

NATIONAL CENTRE FOR STREPTOCOCCUS

ANNUAL REPORT FOR APRIL 1, 1999 TO MARCH 31, 2000

Introduction

The National Centre for Streptococcus experienced its busiest year since it was established at the Provincial Laboratory of Public Health for Northern Alberta in 1991. Meeting this increased workload was challenging, however we were pleased to see an apparently heightened interest in the utilization of our services to supplement Provincial laboratory-based surveillance programs. As of January 1, 2000, invasive *Streptococcus pneumoniae*, group A and group B *Streptococcus* infections were added to the list of nationally notifiable diseases, and we anticipate that this move may prompt even further interest in characterization of clinical isolates over the coming year.

Goals and Objectives for the Past Year

We were less successful than in previous years in meeting our goals primarily due to the increased workload we experienced. However some progress was made, and we will continue to work on those projects that are incomplete over the coming year. The goals set for the past year relate to service and investigation.

Service

1. Invasive group A *Streptococcus* disease was placed under surveillance in Alberta on August 1, 1999. The NCS has worked with Alberta Health to implement a laboratory-based surveillance program that will facilitate collection of clinical information in addition to the collection and characterization of isolates recovered from patients with serious disease. The program is monitored jointly by the NCS and Alberta Health and we are pleased to report steadily increasing interest and participation by the health care community in that province.
2. Invasive pneumococcal disease was placed under surveillance in Alberta in October, 1998. As a result, over the past year the NCS has received almost all of the invasive pneumococcal isolates recovered in that province. This has facilitated the ability to provide a clinically useful overview of beta-lactam resistance in Alberta. The NCS has implemented a semi-annual report of these data for both children and adults. This is shared with Alberta Health and other interested parties to assist with the development of empiric antibiotic treatment guidelines for invasive pneumococcal disease. Comparative data for 1998 has been completed, and we are currently working on further retrospective analyses for all pneumococci submitted from Alberta since 1992.
3. In July, 1999, we distributed a redesigned NCS organism submission form to facilitate the collection of complete patient demographics and clinical information for all isolates submitted to the NCS. Our submitting laboratories are to be congratulated for the consistency with which they provide specific patient demographics, but obtaining a diagnosis for the patients from whom the isolates were recovered continues to be a challenge.
4. We had planned to design a clinical information form specifically for requests for pneumococcal serology to standardize data collection on patients for whom this test is required. Unfortunately this project has not been completed and will be added to the goals for the coming year.

5. We were unable to further development the NCS web site over the past 12 months and this will remain on our planning list.

Investigation

1. Screening for new M types 83, 89, 90 and 92 from our archived (1992-1999) M-nontypable group A *Streptococcus* isolate collections is progressing. We hope to have this project completed by the end of 2000.
2. Investigation of new group A *Streptococcus* sequence type *emm2967* has included the preparation of specific antisera as well as molecular investigation of targeted strains. Data were presented at the Lancefield Symposium in New Zealand in October, 1999. Further work on this project will include a proposal for its recognition as an official M provisional type, and publication of our data. This *emm* type is interesting since it is consistently resistant to erythromycin and bacitracin.
3. Molecular investigation of invasive group B *Streptococcus* isolates that we have been unable to type serologically has been initiated but is incomplete at this time.
4. Investigation of penicillin-resistant *S. pneumoniae* serotype 9V that has been prevalent in Western Canada since 1995 is incomplete. Further molecular work is required, and will be undertaken in the coming year.
5. We have not done any further work with the typing of pneumococcus surface protein A. We hope to explore this as a method of strain classification in the coming year.

Activities

a. Reference Services

The total testing volume for 1999/2000 was the highest it has ever been, increasing by 27% over last year. Ninety percent of these strains were submitted by Canadian agencies, and we believe that the increase we have observed over the past two years is due to implementation of new provincial surveillance programs. The increase in the number of group B streptococci is due primarily to research being conducted in Alberta. Comparison of specimen numbers for the past four years is presented in Table 1. Services provided for research projects for 1999/2000 and the proportion of the total testing dedicated to this function are also identified. Some, but not all research projects are externally funded.

Table 1. Specimen Volume and Research Testing

Total Test Requests	1996/97	1997/98	1998/99	1999/00	1999/00 Research	% Testing
Group A Serotyping	789	765	926	1140	563	49.4%
Group B Serotyping	300	89	319	473	425	89.9%
Pneumococcal Serotyping	1492	1507	1434	1734	1195	68.9%
Identification	333	274	249	243	0	0%
Pneumococcal Serology	NA	93	159	299	90	30.1%
Other	9	0	0	28	0	0%
Total Isolates Received	2923	2728	3087	3917	2273	58.0%

b. Laboratory Surveillance

All of the data presented in this section reflect passive surveillance only, and must be interpreted with caution. The majority of all isolates tested at the NCS are recovered from, or 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 occasionally prevented interpretation of this information for some isolates.

Group A *Streptococcus*

The majority of the GAS that we receive are submitted from Alberta, Ontario and Quebec (Figure 1). These three provinces account for 77 - 92% of the isolates we have examined each year since 1992. Consequently differences in annual seroprevalence reported here may be attributed primarily to variations seen in those provinces.

Figure 1.

