), and Hutt Hospital (14 people).

3 A strain designated AKAH2 was isolated from 78 people. This strain was first identified in late 1998 in Auckland Hospital. Like WGWH1, its phage pattern (83A/85) is typical of Australian multiresistant MRSA. While the AKAH2 strain was chiefly isolated from people in Auckland Hospital, it was also isolated from several other hospitals in Auckland, in particular North Shore and Middlemore Hospitals and the Otago Spinal Unit. In

addition, it was isolated from 13 people in Whangarei Hospital following transfer of patients from Auckland hospitals.

4 A strain frequently isolated from people who had been in Australia, often in hospital, was designated AMRSA-1 (Australian MRSA-1). This strain is recognised by its reverse phage typing pattern. AMRSA1 was isolated from 43 people in 1999, mostly commonly from patients in Auckland hospitals.

5 Multiresistant isolates of the WR/AK1 strain, a strain that was first identified in 1998, continued to be made from hospital and community patients in Auckland, and community patients in Whangarei. Multiresistant WR/AK1 were isolated from 27 people in 1999. There were also several non-multiresistant isolates of this strain identified during 1999.

Nine hospitals had 10-19 patients or staff with multiresistant MRSA, two had 20-49, two had 50-99, and one had >100 (119). These data exclude patients who were nursed in isolation from the time of their admission. There was a notable increase in the number of multiresistant MRSA isolated from people in long-term care facilities in 1999: 13.7% of hospital patients were in long-term care facilities rather than acute care hospitals.

The incidence rates of multiresistant MRSA in the various health districts is shown in Figure 8. Rates were above the national average in five health districts: Auckland (the three combined Auckland health districts), Wanganui, Wellington, Manawatu, and Rotorua. Historically, rates of MRSA have been highest in the Auckland and Wellington areas.

Figure 8. Incidence of multiresistant MRSA by health district, 1999

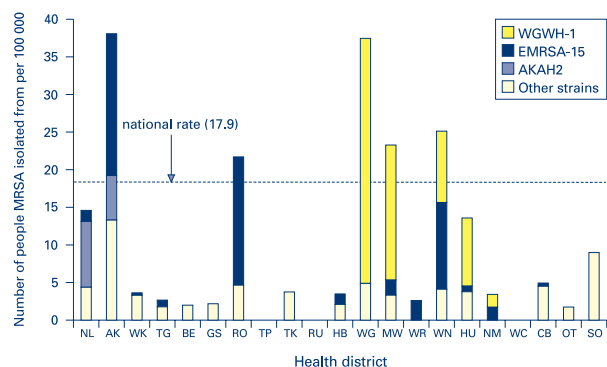


Table 19. Hospitals with patients and staff with EMRSA-15, 1999

Hospital	Number of people EMRSA-15 isolated from (% of total) <sup>1</sup>
Whangarei	1 (0.4)
North Shore	13 (5.6)
Waitakere	2 (0.9)
Auckland	20 (8.6)
Middlemore	83 (35.6)
Otago Spinal Unit	14 (6.0)
Auckland long-term care facilities	50 (21.5)
Auckland subtotal	182 (78.1)
Tauranga	1 (0.4)
Rotorua	1 (0.4)
Rotorua long-term care facilities	11 (4.7)
Hawkes Bay	2 (0.9)
Horowhenua	1 (0.4)
Wellington	22 (9.4)
Kenepuru	8 (3.2)
Wellington long-term care facilities	2 (0.9)
Nelson	1 (0.4)
Christchurch	1 (0.4)
<b>Total</b>	<b>233<sup>2</sup></b>

Notes: 1 The same person may be recorded in more than one hospital  
 2 In addition to these 233 hospital patients and staff with EMRSA-15, this strain was isolated from another 39 people recorded as community patients, and from pre-employment swabs of three healthcare workers.

