

ANNUAL SUMMARIES - 2002

BACTERIOLOGY

INVASIVE INFECTIONS

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

Haemophilus influenzae

A total of 23 isolates of *H influenzae* were received from sterile site specimens during 2002. Only three were serotype b and all three were from adult cases. This is the first year that no Hib isolates have been received from vaccine aged children. However, it should be noted that 9/23 (39%) non-serotype b isolates were from children under the age of four years. Only one of the nine had a capsule (type f). The other eight were negative by PCR for the *bex* gene encoding capsular expression and all nine were negative for the *cap* gene encoding serotype b expression.

Neisseria meningitidis

The increase in disease rates since 1991 has largely been attributable to serogroup B meningococci expressing the PorA P1.7b,4 protein. Serogroup B disease, particularly that caused by the epidemic type, continued to dominate in 2002. Of the isolates obtained from cases 83.6% (188/225) were serogroup B and of these 173 (92%) were the epidemic type. Although case numbers were higher in 2001 (282), a comparable proportion of isolates were B with the PorA subtype P1.7b,4 (92.9%; 262/282). In fact, since 1995 greater than 85% of all serogroup B disease has been caused by this type. The complete dominance of this type with respect to all disease isolates, regardless of serogroup, is demonstrated in Figure 1.

Since 1991 the proportion of cases caused by serogroup C has varied in relation to serogroup B. W135 and Y serogroups are rarely identified in New Zealand (Figure 1). During 2000, only 10 (3.9%) cases were caused by serogroup C. In 2001, a small resurgence of cases caused by serogroup C occurred particularly in the Otago Health District, and a total of 30 cases (9.4%) were recorded. This increase was sustained in 2002, with 35 (15.5%) serogroup C cases identified throughout New Zealand. Thirteen were from the Otago District Health Board giving a rate for that area of 7.6 per 100 000. Only one case with serogroup W135 and one with serogroup Y was identified in 2002.

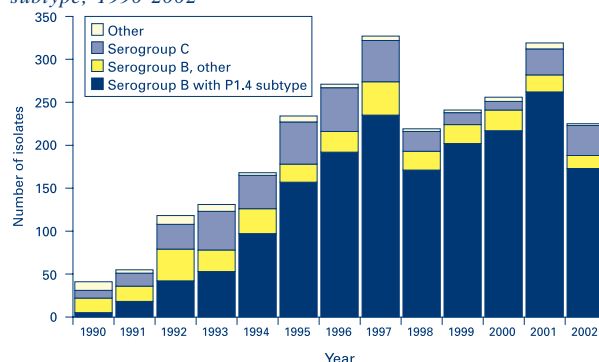
A total of 177 cases were confirmed only by a positive PCR test performed either at a regional hospital or at ESR. Of these, DNA was available for genotyping at ESR for 172. Genotyping using the *siaD* PCR showed that 147 (85.5%) encoded the group B capsular polysaccharide and 10 (5.8%) the C polysaccharide. A further 15 were unable to be defined using the *siaD* PCR. Of those genotyping as group B, 84.4% (124/147) were shown to have DNA encoding the P1.7,4 PorA type.

Consistency in PCR results was demonstrated for 36 cases where both an isolate and DNA from PCR testing was available. In all 36 instances the culture result confirmed the serogroup and/or PorA type obtained by genotyping of the DNA. Twenty-four (66.7%) were B with the P1.7b,4 PorA subtype and 12 were group C's where the PorA was either P1.5 or undefined.

By combining the sero-subtyping results for isolates (n = 225) and the *porA* genotyping results on DNA from PCR positive specimens (n= 159) it was shown that a total of 297 [173 +124] cases out of 384 (77.3%) were caused by meningococci with the P1.7b,4 PorA

protein. This is marginally less than the proportion in 2001 when subtype P1.7b,4 was responsible for 80.5% (372/462) cases. The overall estimate of the number of cases in 2002 attributable to meningococci with the P1.7b,4 PorA protein is 431 (77.3% of 557) which would give a rate of disease of 11.6 per 100 000. This estimate is based on the assumption that all confirmed and probable cases that were reported in 2002 were actual cases of meningococcal disease and that the organism distribution among probable cases was similar to that among confirmed cases.

Figure 1: Meningococcal disease isolate serogroup and dominant subtype, 1990-2002



Meningococci associated with fatal cases

Sixteen of the 18 cases of meningococcal disease who died were confirmed, 10 by isolation of *N. meningitidis* from a sterile site prior to, or at death, and six by PCR of a sterile site specimen. All five serogroup B isolates were B:4: P1.4 (epidemic strain) and four of the remaining five were C:2a P1.5. The fifth typed as C:1:P1.6. Of the six positive by PCR, four genotyped with sequences indicating they were B:P1.7,4; one typed as a C, and one was undefined.

Serogroup C outbreak

In September, a small outbreak of serogroup C disease occurred among school pupils in South Otago. The first case admitted on

Table 1. Serologic distribution of meningococcal disease isolates, 2002

Serogroup	Serotype	Subtype	Number	Percentage of total with serologic phenotype
B	4	P1.4	146	
B	14	P1.4	5	
B	NT	P1.4	20	
B	other	P1.4	2	
Total B:P1.4			173	76.9
B	4 or other	Not P1.4	15	6.7
Total B			188	83.6
C	2a	P1.5,2 or P1.2	15	
C	2a	NST	5	
C	NT	P1.5,2 or P1.2	3	
C	NT	NST	7	
C	Other	Not P1.5,2	5	
Total C			35	15.6
Total W135			1	0.4
Total Y			1	0.4
Total isolates			225*	100

NT = Non-typable
NST = Not serosubtypable
* Does not include four isolates not submitted to ESR

Bacteriology	1	Verocytotoxin producing		Antibiotic Susceptibilities	
Invasive Infections	1	<i>Escherichia Coli</i> (VTEC/STEC)	6	of Invasive Pathogens	9
Legionellosis and Environmental		Shigella	6	Virology	9
Legionella isolates	2	Antibiotic Resistance	6	Respiratory Viruses	10
Special Bacteriology	3	Multiresistant Methicillin-Resistant		Enteroviruses	11
Enteric Pathogens	3	Staphylococcus Aureus	6	Measles, Mumps and Rubella	12
Salmonella	3	Antibiotic Susceptibilities		Adenoviruses	12
Non-Human Salmonella	6	of Salmonella	8	Norovirus	12

August 10th had a meningococcus isolated from blood which typed as C:NT:nst. The second case had a positive PCR blood taken on August 11th. The DNA identified encoded for the C group but the PorA sequence was unidentifiable with the P1.2 probe used. These cases were quickly followed by a further four cases linked by time, place and events in Balclutha. Two had a C:2a:nst isolate and one a C:NT:P1.5 isolate identified from sterile site specimens. The fourth case was confirmed only by PCR and had DNA encoding for the C capsule. Sequence analysis of the isolates showed the PorB protein to encode type 2a and the PorA to encode epitopes P1.5-1 and P1.10-4. Macrorestriction analysis showed all four isolates to have a restriction pattern that was distinct from other serogroup C isolates identified previously in Otago and in other parts of New Zealand. The strain causing the cluster of cases was defined as C:2a:P1.5-1,10-4. Multilocus sequence typing defined the outbreak isolates as sequence type, ST11, confirming that these cases represented a distinct clonal cluster.

Streptococcal Invasive Disease

Reporting of streptococcal diseases, except for acute rheumatic fever, is not mandatory in New Zealand. Surveillance therefore depends on the voluntary referral of isolates to the Streptococcal Reference Laboratory at ESR. As an isolate is not received from every disease case, numbers underestimate 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 vaccines. In 2002 isolates were received from 490 cases of invasive pneumococcal disease compared with 445 in 2001. The 23-valent vaccine, used only in adults, 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 older than 14 years of age, 88.6% (273/308) belonged to serogroups/serotypes covered by the 23-valent 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, 19F and 23F; the nine-valent vaccine additionally contains types 1 and 5; and the eleven-valent vaccine additionally contains types 3 and 7F. In 2002, invasive disease isolates were received from 182 children less than 15 years of age of which 162 were under 5 years of age. Distribution of serotypes was different among the two age bands. By comparing the serotypes of the isolates for those under 5 years against the three conjugate vaccines, seven-valent, nine-valent, and eleven-valent, it was predicted that 88.3% (143/162), 90.1% (146/162), or 90.1% (146/162) respectively of paediatric disease may have been prevented by use of these vaccines.

Streptococcus pyogenes (Group A Streptococcus)

Of the 203 isolates of group A streptococci received in 2002, 170 (83.7%) were from cases of invasive disease. This represented an increase from 2001 when invasive disease isolates totalled 120. Forty distinct M/emm types occurred among the 108 blood isolates demonstrating the wide range of types that can cause invasive disease in New Zealand. Consistent with previous years the most common M/emm types were 1, 3, 28, 75, 81, and 89. Seven isolates were from cases of necrotising fasciitis. No one M/emm type predominated among these. Four isolates from scarlet fever (SF) cases were all different but typical SF types, namely 1,12, 22 and 49. Only one isolate, an M/emm type 4 was from a case of acute glomerulonephritis. Three isolates were from throats of cases of rheumatic fever at admission.

Streptococcus agalactiae (Group B Streptococcus)

Infection with *S. agalactiae* can cause serious invasive disease in newborns. The disease is not notifiable. Microbiological surveillance depends on referral of isolates. During 2002, isolates were received from 121 cases of invasive group B streptococcal disease. Forty-three cases were from neonatal sepsis of which 28 were classified as early onset disease and 15 as late-onset disease. Serotype III continued to be the most common serotype involved in neonatal sepsis accounting for 34.9% (15/43). An increase in referred isolates particularly from blood culture was noted among adult isolates. Seventy-eight such isolates were referred of which 29.5% (23/78) were serotype V.

Bordetella pertussis

Following the epidemic of whooping cough in 2000 involving *B. pertussis* of serotype 1,3 limited monitoring of isolates has continued. In 2002, serotyping was performed on 145 isolates of which 137 (94.5%) were serotype 1,3 and 2 were serotype 1,2.

LEGIONELLOSIS AND ENVIRONMENTAL LEGIONELLA ISOLATES

A total of 53 cases of legionellosis were laboratory-diagnosed during 2002. Five of these cases died. This compares to 56 laboratory-reported cases in 2001 of which two died. All cases in 2002 were sporadic in nature with no outbreaks identified.

