

# NATIONAL CENTRE FOR STREPTOCOCCUS

## ANNUAL REPORT FOR APRIL 1, 2002 TO MARCH 31, 2003

### Introduction

This has been a year of adjustments for the National Centre for Streptococcus (NCS) primarily due to reduced staffing as a result of insufficient funding. This has produced prolonged turn around times for most of our testing, particularly over the past six months. Our specimen load has been similar for the past four years, and reflects participation in both provincial and national notifiable disease programs that have been implemented to monitor these important infections.

Current surveillance data is available on-line through our website at [www.provlab.ab.ca](http://www.provlab.ab.ca). View the National Centre for Streptococcus via the Virtual Lab option. Quarterly and annual reports may be accessed as well as our Guide to Services and expected turn around times. A current summary of publications from the National Centre for Streptococcus is also available.

### Goals and Objectives for the Past Year

1. **Pneumococcal EIA:** Over the past two years, we have endeavored to meet the workload associated with increasing requests for pneumococcal EIA testing. This test is labor intensive and expensive to perform. Furthermore, there are currently no recognized criteria for the clinical interpretation of these results. After consultation with medical specialists, we developed rigorous guidelines to restrict this assay to patients for whom there is evidence of poor vaccination response. Effective January 1, 2003, this assay will be offered only for those patients who have been vaccinated (Pneumovax™ or Prevnar™), and who subsequently develop laboratory confirmed infection with *Streptococcus pneumoniae*. We also request submission of the pneumococcal isolate for serotyping.
2. **Levofloxacin:** Effective April 1, 2002, in response to customer demand, we replaced ofloxacin with levofloxacin as the representative quinolone in our routine antibiotic susceptibility testing panel. Levofloxacin is commonly used to treat pneumococcal pneumonia in the community.
3. **M Type publication:** We completed and published our experience with M type distribution in Canada from 1993 to 1999 (Journal of Clinical Microbiology 2002. 40;4466-4471).
4. **Aerococcus publication:** We completed our collaborative investigation with Dr. Richard Facklam, CDC, Atlanta, of a newly recognized species, *Aerococcus sanguicola*. The data were presented at the 2002 American Society for Microbiology meeting in Salt Lake City, and the manuscript is currently in press (Journal of Clinical Microbiology 2003. June).
5. **emm st2967 investigation:** Our plans to publish our experience with the new group A *Streptococcus emm st2967* was delayed due to conflicting priorities and insufficient time. We hope to pursue this goal in the coming year.
6. **E/Da-Resistant S. pneumoniae phenotype:** We have continued to investigate pneumococci with an unusual erythromycin/clindamycin resistance phenotype. Further molecular work has been completed and we hope to publish this work later this year.

## Activities

### a. Reference Services

After steadily increasing numbers of specimens received at the NCS between 1991 and 1998, our test load has decreased slightly over the past two years. On-going surveillance of invasive *Streptococcus* disease in Canada combined with newly implemented vaccine programs targeted at prevention of invasive pneumococcal disease in young children is expected to result in continued utilization of the testing offered by the NCS. Comparison of specimen numbers for the past four years is presented in Table 1. The majority of the externally funded research projects processed by the NCS last year involved pneumococcus serotyping. Services provided for research projects for 2002/2003 and the proportion of the total testing dedicated to this function are also identified in Table 1. Only externally funded research projects are listed.

Table 1. Specimen Volume and Research Testing

Total Test Requests	1999/00	2000/01	2001/02	2002/03	2002/03 Research	
					# Specimens	% Testing
Group A Serotyping	1140	1111	1103	1133	23	2.0%
Group B Serotyping	473	425	209	279	81	29.0%
Pneumococcal Serotyping	1734	1916	1980	1760	678	38.5%
Identification	243	238	226	224	0	0
Pneumococcal Serology	299	256	351	301	0	0
Other	28	3	11	3	0	0
<b>Total Isolates Received</b>	<b>3917</b>	<b>3949</b>	<b>3880</b>	<b>3700</b>	<b>782</b>	<b>21.1%</b>

### b. Laboratory Surveillance

All of the data presented in this section reflect passive surveillance only. The majority of all isolates tested at the NCS are recovered from normally sterile sites, and/or are associated with invasive disease. Occasionally noninvasive isolates are submitted due to atypical characteristics. Wherever possible, only one isolate was counted per patient, however specimen coding may have prevented interpretation of this information for some isolates.

All data from externally funded studies have been excluded from this report.

Group A Streptococcus

Historically the majority of the GAS that were submitted to the NCS for serotyping have come from Alberta, Ontario and Quebec (Figure 1). Over the past two years we have observed a substantial increase in GAS submitted from British Columbia. We believe that this increase represents enhanced surveillance, and may not necessarily reflect an increase in the incidence of invasive GAS disease in that province. GAS isolates submitted from these four provinces account for 95% (1,073 of 1,133) of the 2002/03 GAS collection.

Figure 1.

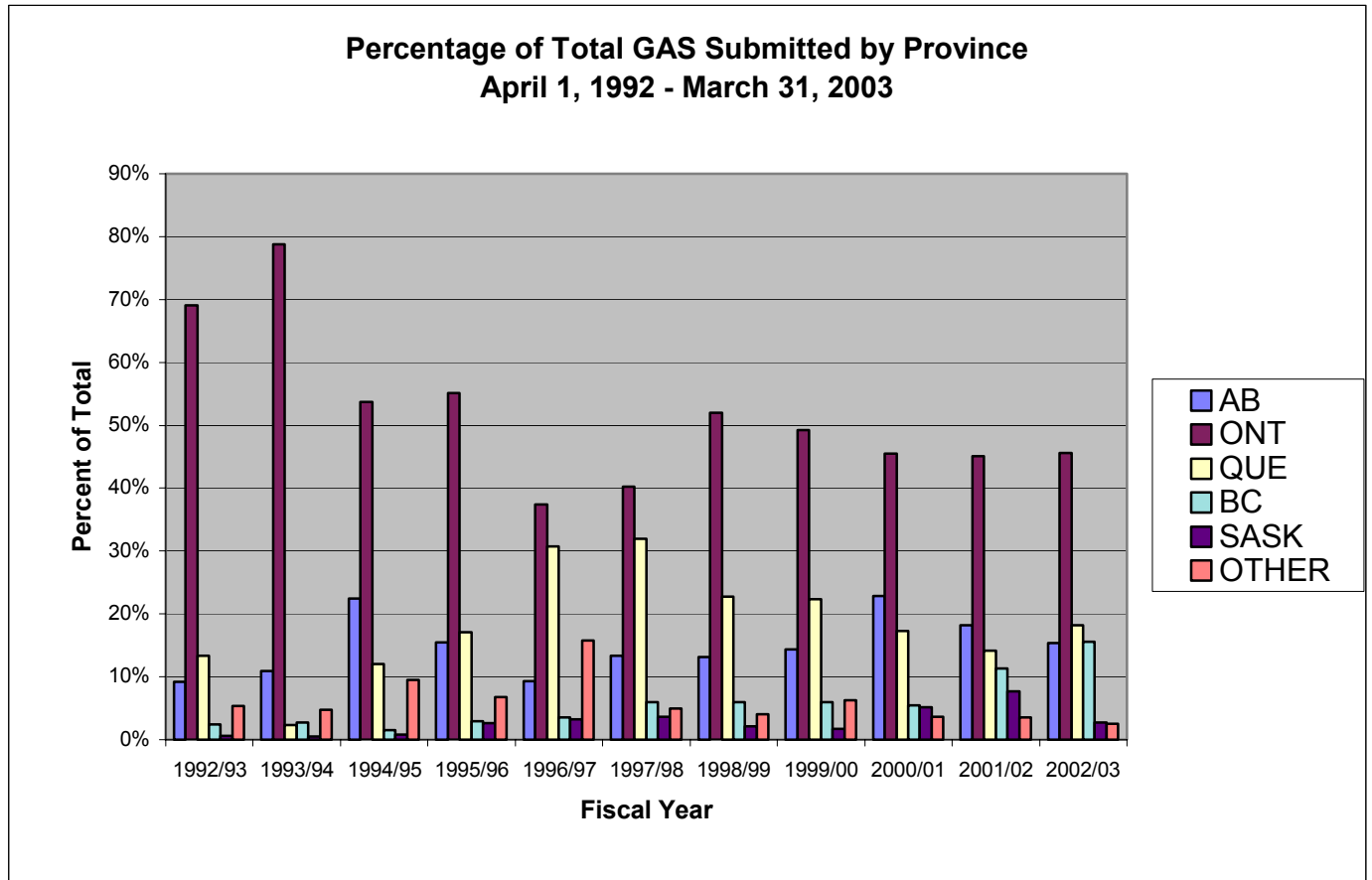


Table 2 presents M type distribution for the past year and comparative data for 2001/02 and 2000/01. Specific M types are known to be poorly antigenic, making it difficult to prepare the M antisera necessary for serological M type classification. Serotypes M28 and M77 fall into this category. These serotypes are more easily classified according to the AOF type, using antisera specific for the serum opacity factor produced by OF positive strains. The AOF type is, with few exceptions, consistent with the M type, and strains typed as 28 or 77 by either method have been listed together in this report.