## ANTIBIOTIC-RESISTANT BACTERIA MONITORING SCHEME

### Multiresistant methicillin-resistant *Staphylococcus aureus*

In 1999, a total of 645 multiresistant isolates were tested for susceptibilities. Of the total tested, 40% (257) were EMRSA-15 strain, 12.9% (83) were the WGWH1 strain, and 11.8% were the AKAH2 strain. WSPPI and WSPPI2 isolates accounted for 2.7% (18) and 0.3% (2) of the multiresistant MRSA isolates respectively.

The percent resistance of the MRSA isolates tested is shown in Table 20. All the EMRSA-15 isolates were resistant to erythromycin (MIC  $\geq$  128 mg/L) and ciprofloxacin (MIC  $\geq$  32 mg/L). As described previously, most of the EMRSA-15 isolates were sensitive to clindamycin (MIC range 0.12-0.25 mg/L) by MIC determination but exhibited inducible clindamycin resistance by a disc approximation test.<sup>1</sup> The predominant antibiogram of the EMRSA-15 strain was resistance to erythromycin, oxacillin and ciprofloxacin which was shared by nearly 92% of the isolates. The AKAH2 and the WGWH1 strains exhibited resistance to four to eight different antimicrobials.

Mupirocin resistance occurred in 15% (98) of the isolates; 12.7% (83) with high-level resistance (MIC  $\geq$  512 mg/L). Among the high-level mupirocin-resistant isolates, 26 were strain WR/AK1, 12 were WSPPI1, 11 were EMRSA-15, and eight were AKAH2. The remaining 26 isolates belonged to various other strains. Fusidic acid resistance occurred in 7.8% (51) of the isolates. Apart from the 26 isolates of the WR/AK1 strain that were resistant

to mupirocin and fusidic acid, fusidic acid resistance occurred among a variety of other strains.

Table 20. Resistances of 645 MRSA referred in January-December 1999

Antimicrobial agent (Resistance breakpoint, mg/L)	% Resistant				
	All isolates (n = 645)	EMRSA-15 (n=257)	AKAH2 (n = 76)	WGWH1 (n = 83)	WSPP1 (n = 18)
Chloramphenicol (MIC ≥ 32)	1.4	0	0	0	5.6
Ciprofloxacin (MIC ≥ 4)	76.7	99.6	98.7	100	0
Clindamycin (MIC ≥ 4)	39.8	2.7 <sup>1</sup>	92.1	75.9	94.4
Co-trimoxazole (MIC ≥ 4/76)	29.8	0	97.4	61.4	0
Erythromycin (MIC ≥ 8)	93.8	99.6	100	100	94.4
Fusidic acid (MIC ≥ 2)	7.8	1.6	5.3	0	0
Gentamicin (MIC ≥ 16)	38.9	1.2	89.5	100	5.6
Mupirocin (MIC ≥ 8)	15.2	5.1	13.2	4.8	72.2
Rifampicin (MIC ≥ 4)	1.2	0	0	4.8	0

<sup>1</sup> EMRSA-15 exhibits inducible clindamycin resistance by a disc approximation test.

### Penicillin-nonsusceptible *Streptococcus pneumoniae*

A total of 748 penicillin-non-susceptible *Streptococcus pneumoniae* (PNSP), defined as pneumococci with penicillin MIC ≥ 0.12 mg/L, were referred in 1999. Among the 748 PNSP were 464 penicillin-resistant (MIC ≥ 2 mg/L) and 284 penicillin-intermediate (MIC 0.1-1 mg/L) isolates. The trend of increased prevalence in cefotaxime resistance that was first evident in 1997 continued in 1999. Cefotaxime resistance (MIC ≥ 2 mg/L) occurred in 25% (187) and cefotaxime intermediate resistance (MIC 1 mg/L) in 42% (316) of the isolates.

Of the 464 penicillin-resistant pneumococci, 79.5% (369) were resistant to more than four antibiotics and exhibited a variety of antibiograms. One antibiogram predominated; 71% exhibited resistance to co-trimoxazole, cefotaxime, erythromycin, penicillin and tetracycline.

