

Infectious Disease / Influenza

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(presentations)

Conflicts of Interest

- none

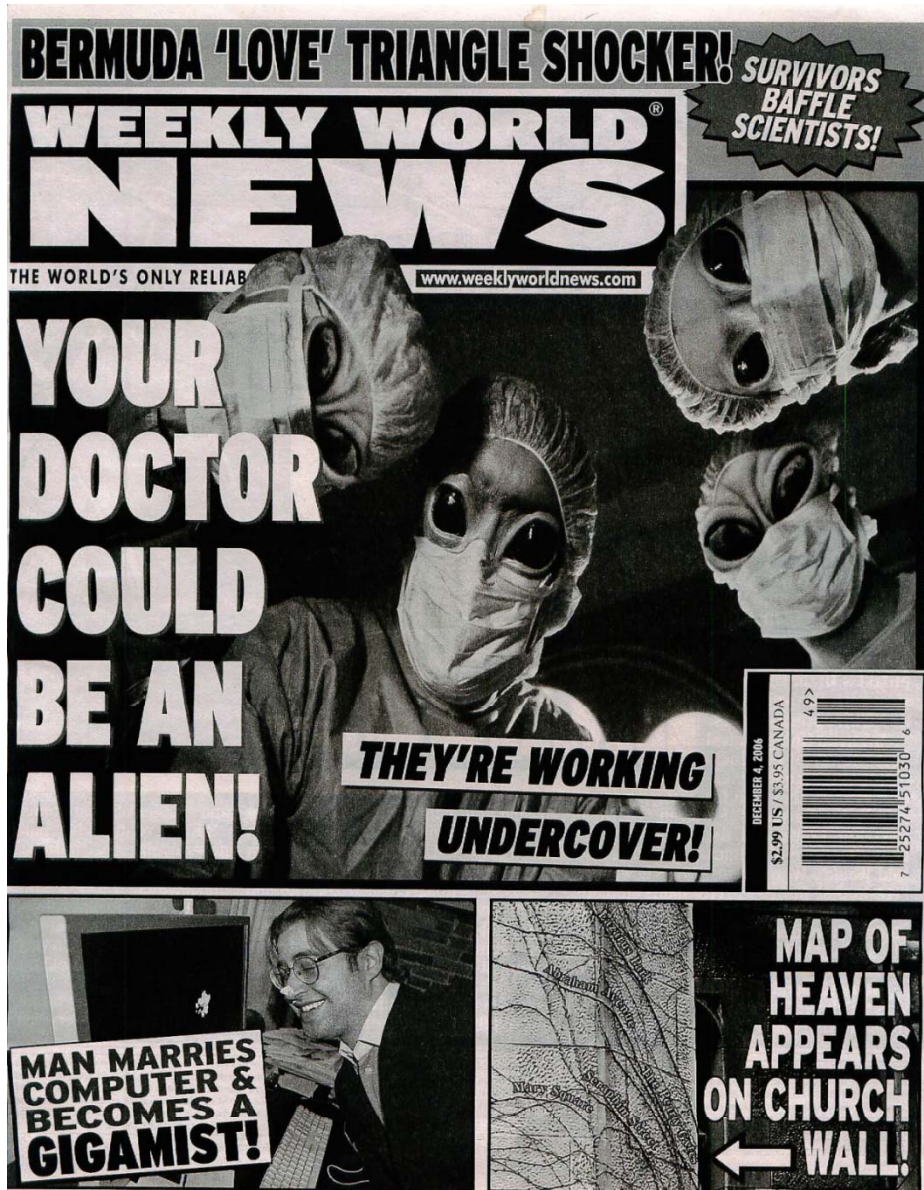


Objectives

- Review important concepts in infectious disease
- Review Influenza



Illustration: Don Smith



WARNING

- I will be showing images of medical nature.
- All images are from the internet. No images are from local patients.
- This talk does not replace individual medical advice that may change with time.

Introductory Concepts

- Infectious Diseases
 - Disease caused by invasion of a micro-organism; may or may not be communicable.
- Communicable Diseases
 - Infectious diseases that can be transmitted from person to person
- Zoonoses
 - Infectious diseases that can be transmitted from an animal to a human

Non-Communicable Infectious Disease

- A Few Examples
 - Malaria (nearly always)
 - Endocarditis
 - Internal abscesses
 - Urinary tract infection
 - Hanta virus



Communicable Diseases

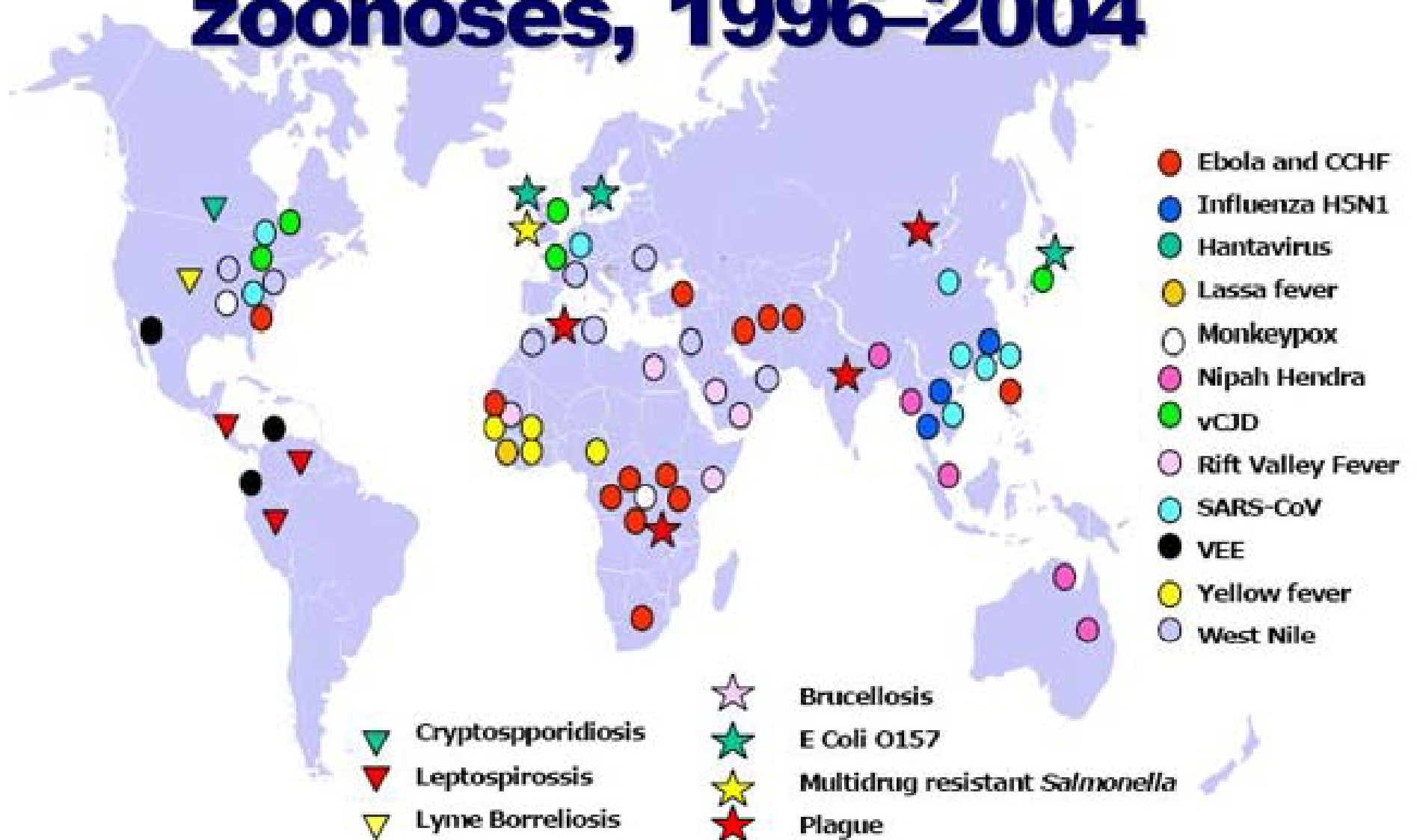
- A Few Examples
 - Childhood
 - Measles
 - Parvovirus
 - Rubella
 - Varicella
 - Sexually Transmitted
 - Gonorrhoea
 - Chlamydia
 - Syphilis
 - Human Immune Def
 - Pneumonias
 - Viral
 - Bacterial / Tuberculosis



