



Pandemic Influenza

Why are we so concerned?

Mark Gilbert, MD

Medical Health Officer

Cadboro Bay Residents Association

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Overview

- Background
 - What is influenza?
 - How influenza can be prevented
 - Avian influenza
- Pandemic influenza

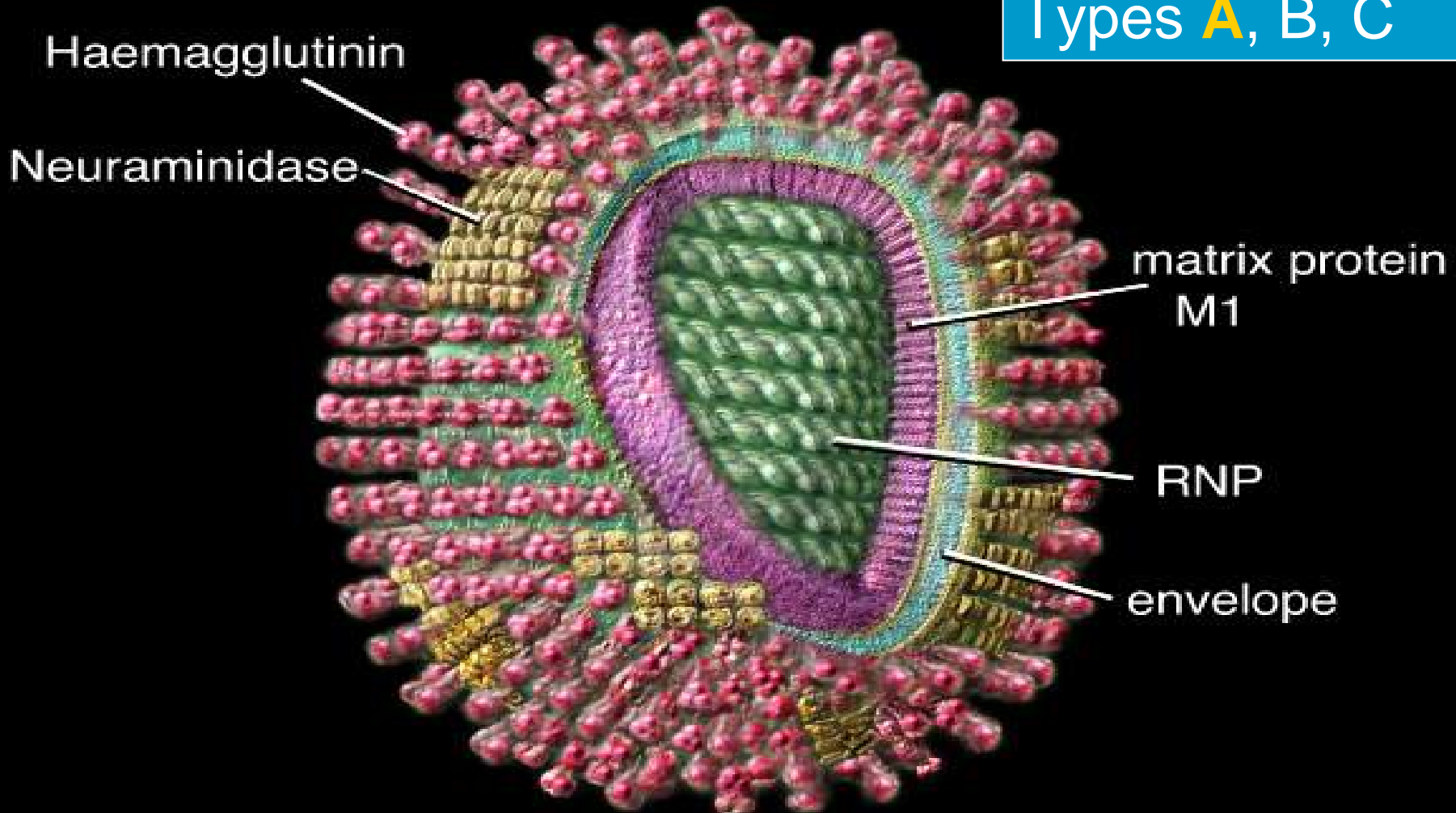
What is Influenza?