Of the 187 pneumococci that were cefotaxime-resistant (MIC ≥ 2 mg/L), 153 exhibited high-level cefotaxime-resistant (MICs ≥ 4 mg/L). Serotyping was carried out on 147 of the high-level cefotaxime-resistant isolates and 144 belonged to serotype 19F, two belonged to serotype 23F, and one was serotype 14.

### Penicillinase-producing *Neisseria gonorrhoeae*

Thirty-three penicillinase-producing *Neisseria gonorrhoeae* were referred in 1999 compared with 21 in 1998. Isolates were referred from Auckland (18), Tauranga (5), Wellington (3), Rotorua (2), Nelson (2), Dunedin (1), Christchurch (1) and Whangarei (1). Of the 12 isolates for which contact information was supplied, 11 were acquired overseas. Ciprofloxacin and high-level tetracycline resistance occurred in 6.1% (2) and 45.5% (15) of the isolates respectively. All isolates were spectinomycin-sensitive.

### High-level gentamicin-resistant enterococci

A total of 47 high-level gentamicin resistant (HLGR) enterococci, including eight from blood cultures, were referred in 1999. Six of the HLGR enterococci, including one from blood culture, were also resistant to ampicillin. The ampicillin-resistant enterococci did not produce β-lactamase. Ciprofloxacin resistance occurred in 34 of the HLGR enterococci.

### Vancomycin-resistant enterococci

In 1999, six vancomycin-resistant enterococci (VRE) were confirmed. The six VRE were speciated as *E. faecalis* and were isolated from five patients: Christchurch (3), Auckland (1), and Hamilton (1). Five VRE possessed the *vanA* gene and had vancomycin and teicoplanin MICs ≥ 256 mg/L. Two VRE (*vanA*) strains with different macrorestriction DNA patterns were isolated from a Christchurch patient. The sixth isolate had the *vanB* gene and had vancomycin MIC ≥ 256 mg/L and teicoplanin MIC 0.5 mg/L. The first VRE in New Zealand was confirmed in 1996 and the second in 1998.

### Extended-spectrum β-lactamase-producing *Enterobacteriaceae*

A total of 14 extended-spectrum β-lactamase (ESBL)-producing

enterobacteriaceae were identified on the basis of the NCCLS recommended confirmatory tests. The phenotypic confirmatory tests compares the inhibition zones obtained with cefotaxime and ceftazidime discs alone and in combination with clavulanic acid. Among the isolates were nine *Escherichia coli*, two *Klebsiella pneumoniae*, and three *Enterobacter* spp. Eight of the ESBL-producing enterobacteriaceae were isolated from the urinary tract.

### Ampicillin-resistant *Salmonella Typhi*

In 1999, eleven *Salmonella Typhi* isolates were tested for susceptibilities. Two isolates were resistant to ampicillin, chloramphenicol and tetracycline. The multiresistant *S. Typhi* were isolated from recent overseas travellers.