Table 2. Group A Streptococcus M type Distribution

M type	2002/03			2001/02			2000/01		
	# Cases	Rank	% of total	# Cases	Rank	% of total	# Cases	Rank	% of total
M1	295	1	29.7	186	1	19.0	173	2	18.9
M12	89	2	9.0	79	3	8.1	62	4	6.8
AOF <sup>†</sup> 28	68	3	6.8	56	6	5.7	76	3	8.3
M4	44	4	4.4	64	4	6.5	53	6	5.8
M/AOF <sup>†</sup> 77	43	5	4.3	40	7	4.1	16	14	1.7
M3	39	6	3.9	104	2	10.6	174	1	19.0
M11	38	7	3.8	20	13	2.1	25	9	2.7
M89 (PT4245)	29	8/9	2.9	35	8/9	3.6	21	12	2.3
M6	29	8/9	2.9	30	10	3.1	27	8	3.0
M5	28	10/11	2.8	62	5	6.3	40	7	4.4
M82	28	10/11	2.8	15	16	1.5	NA		
PT2967	27	12	2.7	35	8/9	3.6	56	5	6.1
M nt*	58		5.8	80		8.2	48		5.2
Other	179		18.0	172		17.6	144		15.8
<b>Total</b>	<b>994</b>		<b>100</b>	<b>978</b>		<b>100</b>	<b>915</b>		<b>100</b>

NA = not available

<sup>†</sup>AOF = Anti Opacity Factor type

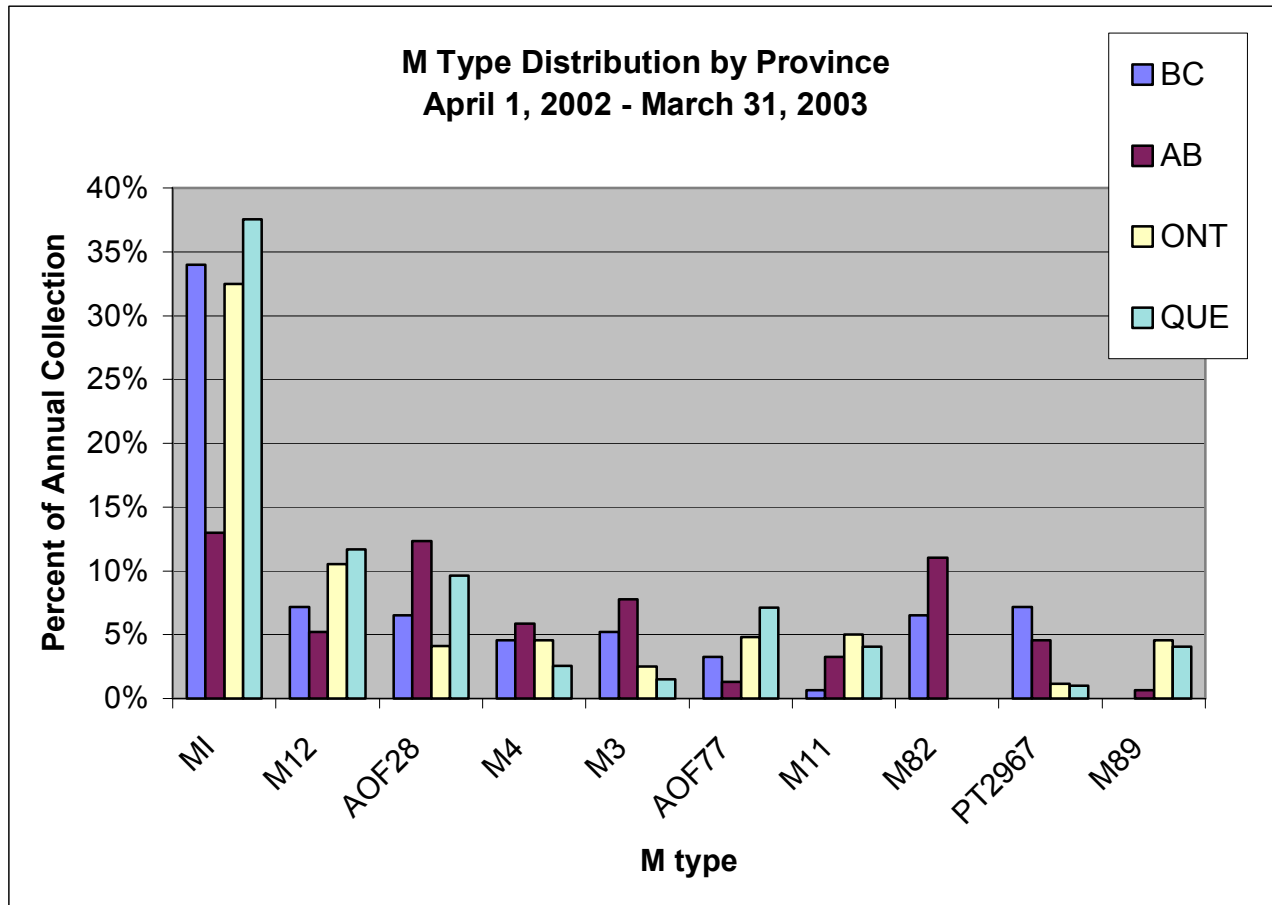
\*nt = not typable

After falling to second place in 2000/01, M1 has regained its first place ranking. Except for 2000/01, this M type has consistently been the most frequently encountered serotype since the NCS began reporting national GAS seroprevalence in 1992. With the exception of M11 and M82, the top 12 serotypes are the same as those reported last year.

The Provincial distribution of the top 10 ranking M types in the 2002/2003 collection, are presented in Figure 2. There is obvious geographic variation across Canada. The predominance of M1 in British Columbia, Ontario and Quebec last year is striking; this type accounted for 34% of the isolates submitted from British Columbia, 32% of those from Ontario, and 38% of the Quebec isolates.

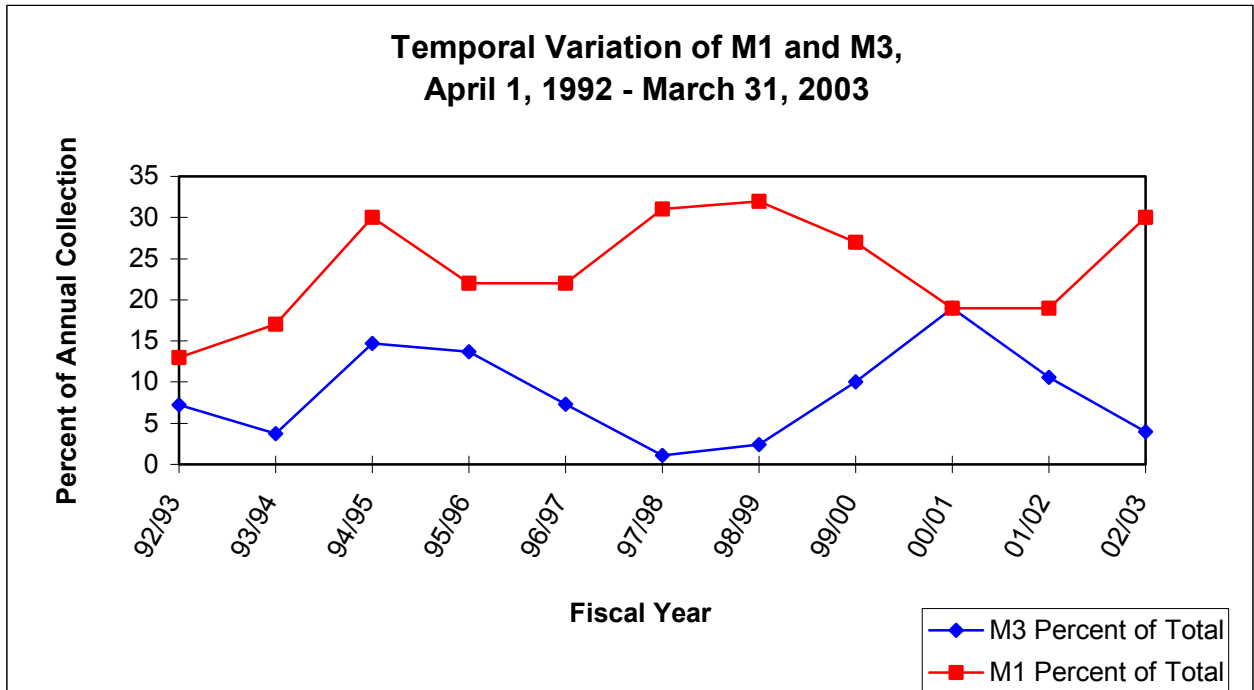
In Alberta, AOF28 was almost as common as M1. Interestingly, M82, PT2967 and M3 were encountered most frequently in isolates submitted from Western Canada.

Figure 2.



The temporal variation of M1 over the past 10 years is compared with that of M3 in Figure 3. For the first four years of our surveillance, the ratio of these two types was relatively proportionate but in 1996/97, the prevalence of M3 began to decline followed by an increase in the prevalence of M1. During 2000/01 M3 was equally as important as M1 as a cause of invasive disease in Canada. The decline in M3 observed over the past two years suggests a 4-5 year pattern in seroprevalence variation for this M type.

Figure 3.



