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OUTBREAK OF MUMPS, MONTREAL, OCTOBER 1998 TO MARCH 1999 - WITH A PARTICULAR FOCUS ON A SCHOOL

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Mumps is a vaccine preventable disease. Although the Quebec program of a combined measles, mumps, rubella (MMR) vaccine was introduced in 1976, mumps only became a notifiable disease in 1986.[1] The coverage for children 7 years of age in the province of Quebec is estimated at 95%.[1] Very few cases are reported each year in the Montreal-Centre Region. However, in the fall of 1998, an upsurge was noticed in the number of cases of mumps in the community and in one school in particular.

Upon indication of the increase, a letter was forwarded by the Montreal-Centre public-health unit to the Centres *locaux de services communautaires* (CLSC) of Montreal, to emergency rooms, and to *Info-Santé* (a telephone line providing medical information to the public) asking for notification of any suspected cases.

Case definitions

A confirmed case was defined as presenting clinical manifestations compatible with those of mumps (i.e., fever and painful swelling of one or more salivary glands) and the presence of one of the following conditions:

- serologic detection of IgM mumps antibodies or detection of a significant increase (at least fourfold) in IgG mumps antibodies in the serum collected during the acute phase and that collected during the convalescent phase (with an interval of at least 2 weeks between the two and with an analysis carried out in the same laboratory);
- isolation of the mumps virus;
- epidemiologic link with a confirmed case using one of the above-mentioned laboratory tests.

A probable case was defined for this outbreak as presenting with painful swelling of one or more salivary glands for at least 2 days and symptom onset after 27 August 1998.

Immunization records were also checked by CLSC area school nurses.

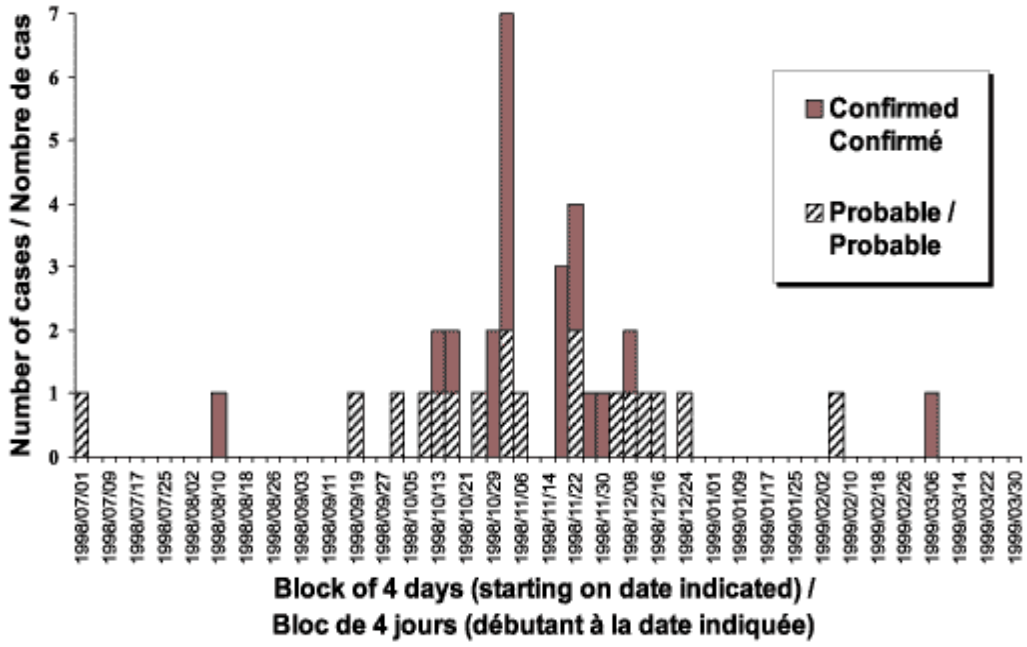
Results

In all, 37 cases corresponded to the definition of confirmed or probable cases; 49% were male. The average age was 10.5 years (range: 0.9 to 42 years) and the median age was 8 years. School children accounted for 23/37 (62%) of the cases. Half of these were from the same school. Children in four daycare centres accounted for 5/37 (14%) of the cases. In all, 59% of the cases had been vaccinated or indicated having been vaccinated. In school X, which accounted for 30% of the cases, 7/12 (58%) had not been vaccinated (the immunization status of one case was unknown). 19/37 (51%) were confirmed, eight by IgM serologic confirmation, two by means of a viral culture and nine through epidemiologic linkage. Figure 1 illustrates the epidemic curve.