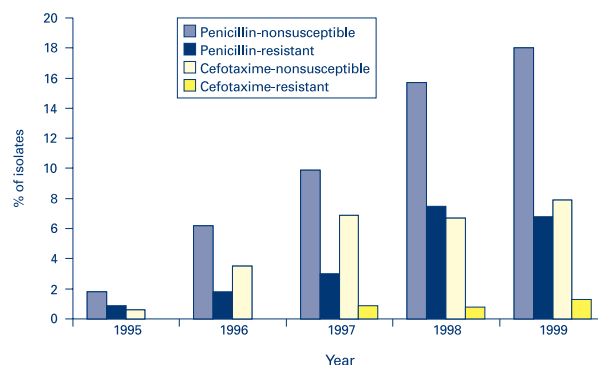
<sup>1</sup> LabLink 1999; 6: 27-8

## 1999 ANTIBIOTIC SUSCEPTIBILITIES OF INVASIVE PATHOGENS

### *Streptococcus pneumoniae*

A total of 473 *S. pneumoniae* isolates from invasive disease were tested for susceptibilities at ESR in 1999 compared with 333 in 1998. Penicillin nonsusceptibility occurred in 18% (85) of the isolates; 6.8% (32) with high-level resistance (MIC ≥ 2 mg/L), and 11.2% (53) with intermediate-level resistance (MIC 0.12 - 1 mg/L). Figure 9 shows the increase in the prevalence of penicillin and cefotaxime resistance among isolates from invasive disease since 1995.

Figure 9. Penicillin and cefotaxime non-susceptibility among pneumococci from invasive disease, 1995-1999



Chloramphenicol and erythromycin resistance occurred in 3.4% (16) and 2.3% (11) of the isolates respectively. All isolates were vancomycin-sensitive. The 32 high-level penicillin-resistant *S. pneumoniae* belonged to serotype 9V (18), serotype 23F (8), serotype 19F (5), and serotype 14 (1). Of the six cefotaxime-resistant (MIC ≥ 2 mg/L) isolates, four were serotype 23F and two were serotype 19F.

### *Haemophilus influenzae*

Among the 43 *H. influenzae* isolates from invasive disease that were tested for susceptibilities in 1999, 3 (7.0%) were β-lactamase positive. All isolates were sensitive to cefotaxime and chloramphenicol. One isolate was rifampicin-resistant.

### *Neisseria meningitidis*

Of 240 *meningitidis* isolates from invasive disease that were referred to ESR, 130 were tested for susceptibility to penicillin, ceftriaxone, ciprofloxacin, and rifampicin. Reduced penicillin susceptibility (MIC 0.12 - 0.25 mg/L) occurred in 18.4% (24) isolates, an increase from previous years. The proportion of isolates with reduced penicillin susceptibility had varied from 0% to 6.4% between 1991 and 1997 and increased to 7.4% (7/95) in 1998. All isolates were sensitive to ceftriaxone, ciprofloxacin and rifampicin.

## NCCLS NEW PUBLICATIONS

NCCLS released new antimicrobial susceptibility testing standards M2-A7 and M7-A5 in January 2000:

## RESPIRATORY VIRUSES

### Influenza

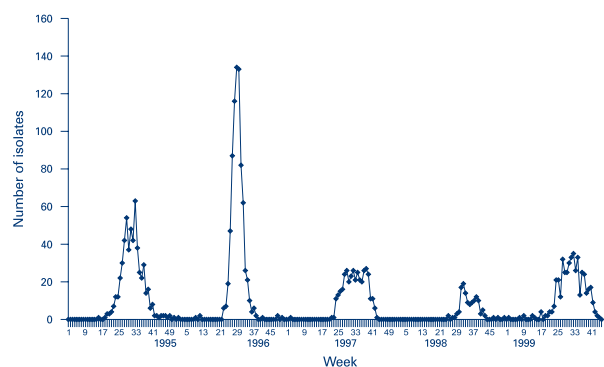
The 1999 influenza activity has been higher than 1997 and 1998 (Figure 10 and 11). Through the sentinel surveillance programme, a total of 425 influenza isolates were identified. There were 264 (62.1%) isolations of A(H3N2). This strain predominated in New Zealand from May to the end of August, causing several outbreaks in Auckland, Waikato, Christchurch and Wellington, and was associated with severe disease in all age groups. All A (H3N2) isolates were antigenically similar to the A/Sydney/5/97. Again, similar to last year, two major groups of A/Sydney/5/97 were identified: one which showed a typical reaction with A/Sydney/5/97 antisera and the other showing a reduced reaction to this antiserum (a reduction of four-fold or more). This latter group of low reacting strains constituted an even greater proportion of isolates (45%) in 1999 compared with that of 1998 (30%).