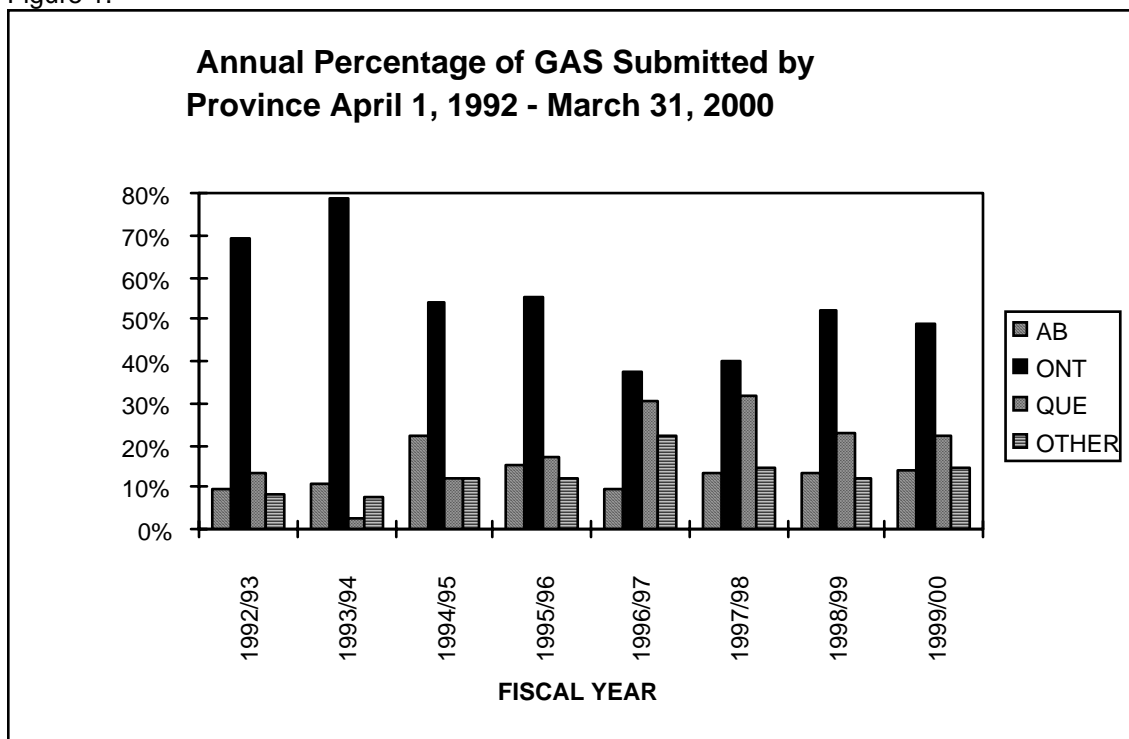


Table 2 presents M type distribution for the past year and comparative data for 1998/99 and 1997/98. Aside from slight changes in ranking, the top eight M types have remained relatively constant over the past 3 years.

Table 2. Group A Streptococcus M type Distribution

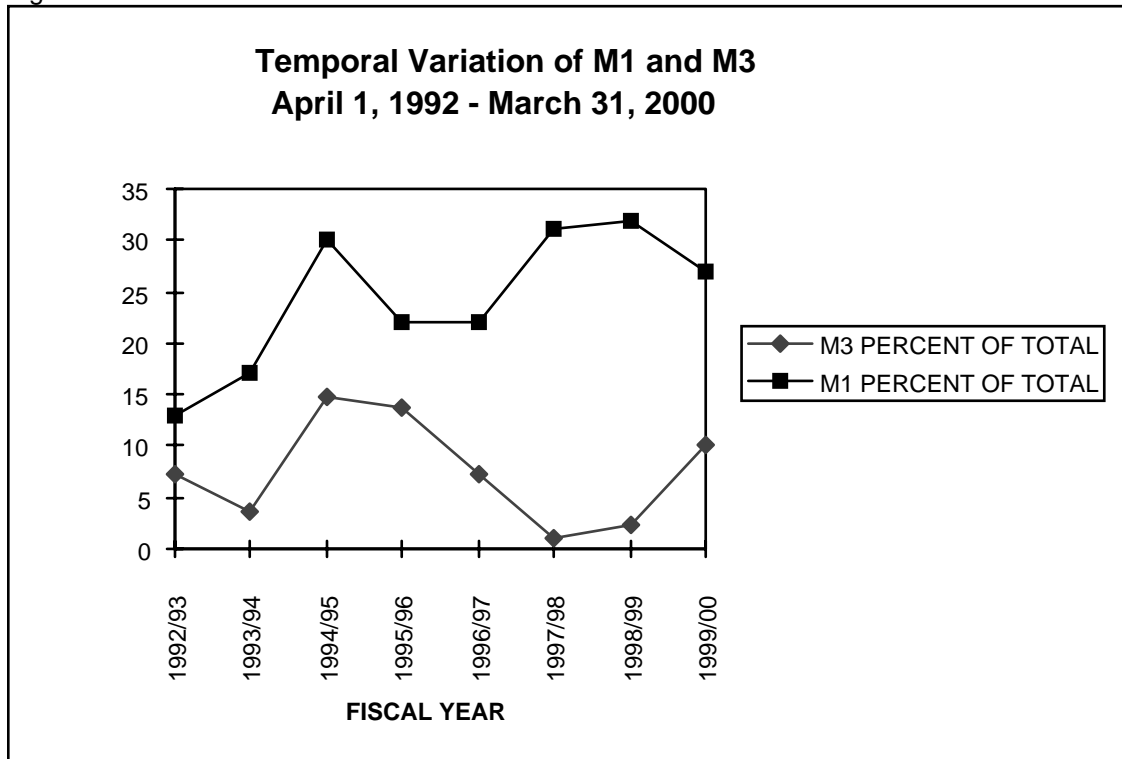
M type	1999/00			1998/99			1997-1998		
	# Cases	Rank	% of total	# Cases	Rank	% of total	# Cases	Rank	% of total
M1	216	1	27.3	261	1	31.9	226	1	31.0
M28	81	2	10.2	93	2	11.4	72	3/4	9.9
M3	79	3	10.0	20	8	2.4	8	14	1.1
M12	69	4	8.7	75	3	9.2	72	3/4	9.9
M11	42	5	5.3	56	4	6.9	77	2	10.6
M89 (PT4245)	40	6	5.1	27	7	3.3	39	5	5.3
M4	36	7	4.6	36	5	4.4	35	6	4.8
M77	25	8	3.2	18	9	2.2	13	8	1.8
M nt*	79		10.0	111		13.6	93		12.8
Other	123		15.6	120		14.7	93		12.8
Total	790		100	817		100	728		100