The majority of cases occurred between October and December 1998. Between January and March 1999, 11 cases were reported; only one was confirmed by serology. Serologic testing was carried out on seven of the suspect cases and six were found to be negative. It therefore appeared that the cases were parotitis caused by another type of virus and that the outbreak

Figure 1

Epidemic curve, outbreak of mumps in Montreal, October 1998 to March 1999 (n=37)



was over. None of the cases presented with the complications associated with the mumps virus infection.

Discussion

Mumps outbreaks have been reported in highly vaccinated populations or in populations where vaccine coverage was found to be insufficient(2-6). In this case, school X presented a majority of cases deemed unvaccinated. During the epidemiologic survey, it was found that all of these cases were among students attending welcoming classes. Such classes are organized specifically for children who have recently immigrated to Canada. They may possibly have received measles vaccine, but without a mumps component, at an early age in their country of origin under the Expanded Programme on Immunization (EPI). It is possible that these children did not have the opportunity to be vaccinated against rubella and mumps, and are therefore susceptible to these diseases. The Quebec immunization program includes two doses of measles vaccine. The second dose should be given in the form of the combined MMR vaccine to ensure that these children would also be protected against mumps and rubella.

When the CLSC-area school nurses attempted to determine the immunization status of the children, it was found that it was unknown for almost one-third of the students at the school. This outbreak is a good example of the difficulties encountered by school nurses, especially in a multi-ethnic environment, when attempting to evaluate the immunization status of students to determine who should or should not be vaccinated.

It is possible to conclude that children born in other countries, especially in countries that have an EPI, are not necessarily protected against mumps and can constitute a reservoir susceptible to the disease and thus contribute to a possible outbreak in the community. It therefore important to verify and update, as quickly as possible, the immunization status of children at the beginning of the school year or at the time of their arrival at the school.

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DISEASE CONTROL SERVICE COMMENT

Mumps is a disease that has not received a lot of attention lately but while in the shadow of other high profile initiatives, such as measles elimination, the incidence of this disease has quietly decreased to all time lows. Prior to the introduction of routine immunization against mumps in 1975 (as MMRI vaccine), epidemics of mumps occurred every 3 to 4 years, with around 20,000 cases typically reported during an epidemic year. On average 11,000 cases were reported each year in Ontario during the 1960's and early 1970's.

After the introduction of MMR vaccine in 1975 and the replacement product, MMRII in 1980, the incidence rates began to decrease dramatically, from 152 reported cases per 100,000 population in 1974 to 19 reported cases per 100,000 population in 1980 and less than 7 per 100,000 each year from 1981 to 1989. In addition, there was less variation in annual totals suggesting the disappearance of large outbreaks. Throughout the 1980's an average of approximately 470 cases were reported each year.

By the early 1990's approximately 137 cases were being reported each year for an average incidence rate of 1.3

per 100,000 population. In fact, the provincial and national goal to reduce the annual incidence rate of mumps to 1.0 per 100,000 population was first achieved in Ontario in 1990.

When a second dose of measles vaccine was introduced into the routine schedule in 1996, children 4-6 years of age started receiving not only a second dose of measles vaccine but also a second dose of mumps and rubella vaccines since MMR vaccine was recommended for this purpose. Since 1996 the incidence of mumps has remained below the 1/100,000 target with an average rate of 0.39/100,000 (42 cases per year) between 1996 and 2000.

Can the decline in incidence observed since 1996 be directly attributed to this second dose? It is impossible to say without further analysis since the age and immunization status (at minimum) would have to be considered.

It is important to recognize that in many parts of the world mumps vaccine has only recently been included in the routine immunization schedule. The EPI program still does not include mumps vaccine. As evidenced by this report from Quebec, the immunization records of all foreign-born students need to be assessed at school entry for the need for additional immunizations. When records are not available for school age children and immunization is not contraindicated it is generally best to give the MMR vaccine (2 doses if necessary for measles), since adverse events, especially in previously immunized individuals are rare.