Modes of Transmission

- Droplet contact
 - coughing or sneezing on another person
- Airborne Transmission
 - if the microorganism can remain in the air for long periods
- Direct physical contact
 - touching an infected person, including sexual contact
- Indirect contact
 - touching soil contamination or a contaminated surface
- Fecal-oral transmission
 - contaminated food or water
- Vector borne transmission
 - carried by insects or other animals

Emerging and re-emerging zoonoses, 1996–2004



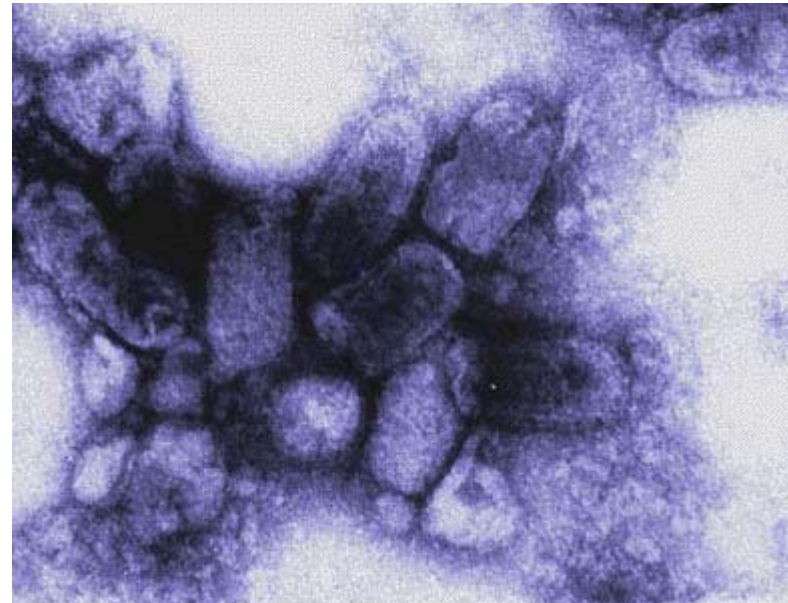


Infectious Agents

- Viruses
- Bacteria
- Fungi
- Protozoa
- Parasites
- <http://www.cellsalive.com/howbig.htm>

Viral Infections

- Viruses
 - small
 - can hide in cells
 - spectrum of diseases
 - difficult to treat!



Bacterial Infections

- Bacteria
 - 100X viruses
 - a few can hide in cells
 - spectrum of diseases
 - antibiotics often effective
 - resistance is growing
 - adverse effects of antibiotics
 - surgery sometimes needed



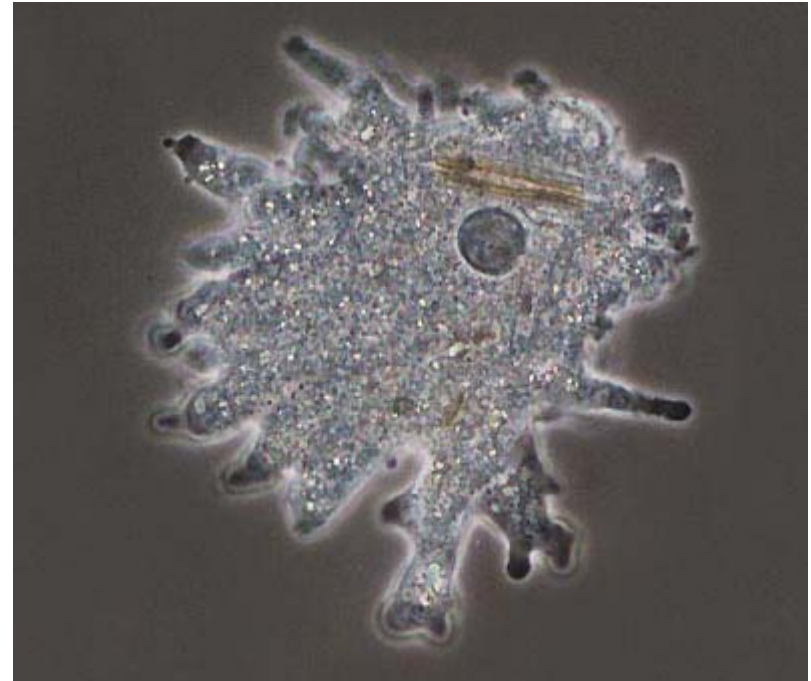
Fungal Infections

- Fungi
 - large
 - yeast is most common
 - colonization vs infection
 - deep infections are difficult to treat
 - antifungal toxicity
 - long duration



Protozoal Infections

- Protozoa
 - larger
 - spectrum of disease
 - less common in Canada
 - drugs available but some are toxic