There have been sporadic cases of influenza A(H1N1) isolated in the Americas, Asia and Oceania in 1999. These A(H1N1) viruses were related either to the A/Bayern/7/95-like lineage or A/Beijing/262/95-like lineage, the two distinct lines of influenza A(H1N1) circulating in recent years. A/Beijing/262/95 viruses were initially restricted in Asia, but have spread to Oceania this year. An outbreak in New Caledonia in May-June 1999 was caused by viruses of the A/Beijing/262/95 lineage. There were two cases of influenza A(H1N1) isolated in New Zealand this year. The first A(H1N1) isolate was designated as A/Auckland/176/99. It was isolated in Auckland through the sentinel surveillance programme. A nasal swab was taken on 6 July from a 6 year old female who had a flu-like illness. The WHO collaborating centre in Melbourne has shown that it is more closely related to A/Beijing/262/95 viruses than A/Bayern/7/95 viruses. This is the first time a virus of A/Beijing/262/95 lineage has been isolated in New Zealand. The second A(H1N1) isolate was designated as A/Waikato/86/99. It was isolated through the hospital surveillance programme (also referred as the non-surveillance programme). A throat swab was taken on 23 August from a 10 year old female. The ESR virology laboratory has shown that this isolate was more closely related to the A/Beijing/262/95 virus than the A/Bayern/7/95 virus. The majority of influenza B viruses world-wide were antigenically related to the B/Beijing/184/93 reference strain. In New Zealand, all 84 (19.2% of total isolates) laboratory-confirmed influenza B viruses were related to B/Beijing/184/93 and influenza B became the predominant type from the end of August.

Based on all epidemiology data from the southern hemisphere countries such as Australia, South Africa and New Zealand, the Australian Influenza Vaccine Committee, with a New Zealand representative, met on 7 October and 9 November 1999 to consult on the influenza vaccine composition for 2000. The recommended composition was:

- A(H1N1) an A/New Caledonia/20/99-like strain
- A(H3N2) an A/Sydney/5/97-like strain
- B a B/Beijing/184/93-like strain

Figure 10. Laboratory-confirmed influenza isolates, January 1995 - September 1999



- M2-A7, *Performance Standards for Antimicrobial Disk Susceptibility Tests; Approved Standard - Seventh Edition*
- M7-A5, *Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria that grow aerobically; Approved Standard - Fifth Edition*

These publications can be purchased from NCCLS, 940 West Valley Road, Suite 1400, Wayne, Pennsylvania 19087-1898, USA. (Fax: 610.688.0700; Email: exoffice@nccls.org)

Compiled by Maggie Brett  
Antibiotic Reference Laboratory, ESR

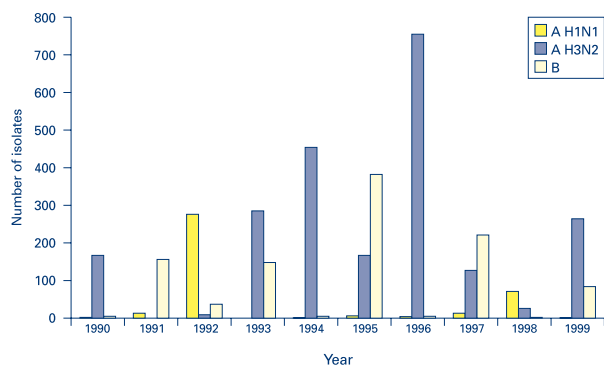
## VIROLOGY

Table 21 summarises viral identification and mycoplasma infections in New Zealand in 1999. The information is based on weekly data collated from the virology laboratories of Auckland Healthcare, Healthcare Waikato, Canterbury Health Laboratories, Healthcare Otago, and ESR.