NA = not available

*nt = not typable

Type M1 has been the most frequently encountered serotype since surveillance began in 1991, representing between 13% (1992/93) and 32% (1998/99) of each annual collection. The most significant annual variations were observed for type M3. This serotype has ranked as low as 14th during 1997/98 and as high as 2nd between 1994 and 1996. A comparison of the temporal variation of M3 with that of M1, the consistently top ranking serotype, is presented in Figure 2.

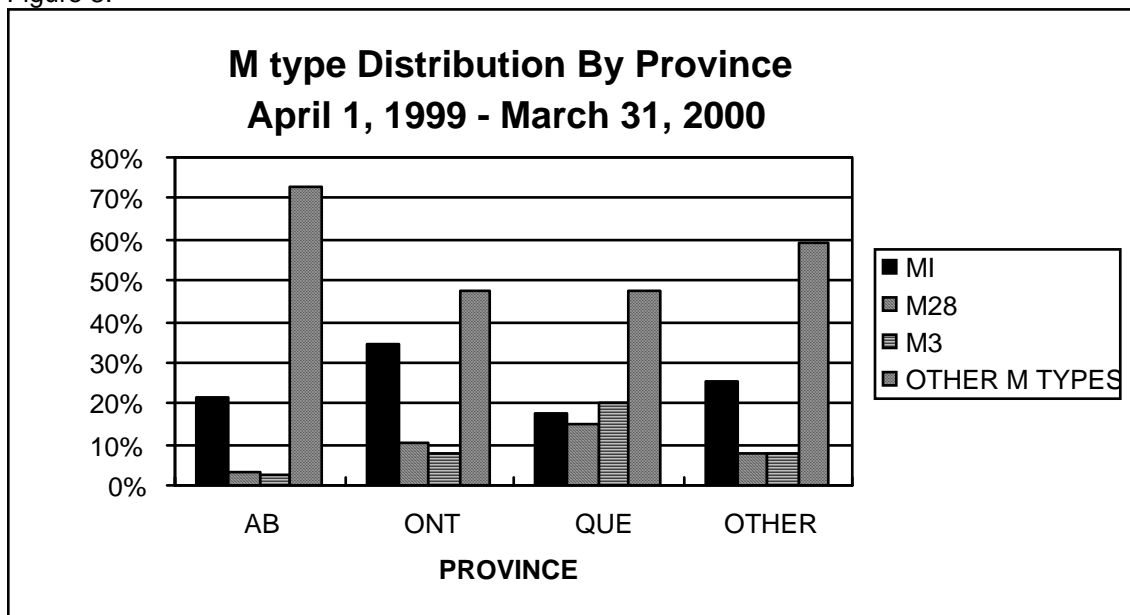
Figure 2.



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 with a concurrent increase in the prevalence of M1. During the past year, M3 has resumed its position as one of the top three most common M types in Canada.

The Provincial distribution (Alberta, Ontario, Quebec and Other Provinces) of M1, M28 and M3, the top 3 ranking M types in the 1999/2000 collection, are presented in Figure 3.

Figure 3.



Over the past two years, M3 has risen from 2% to 10% of the annual national collections, and the majority of this change was due to isolates submitted from Quebec where M3 is the most common M type, unlike Alberta and Ontario where M1 continues to rank first. In Ontario, M3 ranks fourth, while in Alberta only 3 isolates of M3 were received during 1999/2000.

Group B *Streptococcus*

Serotyping requests for group B streptococci are received routinely from Alberta and Saskatchewan, but infrequently from the other provinces. Isolates from 145 cases of invasive disease were available for analysis after data for non-invasive isolates from specified research studies were excluded; 110 (76%) of these were from Alberta. The seroprevalence reported in Table 3 therefore, does not represent national trends.