## GAS and Antibiotic Resistance

Antibiotic susceptibility of all GAS submitted for serotyping was determined by the disk diffusion method. Penicillin, erythromycin, clindamycin, chloramphenicol and vancomycin were routinely tested. Only data from Provinces submitting >50 isolates over the past year were analyzed in Table 3. Resistance to erythromycin was associated with MPT2967 and M58.

Table 3. Proportion (%) of Antibiotic Resistance by Region for Group A Streptococci;  
April 1/02 – March 31/03 (comparative data for April 1/01 - March 31/02)

<b>Antibiotic</b>	<b>BC</b>	<b>AB</b>	<b>ON</b>	<b>QB</b>	<b>Other</b>	<b>Total</b>
Erythromycin	14.4 (16.1)	9.1 (11.8)	9.2 (8.8)	11.7 (9.3)	17.0 (16.3)	10.9 (11.0)
Clindamycin	3.3 (1.8)	0 (0.5)	1.1 (0)	3.6 (2.0)	3.8 (0)	1.9 (0.9)
Chloramphenicol	0 (0)	0 (0)	0 (0)	0 (0.7)	0 (0)	0 (0.1)
Penicillin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Vancomycin	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total # isolates tested	153 (112)	154 (187)	437 (430)	197 (151)	53 (98)	994 (978)

All erythromycin-resistant isolates were also screened for inducible resistance to clindamycin using the double disk test. Inducible resistance was detected in 59 of 108 (55%) of the erythromycin-resistant isolates. This resistance mechanism was demonstrated for all MPT2967 isolates examined over the past three years.

Group B Streptococcus

The data presented in table 4 represents the number of cases of invasive disease for which isolates were submitted to the NCS for serotyping. These were primarily from the province of Alberta. Isolates from 146 of 185 cases (79%) received from April 1, 2002 and March 31, 2003 and isolates from 133 of 179 cases (74%) received from April 1, 2001 to March 31, 2002 were from that province. The data therefore may not be representative of national trends. Only one isolate per case was included in the analysis.

Table 4. Group B Streptococcus Serogroup Distribution by Age for April 1, 2002 - March 31, 2003  
(Comparative data for April 1, 2001 - March 31, 2002)

Serotype	<3 mon	3 mon-20 yr	21-50 yr	>50 yrs	Age not specified	Total
V & V / R	5(6)	0(1)	19(14)	26(36)	0(0)	50(57)
III & III / R	10(12)	3(3)	8(5)	15(10)	1(0)	37(30)
Ia & Ia / c	7(5)	1(0)	7(13)	19 (24)	0(0)	34(42)
II & II / c	1(1)	2(0)	9(5)	12(4)	0(0)	24(10)
Ib & Ib/ c	1(3)	1(1)	3(8)	14(9)	0(0)	19(21)
IV	0(0)	0(0)	0(0)	1(2)	0(0)	1(2)
VI	0(0)	0(0)	1(0)	0(2)	0(0)	1(2)
VII	0(0)	0(0)	0(0)	1(0)	0(0)	1(0)
Not typable*	0(1)	0(0)	6(2)	12(12)	0(0)	18(15)
<b>TOTAL</b>	<b>24(28)</b>	<b>7(5)</b>	<b>53(47)</b>	<b>100(99)</b>	<b>1(0)</b>	<b>185 (179)</b>

\*Not typable = carbohydrate antigen not detected

Types V, III and Ia (with and without the c or R protein antigens) account for 65% of the disease represented by this sample. Isolates belonging to serotypes V, Ia, Ib, and II were associated with adult disease; 109 of 127 isolates (86%) belonging to these serotypes were recovered from patients ≥21 years of age. Nontypable isolates are most frequently encountered in older adults. Ten of 24 isolates (41%) that caused invasive disease in the youngest age group (<3 months) belonged to serotype III and III/R.

Five isolates from cerebrospinal fluid were submitted. Four of these were from children <3 months old; two belong to serotype III/R, one to serotype V/R and one to serotype Ia/c. The fifth CSF isolate was cultured from a 65 year old adult and belonged to serotype Ib/c.

## GBS and Antibiotic Resistance

Antibiotic susceptibility of all GBS submitted for serotyping was determined by the disk diffusion method. Penicillin, erythromycin, clindamycin, chloramphenicol and vancomycin were routinely tested. Because the majority of the isolates were submitted from Alberta, data are presented for that province separately from the rest of Canada (TROC) in Table 5.

In Alberta, erythromycin resistance is similar to that observed in 2001/02 while the proportion of clindamycin resistance has increased. Resistance to both antibiotics decreased for isolates submitted from other provinces, but resistance rates for TROC should be interpreted with caution due to the small sample size. There is no obvious association between serotype and resistance to either of these antibiotics; resistance was encountered in all of the most common serotypes and in nontypable isolates.

Table 5. Proportion (%) of Antibiotic Resistance by Region for Group B Streptococci; April 1/02 – March 31/03 (comparative data for April 1/01 - March 31/02)

<b>Antibiotic</b>	<b>Alberta</b>	<b>TROC</b>	<b>Total</b>
Erythromycin	21.2 (21.8)	12.8 (17.4)	19.5 (20.7)
Clindamycin	15.1 (7.5)	2.6 (8.7)	12.4 (7.8)
Chloramphenicol	0(0)	0(0)	0(0)
Penicillin	0(0)	0(0)	0(0)
Vancomycin	0(0)	0(0)	0(0)
<b>Total # isolates tested</b>	<b>146 (133)</b>	<b>39 (46)</b>	<b>185 (179)</b>

Streptococcus pneumoniae

The following analyses for April 1, 2000 to March 31, 2003 exclude data from isolates received from Laboratoire de Santé Publique du Québec (LSPQ), where serotyping for their provincial pneumococcal surveillance program is performed. Only isolates of less common serotypes are submitted to the National Centre for Streptococcus for factoring; data from these uncommon serotypes have been excluded in an effort to eliminate the resulting bias. Data specific for Quebec may be obtained by contacting the LSPQ directly. Please note that comparative data from previous years do not exclude isolates from Québec, and this must be considered when interpreting the data.

Seroprevalence for pneumococcal isolates recovered from blood and CSF for the past five years is presented in Table 6. These same serotypes have consistently been among the top 13 for the past 5 years with only slight changes in ranking. The reason for an apparent slight increase (2001- 2003) in the prevalence of type 3 over the previous 3 years is unclear. With the exception of serotype 6A, all serotypes listed in table 6 are included in the currently available 23-valent vaccine, and cross-protection for serotype 6A is expected. Overall, vaccine coverage can be expected for 93% of the total cases represented in the 2002/03 collection, and 89% if serotype 6A is excluded.

Table 6. Comparative Ranking of the Most Common Serotypes April 1, 1998 - March 31, 2003

<b>Serotype</b>	<b>2002-03</b>	<b>2001-02</b>	<b>2000-01</b>	<b>1999-2000</b>	<b>1998-1999</b>
<b>Type 14</b>	1	1	1	1	1
<b>Type 4</b>	2	2	2	5	4
<b>Type 19F</b>	3	7	4	3	3
<b>Type 6B</b>	4	5	3	2	2
<b>Type 9V</b>	5	3	5	4	5
<b>Type 23F</b>	6	11	10	6	6
<b>Type 18C</b>	7	4	6	7	8
<b>Type 3</b>	8	6	11/12	11	10
<b>Type 22F</b>	9	8	9	8	11
<b>Type 6A</b>	10	12	13	10	10
<b>Total cases</b>	<b>828</b>	<b>703</b>	<b>670</b>	<b>772</b>	<b>876</b>

As in previous years, Alberta was disproportionately represented in this collection, presumably because of proximity and community awareness of national and provincial surveillance programs. Forty-nine percent (403 of 828 isolates) of the 2002/03 sample was from Alberta. Because of this obvious bias, Table 7 presents Alberta data separately from the rest of Canada (TROC). Types 14 and 4 are the most common serotypes across Canada. The top 10 serotypes are the same for both Alberta and TROC.