Parasitic Infections

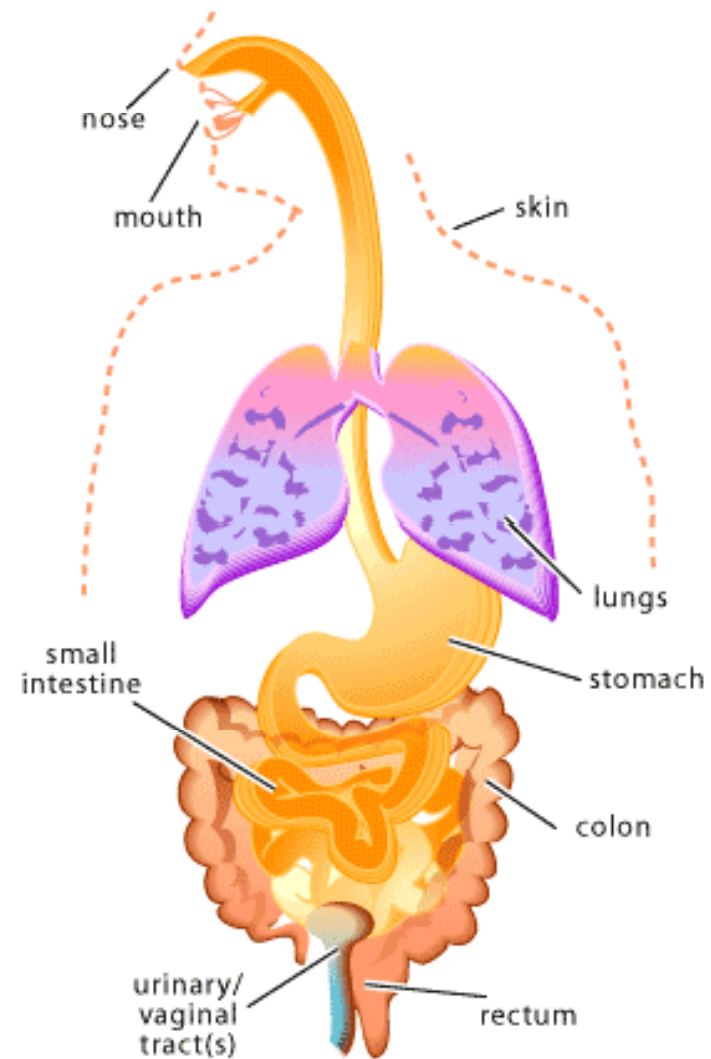
- Parasites
 - very large
 - spectrum of disease
 - less common in Canada
 - sanitation
 - food preparation
 - usually easy to treat
 - e.g. lice



Massive Ascaris infection in child. A large bolus of roundworms expelled following anthelmintic treatment.

Colonization versus Infection

- The mere presence of micro-organisms is not the same as infection.
- Infection depends
 - invasion of tissue
 - type of micro-organism
 - location



Prevalence versus Incidence

- Prevalence
 - number of people with a disease
- Incidence
 - number of new cases of disease among those at risk
 - e.g. 'Attack Rate'

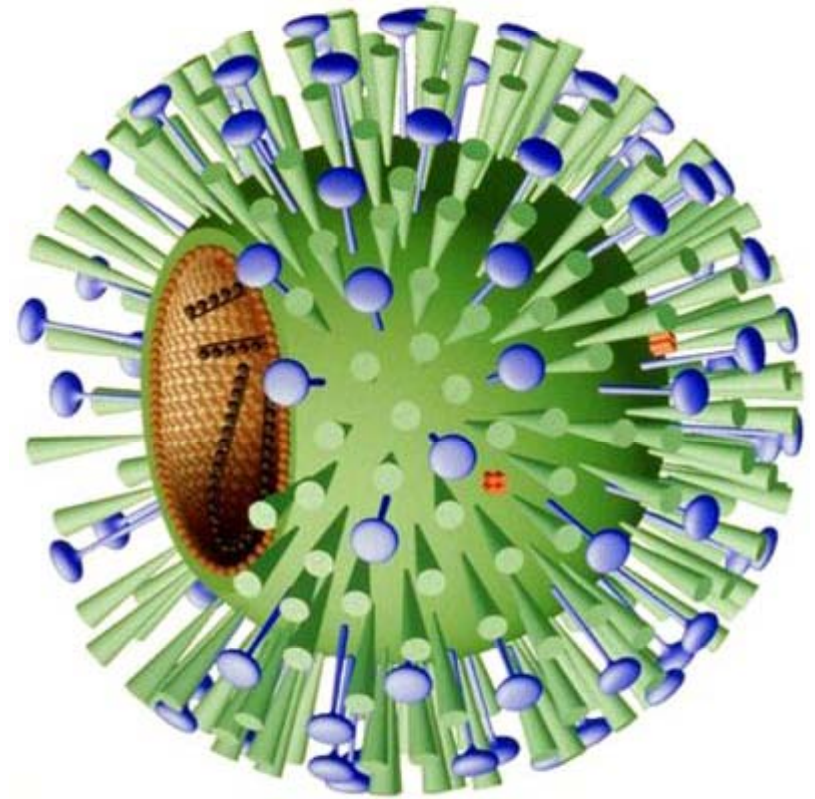
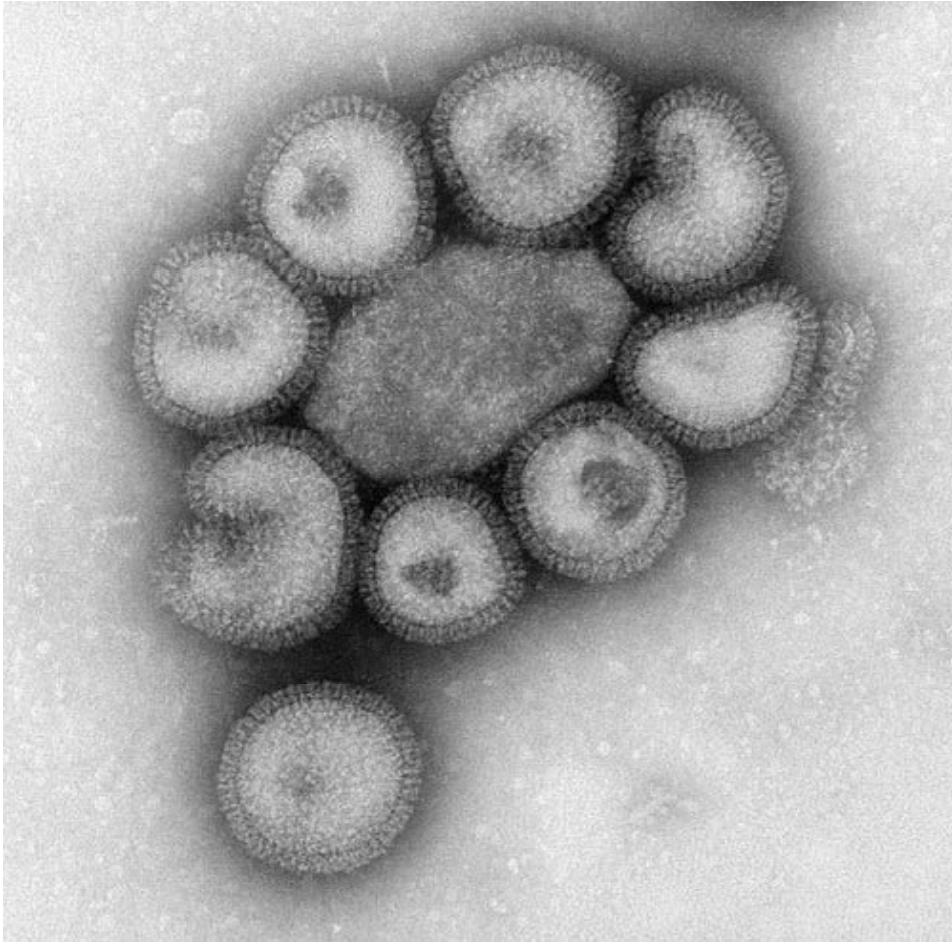
Epidemic and Pandemic