Of the 53 laboratory-diagnosed cases, 44 were confirmed either by culture isolation of legionella organisms (five cases), the demonstration of an antibody seroconversion (seven cases), a four-fold or greater rise in antibody titre (10 cases), PCR positive from blood and the demonstration of antibody titres above 256 on more than one occasion (one case), the demonstration of two of more antibody titres at or above 512 (19 cases), or the demonstration of rising antibody titres to above 512 (two cases).

A further nine cases were regarded as probable. All nine had symptoms compatible with legionellosis, but four of these cases showed high titres by the legionella IFAT to more than two of the five antigen pools used, making it impractical to determine the *Legionella* species causing the reaction. The other five were regarded as probable cases because laboratory diagnosis was based on a single high titre (≥ 512) (2 cases) or a positive urinary antigen test only (three cases).

Of the 53 laboratory-diagnosed cases, all but nine were notified. A further seven cases were notified without fitting the case definition. Of these, laboratory tests showed IFAT end-point titres of < 256 for three cases, suggesting that legionella may not be the causative agent. One of the recognised limitations for the serological diagnosis of legionellosis is that some patients fail to seroconvert. Four others showed end-point titres of 256 for paired sera, indicating previous exposure to *Legionella* and not recent infection.

Epidemiological information was available for all 53 laboratory-diagnosed cases for 2002. Of these, 31 were males aged 25 to 83 year (median age 60 years) and 22 were females aged 22 to 85 years (median age 53 years). The median age for all cases was 58 years.

There were five deaths associated with legionellosis in 2002, giving an overall case fatality rate of 9.4%. One death followed infection with *L. longbeachae* serogroup 1, two involved infection with *L. pneumophila* serogroup 1, and two were associated with *L. gormanii* infection. One of the fatal *L. gormanii* cases was classified as a 'probable case' since only the acute serum sample was available for testing. In this case serological tests for other agents of atypical pneumonia were unrevealing. For the two *L. pneumophila* cases, one was positive by the urinary antigen test alone, so is defined as a probable case, while the other was culture-proven, with *L. pneumophila* serogroup 1 isolated from the sputum.

Table 2 lists the *Legionella* species identified by testing in 2002. The predominant species causing infection were *L. pneumophila* serogroup 12 and *L. longbeachae* serogroup 1, with eight cases each. The predominant source of the *L. longbeachae* infections was composted material (both home-made and commercially-prepared), while the sources for *L. pneumophila* serogroup 12 infections are unknown, since no environmental *L. pneumophila* serogroup 12 isolates associated with these cases were identified.

Table 2. Laboratory-reported *Legionella* by species/serogroup for 2002

Legionella species	Serogroup	Serology IFAT		Urinary antigen test*	Culture isolates	Total
		Confirmed	Probable			
<i>L. bozemanii</i>	1	3	0	-	0	3
	unidentified	1	0	-	0	1
<i>L. dumoffii</i>	1	3	0	-	0	3
<i>L. feeleii</i>	1	1	0	-	0	1
<i>L. gormanii</i>	1	3	1	-	0	4
<i>L. hackelliae</i>	1	2	0	-	0	2
	2	1	0	-	0	1
<i>L. jordanis</i>	1	1	0	-	0	1
<i>L. longbeachae</i>	1	7	0	-	1	8
	2	1	0	-	0	1
	unidentified	2	0	-	0	2
<i>L. micdadei</i>	1	0	0	-	1	1
<i>L. pneumophila</i>	1	0	0	3	2	5
	3	1	0	-	0	1
	5	1	0	-	0	1
	8	1	0	-	0	1
	12	8	0	-	0	8
	13	0	0	-	1	1
<i>L. pneumophila</i>	unidentified	1	0	-	0	1
<i>Legionella</i> sp unidentified		1	5	-	-	6
<i>L. bozemanii</i> / <i>L. longbeachae</i>	Antibody cross-reaction	1	0	-	-	1
Total		39	6	3	5	53

*Test detects *L. pneumophila* serogroup 1 only

SPECIAL BACTERIOLOGY

Listeria monocytogenes

Isolates from 19 cases of listeriosis were received for typing and surveillance purposes in 2002 (Table 3), the same number as was received in 2001. Six (32%) of the 19 cases were perinatal and three foetal deaths were recorded. All but one of the non-perinatal cases had an underlying illness and/or were elderly; the one case (M 1y) where no risk factors were identified had been well prior to his listeria infection.

The serotype distribution of the 19 isolates was:

- Serotype O1/ 2 11 (58%)
- Serotype O4 8 (42%)

Table 3. *Listeria monocytogenes* from human cases, 2002

Month isolated or of onset	Health district	Sex/Age	Specimen source	O antigen serotype
Perinatal Cases				
January	Waikato	M 1d	BC	4
April	Canterbury	F 1d ¹	BC	4
July	Tauranga	F 36y ¹	Foetus	1/2
August	Southland	F 30y	BC	1/2
November	Central Auckland	M 1d	BC	1/2
December	Central Auckland	F 1d ¹	Body swabs	4
Non-perinatal Cases				
February	Canterbury	F 72y	BC	1/2
February	South Auckland	M 77y	Knee joint	4
February	Hutt	M 50y	BC	1/2
March	Canterbury	M 1y	BC	1/2
July	South Auckland	F 60y	BC	4
July	North West Auckland	F 69y	BC	4
August	North West Auckland	F 23y	CSF	1/2
September	Canterbury	F 72y	BC	1/2
September	Manawatu	F 20y	BC	1/2
September	Central Auckland	M 60y	BC	1/2
October	Canterbury	M 72y	BC	4
November	North West Auckland	M 59y	CSF	1/2
November	Central Auckland	F 67y	BC	4

¹ Foetal death

Corynebacterium diphtheriae

Four isolates of *Corynebacterium diphtheriae* were received for toxigenicity testing, typing and surveillance purposes in 2002. The isolates

Table 4. *Corynebacterium diphtheriae* isolations, 1993-2002

Year	Health district	Sex/Age	Source	Biovar
1993	Wellington	M 12y	cutaneous	mitis
	Waikato	M 78y	respiratory	mitis
	Wellington	F 20y	cutaneous	mitis
	Wellington	M 41y	cutaneous	mitis
1994	Central Auckland	M 27y	blood	gravis
1995	Wellington	M 38y	cutaneous	gravis
	Wellington	M 22y	cutaneous	mitis
1996	Central Auckland	M 58y	respiratory	mitis
	Central Auckland	F 12y	blood	gravis
	Wellington	F 22y	cutaneous	gravis
1997-no isolates received				
1998	Canterbury	M 21y	cutaneous	mitis
	Central Auckland	M 2y	respiratory	intermedius ¹
1999	Central Auckland	F 18y	respiratory	mitis
	Waikato	F 16y	blood	gravis
	Central Auckland	F 29y	cutaneous	gravis
	South Auckland	F 49y	respiratory	mitis
2000	Central Auckland	M 23 y	cutaneous	mitis
	Central Auckland	M 17y	cutaneous	gravis
	Wellington	M 61y	cutaneous	mitis
	Central Auckland	M 32y	cutaneous	mitis
	Central Auckland	M 11y	cutaneous	mitis
2001	Central Auckland	F 38y	cutaneous	mitis
	Central Auckland	F 9y	cutaneous	mitis
	Central Auckland	F 35y	cutaneous	mitis
	Wellington	M 13y	cutaneous	gravis
2002	Canterbury	M 66y	respiratory	mitis
	South Auckland	M 4y	hip aspirate	gravis ¹
	Wellington	M 42y	cutaneous	mitis
	Canterbury	M 40y	cutaneous	mitis

¹ toxigenic strains.

were from sputum, hip aspirate, leg tattoo and face lesion. The isolate from the hip aspirate was toxigenic; the patient (M 4y) had septic arthritis and the culture was obtained in pure growth. The child was fully immunised and had no toxin-related symptoms. The remaining isolates were non-toxicogenic strains. Toxigenicity was determined by PCR detection of the toxin gene.

The last case of diphtheria (toxigenic strain from throat) occurred in 1998¹. The distribution of isolates received over the ten-year period 1993-2002 is shown in Table 4.

¹ NZPHR 1998; 5: 73-6.

ENTERIC PATHOGENS

SALMONELLA

There were 2,067 human isolates in 2002 compared with 2,605 in 2001. The distribution of serotypes is shown in Table 5 and percentage totals of serotypes and phage types are shown in Figures 2 and 3.

Figure 2. Human *Salmonella* isolates, 2002

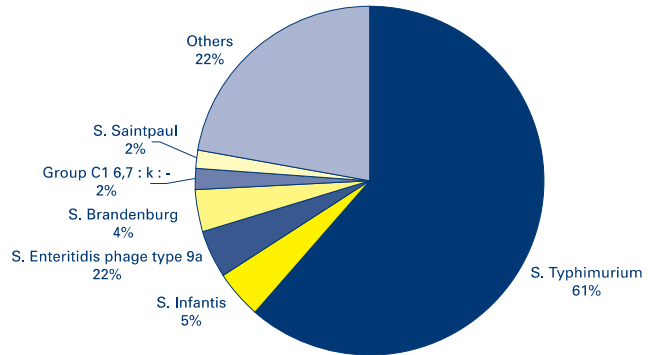
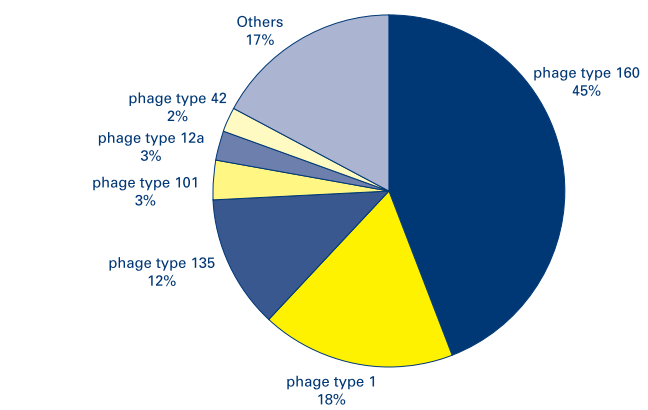


Figure 3. *S. Typhimurium* isolates by phage type, 2002



Isolates were received from 23 cases of *S. Typhi* compared with 26 cases in 2001. Phage types isolated were as follows A (1), C1 variant (1), D2 (4), E1a (10), E7 variant (4), O (1), Untypable (2).

New serotypes/phage types isolated in 2002 include:

- S. Baildon 9,46 : a : en,x no travel details.
- S. Ealing 35 : g,m,s : - recent overseas travel Africa.
- S. Djugu 6,7 : Z₁₀ : e,n,x recent travel India
- S. Typhimurium phage type U291 incoming visitor Samoa

Mixed Infections

S. Bovismorbificans and *S. Derby* Hawkes Bay no details.
S. Enteritidis phage type 4 and *Salmonella* Group B 4,5,12 : d : - Wellington no details.
S. Anatum 15+ and *S. Javiana* Nelson/Marlborough no details.
 Although no travel details have been given all six serotypes are seen in overseas travellers and are not commonly isolated in New Zealand.

