

Pandemic H1 N1 Influenza

**A South Eastern Ontario
Infection Control Network**

**Pandemic H1 N1 Influenza Update
September 17, 2009**

**Dr. Dick Zoutman
Medical Coordinator
SEOICN**

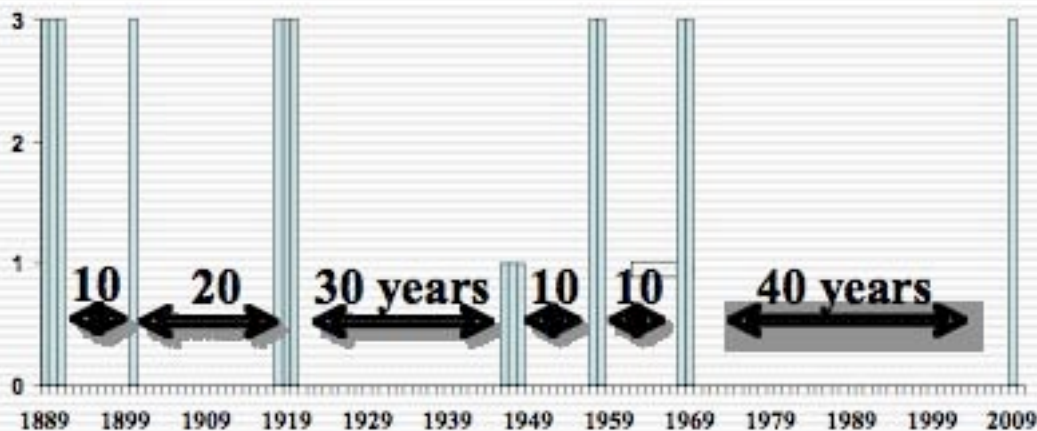
Goals and Objectives

- **The attendee will be able to:**
- **describe the evolving epidemiology of the H1N1 pandemic and**
- **The current recommendations for treatment and vaccination against this pandemic strain of influenza**









Disclaimer

- **I have done my best to provide accurate up to date information**
- **But the data is changing rapidly**
- **Please be sure to stay informed of new data, information and guidelines**

Pandemic Schedule



Different H & N Types

Haemagglutinin subtype				Neuraminidase subtype					
									
H1					N1				
H2					N2				
H3					N3				
H4					N4				
H5					N5				
H6					N6				
H7					N7				
H8					N8				
H9					N9				
H10									
H11									
H12									
H13									
H14									
H15									
H16									

Time Line of Human Influenza

2009-10 – H1N1 Swine virus
 2005-8 – More H5N1 Avian virus
 2004 – H7N1 Avian virus
 2004 – H7N3 Avian virus
 2004 – H5N1 Avian virus
 2003 – H7N7 Avian virus
 2003 – H5N1 Avian virus
 1999 – H9N2 Quail virus
 1997 – H5N1 Avian virus
 1995 – H7N7 Duck virus
 1993 – Swine/avian recombinant
 1988 – H1N1 Swine virus
 1986 – H1N1 Swine virus
 1976 – H1N1 Swine flu

Timeline of human infection with novel influenza viruses
(since the 1968 pandemic)

Past Pandemics

Year	Strain	Name	Global deaths
1918-19	H1N1	"Spanish" Flu	20-40 million
1957-58	H2N2	"Asian" Flu	1 million
1968-69	H3N2	"Hong Kong" Flu	1 million

Other Flu Pandemics

Emergence Of Antigenic Subtypes Of Influenza A Virus Associated With Pandemic Or Epidemic Disease