- Infection of the respiratory airways.
- Spread person to person by respiratory droplets or secretions; coughing or sneezing.
- Symptoms: Sudden onset of FEVER & COUGH, sore throat, muscle/joint pain, fatigue.







































Influenza Virus Structure

Types **A**, B, C



Natural Hosts of Influenza A Virus

H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
														
														
														

N1	N2	N3	N4	N5	N6	N7	N8	N9
								
								
								

H=hemagglutinin

N=neuraminidase

Why is influenza a problem every winter?

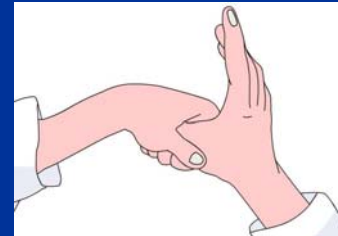
- New flu virus every year because the **H** & **N** proteins on Influenza viruses change slightly each year (“drift”)
- Our immune systems will not fully recognize the altered **H** & **N** on the virus.
- Many people will therefore be susceptible to flu virus in any given year

How can influenza be prevented?

- Influenza vaccine



- Personal precautions/hygiene



- Antivirals



Annual Influenza Vaccine

- Immunization is the most effective way to reduce the impact of influenza.
- Flu virus grown in chickens eggs the split into pieces
- Vaccine is safe and cannot cause influenza



The vaccine changes every year

- It is necessary to update the vaccine each year with the most current strains that are circulating in the population.
- February 10, 2005, Geneva:
 - A/New Caledonia/20/99(H1N1)-like virus
 - A/Wisconsin/67/2005(H3N2)-like virus
 - B/Malaysia/2506/2004-like virus

Flu Vaccine Production Timeline

- Decision on which 3 strains
- Manufacturers purchase hens' eggs
- Virus strains sent to manufacturers
- Eggs inoculated with virus



- Virus multiplies in eggs
- Virus inactivated with chemicals
- Egg white removed / virus harvested
- Vaccine tested for purity & potency



- 3 vaccine strains blended
- Packaging into syringes / vials
- Licensure and release
- Shipping



Immunization begins



Jan

Feb

May

June-July

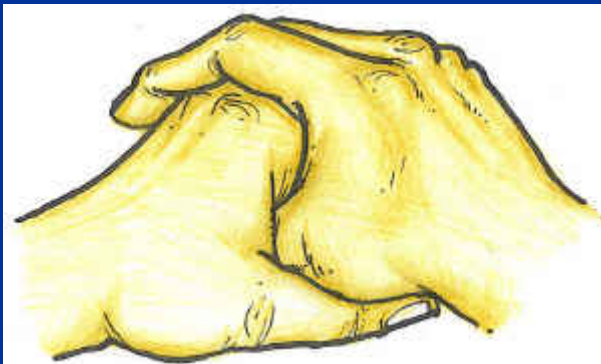
Aug

Sep

Oct

Personal Precautions/Hygiene

- Hand washing, hand washing, hand washing!
 - Especially after coughing or sneezing.
 - Before hand to face contact (e.g. eating)
- Cover your mouth with a disposable tissue when you cough or sneeze.
- If possible, stay home when you are sick.
- If your child is sick, keep them at home.



Anti-flu drugs (Antivirals)

- 2 types of antivirals:
 - M2 inhibitors (amantadine)
 - neuraminidase inhibitors (oseltamivir)
- Are effective for both *treatment* and *prevention* of influenza.
- Differences between the two types of drugs include how the drugs work, side effects, cost and the potential for drug resistance.