Types III and V with and without the R protein antigen account for almost half of the disease represented by this sample. Only one isolate from cerebrospinal fluid was submitted; this was a nontypable isolate from a 1 year old child. Isolates carrying serotype V and serotype Ia polysaccharide antigens were associated with adult disease; 57 of 67 isolates (85%) belonging to these serotypes were recovered from patients \geq 21 years of age. Forty-five percent of isolates belonging to serotype III and III/R were isolated from the youngest age group (<3 months).

Table 3. Group B *Streptococcus* Serotype Distribution by Age for 1999/00 (Comparative data 1998/99)

Serotype	< 3 mon	3 mon-20 yrs	21-50 yrs	> 50 yrs	Age Not Specified	Total
III & III / R	14 (22)	2 (2)	6 (2)	9 (3)	0 (0)	31 (29)
V & V/R	3 (3)	1 (1)	12 (7)	21 (22)	1 (2)	38 (35)
Ia & Ia / c	3 (3)	2 (0)	7 (0)	17 (8)	0 (1)	29 (12)
Ib / c	3 (1)	2 (1)	3 (1)	9 (0)	2 (2)	19 (5)
Other	2 (3)	2 (1)	3 (4)	8 (5)	0 (0)	15 (13)
Not typable*	1 (2)	3 (0)	4 (0)	3 (4)	2 (0)	13 (6)
TOTAL	26 (34)	12 (5)	35 (14)	67 (42)	5 (5)	145 (100)

*Not typable = carbohydrate antigen not detected

Streptococcus pneumoniae

Seroprevalence for the past five years is presented in Table 4. With the exception of a slight variation for serotype 18C in 1998-1999, these same serotypes have consistently been the top 7 for the past 5 years with only slight changes in ranking. These seven types are represented in the new heptavalent conjugate vaccine and make up 61% of the 1999-2000 sample. All are included in the currently available 23-valent vaccine. Overall, vaccine coverage can be expected for 93% of the total cases represented in this sample including expected cross-protection for serotype 6A, and 90% if serotype 6A is excluded. It should be noted that the province of Quebec performs serotyping for the most common serotypes. Less common serotypes are referred to the NCS for factoring. This selective isolate referral must also be considered when interpreting the seroprevalence data provided in Tables 4 and 5.

Table 4. Comparative Ranking Of Seroprevalence April 1, 1995 - March 31, 2000

Serotype	1999-2000	1998-1999	1997-1998	1996-1997	1995-1996
Type 14	1	1	1	1	1
Type 6B	2	2	2	4	3
Type 19F	3	3	3	7	6
Type 9V	4	5	4	2	2
Type 4	5	4	7	3	5
Type 23F	6	6	5	5	4
Type 18C	7	8	6	6	7
Total cases	772	876	856	737	732

As in previous years, Alberta is disproportionately represented in this collection, presumably because of proximity and community awareness of national and provincial surveillance programs. Forty percent (310 of 772 isolates) of the 1999/00 sample is from Alberta. Because of this obvious bias, Table 5 presents Alberta seroprevalence compared with data for isolates submitted from the rest of Canada for the past two years. While there are slight differences in ranking between Alberta and the other Provinces, the same seven serotypes predominate across Canada.

Table 5. Serotype Distribution in Alberta Compared with the Rest of Canada for 1999/00 & 1998/99 Rank and Percent of the total for 1999/00 (comparable data for 1998/99)

Serotype	Alberta		Other Provinces	
	Rank	Percent of Total	Rank	Percent of Total
Type 14	1 (1)	15.5 (17.4)	1 (1)	18.0 (19.0)
Type 6B	2 (5)	9.7 (6.5)	2 (2)	11.3 (11.6)
Type 4	3 (2)	9.0 (9.4)	6/7 (7)	5.2 (5.7)
Type 9V	4 (3)	8.7 (9.2)	5 (9)	6.3 (5.1)
Type 19F	5 (8/9)	6.8 (4.2)	3 (3)	8.7 (11.0)
Type 23F	6 (4)	6.1 (6.7)	4 (6)	6.5 (5.9)
Type 18C	7 (8/9)	5.8 (4.2)	6/7 (4)	5.2 (6.8)
Other Types		38.4 (32.8)		38.8 (26.0)
Total # cases		310 (403)		462 (473)

Because noninvasive penicillin-resistant pneumococci may be submitted to the NCS for further investigation, an erroneously high resistance rate is obtained if these strains are included in the analysis. Therefore the incidence of reduced susceptibility to penicillin and ceftriaxone, presented in Table 6, has

been calculated only for isolates recovered from blood and CSF. Only one isolate per patient was included in the analysis.

Reduced susceptibility to ceftriaxone is associated with increasing penicillin MICs. Typically the MIC for ceftriaxone is equal to or one log₂ dilution lower than the penicillin MIC. During 1999/00 intermediate resistance to ceftriaxone was detected in 41 isolates, all of which had penicillin MICs of 1.0 - 4.0 mg/L. To date we have not received any invasive pneumococci for which full resistance to this antibiotic (MIC =2.0 mg/L) has been demonstrated.