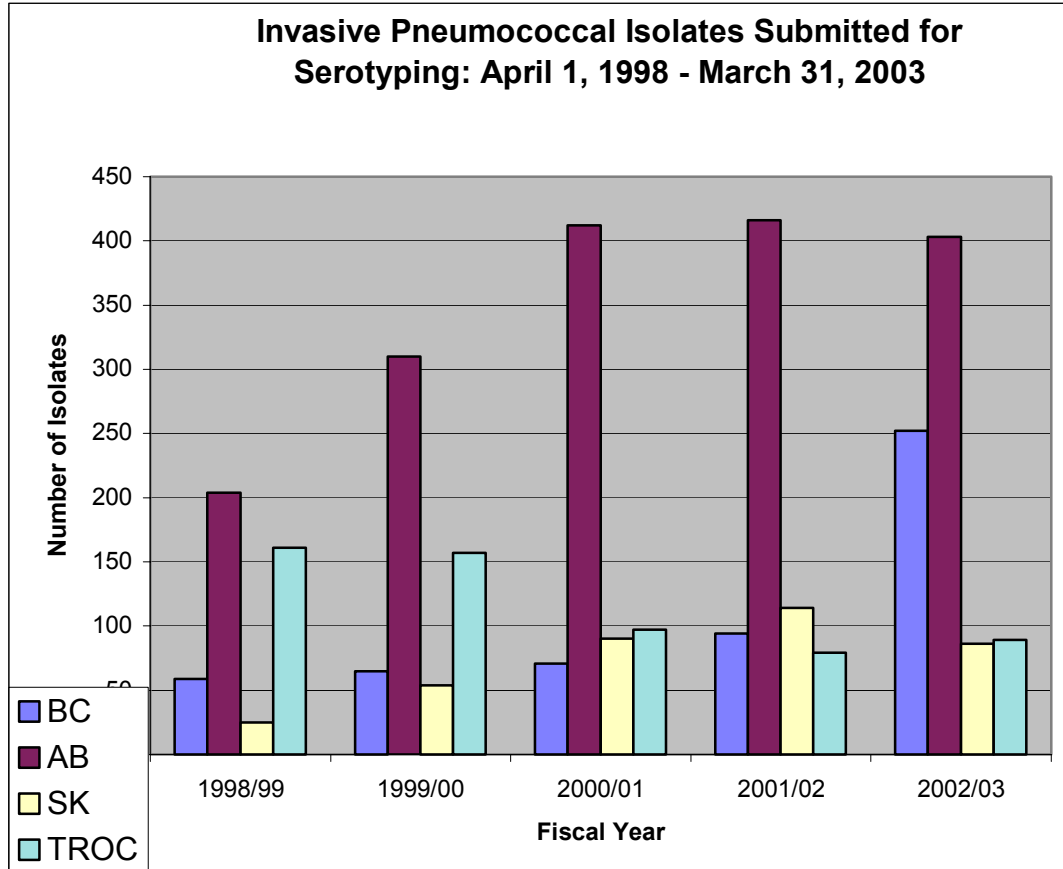
Table 7. Serotype Distribution in Alberta compared with the rest of Canada (TROC) for 2002/03 Rank and Percent of the total for 2002/03 (comparable data for 2001/02)

Serotype	Alberta		TROC	
	Rank	Percent of Total	Rank	Percent of Total
<b>Type 14</b>	1 (1)	15.9 (17.6)	1 (1)	20.0 (12.9)
<b>Type 4</b>	2 (2)	10.4 (13.0)	2 (2)	8.2 (11.9)
<b>Type 6B</b>	3 (7)	7.0 (5.3)	6 (4)	6.8 (8.0)
<b>Type 19F</b>	4 (8)	6.7 (4.3)	4-5 (5)	7.3 (7.3)
<b>Type 22F</b>	5 (4)	6.5 (6.3)	9 (12)	4.0 (3.5)
<b>Type 3</b>	6 (5)	6.2 (6.0)	8 (8)	4.9 (5.2)
<b>Type 18C</b>	7 (3)	5.5 (7.2)	7 (7)	5.9 (5.6)
<b>Type 9V</b>	8 (6)	5.2 (5.5)	3 (3)	7.5 (9.8)
<b>Type 6A</b>	9 (9)	4.7 (4.1)	10 (13)	3.3 (2.1)
<b>Type 23F</b>	10-12 (11)	4.2 (3.4)	4-5 (9/10)	7.3 (4.2)
<b>Type 1</b>	10-12 (12)	4.2 (2.6)	13 (6)	2.4 (5.9)
<b>Type 8</b>	10-12 (10)	4.2 (3.6)	14 (9/10)	2.1 (4.2)
<b>Other Types</b>		19.3 (21.1)		20.3 (19.4)
<b>Total # cases</b>		<b>403 (416)</b>		<b>425 (287)</b>

The number of pneumococcal isolates submitted to the NCS from outside Alberta increased substantially from the previous year (425 compared with 287). This was due primarily to an increase from the Province of British Columbia. A comparison of the number of isolates submitted from the 3 Western provinces compared with those submitted from the rest of Canada (TROC), excluding Quebec, is presented in Figure 4. The increase observed for Alberta after 1998 was due to the implementation of a Provincial surveillance program in the fall of that year, to monitor invasive pneumococcal disease. Based on the limited number of isolates received from provinces east of Saskatchewan, it appears that only selected pneumococcal isolates from those regions are submitted for serotyping.

It should be noted that Ontario has initiated a provincial pneumococcus surveillance program and they have indicated that they wish to begin sending invasive isolates to the NCS for serotyping. Our significant funding problems have prevented us from providing laboratory support at this time. This problem has been brought to the attention of the appropriate National Funding agency.

Figure 4. Pneumococcal Isolates Submitted to the NCS. (Excludes Quebec)



The serotypes that cause invasive disease in young children are known to be different from those causing disease in older patients. The data for April 1, 2002 – March 31, 2003 have been presented in tables 8 and 9 sorted according to patient age. Comparative data for the previous year are also provided.

Table 8. Serotype Distribution for Children ( $\leq 16$  years) for April 1, 2002 - March 31, 2003  
(Comparative data for April 1, 2001 - March 31, 2002)

Serotype	$\leq 5$ years	6 - 16 years	Total $\leq 16$ years	
	# Cases	# Cases	# Cases	Rank
Type 14*	76(55)	4(1)	80(56)	1(1)
Type 19F*	30(23)	1(1)	31(24)	2(4)
Type 6B*	29(27)	1(2)	30(29)	3(3)
Type 18C*	20(25)	6(6)	26(31)	4(2)
Type 4*	16(16)	2(2)	18(18)	5(6)
Type 23F*	15(8)	1(0)	16(8)	6(10)
Type 9V*	6(16)	9(3)	15(19)	7(5)
Other Types	52(40)	18(20)	70(60)	
Total No. Cases	244(210)	42(35)	286(245)	

\* Serotypes included in the heptavalent conjugate vaccines

Serotype 14 is the most prevalent serotype in both adults and children, while serotypes 18C and 19F were commonly isolated from invasive disease in children and were encountered less frequently in adults.

Seventy-nine percent of the isolates recovered from children  $\leq 5$  years of age (192 of 244 isolates) belong to the seven serotypes which are included in the heptavalent conjugate vaccines.

Table 9. Serotype Distribution for Adults ( $\geq 17$  years) for April 1, 2002 – March 31, 2003  
(Comparative data for April 1, 2001 - March 31, 2002)

Serotype	17-64 years	$\geq 65$ years	Total $\geq 17$ years	
	# Cases	# Cases	# Cases	Rank
Type 14*	40(27)	29(27)	69(54)	1(2)
Type 4*	46(58)	13(12)	59(70)	2(1)
Type 3*	19(17)	24(18)	43(35)	3(3)
Type 9V*	23(18)	15(14)	38(32)	4(5)
Type 22F*	21(21)	16(12)	37(33)	5(4)
Type 23F*	16(8)	16(10)	32(18)	6(8)
Type 6B*	12(9)	15(7)	27(16)	7-8(9-10)
Type 19F*	16(10)	11(5)	27(15)	7-8(11-12)
Type 8*	20(20)	5(5)	25(25)	9(6)
Type 7F*	19(13)	5(3)	24(16)	10(9-10)
Type 18C*	14(10)	7(5)	21(15)	11(11-12)
Other Types	97(75)	43(54)	140(128)	
Total No. Cases	343 (286)	199(172)	542(457)	

\* Serotypes included in the 23-valent vaccine

Serotypes 3, 7F, 8 and 22F were frequently recovered from the adult population, but not from young ( $\leq 5$  yrs) children. The 23-valent vaccine (Pneumovax™) would provide coverage for 92% of these invasive adult isolates (498 of 542), assuming cross-protection for types 6A and 6B.

Forty-five isolates from cerebrospinal fluid were submitted. These belonged to 18 different serotypes. Eighteen of the 45 cases had an accompanying blood isolate; the serotype of these isolates always matched the serotype of the CSF isolate. Cases were distributed over all age ranges; 22 (49%) were from patients  $\leq 16$  years of age including 18 from children  $\leq 2$  years, the target group for the new 7-valent conjugate vaccine. Of 23 isolates from the  $\geq 17$  year old age group, only 6 patients were  $\geq 65$ . Table 10 compares the serotype with the age range of the patients from whom the pneumococci were isolated.

Table 10. Comparison of serotype & age range for pneumococci from CSF for Apr 1/02 - Mar 31/03.

<b>Serotype</b>	<b><math>\leq 2</math> years</b>	<b>3-5 years</b>	<b>6-16 years</b>	<b>17-64 years</b>	<b><math>\geq 65</math> years</b>	<b>Total</b>
Type 14 <sup>Δ</sup>	5	1			1	7
Type 4 <sup>Δ</sup>	1			3	1	5
Type 23F <sup>Δ</sup>	3	1		1		5
Type 6B <sup>Δ</sup>	3			1		4
Type 18C <sup>Δ</sup>	3			1		4
Type 22F <sup>Δ</sup>	1				2	3
Type 6A				1	1	2
Type 3 <sup>Δ</sup>				1	1	2
Type 9V <sup>Δ</sup>				2		2
Type 19A <sup>Δ</sup>	1			1		2
Type 34				2		2
Type 9N <sup>Δ</sup>			1			1
Type 12F <sup>Δ</sup>				1		1
Type 19F <sup>Δ</sup>				1		1
Type 23A			1			1
Type 15C				1		1
Type 35B				1		1
Type 38	1					1
<b>Total</b>	<b>18</b>	<b>2</b>	<b>2</b>	<b>17</b>	<b>6</b>	<b>45</b>

<sup>Δ</sup> Serotypes included in the 23-valent vaccine (Pneumovax™)

*Streptococcus pneumoniae* and Antibiotic Resistance

As of April 1, 2000 susceptibility testing of chloramphenicol, clindamycin, erythromycin, ofloxacin, trimethoprim-sulfamethoxazole and vancomycin was implemented for all invasive pneumococci submitted to the NCS for serotyping (excluding Quebec). In April, 2002, ofloxacin was replaced by levofloxacin as the representative quinolone in our testing panel. The minimum inhibitory concentration was determined by the National Committee for Clinical Laboratory Standards (NCCLS) recommended broth microdilution method.