- Epidemic
 - higher than normal incidence of disease
- Pandemic
 - an epidemic that involves large regions or world

Influenza

- Influenza
 - caused by the influenza viruses
 - commonly and incorrectly used to refer to similar illnesses caused by other viral infections (e.g. stomach flu)
 - Classified as A, B, or C according to their protein
 - Influenza C virus infection does not cause typical influenza illness.

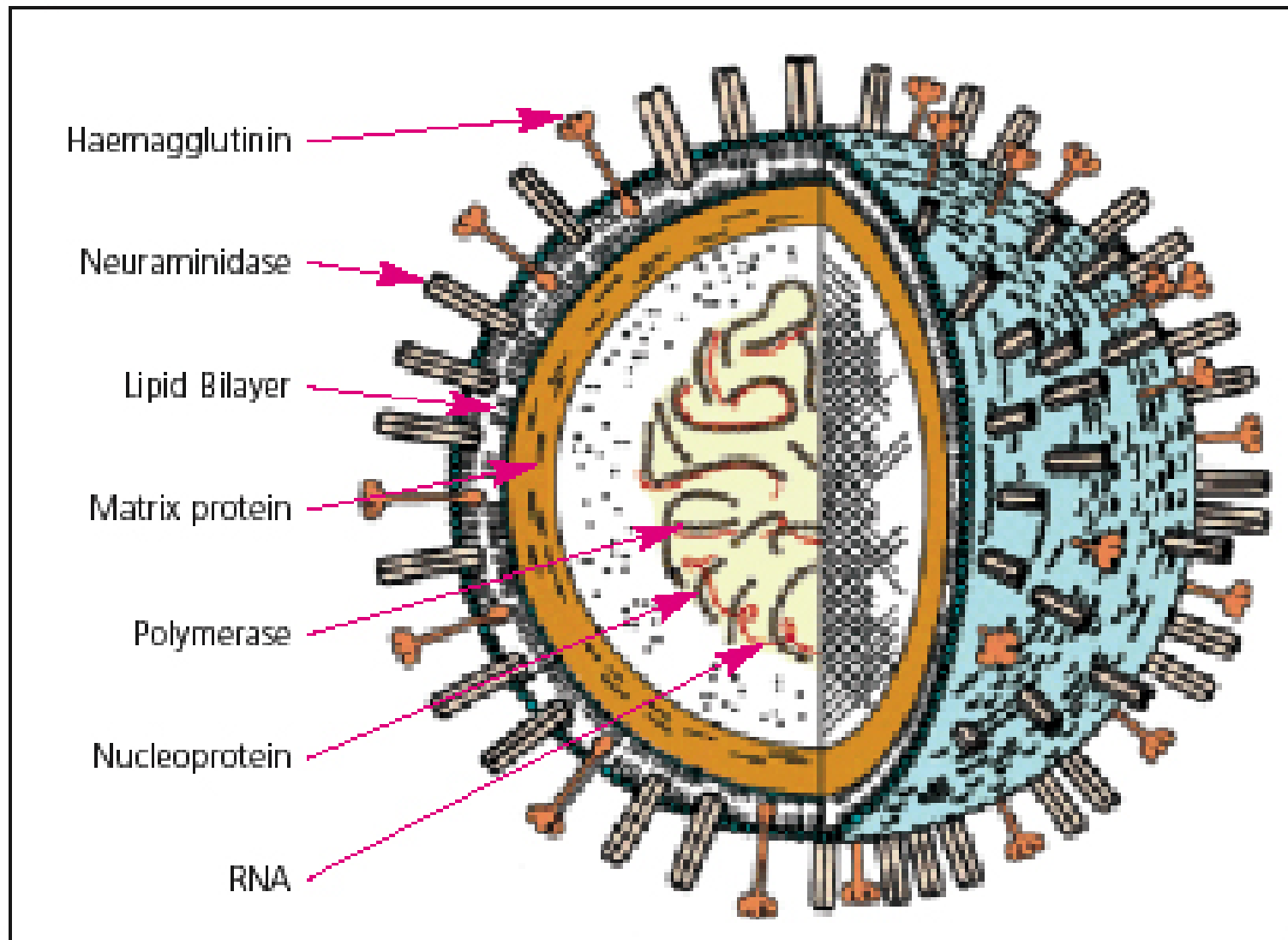
Influenza A Virus



What's up with the H and N?