Table 21. Summary of virus identification and mycoplasma notifications, 1999

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Influenza A H3N2	2	2	2	0	103	152	135	54	3	0	0	0	453
Influenza A H1N1	0	0	0	0	0	0	1	1	0	0	0	0	2
FluA not subtyped	1	0	3	10	21	57	62	37	2	3	3	2	201
Influenza B	0	0	0	2	13	5	10	81	35	9	4	1	160
Parainfluenza 1	0	0	0	0	0	0	0	1	0	0	0	0	1
Parainfluenza 2	0	0	0	0	0	0	1	1	0	0	0	0	2
Parainfluenza 3	1	1	6	0	3	8	21	40	20	15	5	2	122
R SV	1	4	4	5	30	162	179	289	128	42	9	5	858
Rhino	1	0	3	1	4	6	28	9	4	23	31	3	113
Mycoplasma	2	3	0	3	6	0	1	4	0	0	0	2	21
CMV	0	2	0	2	0	4	0	1	0	4	1	1	15
Varicella zoster	2	1	7	3	2	6	5	7	5	5	4	7	54
Rubella	0	0	0	0	0	0	0	0	0	0	0	0	0
Mumps	1	1	1	0	0	0	1	0	0	0	0	0	4
Measles	0	0	1	0	1	0	0	0	0	0	0	0	2
Adeno	9	5	5	6	2	7	5	24	18	11	8	5	105
Adeno type 1	2	0	0	4	1	1	2	1	3	2	1	1	18
Adeno type 2	2	2	0	0	1	1	2	0	3	1	1	3	16
Adeno type 3	19	3	2	2	6	2	4	1	1	2	1	0	43
Adeno type 4	0	0	1	0	0	0	0	0	0	0	3	1	5
Adeno type 5	0	1	0	0	0	0	0	1	2	1	1	1	7
Adeno type 11	1	2	0	0	0	1	0	1	0	0	0	0	5
Adeno type 13	0	0	3	0	0	0	0	0	0	0	0	0	3
Adeno type 14	0	1	1	0	0	0	0	0	0	0	0	0	2
Adeno type 15	0	0	0	1	1	0	0	0	0	0	0	0	2
Adeno type 21	0	0	0	0	0	0	0	0	1	1	0	0	2
Untypable adeno	0	0	0	3	2	0	0	0	2	0	0	0	7
Enterovirus	1	2	5	3	3	3	1	6	6	7	10	8	55
Polio 1	0	0	1	1	1	1	2	3	5	4	2	2	22
Polio 2	0	0	1	0	1	0	3	1	2	0	3	2	13
Polio 3	0	0	0	0	0	0	2	0	0	1	0	0	3
Coxsackie A9	0	0	0	0	0	0	1	0	0	0	0	0	1
Coxsackie A16	0	0	0	4	2	2	6	2	0	0	0	0	16
Coxsackie B4	0	0	0	0	0	0	1	0	1	1	2	0	5
Echo 3	0	0	0	0	1	0	0	1	0	0	1	0	3
Echo 6	0	0	0	0	0	0	0	1	0	1	0	0	2
Echo 7	0	0	0	0	0	0	0	0	0	0	0	1	1
Echo 9	0	0	0	0	0	0	1	1	2	0	1	4	9
Echo 11	2	1	1	0	0	1	0	0	0	0	0	0	5
Echo 21	0	0	0	1	0	0	0	0	0	0	0	0	1
Echo 30	0	1	0	0	0	0	1	0	0	0	0	0	2
Enterovirus 71	0	0	0	0	1	0	0	0	0	0	0	0	1
Untypable enterovirus	0	1	1	0	1	1	8	3	0	2	0	3	20

Figure 11: Laboratory-confirmed influenza isolates by type, 1990-99



### Respiratory Syncytial Virus (RSV)

The 1999 RSV outbreak was the highest (858 cases) since 1990 (Figures 12 and 13). It had an early onset in the middle of June (31 cases in week 24), four weeks earlier than that of 1998. RSV activity remained at a high level through June, July, August and the end of September, showing a broader and shorter peak than 1998. The largest number of cases was reported at the end of August with 73 cases in the 34th week which was three weeks later than 1998 (90 cases in the 31st week). The number of reported cases declined rapidly around the middle of October.