Masks

- Not likely to be effective for reducing disease spread in the general population.
- May provide a false sense of security and ↓ other infection control practices.



Avian Influenza (Bird Flu)

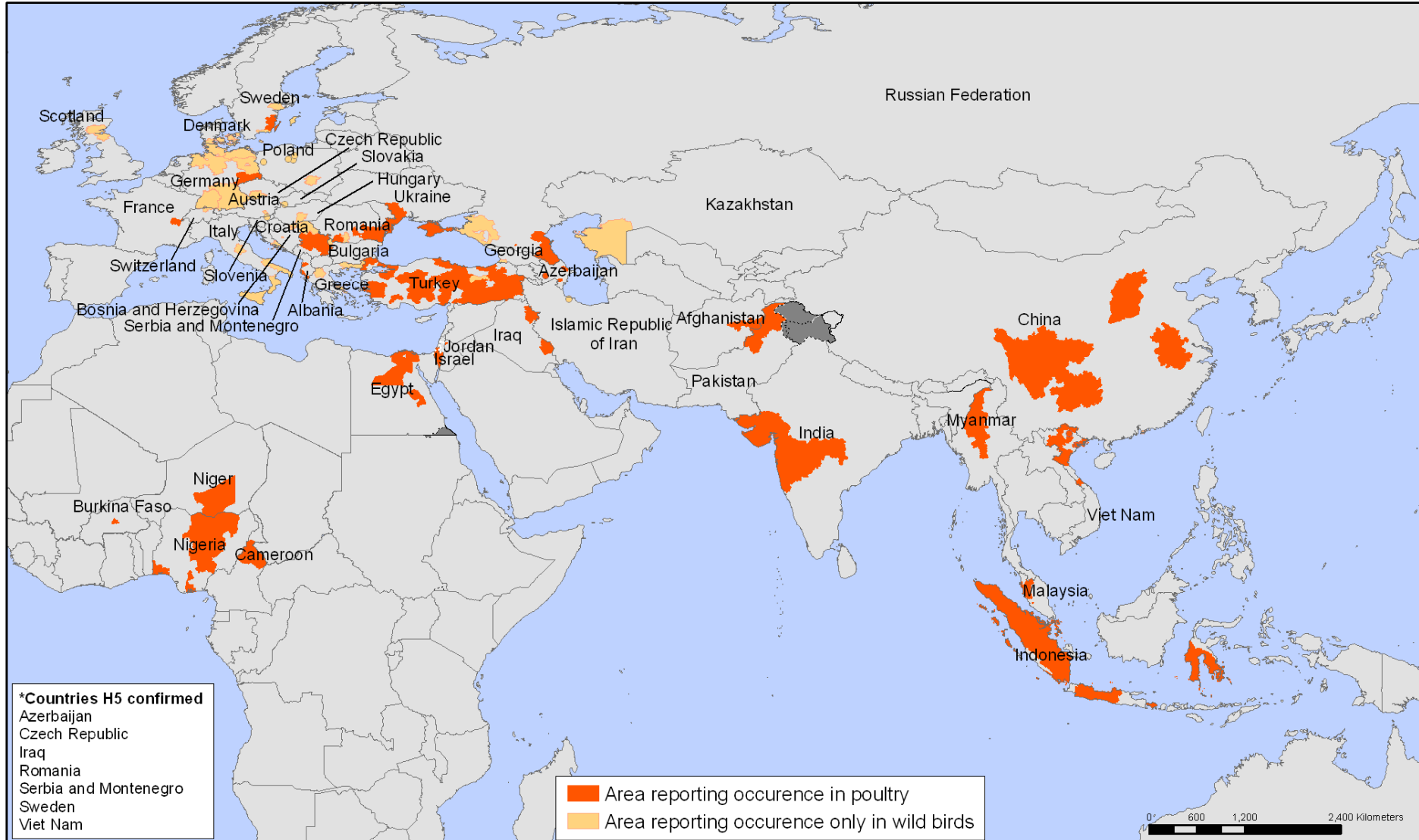


Avian Influenza A

- Many subtypes (e.g. H7N7, H9N2, **H5N1**)
- Manifestations in poultry: reduced egg production, coughing, sneezing, diarrhea
- **Human infections** could occur in people in close contact with an infected flock
- Human illness varies: typical flu-like illness, eye infections, severe multi-organ failure
- *Usually not spread person to person*