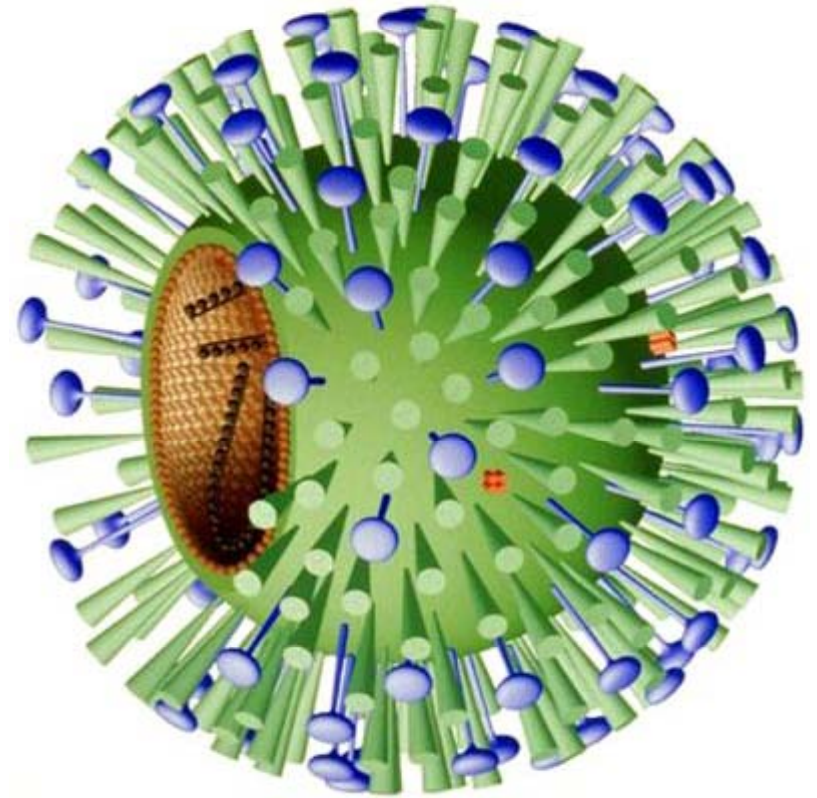
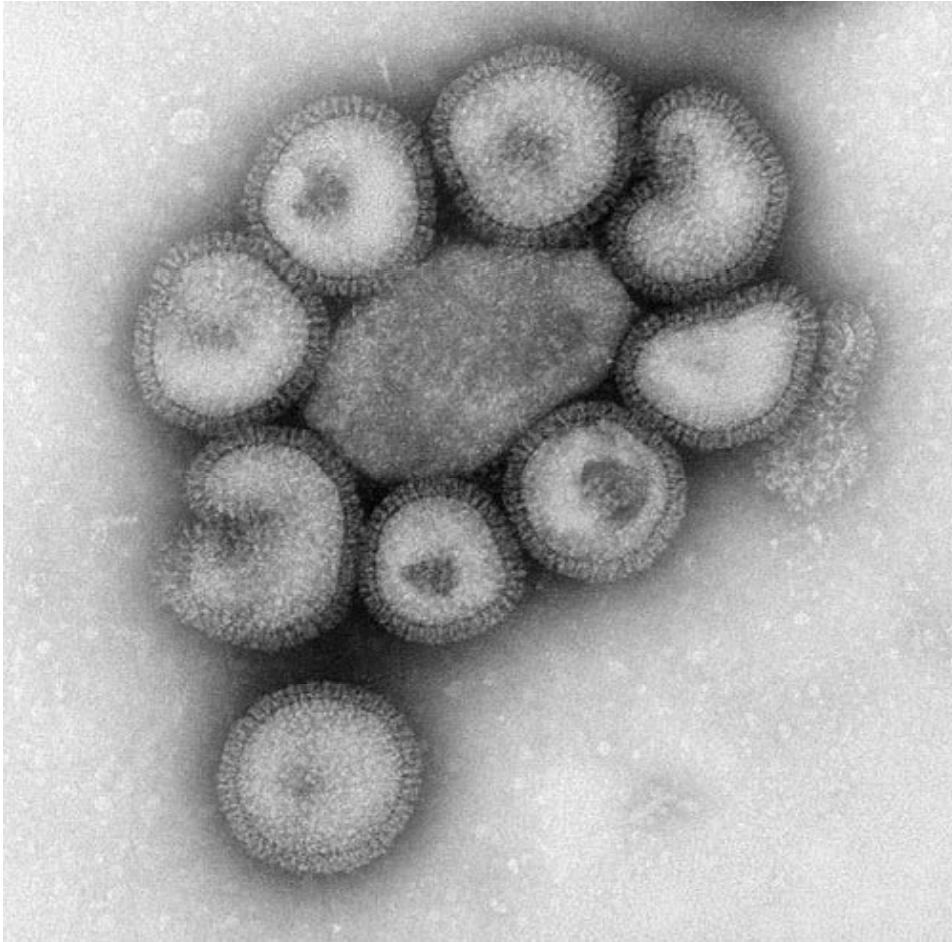
- Hemagglutinin (HA)
 - glycoprotein on the influenza surface
 - allows the virus to bind to cellular sialic acid
 - allows the virus to fuse with the host membrane.
- Neuraminidase (NA)
 - glycoprotein on the influenza surface
 - enzymatically removes sialic acid
 - promoting viral dispersion from the infected cell