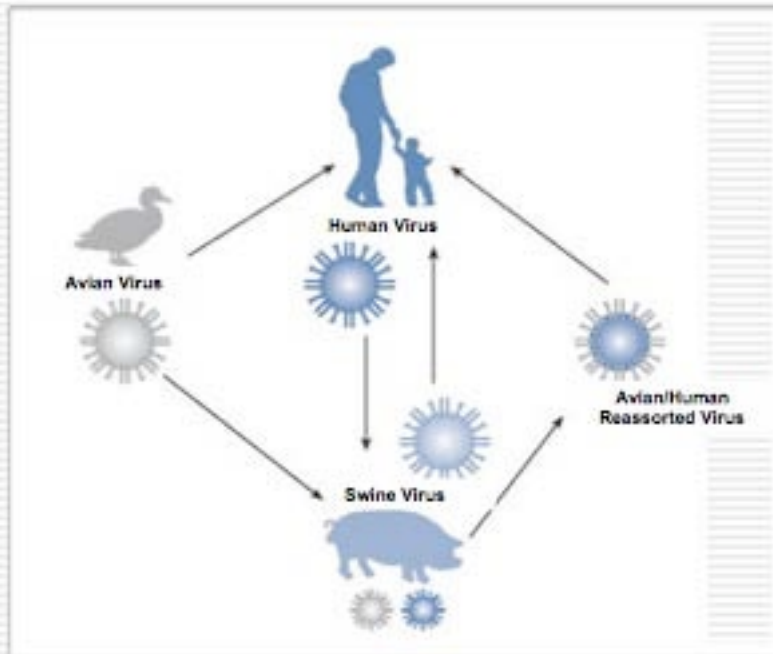
Year	Subtype	Extent Of Outbreak
1889-90	H2N8 ^a	Severe pandemic
1900-03	H3N8 ^a	?Moderate epidemic
1918-19	H1N1 ^b (formerly HswN1)	Severe pandemic
1933-35	H1N1 ^b (formerly H0N1)	Mild epidemic
1946-47	H1N1	Mild epidemic
1957-58	H2N2	Severe pandemic
1968-69	H3N2	Moderate pandemic
1977-78 ^c	H1N1	Mild pandemic
1997-98	H5N1	Local with interspecies spread

^aAs determined by retrospective serologic survey of individuals alive during those years ("seroarcheology").

^bHemagglutinins formerly designated as Hsw and H0 are now classified as variants of H1.

^cFrom this time until the present viruses of the H1N1 and H3N2 subtypes have circulated either in alternating years or concurrently.

Viral Genetics



What We Know About Pandemics

- **Occur unpredictably, not always in winter**
- **Great variations in mortality, severity of illness and pattern of illness or age most severely affected**
- **Rapid surge in number of cases over brief period of time, often measured in weeks**
- **Tend to occur in waves - subsequent waves may be more or less severe**
- **Key lesson - unpredictability**