In England and Wales where immunization against mumps was introduced in 1988, coverage rates by age two for a single dose of mumps-containing vaccine were reported to be in the low nineties in 1997.[1]

In support of a two dose vaccination schedule, Gay et al (1997) concluded through mathematical modeling that 85% to 90% immunity is required in the population to eliminate mumps. At the time their single dose program did not achieve this level of immunity because the vaccine's moderate efficacy necessitated higher coverage levels. A two-dose MMR program has since been implemented in these jurisdictions.

In Quebec a routine second dose of MMR was introduced in 1996. The recommended timing of the second dose was, and currently is, at 18 months of age. A catch-up campaign for measles was conducted in 1996 but like Ontario, monovalent measles vaccine was used for this campaign. Therefore at the time of this reported mumps outbreak in 1998, it is likely that two-dose mumps coverage in the school age population was very low. It is somewhat reassuring that despite the clustering of unimmunized individuals which was sufficient to allow this outbreak to occur, there appeared to be very little "spill over" into the predominantly single-dose recipients in the school population. In addition, this outbreak did not identify that waning immunity was a significant problem among vaccinated individuals in this population.

These data in addition to the decline in incidence observed prior to 1996, suggest that high single-dose coverage is sufficient to control the spread of mumps. However, with the inclusion of a second dose of mumps vaccine in the routine schedule, indigenous transmission of this disease may be eliminated in Ontario in the near as opposed to distant future. Further analysis of recent mumps cases, including the classification of cases as indigenous or imported will provide a clearer picture of the epidemiology of this disease in Ontario and the possibility of elimination.

The decline in the incidence of mumps raises the issue of the need for laboratory confirmation of suspect cases. In the Quebec outbreak, 18 of the 37 cases (49%) were considered "probable cases" since they had an illness consistent with mumps but no laboratory confirmation or epi-link to a lab confirmed case. Near the end of this outbreak 6 of the 7 suspect cases for whom serological testing was carried out were found to be negative for mumps. As indicated by Gaulin et al, "*overestimation of the number of cases of mumps among immunized individuals on the basis of the surveillance definition is of particular concern especially when efforts are being made to eradicate this disease…*".[2] In May 2000 a supplement to CCDR titled "Case Definitions for Diseases Under National Surveillance" was published.[3] In this document the confirmed case definition for mumps was changed to require laboratory confirmation or an epi-link to a laboratory confirmed case. Currently the RDIS case definition remains unchanged (from May 1996) and permits the reporting of both confirmed and clinical cases. In light of the declining incidence of mumps, health unit staff should encourage physicians to submit specimens from suspect cases for laboratory confirmation.

Laboratory confirmation can be achieved through serological testing. While a single positive IgM result is sufficient to meet the confirmed case definition, testing of acute and convalescent sera for a significant rise in IgG is more conclusive. Viral isolation of mumps can be performed at the Central Public Health Lab in Toronto. Viral isolation, however, is not a rapid test, is difficult and is frequently unsuccessful; therefore serological testing is preferred for mumps diagnosis.

- Specimens suitable for mumps virus isolation include:
- Throat swab in viral transport media (collected up to 8 days after onset of symptoms)
- Saliva (collected up to 8 days after onset of symptoms)
- Urine (recommended transported on ice). Note: this is more successful if orchitis is present and the specimen is collected within 2 weeks after onset of symptoms
- CSF (if meningitis present) within 8-9 days of onset of meningitis

In conclusion, it might be time to start thinking about the elimination of mumps. This goal is achievable; however, more attention will need to be paid to the immunization status of individuals new to Canada and to laboratory confirmation of cases. As this is a relatively rare disease now, consideration has to be given to the other causes of parotitis when making a clinical diagnosis of mumps and physicians need to be educated about the need for laboratory specimens in order to confirm the diagnosis especially in previously immunized individuals.