Table 6. Reduced Penicillin & Ceftriaxone Susceptibility for Pneumococci from Blood or CSF 1999-2000 (1998-1999)

	Alberta	Other Provinces	Total from all of Canada
Blood &/or CSF isolates submitted	310 (204)	462 (457)	772 (661)
Isolates with reduced penicillin susceptibility (MIC >0.06 mg/L)	45 (33)	72 (46)	117 (79)
Reduced Susceptibility to Penicillin (MIC >0.06 mg/L)	14.5% (16.2%)	15.6% (10.1%)	15.2% (12.0%)
High Level Resistance to Penicillin (MIC = 2.0 mg/L)	6.1% (2.9%)	5.6% (2.2%)	5.8% (2.4%)
Intermediate Resistance to Ceftriaxone (MIC = 1.0 mg/L)	4.5% (3.9%)	5.8% (3.3%)	5.3% (3.5%)

NA = not available

The proportion of reduced susceptibility to penicillin observed for isolates submitted to the NCS between April 1, 1992 and March 31, 1999 is provided in Table 7. Resistance rates for pneumococci submitted from Alberta are compared to those submitted from the rest of Canada for the past four years.

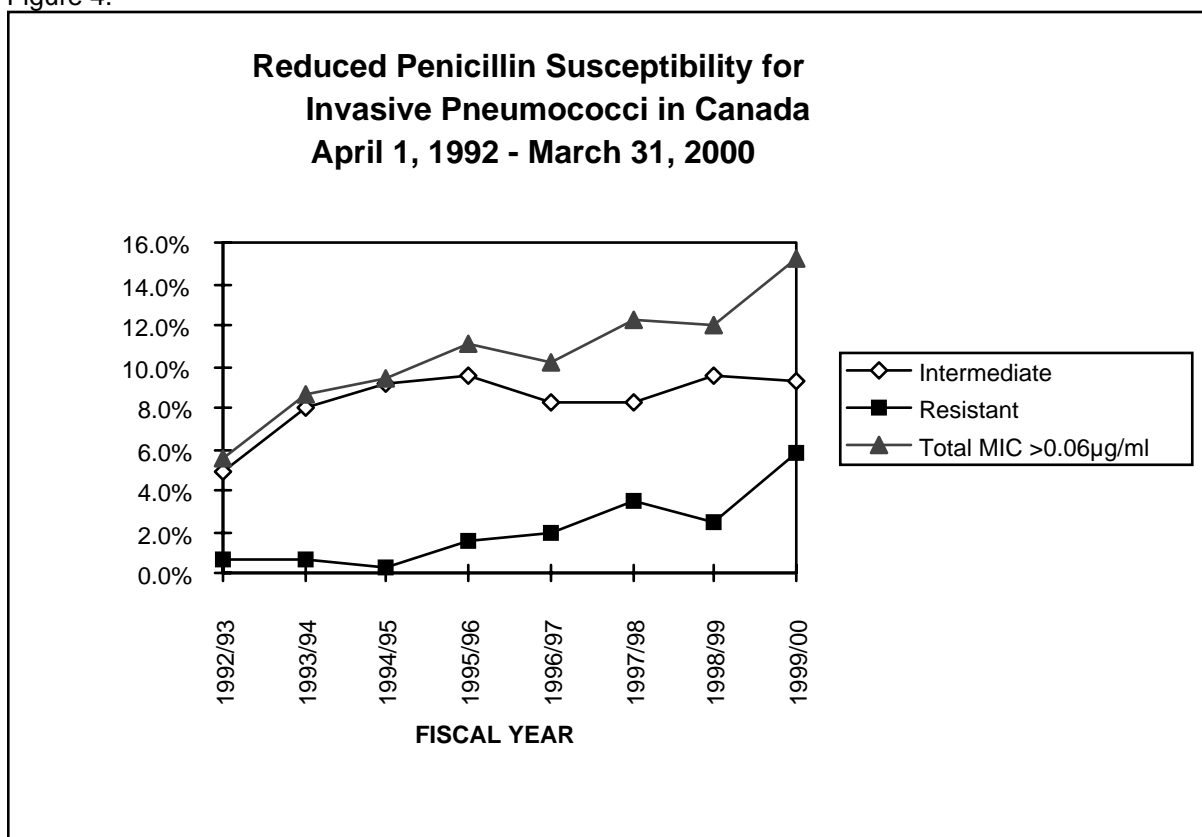
Table 7. Reduced penicillin susceptibility (MIC >0.06 µg/ml) for isolates from blood or CSF submitted from Alberta and the rest of Canada (TROC) between April 1, 1992 and March 31, 2000 Number of isolates (%)

Fiscal Year	Alberta		TROC		All of Canada	
	Total	>0.06 mg/L (%)	Total	>0.06 mg/L (%)	Total	>0.06 mg/L (%)
Apr 1/99 - Mar 31/00	310	45 (14.5)	462	72 (15.6)	772	117 (15.2)
Apr 1/98 - Mar 31/99	204	33 (16.2)	457	46 (10.1)	661	79 (12.0)
Apr 1/97 - Mar 31/98	259	46 (17.8)	493	46 (9.3)	752	92 (12.2)
Apr 1/96 - Mar 31/97	171	28 (16.4)	468	37 (7.9)	639	65 (10.2)
Apr 1/95 - Mar 31/96	Not Available		Not Available		594	66 (11.1)
Apr 1/94 - Mar 31/95	Not Available		Not Available		319	30 (9.4)
Apr 1/93 - Mar 31/94	Not Available		Not Available		162	14 (8.6)
Apr 1/92 - Mar 31/93	Not Available		Not Available		181	10 (5.5)

Between 1996 and 1999 we observed a significant difference in the rates of reduced susceptibility to penicillin in Alberta compared with the rest of Canada. Our data for 1999-2000 suggest that this regional variation is no longer present. We report a steadily increasing resistance rate for isolates received from other provinces, accompanied by a slight decrease in the rate in Alberta over the past year.