Because isolates from Alberta account for almost half of this collection, antibiotic resistance data have been analyzed separately in Tables 11 and 13-15. The proportion of intermediate and full resistance to seven antibiotics for Alberta compared with the rest of Canada (TROC) is presented in Table 11. These data are analyzed separately for children ( $\leq 16$  yrs) and adults ( $\geq 17$  yrs) in tables 13 and 15. As expected, all isolates were susceptible to vancomycin.

Table 11. Proportion (%) of Antibiotic Resistance by Region for Pneumococci;

**Analysis for All Ages:** from April 1, 2002 - March 31, 2003

(Comparative data for April 1/01 - March 31/02)

Antibiotic	Interpretive Category	Alberta # of isolates = 403(416)	TROC # of isolates = 425(287)	Total for Canada # isolates = 828(703)
Penicillin	Intermediate	6.5(4.1)	6.6(5.6)	6.5(4.7)
	Resistant	2.2(6.0)	3.3(5.2)	2.8(5.7)
	<b>Total</b>	<b>8.7(10.1)</b>	<b>9.9(10.8)</b>	<b>9.3(10.4)</b>
Ceftriaxone***	Intermediate	0.3(6.5)	0.5(5.2)	0.4(6.0)
	Resistant	0(0.7)	0(1.1)	0(0.8)
	<b>Total</b>	<b>0.3(7.2)</b>	<b>0.5(6.3)</b>	<b>0.4(6.8)</b>
Chloramphenicol	Intermediate	0(0)	0(0)	0(0)
	Resistant	1.5(1.7)	2.4(1.1)	1.9(1.4)
	<b>Total</b>	<b>1.5(1.7)</b>	<b>2.4(1.1)</b>	<b>1.9(1.4)</b>
Clindamycin	Intermediate	0(0)	0(0)	0(0)
	Resistant	3.0(1.2)	2.8(1.7)	2.9(1.4)
	<b>Total</b>	<b>3.0(1.2)</b>	<b>2.8(1.7)</b>	<b>2.9(1.4)</b>
Erythromycin	Intermediate	0.3(0)	0(0)	0.1(0)
	Resistant	7.9(7.9)	9.6(6.6)	8.8(7.4)
	<b>Total</b>	<b>8.2(7.9)</b>	<b>9.6(6.6)</b>	<b>8.9(7.4)</b>
Levofloxacin	Intermediate	0(0)	0(0.3)	0(0.1)
	Resistant	0(0)	0.7(0.3)	0.4(0.1)
	<b>Total</b>	<b>0(0)</b>	<b>0.7(0.7)</b>	<b>0.4(0.3)</b>
Trimethoprim-Sulfamethoxazole	Intermediate	10.9(5.0)	7.3(7.3)	9.1(6.0)
	Resistant	11.4(10.6)	10.4(11.2)	10.9(10.8)
	<b>Total</b>	<b>22.3(15.6)</b>	<b>17.6(18.5)</b>	<b>19.9(16.8)</b>

\*\*\* Ceftriaxone category interpretation for the previous fiscal year (April 1, 2001 to March 31, 2002) is based on NCCLS 2001 guidelines (M100-S11). Ceftriaxone category interpretation for the current surveillance period (April 1, 2002 – March 31, 2003) is based on NCCLS 2002 guidelines (M100-S12).

In January, 2002, the NCCLS modified the interpretive standard for pneumococci when testing ceftriaxone, cefotaxime and cefepime (Document M100-S12). The MIC breakpoints for these drugs for pneumococci isolated from patients with meningitis are now interpreted differently from pneumococci isolated from nonmeningitis cases. The new interpretation for all three antibiotics is provided in Table 12.

Table 12. Jan, 2002 NCCLS ceftriaxone, cefotaxime & cefepime interpretive standards for *S. pneumoniae*

	<b>Susceptible MIC breakpoint</b>	<b>Intermediate MIC breakpoint</b>	<b>Resistant MIC breakpoint</b>
<b>Meningitis</b>	≤0.5 µg/ml	1.0 µg/ml	≥2.0 µg/ml
<b>Nonmeningitis</b>	≤1.0 µg/ml	2.0 µg/ml	≥4.0 µg/ml

The marked reduction in reduced susceptibility to ceftriaxone reported for 2002/03 compared with data from 2001/02 is a result of the application of these new criteria, rather than a reflection of changed resistance patterns.

Table 13. Proportion (%) of Antibiotic Resistance by Region for Pneumococci;  
**For children (≤16 yrs);** from April 1, 2002 – March 31, 2003  
 (comparative data for April 1/01 - March 31/02)

Antibiotic	Interpretive Category	Alberta # of isolates = 125(141)	TROC # of isolates = 161(104)	Total for Canada # isolates = 286(245)
Penicillin	Intermediate Resistant	9.6(5.7) 2.4(8.5)	8.1 (9.6) 5.0 (6.7)	8.7(7.3) 3.9(7.8)
	<b>Total</b>	<b>12.0(14.2)</b>	<b>13.0(16.3)</b>	<b>12.6(15.1)</b>
Ceftriaxone***	Intermediate Resistant	0.8(8.5) 0(2.1)	0.6(5.8) 0(1.9)	0.7(7.4) 0(2.0)
	<b>Total</b>	<b>0.8(10.6)</b>	<b>0.6(7.7)</b>	<b>0.7(9.4)</b>
Chloramphenicol	Intermediate Resistant	0(0) 3.2(1.4)	0(0) 3.1(1.0)	0(0) 3.2(1.2)
	<b>Total</b>	<b>3.2(1.4)</b>	<b>3.1(1.0)</b>	<b>3.2(1.2)</b>
Clindamycin	Intermediate Resistant	0(0) 4.0(2.8)	0(0) 5.0(2.9)	0(0) 4.6(2.9)
	<b>Total</b>	<b>4.0(2.8)</b>	<b>5.0(2.9)</b>	<b>4.6(2.9)</b>
Erythromycin	Intermediate Resistant	0(0) 11.2(9.9)	0(0) 11.2(12.5)	0(0) 11.2(11.0)
	<b>Total</b>	<b>11.2(9.9)</b>	<b>11.2 (12.5)</b>	<b>11.2 (11.0)</b>
Levofloxacin	Intermediate Resistant	0(0) 0(0)	0(0) 0(0)	0(0) 0(0)
	<b>Total</b>	<b>0(0)</b>	<b>0(0)</b>	<b>0(0)</b>
Trimethoprim-Sulfamethoxazole	Intermediate Resistant	12.8(5.7) 13.6(13.5)	6.2(13.5) 13.0(11.5)	9.1(9.0) 13.3(12.6)
	<b>Total</b>	<b>26.4(19.2)</b>	<b>19.3(25.0)</b>	<b>22.4(21.6)</b>

\*\*\* Ceftriaxone category interpretation for the previous fiscal year (April 1, 2001 to March 31, 2002) is based on NCCLS 2001 guidelines (M100-S11).  
 Ceftriaxone category interpretation for the current surveillance period (April 1 – December 31, 2002) is based on NCCLS 2002 guidelines (M100-S12).

Because the interpretation of the ceftriaxone MIC is dependent upon whether or not the patient has meningitis, a breakdown of that MIC interpretation by specimen source is provided in Tables 14 and 16.

Table 14. **Ceftriaxone interpretation** for pneumococci from **children (≤16 yrs)** (April 1/02 - March 31/03) by specimen source according to NCCLS Document M100-S12, January, 2002  
 Number of isolates (%)

Specimen Source	ALBERTA			TROC			TOTAL		
	# Isolates	Inter-mediate	Resis-tant	# Isolates	Inter-mediate	Resis-tant	# Isolates	Inter-mediate	Resis-tant
Blood/nonmeningitis	112	0	0	152	1	0	264	1	0
CSF/meningitis	13	1	0	9	0	0	22	1	0
<b>Total</b>	<b>125</b>	<b>1(0.8)</b>	<b>0(0)</b>	<b>161</b>	<b>1(0.6)</b>	<b>0(0)</b>	<b>286</b>	<b>2(0.7)</b>	<b>0(0)</b>

The most notable change in resistance patterns observed for children is the encouraging decrease in penicillin resistance observed overall. Of particular note is the reduction in full penicillin resistance observed for children from Alberta. While the resistance rates for trimethoprim/sulfamethoxazole appeared unchanged overall, there was an increase in Alberta, accompanied by an apparent decrease in resistance for isolates submitted from the rest of Canada. Resistance rates increased for both chloramphenicol and clindamycin. The overall resistance rate for erythromycin is similar to that reported for the previous fiscal year, but appears to have increased slightly in Alberta. Reduced resistance to ceftriaxone was due to the implementation of new interpretive criteria.