Table 5. Salmonella serotypes, human isolates 2002

Serotypes	HEALTH DISTRICTS																				Total					
	NL	NW	CA*	SA	WK	TG	BE	GS	RO	TP	RJ	HB	TK	WG	MW	WR	WN	HU	NM	WC		CB	SC	OT	SO	
Agona			1		1	1								1							3					8
Alachua				1																		1				1
Albany																										1
Anatum				1	1					1		1							2							6
Anatum 15+				1															1							2
Bairdon					1															1						1
Bareilly		1	1						2												1					5
Birkenhead																					1					1
Bleckley				3											1											4
Bovismorbificans	1	1	1								1	1					1	1			1				9	
Braenderup	1		1	1																	1		1			5
Brandenburg			1	5	1								1						1		7	10	23	36		85
Bredenev				1	1																					2
Brunei				1																						1
Choleraesuis var Kunzendorf			1																							1
Cubana																										1
Derby					1							1						1								3
Djugu				1																						1
Ealing																							1			1
Emek				1	2																					3
Enteritidis phage type	1		2				1	1				1					1		1		2					9
4		6	5	4	4							1	3	1		1	6	2			5		2	1	41	
5			1																							1
6a					4							1														7
9a	1	2	14	3	20	5			1			2	4	2	4	2	4	2	2		10	4	5	1	88	
13a			2											1												3
14b																			1	1						2
20						1																				2
21			2																							2
40			1	1	2					1	1															7
RDNC		1	2	1				3												1		1				10
Rough												1									1					1
Hadar		2	4	1		2								1			5				2					17
Heidelberg		1			3	1															6		2	2		15
Hindmarsh					1							3									1		1			6
Hvittingfoss		1	1			1							1								1					6
Infantis	9	13	15	4	11	3	3	1	6			1	1	9	2		6	1	1	1	4		2	1	94	
Isangi			1																							1
Javiana		1	1	1	1											1	1		1		1					8
Kentucky				1	1	1																				3
Livingstone			1																							1
London																1										1
Mbandaka			2	2		1														1						6
Mississippi				1																	2	1	3			9
Montevideo		1	6	2	1				1				1				2	1			1	1	1	3		21
Muenchen			1																							1
Newport	1		6	1								2						1	1		2	1				15
Oranienburg		1	1		1																		1			6
Orion																										1
Orion 15+				1																						1
Oslo		1																								2
Panama			1	1								1														3
Papuana																										1
Paratyphi A				1	1															1						3
Paratyphi B	1		2	1														1								6
Paratyphi B var. Java	3	3	1		3				1			2								1					1	16
Pensacola	1			1																						3
Poona			2	2																						2
Reading		2	1	1															1		1		1			7
Rissen			1	1																					1	3
Rubislaw				1																						1
Saintpaul						1				1		8					1				9	3	6	5		35
Schwarzengrund			1																		1					2
Senftenberg			2	1																						3
Stanley																										2
Tennessee			2																							2
Thompson	2	2	8	3	3			1				4		1	1											25
Typhi			5	4	9													3	1							23
Typhimurium phage type	1	6	8	12	8	10	4		5	1	1	1	4	4	2	5	1	10	9	85	6	28	8	5	2	225
6					3																					3
8		2	1		1										1								1	2		8
9			1		4	1	3	2			1		4							1	1	2	4	2		26
12a		2	3	2									1	1					1	2	1	12	6	6		37
23		4	2	2	3			1		1		1	2													18
26			2																							2
36		1																								1
41				1																						1
42				1	3			1													6	2	5	1		26
60								1																		1
67												1														1
101	3	3	3	5	2	1			2			2	2		1	1				5	1	8	2	2	1	44
104						1																				1
135	3	11	14	18	16	3	1	14	6	1	1	6	5	4	4	1	13	6			11		15	2	155	
154		1			1																					3
155					2																					2
156	4	7	5	5	12	1				1	1	5	3	1	8	3	12	4	2		6	2	1	2	85	
160	16	61	64	50	42	14	5	14	18	7	1	34	13	6	22	6	47	18	17	5	59	20	13	9	561	
195			1																							1
205																										2
206		2																			1					6
U291			2	1																		4				4
RDNC	1	3	6	1	1				1			2	1	1	5		2	2			6		2		34	
Rough		1										2		1							1					6
Untypable		2	5			1			1			2														

Table 7. *Salmonella* serotypes, non-human isolates 2002

SEROTYPE	ANIMALS														Meat/bone meal	Environmental	Food*	Shellfish	Not specified	POULTRY				TOTAL	
	Alpaca	Avian	Bovine	Canine	Caprine	Cervine	Equine	Feline	Hedgehog	Ovine	Porcine	Reptile	Sealion	Wallaby						Whale	Neckflap	Feed	Environmental		Miscellaneous including product
Adelaide																			1						1
Agona																					4	10			14
Albany																				1					1
Anatum			1								1						11	2	1		3	2	8		29
Anatum 15+																				1	1				2
Bovismorbificans																				1					1
Brandenburg		1	53	5			4			174	3					5	14	52		4	3	2		320	
Cerro												6												6	
Choleraesuis var Kunzendorf											1													1	
Cubana																					9		1	10	
Derby															2						9			11	
Eastbourne											2													2	
Enteritidis phage type 1	1											1												1	
Enteritidis phage type 9a			3					1									4							8	
Give																						1		1	
Give 15+																					10	2	2	14	
Hadar																						1		1	
Havana																					2			2	
Hindmarsh			9						112				1			14	7	10			9			141	
Infantis			5				1														27	12	10	91	
Kentucky			4																					4	
Kiambu																					2			2	
Lille															3						3			6	
London																							1	1	
London 15+																					4			4	
Mbandaka			1	1				2								1					19		1	25	
Meleagridis					1																			1	
Mississippi																						2		2	
Montevideo				2											4	2			3					11	
Muenster																			1					1	
Newport			1									3							1					5	
Oranienburg		1																	1		8			10	
Orion																					1			1	
Orion 15+															4						2			6	
Paratyphi B											1						1							2	
Ruru			2																		1	2		5	
Saintpaul								2										2			1			5	
Sandiego																							1	1	
Senftenberg																					22	45	1	68	
Tennessee															5						4	1	1	11	
Thompson																			1		2	1		4	
Typhimurium phage type 1	1		1	33	1		1			4						14	1		1	27	1	3	4	1	91
Typhimurium phage type 6				2																					2
Typhimurium phage type 8				3	2					2															7
Typhimurium phage type 9				17													4				1			22	
Typhimurium phage type 12a		1		11			1			1											1	2	3	20	
Typhimurium phage type 23				5				1								1			2					9	
Typhimurium phage type 41																	2							2	
Typhimurium phage type 42				8			1										1					8	1	19	
Typhimurium phage type 101				13						1											3	1	1	22	
Typhimurium phage type 104					3			1																4	
Typhimurium phage type 135			1	27	1	1	2	2	3	1						3				3	8		9	71	
Typhimurium phage type 154				2				1																3	
Typhimurium phage type 155																					1			1	
Typhimurium phage type 156			1	15			1	1		1						3	3		2		4			31	
Typhimurium phage type 160	1	19	11	4			6	20								11	4	1	4	2	12	62	15	172	
Typhimurium phage type 205																				1				1	
Typhimurium phage type RDNC			1	7	2					1	1				1	18			5			2		38	
Typhimurium phage type Rough			1	1																		1		3	
Typhimurium phage type Untypable			3	5	1																	1	1	11	
Uganda																			2					4	
Uganda 15+			1																					1	
Weltevreden																		2						2	
Weltevreden 15+																		4						4	
Westhampton																					5			5	
Westhampton 15+																					1			1	
Group B 4,5,12 : d : -																		1						1	
Group B 4,12 : - : 1,2			5															1						6	
Group B 4,12 : - : - (non motile)																						6		6	
Group C 6,7 : k : -							1										1							2	
Group C 6,7 : r : -																							1	1	
Group C 6,7 : z10 : -																					1			1	
Group C 6,7 : - : - (non motile)																					2	1		3	
Group C 8 : r : -									2															2	
Group D 9,12 : - : -											1													1	
Group E 3,15 : e,h : -												1												1	
Group E 3,19 : - : -																								1	
Subspecies II 21 : z10 : z6																								1	
Subspecies II 42 : g,t : -																					1			1	
Rough : r : 1.5										1												4	1	6	
TOTAL	2	29	245	22	2	3	18	31	1	300	6	4	10	2	1	50	88	90	1	73	14	180	188	51	1411

S. Typhimurium 529
Other serotypes 882
Poultry isolates 433
Animal isolates 676

* casings and animal carcasses from meatworks are included

Unusual Site Isolates

Salmonella species 6,7 : - : 1,5 isolated from femoral artery aneurysm tissue.

Salmonella Typhimurium phage type U291 from knee aspirate.

Salmonella Enteritidis phage type 4 from an aortic aneurysm swab.

Salmonella Brandenburg from a tibial leg abscess.

S. Paratyphi B isolated from F 3y and also from water from the family turtle aquarium.

Table 6. Significant outbreaks/clusters 2002

Serotype	Phage type	Month	Health District	No. of Cases	Comment
Group C 6,7 : k : -		February/ March	NW, CA, SK	25	Traced to potato topped pies supplied to cafe. Food handler had gastroenteritis
Weltevreden 15+		March	SA	8	Family group, consumed umu meal brought from Samoa
<i>S. Typhimurium</i>	1	March	NM	62	Church camp, no point source identified
<i>S. Typhimurium</i>	1	March	NM	10	School camp, no point source identified
Group C 6,7 : r : -		July	SA	11	Group of immigrants
<i>S. Typhimurium</i>	160	November	CA	4	Includes one food handler, America's Cup village
<i>S. Typhimurium</i>	160	December	WN	6	Linked to a Wellington cafe

NON-HUMAN SALMONELLA

There were 1,411 non-human isolates typed in 2002 compared with 2,117 in 2001. The distribution of serotypes is shown in Table 7.

Poultry Isolates

There were a total of 433 poultry isolates compared with 623 in 2001. *S. Typhimurium* phage type 160 and *S. Senftenberg* were the predominant strains isolated (Table 8).