Figure 1 Influenza virion

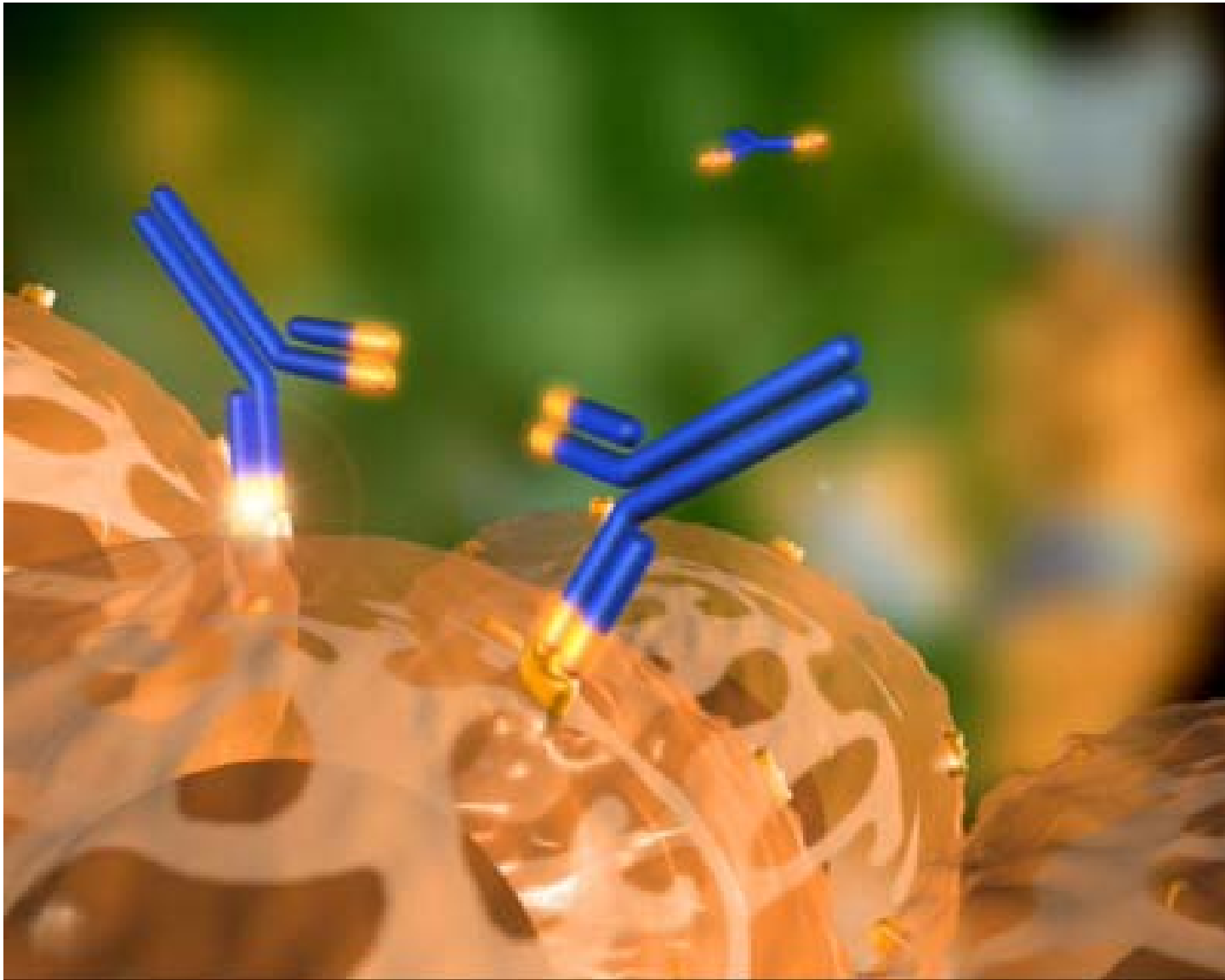


Source: Chotani RA (2006) *The impact of pandemic influenza on public health.*¹⁶

Influenza A Virus



We make antibodies to each H and N...



H and N

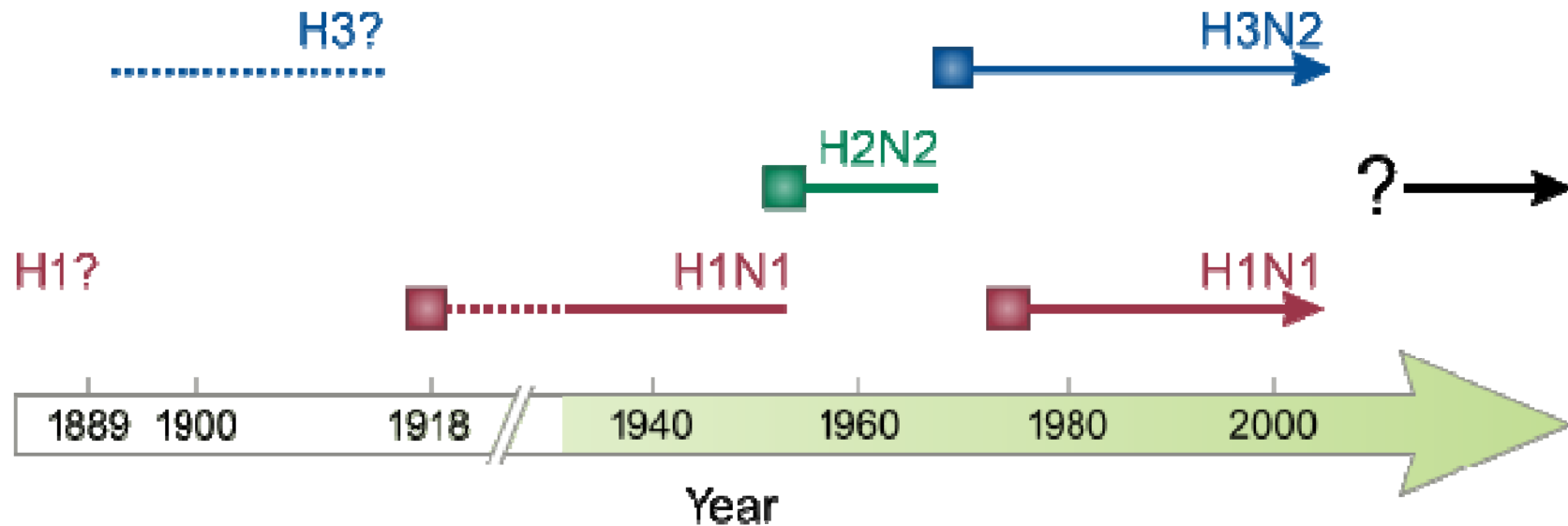
- Hemagglutinin and Neuraminidase
 - **Minor Mutations** of HA and NA occur frequently
 - results in new viral strains → less population immunity
 - “Antigenic Drift”

 - **Major Mutations** of HA and NA occur ~ 10 – 40 years
 - results in new viral strains → NO population immunity
 - ‘Antigenic Shift’ → leads to pandemics

H1, H2, H3.... N1, N2, N3...

H1N1, H5N7

Influenza A virus subtypes in the human population



- H1N1 is revisiting us.... those born before 1957 **may** (emphasis intended) have been exposed to it. My personal concern is that prior to 1957, we did not have mass transit.... I suspect exposure is less certain and whether exposure is still protective is not known. Those born after were never exposed (not immune at all)

Epidemiology of Influenza A and B

- Illness
 - usually fall and winter
 - 2 waves
 - 1st in schoolchildren and their household contacts (younger people)
 - 2nd mostly in housebound or institutionalized people, particularly the elderly.
- Transmission
 - airborne droplets**, person-to-person contact, or contact with contaminated items.