Table 15. Proportion (%) of Antibiotic Resistance by Region for Pneumococci;  
**For adults (≥17 yrs);** from April 1, 2002 – March 31, 2003  
 (comparative data for April 1/01 - March 31/02)

Antibiotic	Interpretive Category	Alberta # of isolates = 278(275)	TROC # of isolates = 264(182)	Total for Canada # isolates = 542(457)
Penicillin	Intermediate Resistant	5.0(3.3) 2.2(4.7)	5.7(3.3) 2.3(4.4)	5.4(3.3) 2.2(4.6)
	<b>Total</b>	<b>7.2(8.0)</b>	<b>8.0(7.7)</b>	<b>7.6(7.9)</b>
	Ceftriaxone***	0(5.5) 0(0)	0.4(5.0) 0(0.6)	0.2(5.3) 0(0.2)
Chloramphenicol	Intermediate Resistant	0(0) 0.7(1.8)	0(0) 1.9(1.1)	0(0) 1.3(1.5)
	<b>Total</b>	<b>0.7(1.8)</b>	<b>1.9(1.1)</b>	<b>1.3(1.5)</b>
	Clindamycin	0(0) 2.5(0.4)	0(0) 1.5(1.1)	0(0) 2.0(0.7)
Erythromycin	Intermediate Resistant	0.4(0) 6.5(6.9)	0(0) 8.7(3.3)	0.2(0) 7.6(5.5)
	<b>Total</b>	<b>6.8(6.9)</b>	<b>8.7(3.3)</b>	<b>7.8(5.5)</b>
	Levofloxacin	0(0) 0(0)	0(0.3) 1.1(0.3)	0(0.1) 0.6(0.1)
Trimethoprim-Sulfamethoxazole	Intermediate Resistant	10.1(4.7) 10.4(9.1)	8.0(3.8) 8.7(11.0)	9.0(4.4) 9.6(9.8)
	<b>Total</b>	<b>20.5(13.8)</b>	<b>16.7(14.8)</b>	<b>18.6(14.2)</b>

\*\*\* Ceftriaxone category interpretation for the previous fiscal year (April 1, 2001 to March 31, 2002) is based on NCCLS 2001 guidelines (M100-S11).  
 Ceftriaxone category interpretation for the current surveillance period (April 1 – December 31, 2002) is based on NCCLS 2002 guidelines (M100-S12).

Table 16. **Ceftriaxone interpretation** for pneumococci from **adults (≥17 yrs)** (April 1/02 - March 31/03) by by specimen source according to NCCLS Document M100-S12, January, 2002  
Number of isolates (%)

Specimen Source	ALBERTA			TROC			TOTAL		
	# Isolates	Inter-mediate	Resis-tant	# Isolates	Inter-mediate	Resis-tant	# Isolates	Inter-mediate	Resis-tant
Blood/nonmeningitis	268	0	0	251	0	0	519	0	0
CSF/meningitis	10	0	0	13	1	0	23	1	0
<b>Total</b>	<b>278</b>	<b>0(0)</b>	<b>0(0)</b>	<b>264</b>	<b>1(0.4)</b>	<b>0(0)</b>	<b>542</b>	<b>1(0.2)</b>	<b>0(0)</b>

There were only slight changes in antibiotic resistance patterns for adults over the past year. As for children, we observed a reduction in the proportion of fully penicillin resistant isolates both for Alberta and for the rest of Canada. There was a slight increase in clindamycin resistance observed in Alberta, and an increase in erythromycin resistance in isolates submitted from other provinces. Rates of trimethoprim/sulfamethoxazole resistance continue to rise both for children and adults. As expected, quinolone resistance (levofloxacin) was observed only in adult isolates and, similar to last year, was not reported from the province of Alberta.

#### General observations of antibiotic resistance for all ages

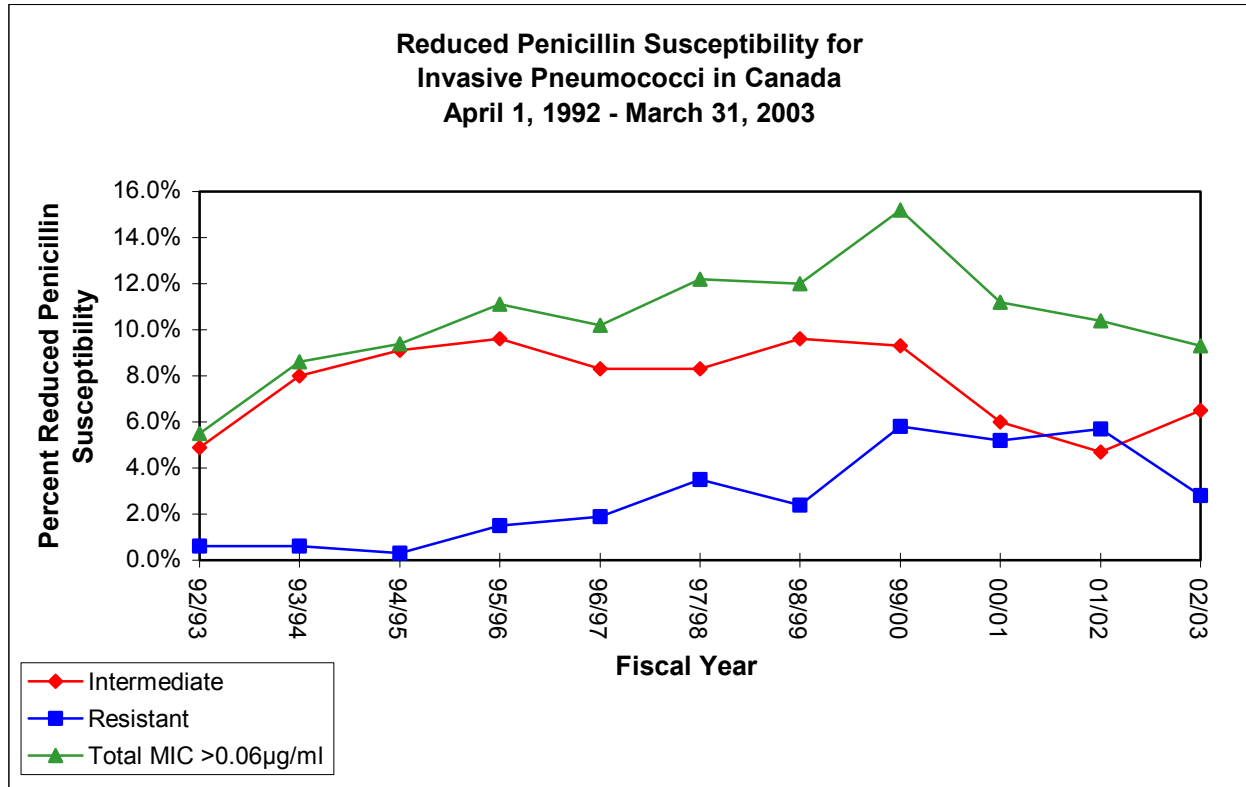
Reduced susceptibility to penicillin was detected in 77 isolates belonging to 8 different serotypes. Ninety-nine percent of these (76 of 77) are covered by the 23-valent vaccine if one assumes cross-protection for serotype 6A. Thirty percent (23 of 77) of these strains are fully resistant to penicillin (MIC ≥2.0 µg/ml); this was observed most frequently for types 9V and 14.

As observed in previous years, resistance to erythromycin and to trimethoprim-sulfamethoxazole frequently occurred in the absence of reduced susceptibility to penicillin. Forty-three (59%) of 73 erythromycin-resistant pneumococci and 98 of 165 (59%) trimethoprim-sulfamethoxazole-resistant pneumococci were susceptible to penicillin. This may be clinically relevant if antibiotic resistance observed for our invasive isolates can be extrapolated to pneumococci causing non-invasive disease. Both drugs are frequently used to treat respiratory infections.

We have defined multiple resistance as intermediate or full resistance to three different classes of antibiotics. Thirty-six of 828 isolates (4.3%) were multiply resistant; 30 of these had reduced susceptibility to penicillin. Multiple resistance was demonstrated in serotypes 14 (15 isolates), 6B (9 isolates), 23F (3 isolates), 19A (3 isolates), 9V (2 isolates), 6A (1 isolate), 19F (1 isolate), 4 (1 isolate) and type 2 (1 isolate). Serotype 2 is very uncommon in the Canadian population; multiple resistance in this isolate makes this a particularly unusual strain. This strain was susceptible to penicillin, but resistant to chloramphenicol, erythromycin and clindamycin. It was isolated from a blood culture of a 55 year old female.

After peaking in 1999-2000, there has been a continued trend toward decreasing rates of penicillin resistance overall (Figure 5). Even more encouraging is the decrease in the proportion of pneumococci that are fully resistant to penicillin (MIC  $\geq 2.0\mu\text{g/ml}$ ) that was observed over the past year.

Figure 5.



### c. Outbreak Investigation

Tracking outbreak and/or clusters of streptococcal infection is sometimes difficult since a description of the event is not always submitted. When non-invasive isolates are received in this laboratory, follow up is initiated to determine the reason for the test request. It is often only after this type of contact with the submitting agency that we are able to identify the group of specimens as part of an outbreak investigation. We encourage laboratory directors to reinforce the importance of submitting outbreak documentation to the NCS, and recruiting the assistance of their local outbreak investigation teams in this regard.