Table 8. Predominant poultry isolates 2000-2002

Serotype	2000	2001	2002
<i>S. Typhimurium</i> 160	10.5%	17.6%	25.6%
<i>S. Senftenberg</i>	9.1%	2.2%	15.7%
<i>S. Infantis</i>	8.9%	8.3%	12%
<i>S. Typhimurium</i> 135	9.5%	31.9%	6%

Animal Isolates

The predominant isolate in animals was *S. Brandenburg* (58% of sheep and 22% of cattle). This is a significant drop since 2001 when the figures were 83% of sheep and 42% of cattle. Sheep and cattle abortions have reduced in numbers attributed to better farming practices and self-diagnosis on the part of the farmers.

VEROCYTOTOXIN PRODUCING ESCHERICHIA COLI (VTEC/STEC)

There were 62 laboratory confirmed isolates of *E. coli* O157 during 2002 (Table 9) compared with 73 in 2001.

Table 9. *E. coli* O157 isolates by Health District 2002

Clinical Data	NL	CA	WK	TG	RO	HB	TK	WG	MW	WN	CB	SC	OT	SO	Total
HUS	1				1		1								3
Bloody diarrhoea			2	1			1			1		1			6
Diarrhoea / vomiting		1	1			1									3
Diarrhoea		4	2	3	1	1				1	2	1		1	16
Asymptomatic contacts										1	1				2
Animal contact (no other details given)								1							1
No details given		5	7	2	1		2		1	1	11		1		31
Total	1	6	14	5	5	2	5	1	1	4	14	2	1	1	62

There were four non-O157 isolates:

- O117 : H- F8y – inactive strain indole negative
- O Rough: HNM M16y CB – inactive strain, indole negative
- O130 : H11 F47y NW – no clinical details
- O84 : HNT M2y AK – no clinical details

Non-human Isolates

There were no isolates confirmed from non-human sources.

SHIGELLA

There were 124 isolates of *Shigella* confirmed in 2002 compared with 190 in 2001.

The multiplex PCR (Lablink Vol. 9, No. 3) has enabled confirmation of 15 isolates that were either rough or gave atypical serology results.

Table 10. *Shigella* isolates, 2002

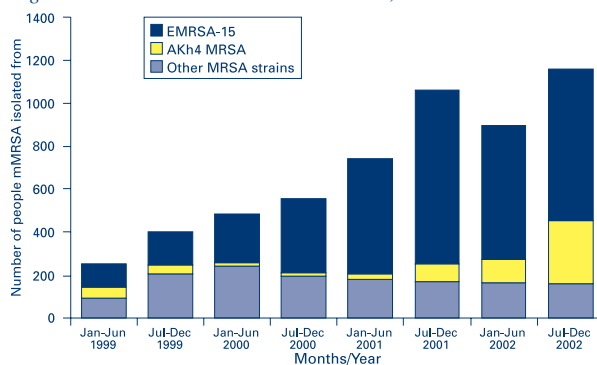
Species	Type	Number	Comment
<i>S. boydii</i>	1	2	One case immigration
<i>S. boydii</i>	2	1	Recent travel Thailand
<i>S. boydii</i>	4	1	
<i>S. boydii</i>	13	3	
<i>S. dysenteriae</i>	2	1	Immigration
<i>S. dysenteriae</i>	species	1	Confirmed by PCR Polyvalent A serology positive, monovalent negative
<i>S. flexneri</i>	1b	3	One case immigration, one case overseas travel
<i>S. flexneri</i>	2	1	Immigration
<i>S. flexneri</i>	2a	29	3 household clusters
<i>S. flexneri</i>	2b	1	
<i>S. flexneri</i>	3	1	Immigration
<i>S. flexneri</i>	3a	5	2 cases immigration
<i>S. flexneri</i>	3c	1	
<i>S. flexneri</i>	3d	1	
<i>S. flexneri</i>	4	1	Recent travel Tonga
<i>S. flexneri</i>	4a	2	One case immigration, one case overseas travel
<i>S. flexneri</i>	6	4	2 cases immigration
<i>S. flexneri</i>	y variant	1	Immigration
<i>S. flexneri</i>	species	2	1 case immigration both confirmed by PCR
<i>S. sonnei</i>	Biotype a	30	7 recent overseas travel, 3 household clusters
<i>S. sonnei</i>	f	1	
<i>S. sonnei</i>	g	20	6 recent overseas travel
<i>Shigella</i>	species	9	These are Rough <i>Shigella sonnei</i> isolates confirmed by PCR
<i>Shigella</i>	species	3	Food handler and two cases confirmed by PCR. Serology negative.

ANTIBIOTIC RESISTANCE

MULTIRESISTANT METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS

During 2002, multiresistant methicillin-resistant *Staphylococcus aureus* (mMRSA) from 1961 people, 1827 patients and 134 healthcare workers, were referred to ESR. mMRSA are resistant to two or more classes of antibiotics in addition to β -lactams. The increase in the incidence of mMRSA in 2002 was smaller than in recent years; increasing 14.6% from 45.8 per 100,000 in 2001 to 52.5 per 100,000 (Figure 4). Information on whether mMRSA was causing infection or colonising was reported for 1256 of the people from whom mMRSA was isolated; 79.1% were infected and 20.9% were colonised.

Figure 4. Multiresistant MRSA isolations, 1999-2002



Nearly three-quarters (73.7%) of the 1827 patients with mMRSA were reported to be hospital patients. Patients were classified as hospital patients if they either were in a healthcare facility (including residential-care facility) when

MRSA was isolated or had been in a healthcare facility in the three months before MRSA was isolated. Among the 134 healthcare workers, 99 had patient contact at the time mMRSA was isolated from them. mMRSA was isolated during pre-employment screening of the other 35 healthcare workers.

Table 11. Most commonly isolated multiresistant MRSA strains, 2002¹

Strain ² (origin)	Number of people the strain isolated from (% of all mMRSA isolations)
EMRSA-15 (UK)	1254 (63.9)
AKh4 (Australia)	393 (20.0)
WR/AK1	134 (6.8)
WSPP1 (Western Samoa)	31 (1.6)
EMRSA-16 (UK)	23 (1.2)

¹ Includes strains isolated from more than 20 people.

² Descriptions of the strains are included in previous LabLink issues: EMRSA-15 and WR/AK1 strains, LabLink 2000; 7(1): 8-9; AKh4 strain, LabLink 2002; 9(1): 8-9; WSPP, LabLink 1997; 4(4): 25-6; and EMRSA-16, LabLink 2002; 9(3): 6.

The mMRSA strains that were predominant in 2002 are shown in Table 11. The predominance of the EMRSA-15 strain declined in 2002: from accounting for 75.0% of mMRSA isolations in 2001 to 63.9% in 2002. There was a concomitant rise in the AKh4 strain, which increased from 7.7% of isolations in 2001 to 20.0%. The majority of patients with these two strains were reported to be hospital patients: 78.0% and 88.4% for EMRSA-15 and AKh4, respectively. The hospitals and other healthcare facilities in which the EMRSA-15 and AKh4 strains were isolated in 2002 are shown in Table 12. The number of hospitals and healthcare facilities in which EMRSA-15 was isolated increased in 2002, although many of the isolations appeared to be sporadic with only a small number (<5) of isolations in many of the facilities (Table 12, footnote 1). EMRSA-15 continued to be most frequently isolated in healthcare facilities in the greater Auckland, Hawkes Bay, and greater Wellington areas. The AKh4 strain was largely confined to healthcare facilities in the greater Auckland area.

Table 12. Healthcare facilities with patients and staff with EMRSA-15 and AKh4 MRSA, 2002

Healthcare facility ¹	Number of people EMRSA-15 isolated from (% of all EMRSA-15 isolations in healthcare facilities, n=1195 ²)	Number of people AKh4 MRSA isolated from (% of all AKh4 isolations in healthcare facilities, n=400 ²)
Whangarei Hospital	6 (0.5)	
North Shore Hospital	88 (7.4)	49 (12.3)
Waitakere Hospital	48 (4.0)	6 (1.5)
Auckland Hospital	155 (13.0)	51 (12.8)
Starship Children's	5 (0.4)	
Green Lane Hospital	15 (1.3)	
Middlemore Hospital	206 (17.2)	210 (52.5)
Other Auckland HCFs ³	302 (25.3)	50 (12.5)
Waikato Hospital	18 (1.5)	5 (1.3)
Other Hamilton HCFs ³	11 (0.9)	
Thames Hospital	5 (0.4)	
Tauranga Hospital	18 (1.5)	14 (3.5)
Whakatane Hospital	6 (0.5)	
Rotorua Hospital	5 (0.4)	
Taupo Hospital	5 (0.4)	
Hawkes Bay Hospital	85 (7.1)	
Other Hawkes Bay HCFs ³	21 (1.8)	
Palmerston North Hospital	6 (0.5)	
Hutt Hospital	6 (0.5)	
Wellington Hospital	41 (3.4)	
Kenepuru Hospital	44 (3.7)	
Other Wellington HCFs ³	33 (2.8)	
Blenheim Hospital	6 (0.5)	
Christchurch Hospital	9 (0.8)	
Dunedin Hospital	6 (0.5)	
Waikari Hospital	7 (0.6)	

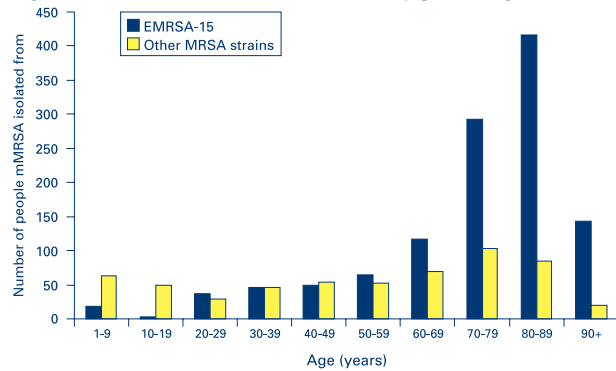
¹ Hospitals and other healthcare facilities (HCFs) with ≥5 patients or staff with EMRSA-15 or AKh4 MRSA are listed in the table. EMRSA-15 was also isolated from people in Kaitiaki Hospital (1 patient or staff), Kaeo HCF (1), National Women's Hospital (4), Tauranga HCF (1), Waihi Hospital (1), Waihi HCF (2), Whakatane HCFs (3), Rotorua HCFs (3), Tokoroa Hospital (1), Taupo HCFs (2), Taumarunui Hospital (1), Taumarunui HCF (3), New Plymouth Hospital (2), Palmerston North HCF (1), Masterton Hospital (1), Lower Hutt HCF (1), Nelson Hospital (1), Burwood Hospital (2), Christchurch HCF (1), Greymouth Hospital (1), Timaru Hospital (1), Timaru HCFs (2), Dunedin HCF (1), and Southland Hospital (1). AKh4 MRSA was also isolated from people in Whangarei Hospital (1), Green Lane Hospital (2), Thames Hospital (1), Whakatane Hospital (1), Rotorua Hospital (1), Rotorua HCF (1), Gisborne Hospital (1), Hawkes Bay Hospital (1), New Plymouth Hospital (1), Lower Hutt Hospital (3), Christchurch Hospital (1), and Dunedin Hospital (1). In these lists, 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.