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CONTACT

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Summary of Reportable Diseases in February 2001

Health Units by Region	1996 Population	AIDS	Campylo.	Chicken-pox	Chlamydia	Enceph./ Meningitis	GAS	Gonorrhea
Algoma	123,953		1	13	8			
North Bay	93,841			18	21			1
Northwestern	80,235			2	12			
Porcupine	97,437			8	11			
Sudbury	201,154		3		19			1
Thunder Bay	161,187							
Timiskaming	38,847				1			
Total - Northern	**796,654**		**4**	**41**	**72**			**2**
Eastern Ontario	185,314		3		8	1		
Hastings-Prince Edward	143,790		2	7				
Kingston-Frontenac	175,568		2		12		1	
Leeds-Grenville	156,129		2	24	7	1		
Ottawa-Carleton	721,136		13	12	80	2	4	11
Renfrew	97,634		3		3		1	
Total- Eastern	**1,479,571**		**25**	**43**	**110**	**4**	**6**	**11**
Durham Region	458,616		3	152	36	1		11
Haliburton-Kawartha	165,039		5		3		1	
Muskoka-Parry Sound	78,675		1	22	2			
Peel Region	852,526		26	219	88	5	1	17
Peterborough	123,448		1		9	2		
Simcoe County	329,865			53	35	1		7
Toronto City - total	2,385,421	1	59	190	383	6	4	131
North	*589,653*		*16*		*89*	*2*	*1*	*25*
South	*653,734*	*1*	*19*	*170*	*116*			*47*
West	*475,252*		*8*	*20*	*115*	*3*	*2*	*39*
East	*666,782*		*16*		*63*	*1*	*1*	*20*
York Region	592,445		7		2	4		
Total - Central East	**4,986,035**	**1**	**102**	**636**	**558**	**19**	**6**	**166**
Bruce, Grey-Owen Sound	153,312		6	2	3			
Elgin-St. Thomas	79,159							
Huron	60,220		1	1				
Chatham-Kent	109,650			46	12		1	1
Lambton	128,975		1					
Middlesex-London	389,616	1			44			14
Oxford	97,142						1	
Perth	72,106		3	14	3	1	1	
Windsor-Essex	350,329		11	42	34			2
Total - Southwest	**1,440,509**	**1**	**22**	**105**	**96**	**1**	**3**	**17**
Brant	114,564		2		20			1
Haldimand-Norfolk Region	102,575		3	4	6			
Halton Region	339,875		6	2	8	3		
Hamilton-Wentworth	467,799		7	11	53		5	7
Niagara Region	403,504		14		35		1	6
Waterloo Region	405,435		3	10	43	1	5	6
Wellington-Dufferin	217,052		11	12	8	2		
Total - Central West	**2,050,804**		**46**	**39**	**173**	**6**	**11**	**20**
February 2001	**10,753,573**	**2**	**199**	**864**	**1,009**	**30**	**26**	**216**
*** Total YTD 2001**	**-**	**5**	**420**	**1,924**	**2,331**	**52**	**64**	**458**
*** Total YTD 2000**	**-**	**12**	**442**	**5,313**	**2,378**	**41**	**89**	**499**

The Toronto City regions above are now defined as: North - former North York; South - former City of Toronto; West - former Etobicoke and City of York; East - former Scarborough and East York

* Adjusted for deletions and late reports.