Current Situation Avian H5N1

- **Widespread:** poultry outbreaks in Asia, recent spread to Europe, Egypt, Niger and Middle East
- **Ability to cause human infections:**
 - 204 confirmed illnesses
 - impact on younger generations
- **High pathogenicity** in birds and humans:
 - 113 human deaths, case fatality rate (55.4%);
- **Mutates rapidly;** can acquire new genes
- **Person to person transmission:** Household clusters



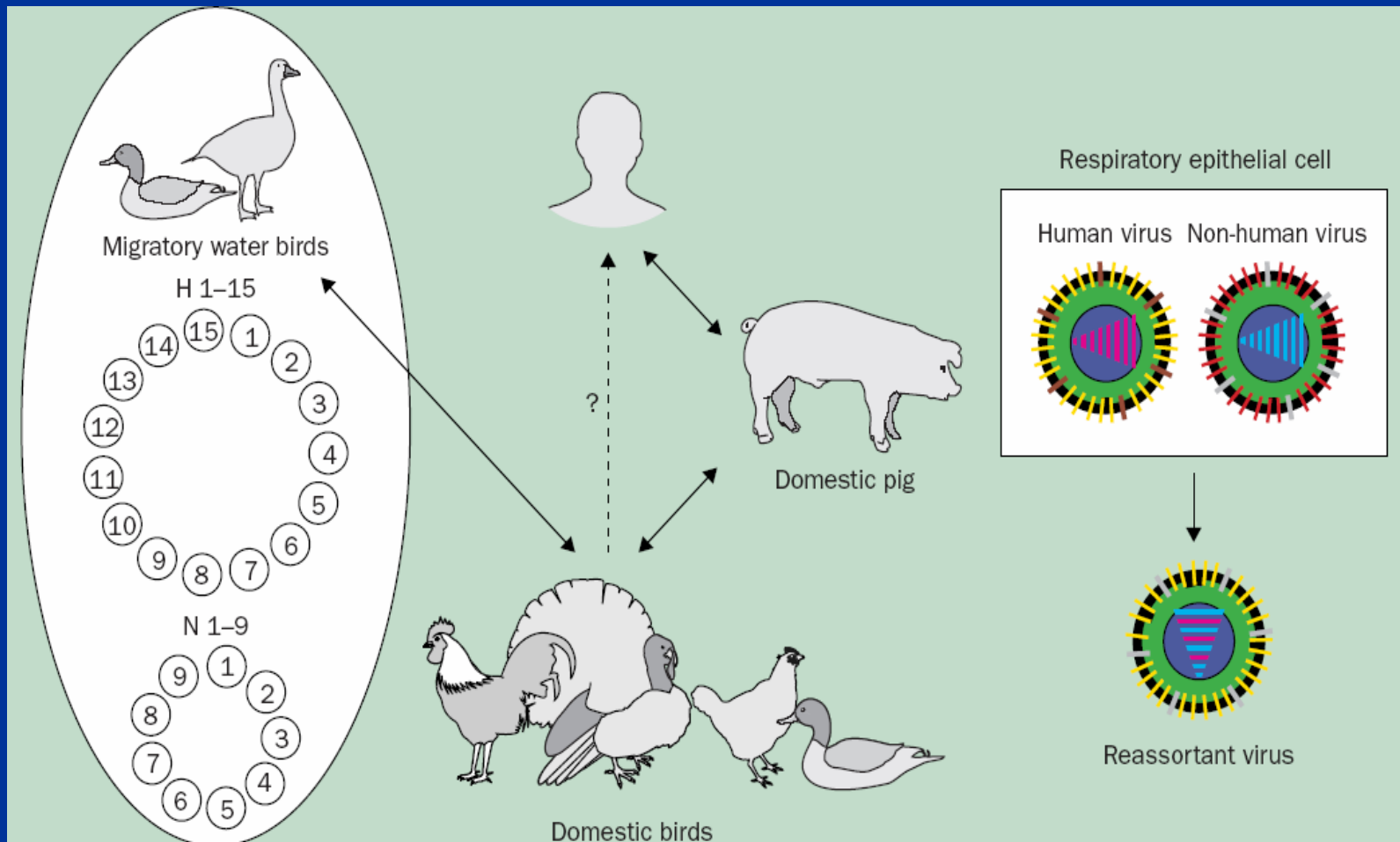
Pandemic Influenza



What is a pandemic?

- A *huge* epidemic occurring worldwide, affecting a very large number of people
- Caused by “Shift”
 - A new virus caused by a large change in **H** & **N**
 - $$\text{H1N1} \xrightarrow{\text{shift}} \text{H2N2}$$
- Occur infrequently
- Everyone is vulnerable

Origin of New Human Strain from Avian Strain and Start of Pandemic



Conditions Needed for a Pandemic

- New subtype (major change in H/N protein – shift)
- Able to cause illness in humans
- Worldwide susceptibility
- Strain transmitted easily from person to person

History of Pandemics



Pandemic Influenza-History

■ Spanish Flu 1918 (A/H1N1)



- It is estimated $\frac{1}{2}$ of the world population was infected
- 20-40 million deaths worldwide
- 30,000-50,000 Canadians died
- Attack rate and mortality was highest among adults 20 to 50 yrs

Pandemic Influenza-History

- **Asian Flu 1957 (A/H2N2)**
 - Predicted, immunity was rare in people <65,
 - The elderly had the highest rates of death.
 - ~70,000 people in the US died

- **Hong Kong Flu 1968 (A/H3N2)**
 - Mildest pandemic in the 20th Century
 - Affected all age groups on all continents