Epidemiology of Influenza A and B

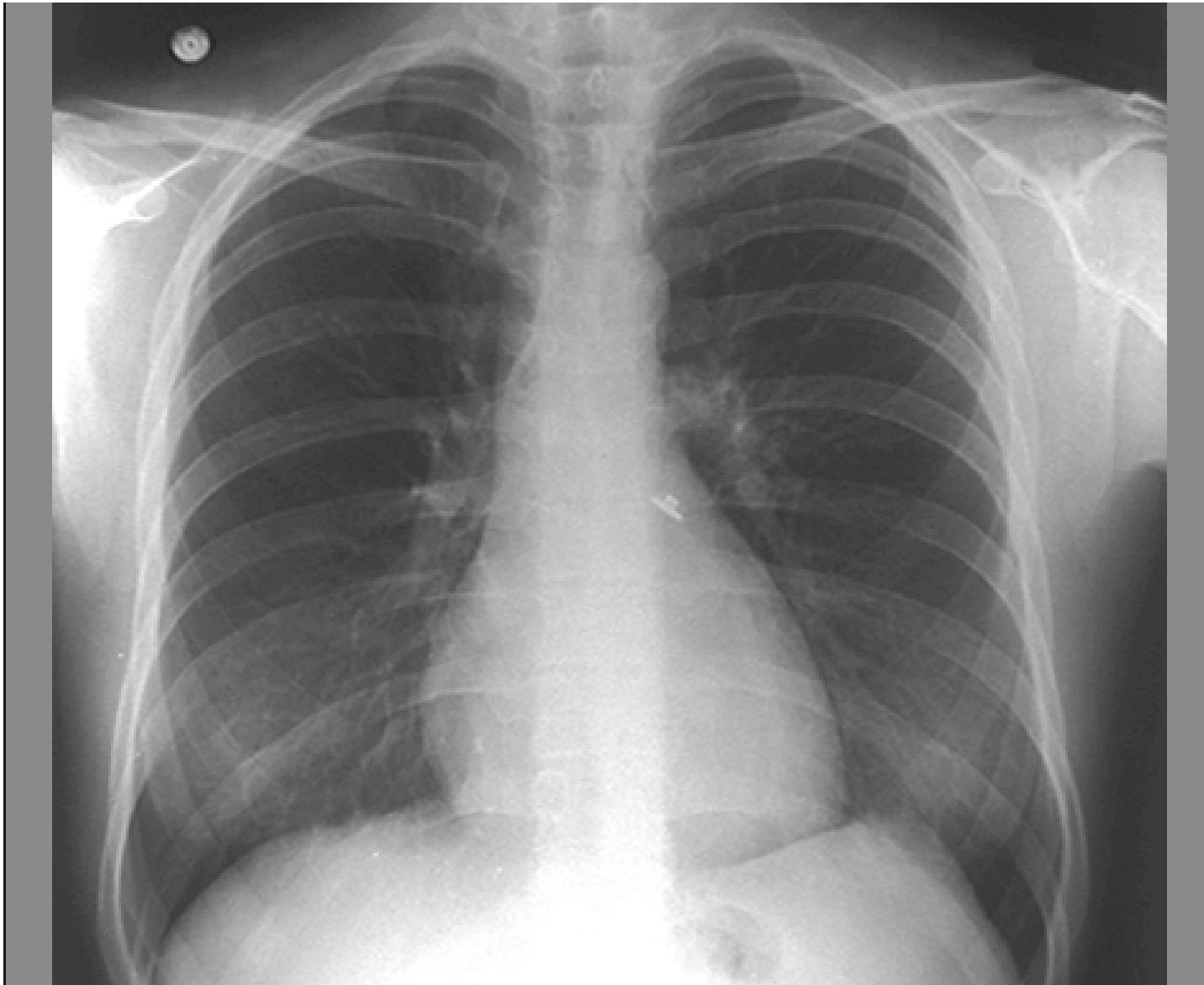
- At most risk
 - heart, lung, kidney, diabetes and immune deficiency
 - women in the 2nd or 3rd trimester of pregnancy
 - children < 24 mo
 - adults > 65 yr
- Morbidity and mortality
 - exacerbation of underlying illness,
 - primary influenza pneumonia
 - secondary bacterial pneumonia

Symptoms and Signs of Seasonal Influenza

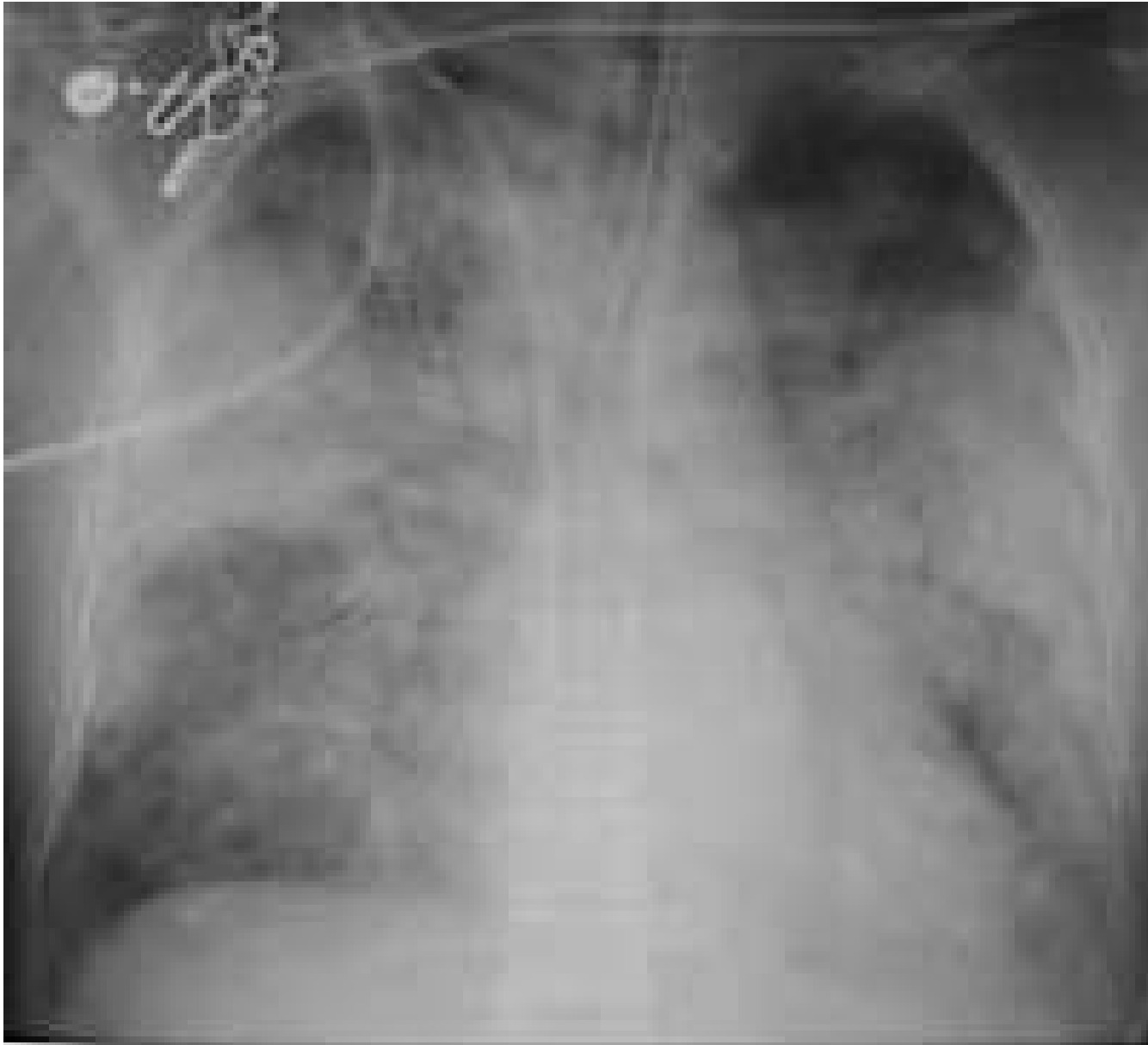
- Incubation
 - 1 to 4 days (average 48 hr)
 - Mild Cases → like common cold (sore throat, runny nose)
 - Typical Cases → sudden onset of chills, fever, prostration, cough, and generalized aches and pains (especially in the back and legs).
 - Headache with photophobia and retrobulbar aching.
 - Respiratory symptoms may be mild at first, with scratchy sore throat, substernal burning, nonproductive cough, and sometimes coryza.
 - Later, lower respiratory tract illness becomes dominant; cough can be persistent, raspy, and productive.
 - Children → can add GI symptoms

Natural history...