H1N1 April to May 2009



H1N1 June-July 2009



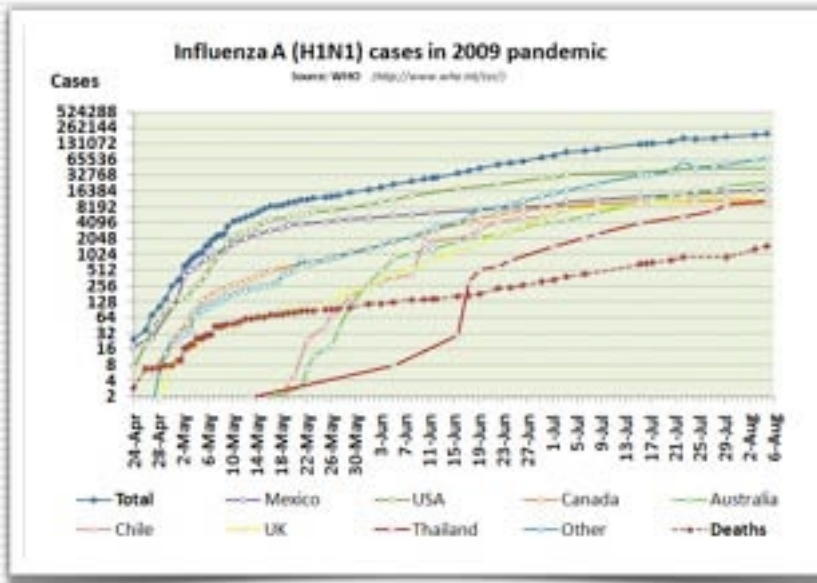
H1N1 July - Aug 2009



H1N1 Sept 2009



World Wide Epidemiology



Epidemiology in Canada

COUNTRIES/PROVINCES	DEATHS	HOSPITALIZATIONS*
CANADA (PHAC)	72	1,454
- BC	4	42
- AB	7	127
- SK	4	23
- MB	7	221
- ON**	23	366
- QC	25	591
- NB	0	2
- NS	1	17
- PEI	0	1
- NL	0	3
- Yukon	0	0
- NWT	0	4
- Nunavut	1	62
U.S. (CDC)	593	9,079
E.U. and EFTA (ECDC)	120	
Mexico	199	
Chile	130	
Argentina	465	
Australia	161	4,548
New Zealand	17	
TOTAL	3,315	

Seasonal & PH1N1

- **H1N1 likely to dominate, not mix with, seasonal flu.**
- **When scientists infected ferrets with the pandemic virus and one of two seasonal flu strains, the pandemic virus multiplied faster than the seasonal strain, caused more severe disease, and spread more easily to other ferrets.**
- **The team found no signs that the strains reassorted (mixed) to create new hybrids.**

Hospitalizations

**Ontario Data as of
Sept 3, 2009**

HOSPITALIZATION STATUS	VENTILATOR AND/OR ICU	NOT IN ICU AND NOT ON VENTILATOR	TOTAL
Number of Currently Hospitalized	12	7	19
Number of Hospitalized and Discharged	62	285	347
Total hospitalized to date	74	292	366*

Among cases that are currently or have previously been hospitalized, a number of complex medical conditions have been reported (for example, COPD, kidney disease, heart disease diabetes, etc).

• 89% of cases that were discharged had a length of stay of at least 2 days

Hospitalizations & Deaths

AGE GROUP	HOSPITALIZATIONS	RATE/100,000	DEATHS	RATE/100,000
<1	20	14.93	0	0
1-4	48	0.70	0	0
5-19	107	4.43	3	0.12
20-49	106	1.00	4	0.07
50-64	50	2.00	9	0.37
65+	35	2.03	7	0.41
Total	368	2.53	23	0.18

Pediatric Mortality

- **CDC reviewed 36 deaths among children aged <18 years April to August 2009**
- **36 children died, seven (19%) were aged <5 years**
- **24 (67%) had one or more of the high-risk medical conditions**
 - **Twenty-two (92%) of the 24 children with high-risk medical conditions had neurodevelopmental conditions**
- **Among 23 children with cultures, laboratory-confirmed bacterial coinfections were identified in 10 (43%)**