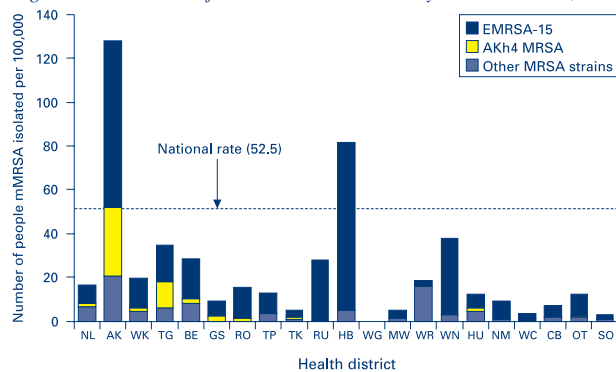
As has been noted in previous years, compared with other mMRSA strains, EMRSA-15 is more frequently isolated from older patients and less frequently isolated from younger patients (Figure 5). Many of the private healthcare facilities in which EMRSA-15 was isolated were residential-care facilities for the elderly.

Figure 5. Multiresistant MRSA isolations by patient age, 2002



The geographic distribution of mMRSA in 2002 displayed the usual pattern, with the highest rate in the Auckland health districts (Figure 6). The next highest rates were in the Hawkes Bay and Wellington Health Districts and were comprised predominantly of EMRSA-15 isolations. Compared with 2001, rates have continued to rise in the Auckland health districts, decreased in Tauranga Health District, and remained about the same in the Hawkes Bay and Wellington Health Districts.

Figure 6. Incidence of multiresistant MRSA by health district, 2002



The susceptibility of mMRSA isolates referred in 2002 was not routinely tested. However, based on previous testing, the typical resistance patterns of the most common strains are shown in Table 13. In addition to multiresistant EMRSA-15 isolates, which are typically resistant to ciprofloxacin and erythromycin, non-multiresistant (ciprofloxacin-resistant and erythromycin-susceptible) isolates also occur. These non-multiresistant EMRSA-15 are not included in the above analyses of mMRSA. In 2002, non-multiresistant EMRSA-15 were isolated from 270 people in addition to the 1254 people with multiresistant EMRSA-15 (Table 11).

Table 13. Resistance patterns of the most common multiresistant MRSA

Strain	Resistance pattern ¹
EMRSA-15	Cip Em ²
AKh4	Cip Cl Co Em Gm Tc
WR/AK1	Fa Mu ^{HL}
WSPP	- ³
EMRSA-16	Cip Em

¹ Cip, ciprofloxacin; Cl, clindamycin; Co, co-trimoxazole; Em, erythromycin; Fa, fusidic acid; Gm, gentamicin; Mu^{HL}, high-level mupirocin; Tc, tetracycline.

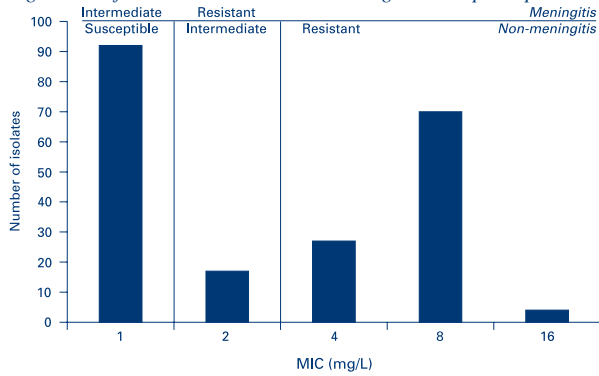
² EMRSA-15 also has inducible clindamycin resistance.

³ Multiresistant WSPP MRSA are most commonly erythromycin resistant and either mupirocin or fusidic acid resistant. However, most WSPP MRSA remain non-multiresistant.

Cefotaxime/ceftriaxone-nonsusceptible *Streptococcus pneumoniae*

During 2002, 210 non-invasive pneumococcal isolates, with cefotaxime MICs ≥1 mg/L, were referred to ESR. The cefotaxime MIC distribution of these isolates is shown in Figure 7. The figure also indicates the interpretation of the MICs according to the current NCCLS interpretive standards for pneumococci from non-meningitis and meningitis cases [see LabLink 2002; 9(1): 9-10]. Among these 210 pneumococcal isolates with cefotaxime MICs ≥1 mg/L, 86.7% were multiresistant to ≥3 non-β-lactam antibiotics, most commonly erythromycin, co-trimoxazole and tetracycline. Most (90%) of the isolates remained susceptible to chloramphenicol and all isolates were vancomycin susceptible. The prevalence of multiresistance rose to 98.3% among isolates with cefotaxime MICs ≥2 mg/L.

Figure 7. Cefotaxime MIC distribution among nonsusceptible pneumococci, 2002



Penicillinase-producing *Neisseria gonorrhoeae*

Penicillinase-producing *Neisseria gonorrhoeae* (PPNG) from 37 patients were confirmed in 2002 by LabPlus, Auckland Hospital, or ESR. Based on the laboratory in which the PPNG was isolated, most (67.6%) patients were from the Auckland area. Information on where the gonococcal infection was acquired was provided for 13 patients, 10 (76.9%) of whom most likely acquired their infection overseas. All PPNG isolates were ceftriaxone susceptible, 56.8% (21) were ciprofloxacin resistant, and 89.2% (33) were tetracycline resistant.

High-level gentamicin-resistant enterococci

Twenty-nine high-level gentamicin-resistant (HLGR) enterococci (MIC ≥ 500 mg/L), including nine from blood cultures, were referred to ESR in 2002. None of the HLGR enterococci were vancomycin resistant, but three were ampicillin resistant, including one of the blood culture isolates. Most (82.8%) of the HLGR enterococci were ciprofloxacin resistant.

Vancomycin-resistant enterococci

No vancomycin-resistant *Enterococcus faecalis* or *E. faecium* (VRE) were referred to ESR in 2002. Since the first reported isolation in New Zealand in 1996, VRE have been isolated from a total of 15 people (Figure 8 and Table 14). *E. faecalis* has predominated (Table 14). 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 have been isolated to date and in four of the five years in which VRE have been isolated.

Figure 8. Vancomycin-resistant enterococci (VRE) isolations, 1996-2002

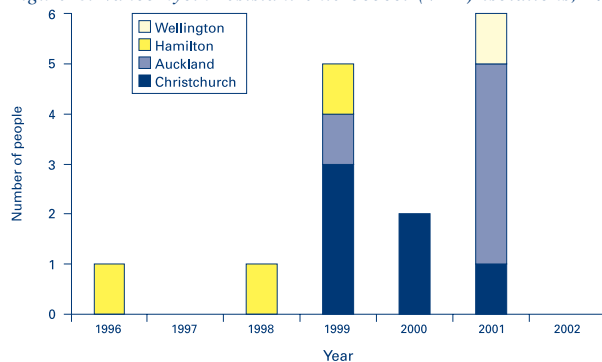


Table 14. Vancomycin-resistant enterococci (VRE) isolated in New Zealand, 1996-2002

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

¹ Repeat isolations from the same patient excluded, unless the isolates differed (see footnotes 3 and 4).
² In chronological order of place of first isolation.
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 2002, extended-spectrum β -lactamase-producing (ESBL) *Enterobacteriaceae* from 230 patients were confirmed by either the NCCLS disc or MIC confirmatory tests, or the double disc diffusion (Jarlier) test. The majority of the confirmed ESBL producers were *E. coli* (Table 15). The Hawkes Bay ESBL *E. coli* outbreak strain continued to be isolated throughout the year, with the strain being isolated from 49 people.

The NCCLS disc confirmatory 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. This test is specified for the confirmation of ESBL production in *E. coli*, *Klebsiella pneumoniae* and *K. oxytoca*. Among the 176 ESBL-producing isolates of these species confirmed in 2002, 3.4% (6) would not have been identified if only cefotaxime discs were used and 19.9% (35) would have been missed if only ceftazidime discs were used. These results emphasise the importance of using both cephalosporins in this test.

A summary of the ESBL-producing *Enterobacteriaceae* isolates, that have been confirmed since surveillance commenced in 1996, is shown in Table 15.

Table 15. Confirmed extended-spectrum β -lactamase (ESBL) producing *Enterobacteriaceae*, 1996-2002

	Year						
	1996	1997	1998	1999	2000	2001	2002
Number confirmed isolates	35	15	16	15	27	83	230
Species							
<i>Escherichia coli</i>	8	9	7	9	121	64	146
<i>Klebsiella pneumoniae</i>	6	5	3	2	6	5	26
<i>K. oxytoca</i> ¹	18 ¹			1 ¹	3 ¹		4 ²
<i>Enterobacter</i> spp	1			3	5	10	46
Other <i>Enterobacteriaceae</i>	2	1	6		1	4	8
Site	na ³						
urine		11	7	9	14	38	125
blood/CSF		0	0	2	4	7	14
other		4	9	4	9	38	91

¹ Some of these *K. oxytoca* isolates may be hyperproducers of chromosomal K1 β -lactamase rather than an ESBL.
² In addition to the four ESBL-producing *K. oxytoca* isolates, six *K. oxytoca* isolates that were hyperproducers of K1 β -lactamase were identified.
³ Site data not available.

ANTIBIOTIC SUSCEPTIBILITIES OF SALMONELLA

In 2002, the antimicrobial susceptibility of a representative sample of 456 non-typhoidal *Salmonella* from isolates routinely referred to ESR for serotyping was tested. The sample comprised 258 human and 198 animal/environmental isolates.

Resistance to each of the 10 antimicrobials tested is shown in Table 16. Antimicrobial resistance among *Salmonella* remains relatively low, with 95.8% fully susceptible to all 10 antimicrobials. There were no significant differences ($P \leq 0.05$) in the rates of resistance among *Salmonella* isolated from human sources and those isolated from other sources.