During the past year the NCS was asked to provide laboratory testing for 13 epidemiological investigations conducted in 3 provinces. This was slightly lower than for 2001-2002 when requests for investigation of 15 events were received from 5 provinces. The investigations conducted during 2002/03 are listed in Table 17.

Table 17. Summary of Epidemiologic Investigations April 1, 2002 - March 31, 2003

Investigation Number	Province Requesting Investigation	Test Request	No. of Samples	Causative Agent
02-505	Ontario	GAS serotyping investigation of day care centre outbreak	5	Random serotype distribution – no pattern
02-506	Ontario	GAS serotyping investigation of nursing home outbreak	2	M1 T1 OF – (2 of 2 isolates)
02-507	Ontario	GAS serotyping investigation of Health Centre outbreak	6	M nontypable T28 AOF 28 OF + (5 of 6 isolates)
02-508	British Columbia	GAS necrotizing fasciitis and contacts	6	M12 T12 OF – (4 of 6 isolates, including index case)
02-509	Ontario	GAS serotyping investigation of nursing home outbreak	7	M77 T9/13/28 R28 AOF 77 OF + (6 of 7 isolates)
02-510	Ontario	GAS serotyping investigation of nursing home outbreak	6	M44/61 T5/27/44 AOF 44 OF + (5 of 6 isolates)
02-511	Ontario	GAS serotyping investigation of nursing home outbreak	5	M11 T11 AOF 11 OF + (5 of 5 isolates)
02-512	Ontario	GAS serotyping investigation of acute care hospital cluster	4	Random distribution of 3 different M types - (2 M1 T1) no pattern
03-5001	Ontario	GAS serotyping investigation of nursing home outbreak	24	M1 T1 OF – (11 isolates including index case) M12 T12 OF – (11 isolates) 2 'other' M types
03-5002	Ontario	GAS serotyping investigation of nursing home outbreak	2	M77 T9/13/28 R28 AOF 77 OF + (2 of 2 isolates)
03-5003	Ontario	GAS serotyping investigation of nursing home outbreak	10	M1 T1 OF – (10 of 10 isolates)
03-5004	Ontario	GAS serotyping investigation of nursing home outbreak	15	M89 T11 AOF 89 OF + (9 of 15 isolates including index case) M12 T12 OF – (5 isolates) 1 'other' M type
03-5005	Nova Scotia	GAS serotyping Acute care cluster investigation; one case fatal pneumonia (2 isolates) plus 4 cases of invasive disease (blood isolates)	6	M3 T3/13/B3264 OF – (fatal pneumonia) M1 T1 OF – (3 of 4 blood isolates) M2 T2/28 R28 AOF 2 OF + (1 blood isolate)

#### d. Research

Table 18 lists completed and/or on-going research projects in which the National Centre for Streptococcus participated during 2002 - 2003.

#### Streptococcus pneumoniae

Table 18. Summary of Research Projects April 1, 2002 - March 31, 2003

Researcher/Agency	Study Description	Services Required
Pan American Health Organization with funding from the Canadian International Development Agency	SIREVA Project - determination of pneumococcal seroprevalence and antibiotic resistance rates in Latin American children <5 yrs of age	SIREVA Network now includes 23 countries in Central and South America. NCS continues to provide leadership and technical resources for the Quality Assurance program
Immunization Monitoring Program, Active (IMPACT) Dr. David Scheifele	Surveillance of invasive pneumococci recovered from Canadian children ≤16 yrs of age	Pneumococcal serotyping and antibiotic susceptibility testing
Dr. Jim Kellner, Alberta Children's Hospital, Calgary, Alberta	Surveillance of invasive pneumococcal disease within the Calgary Regional Health Authority	Pneumococcal serotyping
Dr. Tom Marrie University of Alberta Hospital Edmonton, Alberta	Investigation of community acquired pneumonia and invasive disease in the Capital Health Region	Pneumococcal serotyping and antibiotic susceptibility testing
Dr Fred Aoki, Health Sciences Centre, Winnipeg, Manitoba	Morbidity, Mortality and Health Care Costs of Invasive Pneumococcal Disease in Manitobans	Pneumococcal serotyping
Dr. Alan Parkinson, Arctic Investigations Program, Anchorage, Alaska	International Circumpolar Surveillance of Invasive Pneumococcal Disease	Pneumococcal serotyping and antibiotic susceptibility testing
Dr. Daryl Hoban, Health Sciences Centre, Winnipeg, Manitoba	CROSS national study – selected isolates for characterization	Pneumococcal serotyping
NCS in-house study	Investigation of pneumococci with an unusual erythromycin/clindamycin resistance phenotype	Antibiotic susceptibility testing and molecular testing of selected strains

**Group A Streptococci (*Streptococcus pyogenes*)**

<b>Researcher/Agency</b>	<b>Study Description</b>	<b>Services Required</b>
Dr. Alan Parkinson, Arctic Investigations Program, Anchorage, Alaska	International Circumpolar Surveillance of Invasive GAS Disease	GAS serotyping and antibiotic susceptibility testing
Mark Reddish ID Biomedical/ID Vaccine Corp. Bothell, Washington	StreptAvax™ GAS Vaccine trials	Phase 1 Safety trials - GAS serotyping Contribution to design and participation in Phase 2 Canadian trials planned
Dr. Donald Low Mount Sinai Hospital Toronto, Ontario	Macrolide resistance in group A streptococci	GAS serotyping
Alberta Research Council Edmonton, Alberta	Verification of type strains	GAS serotyping
NCS in-house study	Investigation of emm <i>st2967</i>	GAS serotyping, antibiotic susceptibility testing and molecular analysis

**Group B Streptococcus (*Streptococcus agalactiae*)**

<b>Researcher/Agency</b>	<b>Study Description</b>	<b>Services Required</b>
Dr. Dele Davies Alberta Children's Hospital, Calgary, Alberta	Group B Streptococcus Invasive Disease in Alberta	Group B serotyping
Dr. Alan Parkinson, Arctic Investigations Program, Anchorage, Alaska	International Circumpolar Surveillance of Invasive GBS Disease	GBS serotyping and antibiotic susceptibility testing
Belgin Dogan Food Science Dept. Cornell University New York, NY	Milk Quality Survey	Group B serotyping

**Other Investigations**

<b>Researcher/Agency</b>	<b>Study Description</b>	<b>Services Required</b>
Dr. Richard Facklam Centres for Disease Control, Atlanta, Georgia	Collaborative investigation of new <i>Aerococcus</i> species	Identification

## **e. Training**

There were no formal training events held during 2002/03.

## **f. Other Highlights**

In May, 2002, we were invited to participate in the International Circumpolar Surveillance Invasive Bacterial Diseases Working Group meeting, held in conjunction with the 3<sup>rd</sup> International Symposium on Pneumococci and Pneumococcal Diseases in Anchorage, Alaska. Representatives from Canada, United States, Norway and Finland presented information about current national surveillance systems. In addition, we were asked to present an overview of the International Quality Control System that was initiated in support of this surveillance system in January, 1999. Opportunities and problems associated with expanding this QA initiative to other Northern countries were discussed.

We were invited to speak at the Canadian Laboratory Medicine Congress held in Calgary in May, 2002. We presented a general overview of the services provided by the National Centre for Streptococcus and specific information relevant to Alberta provincial surveillance programs for invasive pneumococcal and group A *Streptococcus* disease.

In September, 2002 we were asked to participate in a Panamerican Health Organization sponsored meeting on *H. influenzae* and *S. pneumoniae* Quality Assurance. This meeting was linked to the on-going SIREVA project in which we have been involved since 1994. We were asked to present an update on the current *S. pneumoniae* Quality Assurance program and, based on our previous experience, contribute suggestions for how best to implement a new QA program for invasive *H. influenzae* disease in Latin America. The *H. influenzae* program will be coordinated through the World Health Organization Collaborating Centre for *Haemophilus influenzae*, located in Oxford U.K.