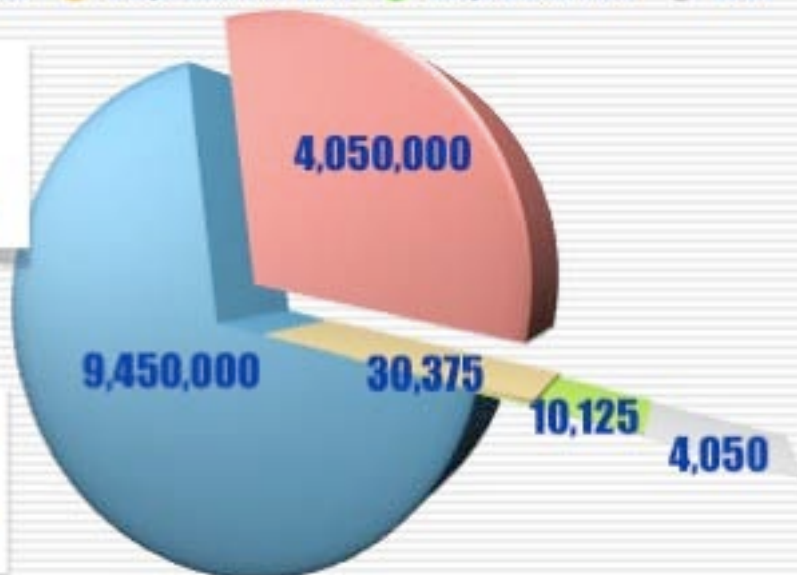
Case Fatality Rates

- The authors describe a simple method developed to obtain an unbiased estimate of confirmed CFR (cCFR), using only the confirmed cases as the denominator
- at an early stage of the epidemic, even when there have been only a few deaths.
- Their method adjusts the biased cCFR by a factor of underestimation which is informed by the time from symptom onset to death
- The maximum likelihood estimate of the unbiased cCFR for influenza may lie in the range of 0.16–4.48%
- Early epidemiological assessment of the virulence of emerging infectious diseases : a case study of an influenza pandemic (Hiroshi Nishiura, Don Klincenberg, Mick Roberts, Johan A. P. Heesterbeek, PLS O., September 2, 2009)

The Risks in Canada

● Not Sick ● Sick ● Hospitalized No Vent ● Hospitalized Vent ● Dead

Attack Rate: 30%
Hospitalization: 1%
Ventilated: 25%
Case Fatality Rate: 0.1%



UK Current Planning Assumptions

www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_104643.pdf

Ontario Population: 13,500,000

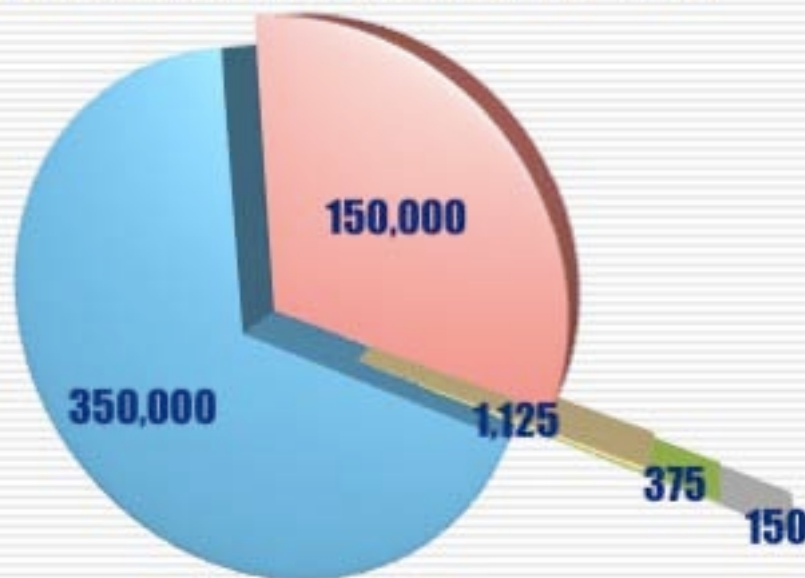
The Risks in SEO

● Not Sick ● Sick ● Hospitalized No Vent ● Hospitalized Vent ● Dead

Attack Rate: 30%
Hospitalization: 1%
Ventilated: 25%
Case Fatality Rate: 0.1%

UK Current Planning Assumptions

[www.dh.gov.uk/
prod_consum_dh/groups/
dh_digitalassets/documents/
digitalasset/dh_104843.pdf](http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_104843.pdf)



SEO Population: 500,000

Australian Experience

- Highest hospitalization rate occurred in young children less than 5 years of age (34.6 per 100,000 population).
- 4% of the hospitalized cases have been reported as pregnant.
- During the month of July, pregnant women accounted for 32% of all hospitalized women aged between 25-29 years.
- Indigenous Australians are approximately 5 times more likely than non-Indigenous Australians to be hospitalized for Pandemic (H1N1) 2009, representing 13.8% of all hospitalizations.
- Most cases had underlying medical conditions, including cancer, diabetes mellitus and morbid obesity.
- 20-30% clinical attack rate
- 0.14% CFR, 1-2% hospitalized, 7-15% of those hospitalized will die