As reported earlier [LabLink 2002; 9(2): 7], ciprofloxacin resistance was identified among the *Salmonella* tested at ESR for the first time in 2002. The isolate, *S. Typhimurium* phage type 12a, was multiresistant to all

Table 16: Antimicrobial resistance among non-typhoidal *Salmonella*, 2002

Antimicrobial	Percent resistance		
	All isolates n = 456	Human isolates n = 258	Animal and environmental isolates n = 198
Ampicillin	1.5	2.3	0.5
Cephalothin	0.4	0.4	0.5
Chloramphenicol	0.4	0.8	0
Ciprofloxacin	0.2	0.4	0
Co-trimoxazole	0.4	0.8	0
Gentamicin	0.4	0.4	0.5
Streptomycin	2.4	3.1	1.5
Sulphonamides	1.3	1.2	1.5
Tetracycline	2.6	3.5	1.5
Trimethoprim	0.4	0.8	0

antimicrobials tested except cephalothin, and was isolated from a child who had recently been in China.

In 2002, 23 *S. Typhi*, 3 *S. Paratyphi A* and 23 *S. Paratyphi B* isolates were referred to ESR. They were tested for susceptibility to the same 10 antimicrobials as the non-typhoidal *Salmonella* (Table 16). All the *S. Typhi* isolates were fully susceptible, except for one isolate that was streptomycin resistant. The three *S. Paratyphi A* isolates were fully susceptible. Over a third (9, 39.1%) of the *S. Paratyphi B* isolates were resistant, with six being multiresistant to ampicillin, chloramphenicol, streptomycin, sulphonamides and tetracycline. However, three of these six resistant isolates were part of an outbreak.

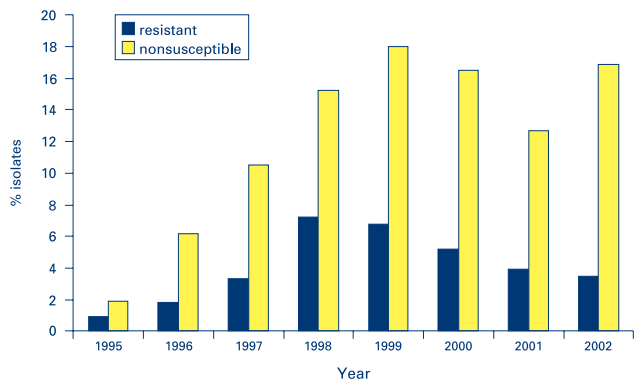
ANTIBIOTIC SUSCEPTIBILITIES OF INVASIVE PATHOGENS

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 viable invasive isolates of these three organisms referred in 2002 was tested.

Streptococcus pneumoniae

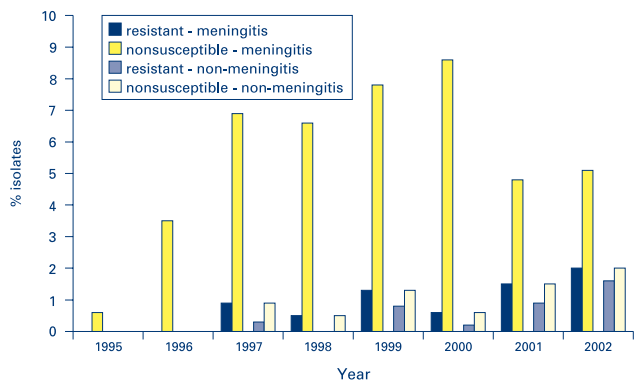
Among the 490 invasive pneumococcal isolates tested in 2002, 16.9% (83) were categorised as penicillin nonsusceptible (MIC ≥ 0.12 mg/L): 3.5% (17) as resistant (MIC ≥ 2 mg/L) and 13.5% (66) as intermediate (MIC 0.12-1 mg/L). The prevalence of penicillin resistance has decreased in each of the last four years since 1998 (Figure 9). While there was also a decline in penicillin nonsusceptibility between 1999 and 2001, the prevalence increased again in 2002.

Figure 9. Penicillin resistance and nonsusceptibility among pneumococci from invasive disease, 1995-2002



The NCCLS interpretive standards for pneumococcal susceptibility to cefotaxime/ceftriaxone were redefined in 2002, with different criteria depending on whether the isolate is from a meningitis or non-meningitis case [see *LabLink* 2002; 9(1): 9-10]. Applying the meningitis interpretive standards, 5.1% (25) of the 490 invasive isolates were categorised as cefotaxime nonsusceptible (MIC >1 mg/L): 2.0% (10) as resistant (MIC ≥ 2 mg/L) and 3.1% (15) as intermediate (MIC 1 mg/L). Applying the non-meningitis

Figure 10. Cefotaxime resistance and nonsusceptibility among pneumococci from invasive disease, 1995-2002



interpretive standards, 2.0% (10) were categorised as cefotaxime nonsusceptible (MIC ≥ 2 mg/L): 1.6% (8) as resistant (MIC ≥ 4 mg/L) and 0.4% (2) as intermediate (MIC 2 mg/L). Trends in cefotaxime resistance and nonsusceptibility since 1995 are shown in Figure 10. In general, resistance has increased, although nonsusceptibility, based on the meningitis interpretive standards, has decreased since 2000.

The rates of resistance to other antibiotics among the 490 invasive isolates tested in 2002 included 2.5% chloramphenicol resistance, 36.1% cotrimoxazole resistance, 9.0% erythromycin resistance, and 6.9% 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 17).

Table 17. Distribution of capsular types among penicillin-nonsusceptible and cefotaxime-nonsusceptible invasive pneumococcal isolates, 2002

Capsular type	Number (%) isolates			
	Penicillin		Cefotaxime	
	Nonsusceptible MIC ≥ 0.12 mg/L	Resistant MIC ≥ 2 mg/L	Nonsusceptible ² MIC ≥ 1 mg/L	Resistant ² MIC ≥ 2 mg/L
9V	33 (39.8)	2 (11.8)	4 (16.0)	1 (10.0)
19F	16 (19.3)	11 (64.7)	13 (52.0)	9 (90.0)
6B	11 (13.3)	0	3 (12.0)	
23F	11 (13.3)	3 (17.7)	3 (12.0)	
14	6 (7.2)	1 (5.9)	2 (8.0)	
19A	3 (3.6)			
Others	3 (3.6) ³			
Total	83 (100)	17 (100)	25 (100)	10 (100)

¹ Percentage of the nonsusceptible or resistant isolates.

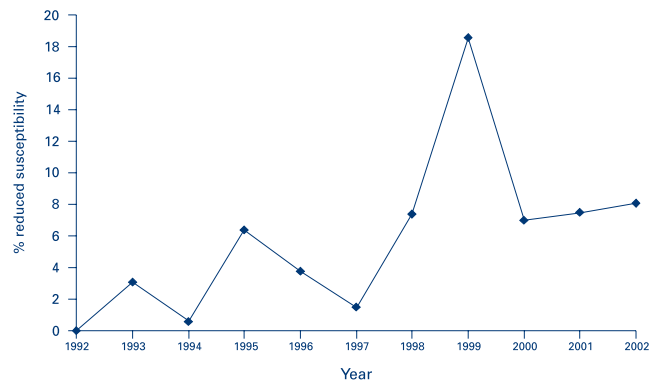
² Based on meningitis interpretive standards.

³ One serotype 6A, one 9N and one 29.

Neisseria meningitidis

In 2002, 223 isolates from cases of invasive meningococcal disease were tested, and all were susceptible to penicillin, ceftriaxone, ciprofloxacin and rifampicin. However, 8.1% (18/223) had reduced penicillin susceptibility, with MICs of 0.12-0.5 mg/L. The proportion of isolates with reduced penicillin susceptibility since 1992 is shown in Figure 11, and shows a trend of increasing prevalence. Until 2002, all isolates with reduced penicillin susceptibility had MICs of 0.12 or 0.25 mg/L. In 2002, one isolate had a penicillin MIC of 0.5 mg/L.

Figure 11. Reduced susceptibility to penicillin among meningococci from invasive disease, 1992-2002



Haemophilus influenzae

Among the 23 invasive *H. influenzae* isolates tested in 2002, eight (34.8%), including two of the total three serotype b isolates, were ampicillin resistant. These eight ampicillin-resistant isolates all produced β -lactamase. All isolates were susceptible to cefotaxime, chloramphenicol and rifampicin.

VIROLOGY

Table 18 summarises viral identification and mycoplasma infections in New Zealand in 2002. 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 18. Summary of virus identification and mycoplasma infections, 2002

Year 2002	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
*Influenza A (not subtyped)	0	1	0	5	42	73	63	26	10	3	0	1	224
*Influenza A H3N2	2	3	1	15	17	75	90	89	31	2	0	0	325
*Influenza A H1N1	1	0	0	0	0	0	1	0	0	0	0	0	2
*Influenza B	0	0	1	0	4	20	26	66	28	5	1	0	151
Parainfluenza 1	1	1	1	3	9	10	11	8	0	0	2	0	46
Parainfluenza 2	0	0	0	1	2	1	0	0	1	0	1	0	6
Parainfluenza 3	0	0	0	0	1	0	2	2	4	13	20	6	48
RSV	2	2	4	3	27	87	242	316	95	32	5	1	816
Rhino	0	2	2	3	7	12	4	10	7	5	10	10	72
Measles	1	0	2	0	1	0	1	0	0	0	0	1	6
Mumps	2	5	3	0	6	1	0	2	1	2	0	0	22
Rubella	0	0	0	0	2	1	1	0	0	0	0	0	4
Varicella Zoster	30	22	26	23	23	20	34	23	18	34	27	26	306
Rotavirus	6	1	5	10	7	8	12	16	23	14	8	4	114
Mycoplasma	64	62	42	41	40	23	24	54	34	10	24	13	431
Adenoviruses	17	18	14	7	25	14	10	25	18	19	24	32	223
Adeno type 1	1	0	0	3	1	1	2	1	2	4	2	7	24
Adeno type 2	2	2	0	0	2	2	0	3	6	1	3	3	24
Adeno type 3	6	7	4	6	9	5	4	14	10	17	7	12	101
Adeno type 4	0	1	0	0	0	0	0	0	0	0	0	0	1
Adeno type 5	0	0	0	0	0	0	0	0	1	0	0	1	2
Adeno type 7	3	1	3	0	3	3	0	0	0	0	0	0	13
Adeno type 8	0	0	0	0	0	1	0	0	3	0	2	0	6
Adeno type 19	0	0	0	0	0	1	0	0	0	0	1	0	2
Adeno type 21	1	0	0	0	0	0	0	0	1	0	0	2	4
Adeno type 22	1	0	0	0	0	0	0	0	0	0	0	0	1
Adeno type 6	0	0	0	0	0	1	0	0	0	0	0	0	1
Adeno type 24	1	0	0	0	0	0	0	0	0	0	0	0	1
Untypable Adenovirus	2	4	5	0	3	2	5	5	4	1	1	0	32
Enteroviruses	126	19	4	3	4	2	5	8	9	12	16	11	219
*Polio 1+2	0	1	0	0	0	0	0	0	0	0	0	0	1
Coxsackie B1	1	0	0	0	0	0	0	0	0	0	0	0	1
Coxsackie B2	0	0	0	0	0	0	0	0	0	2	0	3	5
Coxsackie B3	0	0	0	0	0	0	0	0	0	1	0	0	1
Coxsackie B4	1	1	0	0	3	0	0	0	0	1	0	1	7
CA6	0	0	0	0	0	0	0	2	0	0	0	0	2
CA9	1	0	0	0	1	0	0	0	0	0	0	0	2
CA16	0	0	0	0	0	0	0	0	0	0	0	1	1
Echo 3	0	0	0	0	0	0	0	1	5	0	1	1	8
Echo 6	0	0	0	0	0	0	0	0	0	0	3	4	7
Echo 7	1	1	0	0	0	0	0	0	0	0	0	0	2
Echo 9	0	0	0	0	0	0	0	0	2	0	1	0	3
Echo 25	0	0	0	0	0	0	0	0	0	0	2	0	2
Echo 30	16	4	3	0	0	0	0	0	0	0	0	0	23
*Echo 13	27	1	0	1	0	0	0	0	0	0	0	0	29
Enter 71	0	0	0	0	0	0	1	0	0	0	0	0	1
Untypable Enter 71	2	2	1	0	1	1	1	1	0	0	1	2	12