 - Caused about, 34,000 deaths in the US.

Pandemic spread

- Once it starts, anticipate:
 - Presence in Canada in 3 months
 - 1st Peak of Illness in 5-7 months
 - 1st Peak of Deaths in 6-8 months
 - At least 6 months to vaccine readiness
 - Several waves – 2nd and 3rd will be worst
 - Outbreaks will occur simultaneously, in multiple waves, and with devastating societal impact

Impact of a Pandemic on VIHA

- First cases in 3 months
- 2 to 3 waves lasting 6-8 weeks each
- Peak illness in 5-7 months; deaths 6-8 months
- 300,000 to 400,000 infected
- 50,000 to 120,000 require outpatient care (20-42%)
- 500 to 4000 require hospitalization (1-10%)
- 160 to 1,400 deaths (5-40%)
- Costs \$24-54 M direct; \$217-428 M indirect

Severity and Impact

- Societal Infrastructure greatly impacted:
 - Health Workers
 - Emergency Services
 - Other community service workers
- Closure of public places & services
- Scarce resources
- Convergence:
 - Seeking limited services



WHO Phases of a Pandemic

Inter-pandemic phase New virus in animals, no human cases	Low risk of human cases	1
	Higher risk of human cases	2
Pandemic alert New virus causes human cases	No or very limited human-to-human transmission	3
	Evidence of increased human-to-human transmission	4
	Evidence of significant human-to-human transmission	5
Pandemic	Efficient and sustained human-to-human transmission	6

Summary

- Global pandemic of influenza is due
 - Illness, deaths, social disruption on VI
- Current outbreaks of avian influenza of concern
- Need plans in place that will allow rapid response when next pandemic is identified
 - To reduce morbidity, mortality, and social disruption