Although the overall rate of reduced susceptibility to penicillin has decreased in Alberta, there has been an alarming increase in the rate of high level penicillin resistance (MIC =2.0 µg/ml) both in Alberta and across Canada. As expected, this is accompanied by increasing rates of reduced susceptibility to the third generation cephalosporins. Between 1992 and 1995, pneumococci with full resistance to penicillin (MIC =2.0 mg/L) were rarely encountered. Since that time, the rate of intermediate resistance to penicillin has stabilized at about 8 - 9%, while the rate of high level resistance has continued to climb, reaching an historical high of 5.7% this year. Figure 4 demonstrates this trend. It is interesting that, after an initial three year lag period, the number of fully resistant organisms began to increase. This is consistent with the theory of antibiotic creep and the NCS will be exploring this further.

Figure 4.



Reduced susceptibility to penicillin was detected in 117 isolates belonging to eleven different serotypes; one strain was nontypable. Ninety-seven percent of these (114 of 117) are covered by the 23-valent vaccine. Thirty-eight percent (44 of 117) of these strains are fully resistant to penicillin (MIC =2.0 mg/L); this was observed most frequently for types 9V, 14 and 23F. The level of resistance observed for each serotype and comparative data for 1998 - 1999 are presented in Table 8. Intermediate resistance is presented as two categories to demonstrate an observed trend toward full resistance which is particularly evident for serotype 9V.

Since 1996 we have observed a significant trend toward high level resistance for type 9V in Western Canada and especially in Alberta. This serotype accounts for half of the isolates (23 of 45) with reduced susceptibility to penicillin in Alberta.

Table 8. Serotype Distribution and MIC Range for Isolates with Reduced Penicillin Susceptibility.
Data for 1999-2000 (1998-1999)

Type	Total # Reduced Susceptibility	Intermediate		Resistant = 2.0 mg/L
		0.12 - 0.5 mg/L	1.0 mg/L	
Type 9V*	46 (34)	0 (4)	26 (23)	20 (7)
Type 14*	16 (16)	3 (6)	1 (6)	12 (4)
Type 19F*	16 (5)	9 (2)	3 (3)	4 (0)
Type 6B*	15 (9)	7 (6)	4 (3)	4 (0)
Type 19A*	13 (5)	12 (4)	1 (0)	0 (1)
Type 23F*	5 (7)	2 (3)	0 (1)	3 (3)
Type 6A*	1 (2)	1 (0)	0 (1)	0 (1)
Type 15B*	1 (1)	1 (1)	0 (0)	0 (0)
Type 22F*	1 (0)	1 (0)	0 (0)	0 (0)
Type 35F	1 (0)	0 (0)	1 (0)	0 (0)
Type 35B	1 (0)	0 (0)	0 (0)	1 (0)
Nontypable	1 (0)	1 (0)	0 (0)	0 (0)
Total	117 (79)	37 (26)	36 (37)	44 (16)

*Coverage expected for 23-valent vaccine

Pneumococcal Serology

Routine requests for pneumococcal serology increased by 31% over 1998/99. In spite of the heavier workload, we were able to meet the goal set last year, of providing test results within one month of specimen receipt.

Submitting laboratories have been very cooperative both in obtaining appropriate clinical information and for insuring that paired sera (pre and post vaccination) are sent for testing. We continue to discourage single serum assays, due to the difficulties with interpretation of the data.

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 characterized isolates from nine epidemiological investigations conducted in three provinces and territories. This compares with 1998/99 when requests for investigation of 8 events were received from four provinces. Listed in Table 9 are the investigations conducted during 1999/2000:

Table 9. Summary of Epidemiologic Investigations April 1, 1999 - March 31, 2000

Investigation Number	Province Requesting Investigation	Test Request	Number of Isolates	Causative Agent
99-502	Ontario	GAS serotyping	4	M89 T11/12 OF +
99-503	Ontario	GAS serotyping	5	M1 T1 OF - M6 T6 OF -
99-504	Ontario	GAS serotyping	2	M28 T28 OF +
99-505	Alberta	GAS serotyping	15	M89 T11/12 OF +
00-500	Ontario	GAS serotyping	14	M1 T1 OF -
00-501	Ontario	GAS serotyping	6	M28 T28 OF +
00-502	Ontario	GAS serotyping	14	M4 T4 OF +
00-503	Northwest Territories	GAS serotyping	18	Predominant M type not determined
00-504	Ontario	GAS serotyping	10	M3 T3/B3264 OF -

d. Research

During 1999 - 2000, the National Centre for Streptococcus provided testing for the following completed and/or on-going research projects:

Streptococcus pneumoniae

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. 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. Allison McGeer, Mount Sinai Hospital, Toronto, Ontario	Retrospective analysis of invasive pneumococci associated with Evaluation of the Ontario Pneumococcal Vaccination program	Pneumococcal serotyping
Dr Fred Aoki, Health Sciences Centre, Winnipeg, Manitoba	Morbidity, Mortality and Health Care Costs of Invasive Pneumococcal Disease in Manitobans	Pneumococcal serotyping
Dr. Upton Allen, Hospital for Sick Children, Toronto, Ontario	Pneumococcal Resistance and Associated Serotypes among Caribbean Children	Pneumococcal serotyping
Dr. Daryl Hoban, Health Sciences Centre, Winnipeg, Manitoba	Non-invasive Pneumococcal Isolates	Pneumococcal serotyping
Dr. Don Low, Mount Sinai Hospital, Toronto, Ontario	Quinolone Resistance in Pneumococci	Pneumococcal serotyping
Dr. Alison Bell, Arctic Investigations Program, Anchorage, Alaska	International Circumpolar Surveillance of Invasive Pneumococcal Disease	Pneumococcal serotyping and antibiotic susceptibility testing
Dr. Tom Marrie, University of Alberta Hospital, Edmonton, Alberta	Canadian Community-Acquired Pneumonia Epidemiology Study	Pneumococcal serology

Group A Streptococci (*Streptococcus pyogenes*)

Researcher/Agency	Study Description	Services Required
Dr. James Musser Baylor College of Medicine, Houston, Texas	Investigation of clonal relationships of M1 Invasive GAS in Canada	Serotyping and molecular investigation Collaborative study
Dr. Bernie Beall, Centres for Disease Control, Atlanta, Georgia	<i>emm</i> and <i>sof</i> gene sequence variation in relation to serologic typing of opacity factor positive group A streptococci	GAS serotyping Collaborative study
Dr. Richard Facklam, Centres for Disease Control, Atlanta, Georgia	Validation of new <i>emm</i> sequences to official <i>emm</i> type	GAS serotyping Collaborative study
Dr. Horacio Lopardo, Buenos Aries, Argentina Dr. Bernie Beall, Centres for Disease Control, Atlanta, Georgia	Investigation of invasive and carriage isolates of <i>S. pyogenes</i>	GAS serotyping Collaborative study
NCS in-house study	Screening M-nontypable isolates for new M types 83, 89, 90 & 92 in 1992-1999 isolate collection	GAS serotyping
NCS in-house study	Investigation of <i>emm st2967</i>	GAS serotyping, antibiotic susceptibility testing and molecular analysis

Group B Streptococcus (*Streptococcus agalactiae*)

Researcher/Agency	Study Description	Services Required
Dr. Dele Davies Alberta Children's Hospital, Calgary, Alberta	Group B Streptococcus Invasive Disease in Alberta	Group B serotyping

e. Training

There were no formal training events held during 1999/2000, however the NCS was pleased to welcome a technologist from Dr. José Gonzalez Hospital, a pediatric acute care facility located in Monterrey, Mexico. This was an informal three week visit during which we were able to provide an opportunity for her to observe a variety of technical skills and Quality Assurance tools utilized in our clinical bacteriology laboratory, as well as more specialized techniques used at the NCS.

f. Other Highlights

The NCS was invited to attend the World Health Organization Informal Consultation of WHO Collaborating Centres and National Streptococcus Reference Laboratories, held in Auckland, New Zealand, October, 1999. This meeting involved participants from eight countries (Canada, USA, England, Czech Republic, Italy, Malasia, Russia and New Zealand), including representatives from each of the six centres world-wide, who offer serological characterization of *Streptococcus pyogenes*. As one of those six centres, we were please to have the opportunity to contribute our experience to this important laboratory working group. Discussion included issues surrounding the validation process for newly recognized M types and *emm* types, and the continuation of the External Quality Control program that was initiated in 1997. It was the recommendation of this group that the WHO formally recognize this committee as a "WHO Laboratory Working Group on Beta Haemolytic Streptococci" and that financial support be provided to facilitate the continuation of the EQA program. The NCS has been invited to be a participating member of this international group.

The International Circumpolar Surveillance (ICS) project, initiated in January, 1999, had a very successful first year of operation. Thirty-four cases of invasive pneumococcal disease were identified and isolates were referred to the NCS for serotyping and antibiotic susceptibility testing. Preliminary data show that, unlike the rest of Canada, serotype 1 is prevalent in the region, and reduced susceptibility to penicillin is uncommon. In January, 2000, the surveillance was expanded to include invasive disease due to group A and group B streptococci, *Haemophilus influenzae* and *Neisseria meningitidis*. The project has also attracted the interest of other Northern countries, including Greenland, Iceland and Finland, all of whom will be joining this international initiative later this year.

The Lancefield International Symposium on Streptococci and Streptococcal Diseases is an international meeting held once every three years. The fourteenth meeting was held in Auckland, New Zealand in October, 1999. It was our privilege to participate at this gathering of international *Streptococcus* experts. We presented data from our investigation of the new GAS *emm* sequence type *st2967* and contributed to two other presentations including a report of an external laboratory quality assurance program for characterization of GAS, and validation of nine new *emm* sequence types.