* Note: Viruses with sign *** were reported based on the specimen taken date, whereas other viruses were based on lab reporting date.

RESPIRATORY VIRUSES

Influenza

Influenza activity from January to December 2002 was low to moderate (Figure 12 & 13). A total of 702 influenza isolates from sentinel and non-sentinel surveillance was identified in 2002. Of these, 241 came from sentinel practice surveillance during May to September. This is lower than the 313 sentinel isolates identified in 2001, but more than three times higher than the 73 sentinel isolates identified in 2000. There were 461 non-sentinel isolates identified in 2002 compared to 341 in 2001 and 230 in 2000.

Figure 12. Influenza isolates, 1998-2002

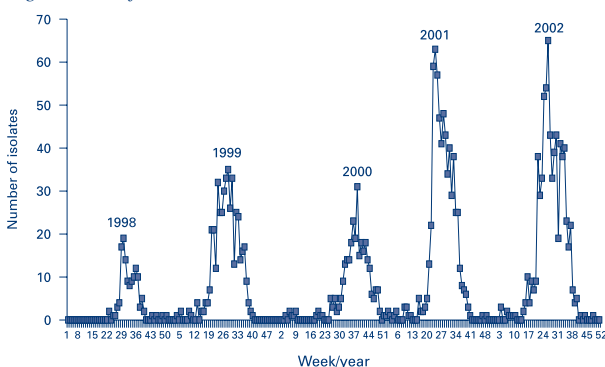
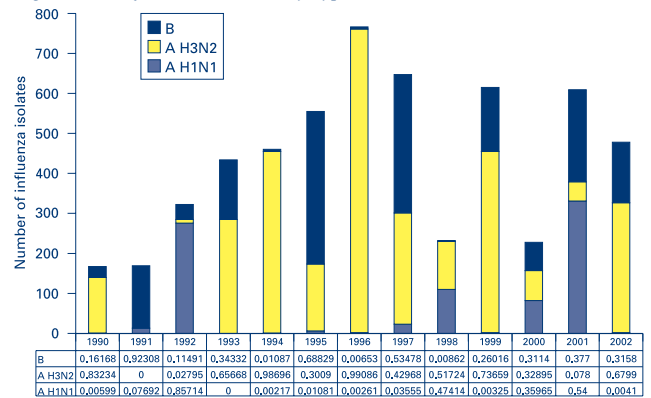


Figure 13. Influenza isolates by type, 1990-2002



Influenza A(H1N1)

In 2002, influenza A(H1N1) represented a very small proportion of isolates, 0.4% (2) of typed and subtyped isolates (478) and 0.3% of all isolates (702). There are two antigenically distinct lines of influenza A(H1N1) circulating 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 worldwide during 2002. Viruses of the A/New Caledonia/20/99 lineage have continued to replace A/Bayern/7/99-like strains.

The Australian WHO Collaborating Centre showed that most A(H1N1) isolates from the Southern Hemisphere in 2002, 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 2003 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 325 influenza A(H3N2) isolations (68% of typed and subtyped isolates and 46% of all isolates) were obtained in 2002. 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. The circulating viruses in this subtype fall into a single lineage, although a degree of antigenic heterogeneity is often observed. Influenza A(H3N2) was the predominant subtype in many countries including New Zealand during the past 12 months.

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 2003 and there is no obvious new candidate reference strain.

Influenza B

There were 151 isolations of influenza B (35% of all isolates) in 2002. There have been 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 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 a small number of isolates from the B/Shangdong/7/97 lineage. For reasons not understood these remained geographically restricted to Asia until 2001. In May-June 2001 some isolates of the B/Victoria lineage were found in Hawaii, but not in other non-Asian countries. Further spread of viruses of this lineage then commenced in the 2001-2002 Northern winter and they

ENTEROVIRUSES

progressively became prominent in some countries, particularly in North America. Earlier human vaccination studies had indicated that a virus of this lineage, B/Shangdong/7/97, induced moderate antibody responses to the alternate lineage, whereas the converse was not true. Based on this, the lack of recent exposure to related viruses and apparent emergence of this lineage, a recent virus of this type (B/Hong Kong/330/2001) was recommended for vaccines for the 2002-3 Northern winter. Europe accepted B/Shangdong/7/97 as a B/Hong Kong/330/2001-like strain whereas the USA accepted B/Hong Kong/330/2001 or B/Hong Kong/1434/2002 as suitable vaccine strains.

The Australian WHO Collaborating Centre showed that majority of B isolates (90%) from the Southern Hemisphere in 2002 including New Zealand were B/Hong Kong/330/2001 lineage viruses. There was only one B/Sichuan/379/99-like virus isolated in New Zealand in 2002. Current vaccines containing influenza B/Hong Kong/330/2001 antigen induced anti-HA antibodies to recently isolated viruses, which were of similar titre and frequency to those against the vaccine virus. Based on the global data, the WHO consultation group concluded that vaccines containing a B/Hong Kong/330/2001-like strain for 2003 as the B component.

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 for 2003 was:

- A(H1N1) an A/New Caledonia/20/99-like strain
- A(H3N2) an A/Moscow/10/99-like strain
- B a B/Hong Kong/330/2001-like strain

Respiratory Syncytial Virus (RSV)

The 2002 RSV activity was at the high level based on laboratory-confirmed RSV cases reported to ESR from 1990 to 2001 (Figure 14). During January to December 2002, a total of 816 RSV infections was reported compared with 565 during the same period in 2001 (Figure 14). The highest RSV activity occurred in 1999 with 858 cases reported.

In 2002, the RSV activity started to increase in May and peaked in Weeks 31 (at the beginning of August), 3 weeks earlier than the peak in 2001 (Figure 15). The RSV activity remained at the high level till Week 37 (early September). Since then, the number of RSV cases has declined to baseline level.

Figure 14. Annual laboratory-confirmed RSV cases, 1990-2002

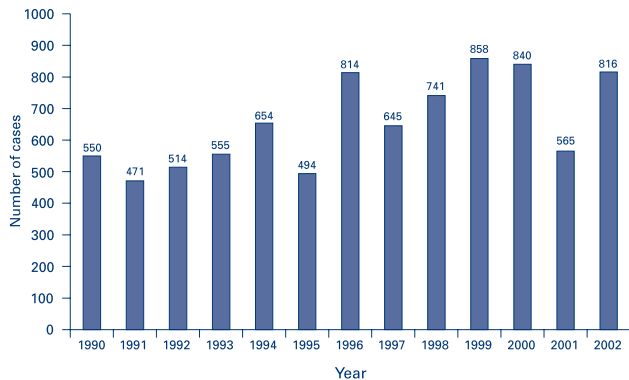
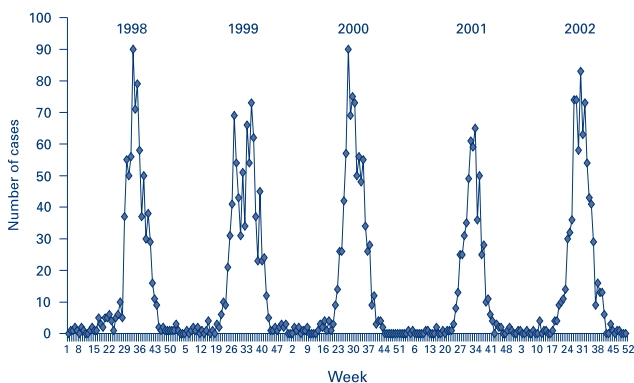


Figure 15. RSV laboratory-confirmed cases by week, 1998-2002



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. 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 these data are then available nationally. Untyped or untypable enteroviruses are referred to ESR for identification.

There was a total of 219 enterovirus isolations in 2002, compared with 381 in 2001. Echovirus type 13 was the most predominant serotype with 32 isolates from 29 cases (14.6%). There were 23 isolations of Echovirus type 30 (10.5%), compared with 32 in 2001 (8.4%). A total of 7 Coxsackie B type 4 isolations was reported in 2002, compared with 6 isolations in 2001. A total of 8 isolations of Echovirus type 3 and 7 isolations of Echovirus type 6 were reported in 2002, compared with 1 Echovirus type 3 and nil report of Echovirus type 6 in 2001.

Echovirus type 13 in 2001-2002

Note: The Echovirus type 13 (E13) outbreak in 2001 was reported in Lablink 2002;9(1):13-14. This report is a summary of the entire E13 outbreak during 2001-2. The E13 isolate details were provided by 5 virology laboratories. Professor Keith Grimwood reviewed the medical notes for 29 confirmed E13 cases from the Wellington region.

Epidemiology:

During a 14-month period from February 2001 to April 2002, a total of 153 E13 isolates from 129 cases (100 in 2001 and 29 in 2002) of mainly aseptic meningitis was identified. These cases were distributed across the Waikato, Auckland, Wellington, Christchurch and Dunedin regions (Figure 16). The outbreak started in February 2001 with the first E13 isolation from faecal and respiratory specimens taken from a 2-month old boy in Waikato. There was a long lag phase in the winter of 2001 with only 2 more cases of E13 reported. The number of cases started to increase in the spring of 2001, peaked in the summer and subsided in the autumn of 2002. The outbreak was initially restricted to Waikato but spread to Auckland, then to the Wellington region and reached Christchurch in week 43 (the end of October). The last E13 isolation was obtained from a CSF specimen taken 15th April 2002 from a 23 day-old infant boy in Wellington. The ages ranged from 10 days to 39 years, with a median of 4 years. Seventy-six were male and 53 were female (ratio M:F = 1.4:1).