Summary of Reportable Diseases in February 2001

Health Units by Region	1996 Population	PPNG	Hepatitis A	Hepatitis B	Hepatitis C	Hib	Influenza	Measles	Meningo-coccal
Algoma	123,953				8		3		
North Bay	93,841				2		1		
Northwestern	80,235						2		
Porcupine	97,437				1		5		
Sudbury	201,154				9	1			
Thunder Bay	161,187				4				
Timiskaming	38,847								
Total - Northern	**796,654**				**24**	**1**	**11**		
Eastern Ontario	185,314				2		17		
Hastings-Prince Edward	143,790				1		7		
Kingston-Frontenac	175,568				30		7		
Leeds-Grenville	156,129			1					
Ottawa-Carleton	721,136				35		42		
Renfrew	97,634		1				2		
Total- Eastern	**1,479,571**		**1**	**1**	**68**		**75**		
Durham Region	458,616	1					19		1
Haliburton-Kawartha	165,039				7		6		
Muskoka-Parry Sound	78,675								
Peel Region	852,526	1		1	23		12		
Peterborough	123,448			1	7		2		
Simcoe County	329,865				1		7		
Toronto City - total	2,385,421	5	3	3	71		31	2	3
North	*589,653*	*1*	*1*		*28*		*8*		
South	*653,734*	*3*	*1*	*3*	*9*		*5*		*1*
West	*475,252*	*1*			*18*		*9*	*2*	*1*
East	*666,782*		*1*		*16*		*9*		*1*
York Region	592,445						13		
Total - Central East	**4,986,035**	**7**	**3**	**5**	**109**		**90**	**2**	**4**
Bruce, Grey-Owen Sound	153,312				7		6		
Elgin-St. Thomas	79,159								
Huron	60,220						3		
Chatham-Kent	109,650						1		
Lambton	128,975								
Middlesex-London	389,616	1			5		4		2
Oxford	97,142					1	3		1
Perth	72,106						6		
Windsor-Essex	350,329		1	3	10		2		
Total - Southwest	**1,440,509**	**1**	**1**	**3**	**22**	**1**	**25**		**3**
Brant	114,564						6		
Haldimand-Norfolk Region	102,575				1		1		1
Halton Region	339,875		1		5		14		
Hamilton-Wentworth	467,799	1			24		28	1	2
Niagara Region	403,504				29		21		1
Waterloo Region	405,435				20		2		1
Wellington-Dufferin	217,052				3		9		
Total - Central West	**2,050,804**	**1**	**1**		**82**		**81**	**1**	**5**
February 2001	**10,753,573**	**9**	**6**	**9**	**305**	**2**	**282**	**3**	**12**
*** Total YTD 2001**	**-**	**24**	**18**	**18**	**689**	**4**	**417**	**4**	**24**
*** Total YTD 2000**	**-**	**52**	**20**	**27**	**1,050**	**1**	**1,397**		**24**

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* Adjusted for deletions and late reports.

Summary of Reportable Diseases in February 2001

Health Units by Region	1996 Population	Mumps	Pertussis	Rubella	Salmon.	Shigellosis	Syphilis (Prim/Sec)	VTEC
Algoma	123,953							
North Bay	93,841				1			
Northwestern	80,235				1			
Porcupine	97,437							
Sudbury	201,154		1		2			1
Thunder Bay	161,187							
Timiskaming	38,847							
Total - Northern	**796,654**		**1**		**4**			**1**
Eastern Ontario	185,314		1			2		
Hastings-Prince Edward	143,790				6	1		1
Kingston-Frontenac	175,568		4		3			
Leeds-Grenville	156,129							
Ottawa-Carleton	721,136				8	1		3
Renfrew	97,634				3			
Total- Eastern	**1,479,571**		**5**		**20**	**4**		**4**
Durham Region	458,616		4		2			
Haliburton-Kawartha	165,039				4			
Muskoka-Parry Sound	78,675				3			
Peel Region	852,526		3		21	3		
Peterborough	123,448		3		1			
Simcoe County	329,865				5			1
Toronto City - total	2,385,421		6	1	34	3		4
North	*589,653*		*4*		*12*			
South	*653,734*			*1*	*3*	*1*		
West	*475,252*		*1*		*11*			*2*
East	*666,782*		*1*		*8*	*2*		*2*
York Region	592,445		1		6	2		1
Total - Central East	**4,986,035**		**17**	**1**	**76**	**8**		**6**
Bruce, Grey-Owen Sound	153,312				4			
Elgin-St. Thomas	79,159							
Huron	60,220				1			
Chatham-Kent	109,650				2			
Lambton	128,975				1			
Middlesex-London	389,616							
Oxford	97,142							
Perth	72,106				1			
Windsor-Essex	350,329				6			
Total - Southwest	**1,440,509**				**15**			
Brant	114,564				2			
Haldimand-Norfolk Region	102,575							
Halton Region	339,875					1		
Hamilton-Wentworth	467,799				9			2
Niagara Region	403,504		1		7	3		2
Waterloo Region	405,435		1		5			
Wellington-Dufferin	217,052		1		1	1		1
Total - Central West	**2,050,804**		**3**		**24**	**5**		**5**
February 2001	**10,753,573**		**26**	**1**	**139**	**17**		**16**
*** Total YTD 2001**	**-**		**72**	**3**	**304**	**41**		**24**
*** Total YTD 2000**	**-**	**6**	**94**		**301**	**38**	**3**	**29**

The Toronto City regions above are now defined as: North - former North York; South - former City of Toronto; West - former Etobicoke and City of York; East - former Scarborough and East York

* Adjusted for deletions and late reports.