Quality Indicators Monitored

1. Turn Around Time

The average turn around times (TAT) for the past year are compared with those for 1998/99 in Table 10. Isolates that are associated with designated outbreak investigations are given priority status and the TAT will be significantly reduced from the averages reported here. A significant improvement in the pneumococcal serology TAT was obtained after we cleared the backlog of sera that had been submitted for testing during 1998. The prolonged TAT for group B serotyping was a result of technical difficulties with antiserum preparation and the extended TAT for pneumococcal serotyping was directly related to a very heavy workload. We experienced a 21% increase over 1998/99 in the number of pneumococci submitted for typing. A recent increase in staffing should enable us to improve on our TAT in the coming year.

Table 10. Average Turn Around Time (TAT) for April 1, 1999 - March 31, 2000 compared to 1998/99

Test Request	Apr 1/99 - Mar 31/00 Avg. TAT in days	Apr 1/98 - Mar 31/99 Avg. TAT in days
Group A Serotyping	22	26
Group B Serotyping	27	13
<i>Streptococcus pneumoniae</i> Serotyping	12	9
Identification	12	19
Pneumococcal Serology	34	169

2. Proficiency Testing Programs

Group A *Streptococcus* Serotyping- An international Quality Control program involving laboratories in England, New Zealand, the Czech Republic, the United States and Canada was implemented in May, 1997. This was initiated as a pilot project and required that each of the six participating laboratories assume responsibility for the distribution of one panel (10 isolates) to each of the other five labs, and for compiling the results for that set of challenge isolates. The NCS distributed the sixth panel in November, 1999. Throughout the pilot project, there was generally good agreement for the serological classification of M protein amongst the 6 laboratories; some variability was observed for T typing. At the beginning of the project only 2 of the 6 labs were using *emm* gene typing; by the end of 1999, 5 of the 6 labs, including the NCS, had implemented this technique. Overall there was excellent agreement between the classic methods and *emm* sequence based methods. The biggest problem encountered by all the participants was the significant cost associated with shipping infectious agents. The World Health Organization has endorsed the importance of this international QA program, and has indicated that it will provide funding in support of continuing and possibly expanding the program in the future.

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 the Arctic Investigation Program laboratory in Anchorage, Alaska. Since April 1, 1999, three panels have been distributed. Correlation for serotyping data varied between 85% and 100% with only minor discrepancies. These provided an opportunity to discuss the problems of known cross-reactivity between specific serotypes, as well as differentiation of non-typable *S. pneumoniae* from viridans group streptococci. The three laboratories achieved 95 - 100% correlation with MIC values within +/- one log₂ dilution for nine antibiotics. Each of the laboratories has agreed to continue to share the responsibility for panel distribution which occurs three times per year.

In 1999, a new Quality Assurance model was implemented for the Sireva Project in Latin America. This network has grown from the original six countries to include almost all of Latin America (23 countries). Primary responsibility for the on-going Quality Assurance program has been transferred into the region and centralized at three National laboratories in Mexico, Colombia and Brazil. Each of these three labs serves as a regional Quality Control Centre for six or seven other countries. The NCS continues to serve as a resource for both education and Quality Assurance, working primarily with the three QC centres, and also participates as an equal partner in the Sireva Network for further collaborative research activities.

Future Plans

The following projects have been identified for the next 12 months:

1. Until recently it was generally believed that, when typing opacity factor positive *S. pyogenes* strains, the anti-OF type was predictive of the M type. Over the past year, we have completed a collaborative research project with the CDC, Atlanta that provides evidence for exceptions to this general rule. As a result, the NCS will be revising the manner in which it reports serological classification of GAS to include both the M type and the anti-OF type.
2. Complete the investigation of GAS *emm st2967*, including proposal as a new provisional M type and submission of data for publication.
3. Complete the molecular investigation of penicillin-resistant *S. pneumoniae* serotype 9V clone.
4. Complete the screening of all M non-typable *S. pyogenes* in our archived collection for newly recognized M types 83, 89, 90 and 92 to determine their historical prevalence. These and existing M type data of invasive GAS will be compiled for publication.
6. Complete the molecular analysis of non-typable invasive group B *Streptococcus* isolates.
7. Review and summarize the antibiotic susceptibility patterns for invasive GAS and GBS 1992 - 1999.
8. Design a clinical information form to be used specifically for requests for pneumococcal serology.
9. Explore the usefulness of PspA typing as a classification method for *S. pneumoniae*.

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Staff

Director: James A. Talbot, MD, PhD, FRCP(C)	Assistant Director: Greg Tyrrell, PhD, FCCM
Phone: (780) 407 - 8904	Phone: (780) 407 - 8949
Fax: (780) 407 - 8984	Fax: (780) 407 - 8984
email: jat@bugs.uah.ualberta.ca	email: gjt@bugs.uah.ualberta.ca

Technical Supervisor: Marguerite Lovgren, MLT, ART
Phone: (780) 407 - 8977
Fax: (780) 407 - 8984
email: ml@bugs.uah.ualberta.ca