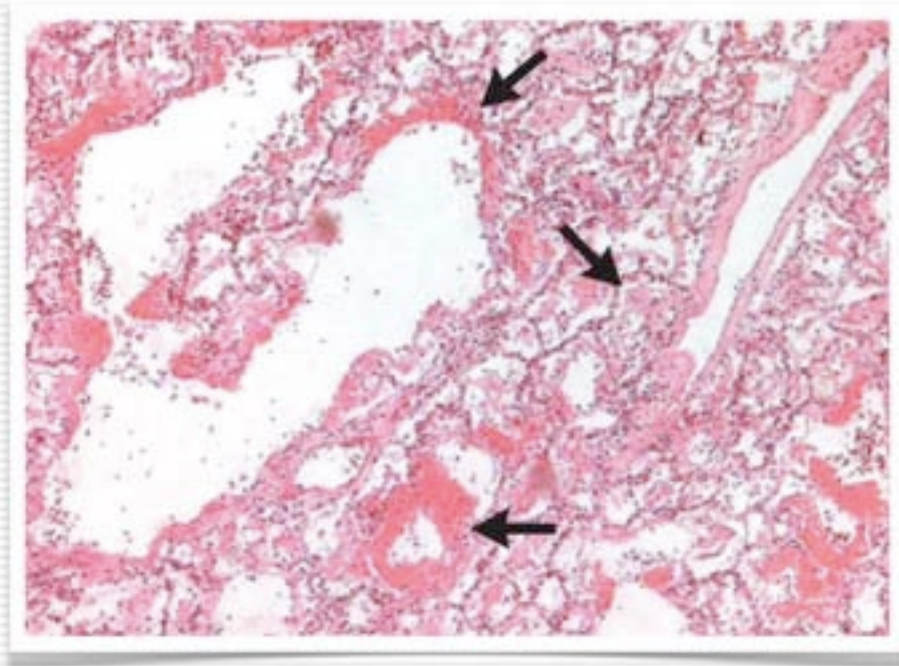
Canadian Deaths

- **23 deaths have been reported among confirmed cases.**
- **Almost all of these fatalities were hospitalized prior to death (83%).**
- **Age of fatal cases ranged from 6 to 81 years of age; median is 56 years and the average age is 54 years.**
- **Among confirmed cases that have died, 20 or 87% had underlying chronic medical conditions compared to 66% of hospitalized cases.**

Symptoms

Symptoms	Number (n=44)	%
Cough	43	98%
Fever	42	96%
Fatigue	39	89%
Headache	36	82%
Sore throat	36	82%
Runny nose	36	82%
Chills	35	80%
Muscle aches	35	80%
Nausea	24	55%
Stomach ache	22	50%
Diarrhea	21	48%
Shortness of breath	21	48%
Joint pain	20	46%

H1N1 Pneumonia



At Risk Groups

- **Chronic cardiopulmonary disease**
- **Diabetics**
- **Chronic renal and liver disease**
- **Immune deficiency (eg HIV, immune modulators, steroids)**
- **Chronic neuromuscular disease**
- **Morbid obesity**
- **Pregnancy**
- **Children ≤ 2 years of age**
- **Isolated**

Diagnostic Tests

- **Test those with severe illness**
- **At start & end of outbreak season**
- **Would be nice to test those you would treat also but not practical**
- **NP Swab**
- **Rapid antigen tests low sensitivity**
- **Even cell culture low sensitivity**
- **PCR is very sensitive and fast (Liao, Zoutman et al J Clin Micro 2009)**

NP Swabs



Vaccine Production



H1N1 Vaccine Sequencing

- **Persons with chronic conditions (NACI list) under the age of 65**
- **Pregnant women**
- **Children 6 months to less than 5 years of age**
- **Persons residing in remote and isolated settings or communities**
- **Health care workers (all health care system workers involved with the pandemic response or delivery of essential health services)**
- **Household contacts and care providers of infants <6 months of age & persons who are immunocompromised**
- **Populations otherwise identified as high risk**

Others Who May Benefit

- **Children 5 to 18 (inclusive) years of age**
- **First responders (police, firefighters)**
- **Poultry and Swine Workers**
- **Adults 19 to 64 (inclusive) years of age**
- **Adults 65 years of age and over**