E13 is a relatively rare serotype of enterovirus with few reports in the literature. The occurrence of E13 in New Zealand has generally followed this trend with no E13 isolations recorded between 1975 and 2000. However, E13 was the predominant echovirus in 2001 and 2002 accounting for 69.5% (153/220) of all echovirus isolates and 31.5% (153/486) of all enterovirus isolates during Feb 2001 to April 2002. This outbreak was also the largest recorded echovirus outbreak in New Zealand.

Virological characterisation:

Faecal specimens (43.8%, 67/153), CSF (33.3%, 51/153), respiratory specimens (17.6%, 27/153) and urine (1.3%, 2/153) most readily yielded E13 viruses.

Sequencing of the New Zealand E13 outbreak isolate showed that it is most similar to one found in Australia in 2001 and Germany (DEU) in 2000. Amongst the 2001 outbreak strains of E13 from around the world there is no more than 4.5% nucleotide difference, all of the strains being closely related.

Clinical features:

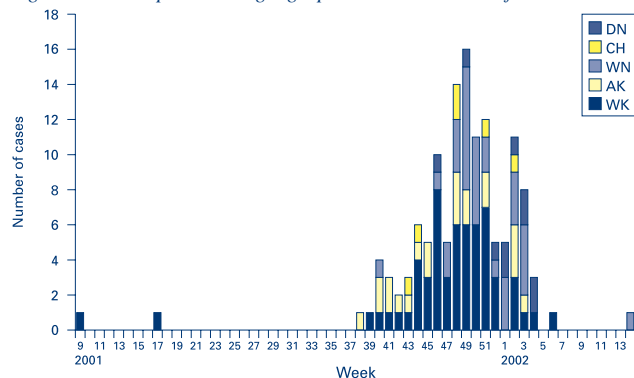
The medical records of the 29 cases (22%, 29/129) from the Wellington region were reviewed. None were immunocompromised and no patient received pleconaril. Overall, all 29 patients were hospitalized and all received 2-7 days of antimicrobial therapy.

Infants ≤ 12-months. Of 8 cases, 5 (62.5%) cases were diagnosed as viral meningitis and 3 as viral infections. The presenting symptoms included rash (morbilliform or petechial; 87.5%, 7/8), vomiting (37.5%, 3/8), fever (100%), stiff neck (12.5%, 1/8), and lethargy (75%, 6/8). Their median hospital stay was 3.5 (range 3-5) days. No infants died due to E13 infection.

Patients > 12-months. Of 21 cases with discharge diagnosis, 20 (95%) had aseptic meningitis and one had bacterial meningitis. The most common complaints were headache (100%), stiff neck (100%), photophobia (86%, 18/21), vomiting (90%, 19/21), lethargy (95%, 20/21) and fever (81%, 17/21). No rash was presented in patients older than 12 months during the medical examinations.

CSF results. The median white blood cell count in the CSF from 28 cases was 197.5 (range 1-1043) x 10⁶/L with 50% (14/28) ≤ 200 x 10⁶/L. Differential cell counts were available for 25 cases; monocytes predominated in 80% (20/25) cases, and neutrophils predominated in 56% (5/25) cases. 69% of cases had CSF protein concentration more than 0.45g/L and 23% with glucose concentration less than 2.5 mmol/L. E13 viruses were isolated from 23/29 (79%) CSF specimens.

Figure 16. Temporal and geographical distribution of the E13 outbreak



MEASLES, MUMPS AND RUBELLA

Measles, mumps and rubella have been notifiable diseases since June 1996. For demographic and vaccination data on MMR notification cases and hospitalisations, please refer to "Infectious diseases in New Zealand: 2002 annual surveillance summary" produced by ESR. This report focuses on the laboratory-confirmed MMR cases.

Measles

In 2002, a total of 6 laboratory-confirmed measles cases was reported from Canterbury (3), Otago (1), and Waikato (2). Patients ranged in age from 12m (1), 15m (2), 7y (1), 22y (1) and 30y(1).

Mumps

A total of 22 laboratory-confirmed mumps cases was reported from Otago (8), Waikato (3), Wellington (3), Taranaki (2), South Auckland (1), Canterbury (1), Rotorua (1), Wanganui (1), Southland (1) and Nelson-Marlborough (1). Patients ranged in age from 7 month to 71 years (average 29 years). Mumps IgM was positive for 21 cases and a mumps virus was isolated by tissue culture from one case with intrauterine death.

Rubella

A total of 4 laboratory-confirmed rubella cases was reported in 2002. A 16-month girl from Taranaki was positive with rubella IgM presumably due to the recent vaccination. The remaining 3 cases occurred in adults, 18y male from Nelson-Marlborough, 21y female from Canterbury and 28y female from Hawkes Bay.

ADENOVIRUSES

There was a total of 224 adenovirus isolations in 2002, compared with 216 in 2001. The predominant serotypes in 2002 were adenovirus type 3 (101 isolates, 45.1%), adenovirus type 1 (24 isolates, 10.7%), adenovirus type 2 (24 isolates, 10.7%), adenovirus type 7 (13 isolates, 5.8%) and adenovirus type 8 (6 isolates, 2.7%). In comparison, in 2001 there were 21 isolations of adenovirus type 3 (9.7%), 16 of adenovirus type 1 (7.4%), 13 of adenovirus type 2 (6.0%), 10 of adenovirus type 7 (4.6%) and 4 of adenovirus type 8 (1.8%).

Adenovirus type 3

Based on DNA homology, adenovirus type 3 (Ad3) belongs to subgenus B, cluster 1 (B:1) of human adenoviruses (*Adenoviridae* family: *Mastadenovirus* genus). Ad3 accounts for 13% of all adenovirus isolates typed and reported to WHO. It shows an epidemic appearance with 4-5 year intervals. It is most frequently isolated from children below the age of 4 years. Ad3 can cause pharyngitis with an exudative tonsillitis and frequently conjunctivitis, together with nasal congestion and cough. It can also cause laryngotracheobronchitis, but the pneumonias that occur in young children are the most serious clinical manifestations. Ad3 can also cause gastroenteritis, probably a sign of a systemic infection. Adenoviruses may be an infrequent cause of meningitis, and Ad3 and Ad 7 account for two-thirds of all adenovirus-associated cases of meningitis or meningoencephalitis.

A total of 101 Ad3 isolates was reported in 2002, higher than that of 2001 (21), 2000 (17), 1999 (43), 1998 (74), 1997 (29), and 1996 (28). Of 101

isolates, 99 had detailed demographic information. Patients ranged in age from 3 months to 69 years with a median of 13.5 years. Fifty-one were male and 48 were female (ratio M:F=1.06:1). Ad3 was reported from Auckland (46), Canterbury (22), Waikato (14), Otago (6), Tauranga (3), Southland (2), Nelson-Marlborough (2), Eastern Bay of Plenty (1), Gisborne (1), Hawkes Bay (1) and Taupo (1). Of 97 isolates with known specimen information, Ad3 was isolated from eye swabs (54), respiratory specimens (36), faeces (6) and urine (1). Ad3 was isolated from patients whose illness ranged from febrile respiratory illness, pneumonia, conjunctivitis and gastroenteritis. Two encephalitis patients yielded adenovirus type 3 from their faeces.

NOROVIRUS

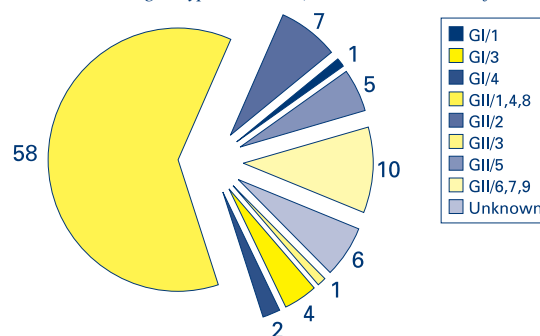
Characterisation of Norovirus strains from gastroenteritis outbreaks occurring in 2002.

In August 2002, the International Committee on Viral Taxonomy reclassified the Norwalk-like virus group into a new Genus *Norovirus* in the *Caliciviridae* Family.

There were 93 outbreaks or clusters of laboratory-confirmed Norovirus - associated gastroenteritis to December 30 2002. Norovirus was also confirmed in a number of individual cases not known to be linked to any outbreaks. As in 2001, there was no seasonal peak in 2002, with outbreaks being reported during all months but 35.5% of the outbreaks occurred in October, November and December. In 2002 extensive spread of NLVs through institutionalised settings was observed both in New Zealand and overseas. In New Zealand, 34 institutional rest home and hospital outbreaks were reported; the majority of these (29, 85.3%) were caused by the GII/1,4,8 'global strain cluster' and occurred in the winter months. Eight outbreaks occurred in child- related settings. Of these, four occurred in child care centres or commercial children's play centres, two in school camps and two in school hostels. Other settings included restaurants, cafes, takeaway bars and catered functions and several family groups around the country. The extent of Norovirus infection originating in the home is unknown.

A wide range of genotypes has circulated during the year. The predominant genotype again was the common 'Lordsdale virus Global strain cluster', GII/1,4,8 (58, 62.4%). The other common genotypes were GII/2 (Melksham virus) and GII/6,7,9 (Napier, Florida and Gwynedd viruses). Uncommon genogroup I strains GI/1 (Norwalk virus) GI/3 (Desert Shield virus) and GI/4 (Chiba virus) are still circulating in New Zealand. A previously rare genotype, GII/5 (White River virus) was identified from five outbreaks. Only one strain of Mexico virus (GII/3) was identified in 2002 and it was associated with consumption of imported oysters. This genotype has been linked with several oyster-related outbreaks in previous years, but has not been identified in New Zealand since December 2000. Imported oysters were implicated in a total of 4 outbreaks and Noroviruses were identified in one imported oyster sample tested. For the majority of outbreaks, person to person transmission was the likely transmission route, with either food or foodhandling implicated in at least 30 outbreaks.

Figure 17. Norovirus genotypes in 2002 (n=94, 2 strains identified in 1 outbreak)



Editorial Note

This will be last issue of Lablink. A new publication, "interPHace", encompassing the material present in both Lablink and New Zealand Public Health Report will be published in the near future.

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