## **Quality Indicators Monitored**

### **1. Turn Around Time**

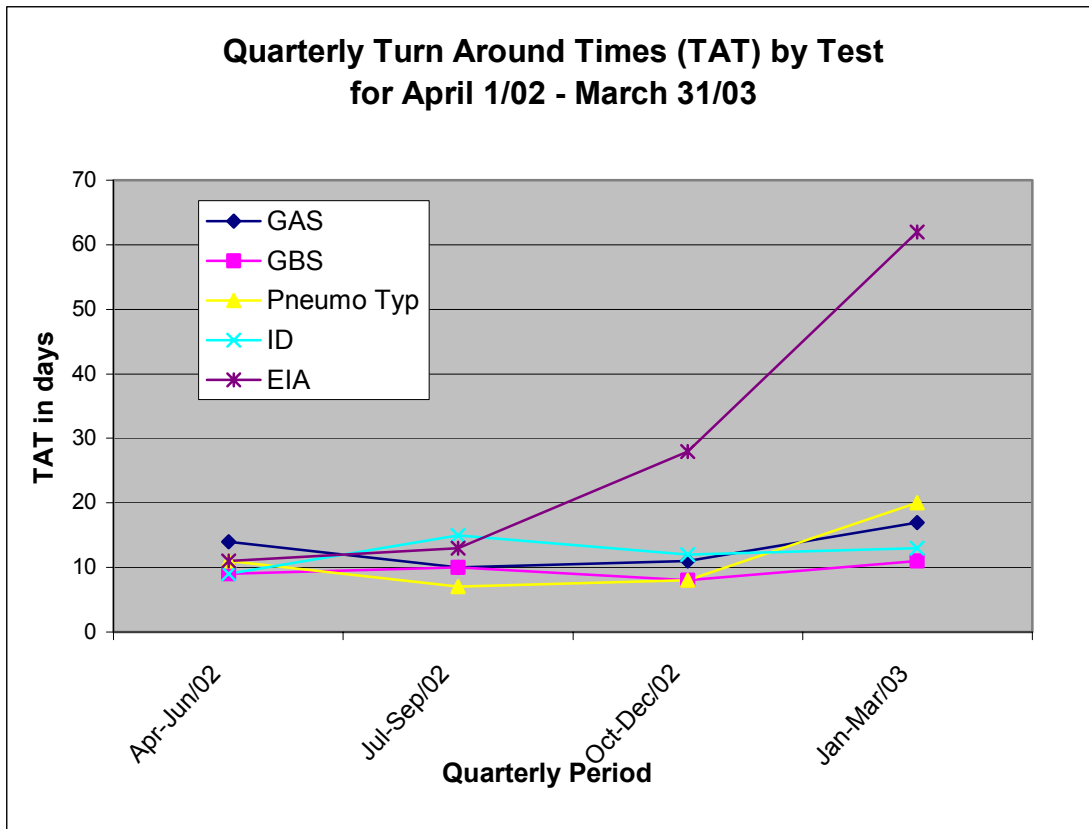
The average turn around times (TAT) for the past year are compared with those for 2001/02 in Table 19. Testing for isolates that are associated with designated outbreak investigations are given priority status and the TAT will be significantly reduced from the averages reported here.

The overall average TATs for 2002/03 were very similar to those reported for 2001/02. However, there was a significant increase for the TATs of specimens received during the last half of the past fiscal year (Figure 6). In October, 2002 the laboratory staff was reduced by one FTE due to the resignation of one of our more experienced technologists. Due to inadequate funding, we were unable to replace this position. The result has been an increase in the TAT for all testing, but is most evident for pneumococcal serotyping and pneumococcal EIA requests. Even though the overall specimen load for pneumococcal EIA was lower than the previous year (301 compared with 351), 129 (42%) of these specimens were received between October and December, 2002. The dramatically increased TAT for this test request (11 days reported for Apr-Jun/02 compared with 62 days for Jan-Mar/03) is a direct result of this overwhelming test load and inadequate staffing. We apologize to our customers for the inconvenience that this may have caused. We will continue to examine our workflow to try find ways to improve our TATs.

Table 19. Average Turn Around Time (TAT) for April 1, 2002 - March 31, 2003 compared to 2001/02

Test Request	Apr 1/02 - Mar 31/03 Avg. TAT in days	Apr 1/01 - Mar 31/02 Avg. TAT in days
Group A Serotyping	13	13
Group B Serotyping	10	10
<i>Streptococcus pneumoniae</i> Serotyping	12	11
Identification	13	13
Pneumococcal Serology	28	30

Figure 6.



## 2. Proficiency Testing Programs

*Streptococcus pneumoniae* Serotyping and Susceptibility testing - The NCS continues to participate in a collaborative Quality Control program involving the Laboratoire de Santé Publique du Québec and the Arctic Investigation Program laboratory in Anchorage, Alaska. Over the past year three panels have been distributed. Correlation for serotyping data for all three labs was 100%. This is the third consecutive year that all centres have achieved this excellent agreement. The three laboratories achieved 90-100% correlation with MIC values within +/- one log<sub>2</sub> dilution for nine antibiotics that are routinely tested. We look forward to continued participation in this important quality assurance initiative.

The NCS continues to serve as a resource for both education and Quality Assurance for the Sireva Project in Latin America. Consistent with the new model established in 1999, we work primarily with the three Quality Control Centres (Mexico, Colombia and Brazil), and continue to coordinate an external quality control program with semiannual distributions of pneumococci for serotyping and MIC testing.

### Future Plans

It should be noted that many of the planned projects listed below are very dependent on funding. We look forward to enhancing our services and are hopeful that the necessary national financial support that will enable us to do so will become available in the near future.

1. Discontinue the distribution of quarterly reports by hard copy to Provincial Public Health Lab Directors. These reports are available on-line through our website at [www.provlab.ab.ca](http://www.provlab.ab.ca). A letter will be sent to all agencies currently receiving our quarterly reports to notify them of this distribution change. We will be pleased to continue to send these reports to anyone who prefers to receive hard copy.
2. Continue our investigation of an unusual phenotype of macrolide-resistant *S. pneumoniae*. Additional molecular investigation is required.
3. Investigate the national distribution and the molecular characterization of an erythromycin-resistant *S. pneumoniae* type 12F clone.
4. Implement the use of a clinical information form to be used for all pneumococcal EIA test requests that meet our newly implemented testing criteria (i.e. patients who have been vaccinated (Pneumovax™ or Prevnar™), and who subsequently develop laboratory confirmed infection with *Streptococcus pneumoniae*). This will insure that we consistently receive vaccination history and information about the patient's clinical condition, specifically related to underlying medical conditions.
5. In December, 2002, the concept of an interprovincial team for investigation for pneumococcal disease was drafted. This group includes members from Alberta, Saskatchewan and Manitoba and has recently been named the "*S. pneumoniae* Prairie Investigation Team (SPPIT)". It was a product of specific interest in changes in pneumococcal disease in the face of emerging provincial vaccination programs, and is focused on identifying research projects and funding opportunities to further our understanding of pneumococcal disease on the Prairies. We anticipate significant involvement in this important group over the next year.
6. Supplement the routine biochemical identification of atypical catalase-negative gram positive cocci with 16S rRNA sequencing. This additional tool would be provided only for isolates that are not easily identified by traditional biochemical testing.

### **Planned Activities Contingent on Funding Availability**

7. Given sufficient funding, we plan to initiate routine molecular investigation of antibiotic resistant pneumococcal isolates that are frequently encountered at the NCS. We hope to be able to determine which of the 21 currently recognized international antibiotic-resistant clones are circulating in the Canadian population.
8. Given sufficient funding, we plan to implement *emm* sequencing for group A streptococci that prove to be M non-typable by serologic methods. The antisera used for this testing are not commercially available, and the in-house preparation, absorption and QC testing is very specialized and labor intensive. We anticipate that molecular characterization may replace traditional serological typing in the future.
9. Given sufficient funding, we plan to increase our pneumococcal antibiotic susceptibility testing panel from 9 to 18 antibiotics. This would provide a broader scope of information on which to base national and provincial empiric therapy guidelines, and would also enable us to compare our resistance data with similar programs in the United States.

## Publications

1. Facklam, R.R., **M. Lovgren**, P.L. Shewmaker and **G.J. Tyrrell**. 2003. Phenotypic description and antimicrobial susceptibilities of *Aerococcus sanguicola* isolated from human clinical samples. *Journal of Clinical Microbiology* (in press).
2. **Tyrrell, G.J., M. Lovgren, B. Forwick**, N.P. Hoe, J.M. Musser, and J.A. Talbot. 2002. M types of group A streptococcal isolates submitted to the National Centre for Streptococcus (Canada) from 1993 to 1999. *Journal of Clinical Microbiology*;40:4466-4471.
3. **Tyrrell, G. J.**, A. Kennedy, S.E. Shokoples and R.K. Sherburne. 2002. Binding and invasion of HeLa and MRC-5 cells by *Streptococcus agalactiae*. *Microbiology*;148:3921-393.
4. **Tyrrell, G.J.**, L. Turnbull, L.M. Teixeira, J. Lefebvre, M. Carvalho, R.R. Facklam and **M. Lovgren**. 2002. *Enterococcus gilvus* sp. nov., and *Enterococcus pallens* sp. nov., isolated from human clinical specimens. *Journal of Clinical Microbiology*;40:1140-1145.

## Presentations

1. **Lovgren, M.** 2002. *Streptococcus* surveillance and new *Aerococcus* species. Oral Presentation. At Canadian Laboratory Medicine Congress. Calgary, Alberta.
2. Marrie, T. J. and **G. Tyrrell**. 2002. Immune response of patients with bacteremic pneumococcal pneumonia to capsular polysaccharides, C-polysaccharide and pneumolysin. Abstr P-07-22A *In: Abstracts of the 3<sup>rd</sup> International Symposium on Pneumococci and Pneumococcal Diseases.* Anchorage, Alaska.
3. Bruce, M. G., A. Bell, K. Waldrep, D. J. Parks, J. Spika, **M. Lovgren**, L. Jette, and A.J. Parkinson. 2002. Use of the international circumpolar surveillance system for population-based surveillance of invasive pneumococcal disease in Alaska and Northern Canada. Abstr P-01-24B *In: Abstracts of the 3<sup>rd</sup> International Symposium on Pneumococci and Pneumococcal Diseases.* Anchorage, Alaska.
4. Reasonover, A., **M. Lovgren**, L.P. Jette, and A. J. Parkinson. 2002. International circumpolar surveillance: an international inter-laboratory quality control program for *Streptococcus pneumoniae*. Abstr P-01-34B *In: Abstracts of the 3<sup>rd</sup> International Symposium on Pneumococci and Pneumococcal Diseases.* Anchorage, Alaska.

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