- after 2 - 3 days symptoms rapidly subside
- fever may last up to 5 days
- cough, weakness, sweating, and fatigue may persist for several days or occasionally for weeks
- Complications:
 - Viral pneumonia → worsening cough, purulent or bloody sputum, dyspnea, and rales.
 - Secondary bacterial pneumonia is suggested by persistence or recurrence of fever, cough, and other respiratory symptoms in the 2nd wk.
 - Encephalitis, myocarditis, and myoglobinuria develop infrequently, usually during convalescence.



- Normal chest radiograph



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- Influenza pneumonia chest radiograph

H1 N1 Strain of Influenza A

- Incubation period of 7 days
- Period of infectivity of 7 days
- In 2009 H1N1 flu virus has spread almost exclusively in the community setting.
- It generally causes a mild disease with a mortality rate in Canada of approximately 3/1000 cases.
- <http://www.health.alberta.ca/health-info/influenza-H1N1-compare.html>

Number of hospitalized confirmed cases of pandemic H1N1 influenza as of October 2, 2009 - Alberta

| Area | Year to Date |
|-------------------|--------------|
| Northern Alberta | 16 |
| Edmonton and area | 49 |
| Central Alberta | 7 |
| Calgary and area | 49 |
| Southern Alberta | 10 |
| Total | 131 |

Total number of deaths to date: Eight (8)*

** One death out of country resident*

Making the diagnosis...

- Usually, the diagnosis is clinical.
- Can send a nasal swab to confirm the diagnosis but not recommended if no fever or respiratory symptoms.
- Rapid tests are not recommended.

Prognosis and Therapy

- Vast majority have full recovery in 1-2 weeks
- Pneumonia is most common threat to high risk groups.
- Antiviral drugs given within 1 to 2 days of symptom onset decrease symptom duration slightly.
- Treatment with antiviral drugs is generally recommended in high-risk patients who develop influenza-like symptoms.

Tamiflu

Oseltivimir Phosphate

- ***Prescription Information***
- One 75-mg capsule twice daily for 5 days
 - In patients with creatinine clearance between 10 mL/min and 30 mL/min, one 75-mg capsule once daily for 5 days*
- Treatment should begin within 2 days of symptom onset
- May be taken with or without food
- When taken with food, tolerability may be enhanced in some patients
- <http://www.tamiflu.com/hcp/influenza-treatment.aspx>



- For otherwise healthy patients with no underlying medical conditions, the basic therapy is supportive.
- Routine advice includes staying at home for 24 hours after resolution of symptoms or for 7 days if pandemic
- H1N1 is suspected. Review good respiratory and hand hygiene practices. Recommend reassessment if symptoms worsen; there have been occasional cases of healthy people with no risk factors becoming very ill from pandemic H1N1 virus.
- For pregnant women and people with other high risk conditions, antivirals are indicated.
- If household contacts of patients have high risk conditions, they should be advised to seek medical assessment at the first indication of ILI symptoms to begin early treatment.

Government of Canada Update

<http://www.phac-aspc.gc.ca/fluwatch/index-eng.php>

Summary of FluWatch Findings for the Week ending September 19, 2009

- The overall influenza activity slightly increased this week and remained high for this time of the year. The national ILI consultation rate increased for a second consecutive week and was above the expected range. The proportion of positive influenza tests was also slightly higher than the previous week. Localized activity was reported in 2 regions in BC.
- This week, 98.3% of the positive influenza A subtyped specimens were Pandemic (H1N1) 2009.
- The intensity of Pandemic (H1N1) infection 2009 in the population was low with only eight hospitalizations and two deaths reported this week. While hospitalized cases were reported from BC, MB, ON, QC and NT, the deaths were from BC and ON. As of September 19, 2009, a total of 1,467 hospitalized cases including 292 cases admitted to an intensive care unit (ICU) and 151 cases required ventilation as well as 78 deaths had been reported since the beginning of the pandemic.
- The prescription rate of Antivirals was high for the second consecutive weeks in southern BC and in NT.
- The influenza activity increased in the U.S. for a third consecutive week.
- In conclusion, no indication yet of emergence of the 2nd wave of Pandemic (H1N1) 2009 but significant increase of influenza activity in southern BC.

Vaccination?

- *October 1, 2009*

Alberta to start regular flu vaccine program in October
H1N1 vaccine to follow mid-November

Edmonton... On October 13, the province will begin a two-part process to immunize Albertans against influenza through immunization clinics across the province.

The immunization program will begin with seasonal influenza immunization aimed at high-risk groups, and shift to universal Pandemic H1N1 influenza immunization as soon as that vaccine is available, likely in mid-November.

- “Immunization against influenza will be our best defense this fall,” said Minister of Health and Wellness Ron Liepert. “The province, Alberta Health Services and the First Nations and Inuit Health Branch of Health Canada are working closely together to protect Albertans against regular flu, and H1N1 flu. I’ll be getting immunized against H1N1 and I encourage all Albertans to do the same to protect themselves, their families and friends.”
- Alberta Health Services will be delivering the seasonal vaccine to seniors and others living in continuing care and designated assisted living settings. All other seniors can attend clinics across the province to receive their immunization. Pregnant women, children six months to 23 months old, and adults and older children at high risk of developing more severe illness can also receive the seasonal influenza vaccine through these clinics.

- Seasonal influenza immunization will stop as soon as the Pandemic H1N1 vaccine becomes available in November. Clinics will then begin immunizing all Albertans over six months of age against H1N1. High-risk groups are encouraged to get their immunization early.
- “As H1N1 is expected to be the most prevalent strain of the influenza virus this year, we will be focusing our efforts on providing that vaccine to as many Albertans as possible, as soon as it is available,” said Dr. André Corriveau, Alberta’s Chief Medical Officer of Health. “We will target high-risk groups who can be more susceptible to serious complications related to flu with both the seasonal influenza and Pandemic H1N1 vaccines.”
- “To make the best use of public health resources, and immunize as many people as quickly as possible, we will be delivering both vaccines in mass immunization clinics,” said Dr. Gerry Predy, Senior Medical Officer of Health for Alberta Health Services. “This will be a change from previous years for some individuals. We are asking everyone to check the Alberta Health Services website, or call Health Link Alberta for information on clinics in their community.”
- <http://alberta.ca/acn/200910/2701510AB8140-C8D2-2AF9-258F853C1763AAB6.html>

Vaccine Questions...

- <http://www.npr.org/templates/story/story.php?storyId=113446539>

Summary

- H1N1 is a new strain of Influenza A
- Most cases have been mild
- Severe disease is rare
- Current concern relates to 'second wave'
- Treatment is mainly supportive & hygienic
- High risk groups likely to receive Tamiflu
- Vaccination against Seasonal and H1N1 strain is recommended.
- Alberta will offer both Seasonal → H1N1 → Seasonal