Vaccine Formats



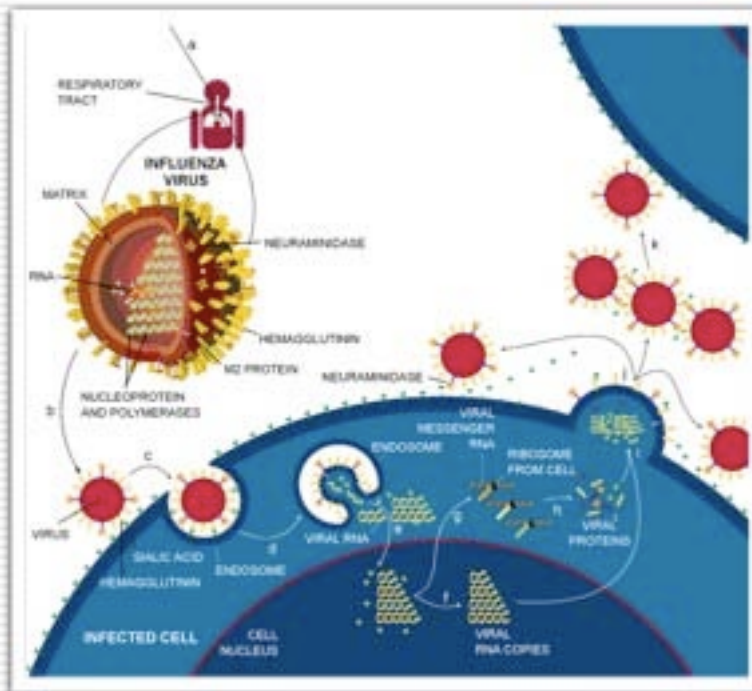
Squalene

- **Adjuvanted vaccine**
- **AS03 "Adjuvant System #03" by GSK**
- **Requires less viral protein (3.7 µg)**
- **1 dose may give 95% seroconversion**
- **Not in small children or pregnancy?**
- **Enough for all who want it**

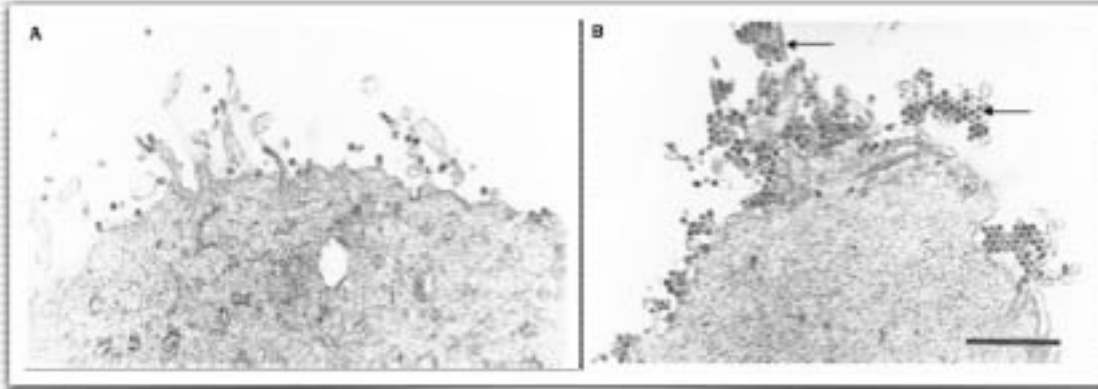
Unadjuvanted Vaccine

- 1.5 million doses planned
- 15 µg protein/dose
- For small children and pregnancy
- Stay tuned!

Antivirals Pharmacology



Neuraminidase Inhibitors



Wishful Thinking?