Figure 12. Annual laboratory-confirmed RSV cases, 1990-1999

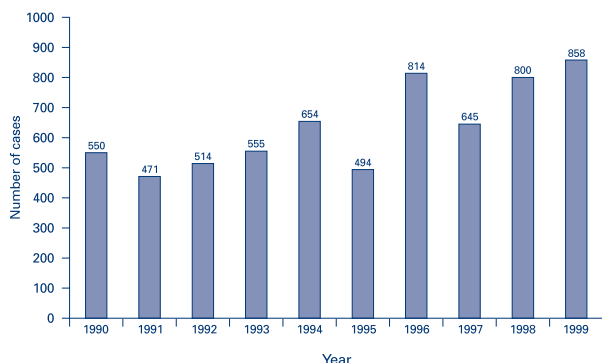
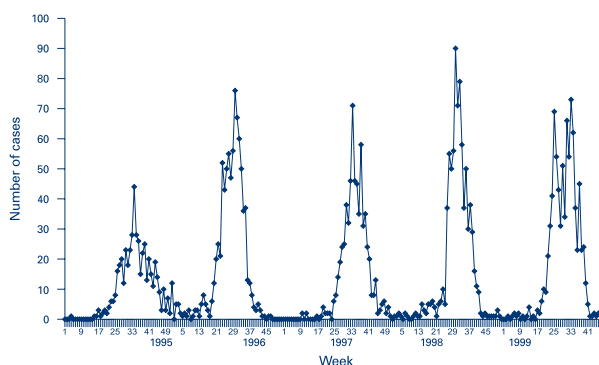


Figure 13. RSV laboratory-confirmed cases by week, 1994-1999



## ENTEROVIRUSES

### Pericarditis outbreak in Wairarapa

Six cases of pericarditis in Wairarapa health district were identified during the first three weeks of November 1999. The diagnosis in each case was based on clinical presentation and abnormalities present on ECG and echocardiograms. Faecal and throat specimens were taken from two cases for virological investigation. Coxsackie B4 was isolated and identified from faeces from an 18-year-old male. No virus was detected from the other case. Virological investigation was not performed on the remaining four cases. The cases had a median age of 36.5 years, five were male and one female. Three were admitted to Masterton Hospital for 1-3 days.

Pericarditis is uncommon in New Zealand, with an admission rate of 2.6/100,000 per annum for 1996-98 inclusive. Wairarapa would expect to admit one case per year, if following the New Zealand trend.

A review in England and Wales<sup>1</sup> found group B coxsackievirus to be the most common cause of infective pericarditis and myocarditis, followed by influenza virus, mycoplasma, chlamydia and *Mycobacterium tuberculosis*. Group B coxsackievirus is an enterovirus, transmitted by faecal-oral or respiratory droplet spread, with an incubation time of 3-5 days.<sup>2</sup> It has been estimated that about 5% of all symptomatic coxsackievirus infections induce heart disease<sup>3</sup>. The virus may affect the endocardium, pericardium, myocardium, or all three. After acute coxsackie carditis, lasting heart damage has been reported with virus persistence in diseased tissue.<sup>3</sup>

Outbreaks of viral myocarditis have been reported in Malaysia. Although no common source of infection was detected for the Wairarapa cases, this outbreak serves as a reminder that pericarditis and myocarditis often have an infectious origin and appropriate testing should be performed to identify the aetiological agent. Pericarditis and myocarditis should be suspected in any patient with sharp retrosternal chest pain. Individuals diagnosed with pericarditis or myocarditis should have a throat swab and faecal specimen tested for enteroviruses, appropriate testing for mycobacteria and a rheumatology screen.

*Dr Craig Thornley, Public Health Registrar  
Regional Public Health, Hutt Valley Health Corporation Ltd.*

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