

Chapter 2: Background on Influenza and Pandemics

Influenza is a highly contagious, acute viral disease of the respiratory tract that causes outbreaks every winter in temperate climates. Influenza is responsible for thousands of hospitalizations and deaths each year in Canada. Complications, such as pneumonia, are most likely to occur in persons with underlying health conditions, seniors, or young children.

Symptoms of influenza include fever, cough, stuffy or runny nose, sore throat, headache, fatigue, and sore muscles. The illness can last five days or more. Infection rates for annual, or seasonal, influenza typically average between 10-20% of the population. Influenza spreads even more rapidly and widely in closed-population settings, such as long term care homes and schools, where up to 50% of the population can be affected.

How Influenza Spreads

Transmission (spread) of the influenza virus is generally through contact with droplets from respiratory secretions (e.g. from coughs and sneezes). Transmission normally occurs at a short distance (i.e. less than one metre) from an infected person. However, transmission may also occur through contact with contaminated surfaces.

The incubation period of influenza is approximately one to three days. Adults shed virus from 24 hours before onset of symptoms up to five days from onset, and children for longer (7-21 days). However, infected persons are most contagious during the first three days of their illness.

The Influenza Virus

There are three types of influenza virus – A, B, and C – but only influenza A and B viruses commonly cause human disease. Both influenza A and B viruses cause seasonal outbreaks, but only influenza A viruses have caused pandemics. Influenza A viruses are named for the haemagglutinin (H) and neuraminidase (N) antigens found on their surface. There are 16 H types and nine N types found in nature, though only H1, H2 and H3 occur as human viruses.

Influenza viruses undergo gradual change to their genetic structure known as antigenic drift. These ongoing changes, or drift, mean that a new influenza vaccine must be created each year to protect the human population from infection.

At unpredictable intervals, influenza A viruses experience antigenic shift, which is a periodic process of major change to the haemagglutinin (H) type of the genetic make-up. It is thought that antigenic shift can occur in several ways, such as:

- (1) Through genetic re-assortment when two viruses infect the same cell and share genetic material. For example, re-assortment may occur when strains of avian

influenza mix with the genetic material found in the human influenza virus in a host, such as a pig or human; and/or

(2) Through mutation as influenza viruses move from host to host.

Regardless of the means of the antigenic shift, this major alteration to the genetic make-up of the influenza A virus can lead to the emergence of a novel influenza A virus to which humans have little or no immunity.

Pandemic Influenza

Pandemic influenza refers to the occurrence, three to four times per century, of a novel influenza A virus infection that circulates around the globe. For a pandemic to occur, the novel virus must have the capacity to spread efficiently from person to person and to cause widespread illness and death. The exact nature of the next pandemic virus, such as its virulence, genetic make-up, transmissibility, and epidemiologic features (e.g. age groups affected) will not be known until it emerges.

Three influenza pandemics occurred in the last century, the 1918-19 Spanish flu (H1N1), the 1957 Asian flu (H2N2), and the 1968 Hong Kong flu (H3N2). The Spanish flu killed over 40 million people worldwide, and predominantly attacked young, healthy adults between the ages of 15 and 35 years. Although not as deadly, the 1957 Asian flu resulted in an estimated two million deaths worldwide, most of whom were elderly and those with underlying medical conditions. The 1968 Hong Kong flu resulted in an estimated one million deaths, mostly among the elderly. In addition, there have been several pandemic alerts that involved the identification of a novel influenza A virus to which the population was largely susceptible, but which lacked the ability to spread easily from person to person. H5N1 is a current example of a novel virus that is being monitored closely for its pandemic potential.

It is now believed that the 1957 and 1968 pandemics arose from genetic re-assortment between human and avian influenza strains. The origin of the Spanish flu virus is less clear, although it is thought to have progressively mutated from an unknown avian strain of influenza.

Experts suggest that strains of pandemic influenza will likely originate in Asia where wild and domestic birds, pigs, and people live in close proximity. These living conditions create a favourable environment for the mixing of avian and human strains of influenza.

World Health Organization (WHO) Pandemic Periods and Phases

To provide assistance in pandemic planning and preparedness, and help coordinate response activities, the World Health Organization (WHO) has categorized the various phases of a pandemic. In April 2005, WHO revised the pandemic phases to take into account avian influenza and its possible relationship to human pandemics (see Table 2.1).

WHO phases reflect the international risk or activity level, but do not necessarily reflect the situation in Canada. Therefore, an adaptation of the WHO numbering scheme has been developed nationally to reflect the Canadian situation. The WHO phase number will be followed by a period and then a number from 0 to 2 to indicate the level of activity in Canada. The Canadian adaptation of the WHO phases is as follows:²

- 0 – no activity observed in Canada;
- 1 – single case(s) observed in Canada but no clusters; and
- 2 – localized or widespread activity in Canada.

For example, WHO Phase 6, a declared pandemic with sustained human-to-human activity, would be represented by Phase 6.0 if it has not yet arrived in Canada.

Table 2. 1: World Health Organization Phases for Pandemic Influenza³

Period	Phase	Description
Inter-pandemic period	Phase 1	No new influenza sub-types have been detected in humans. An influenza virus subtype that has caused human infection may be present in animals. If present in animals, the risk of human infection is considered low.
	Phase 2	No new influenza subtypes have been detected in humans. However, a circulating animal influenza virus subtype poses a substantial risk of human diseases.
Pandemic Alert Period	Phase 3	Human infection(s) with a new subtype, but no human-to-human spread, or limited to rare instances of spread to a close contact.
	Phase 4	Small clusters with limited human-to-human spread, but spread is localized, indicating that the virus has not adapted to humans.
	Phase 5	Larger clusters. However, human-to-human spread remains localized, indicating that the virus is adapting to humans, although not yet fully transmissible (substantial pandemic risk).
Pandemic Period	Phase 6	Increased and sustained human-to-human transmission.
Post Pandemic Period		Return to Inter-pandemic Period.

² Public Health Agency of Canada. (2006). *Canadian Pandemic Influenza Plan for the Health Sector*, Background, p.9. Retrieved December 9, 2006, from <http://www.phac-aspc.gc.ca/cpip-pclcpi/index.html>

³ Public Health Agency of Canada. (2006). *Canadian Pandemic Influenza Plan for the Health Sector*, Background, pp.10-12. Retrieved December 9, 2006, from <http://www.phac-aspc.gc.ca/cpip-pclcpi/index.html>