Amantidine Resistance

	Isolates tested	Resistant Isolates	% Resistance
US Isolates	305	305	100
Foreign Isolates	78	78	100
Global Isolates	383	383	100

Neuraminidase Resistance

	Isolates tested	Resistant (%)	
		Zanamivir	Oseltamivir
US Isolates	267	0 (0)	0 (0)
Foreign Isolates	105	0 (0)	0 (0)
Global Isolates	372	0 (0)	0 (0)

pH1N1 Resistance

- **Oseltamivir-resistant cases have been documented**
- **Denmark (after oseltamivir treatment)**
- **Japan (after oseltamivir treatment)**
- **Canada (after oseltamivir treatment)**
 - **Quebec and Alberta**
- **Hong Kong (no treatment)**

Antivirals Indications

- **ILI + High Risk**
- **SRI**
- **Start it early (within 24-48 hours)**
- **Canada has 5.57+ million Rx courses in National Stock Pile**

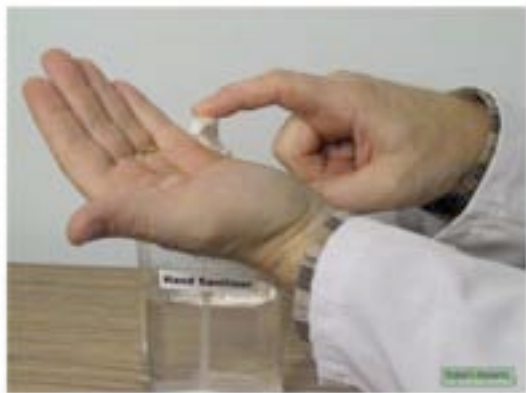
Osetamivir Use

- **Adults: 75 mg po BID**
- **Alternative is zanamivir if > 7 years**
- **Children \geq 12 months:**
 - **\leq 15 kg: 30 mg po BID**
 - **>15 kg to 23 kg: 45 mg po BID**
 - **>23 kg to 40 kg: 60 mg po BID**
 - **>40 kg: 75 mg po BID**
- **Children <12 months:**
 - **2 mg/kg po BID**

Survival of Influenza Virus

- **Hard non-porous surfaces**
 - **24-48 hours**
- **Plastic, stainless steel**
 - **Recoverable for > 24 hours**
 - **Transferable to hands up to 24 hours**
- **Cloth, paper & tissue**
 - **Recoverable for 8-12 hours**
- **Viable on hands <5 minutes only at high viral titers**
- **Potential for indirect contact transmission**
- **Humidity & Temperature Important**
 - **Source: Bean B, et al. JID 1982;146:47-51**

Infection Control



And A Gown!

Community Measures

PUBLIC NOTICE

In view of the severity of the present

Epidemic of Influenza

and in order that all efforts may be concentrated on the stamping out of the disease, the local Board of Health, after consultation with Kingston Medical Society and the Mayor, has enacted that after Oct. 16th, and until further notice,

1. Theatres and Moving Picture Houses shall be closed and remain closed.
2. Churches and Chapels of all denominations shall be closed and remain closed on Sundays.
3. All Schools, Public or Private, including Sunday Schools, shall close and remain closed.
4. Hospitals shall be closed to visitors.
5. No public shall be admitted to courts except those essential to the prosecution of the cases called.
6. The Board advises the public most strongly not to crowd into street cars and to avoid as much as possible any crowded train or an assembly of any kind.

Provisions have been made by the Kingston Medical Society whereby all cases applying for assistance will receive the same either by registered practitioners or by final year medical students acting under instructions. Therefore every case of illness should send in a call to a physician.

A. B. WILLIAMSON,
Medical Health Officer.

October 16, 1918, Kingston

IMS Structure



How To Stay Informed

www.ricn.on.ca

Select "SEO"

Pandemic Influenza page

Also www.pandemicportal.ca

Objectives Achieved

- **The attendee will be able to:**
- **describe the evolving epidemiology of the H1N1 pandemic and** ✓
- **The current recommendations for treatment and vaccination against this pandemic strain of influenza** ✓

Q & A



Physician Survey

- **Please take the physician RICN needs survey!**
- **<http://ricn.on.ca/physiciansinfectionpreventionandcontrolsurveyp975.php>**

Next Presentation

- **November 26, 2009**
- **5:30-6:30 PM**
- **Topic: TBA!**