

# Influenza and COVID-19 Outbreak

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Seasonal influenza is a common respiratory infection caused by influenza viruses. It displays strong seasonal cycles and circulates in all parts of the world [1]. Annual epidemics of influenza cause disease burden with hundreds and thousands of deaths [2]. Influenza has symptoms such as high fever, sore throat, running nose and overall body aches. Influenza A is classified by the subtypes of hemagglutinin (H) and neuraminidase (N). In the 20<sup>th</sup> century, there were three worldwide outbreaks of influenza: 1918, 1957 and 1968. The pandemic of 1918 was caused by H1N1 avian-like influenza virus A, resulted to approximately 50 - 100 million people worldwide. While in 1957, H2N2 virus resulting from a recombination of avian and human influenza viruses emerged in East Asia, and caused 1.1 million deaths worldwide [2 - 4]. Third pandemic was also caused avian influenza A virus (H3N2), however the symptoms were clinically mild with uncomplicated upper respiratory tract disease. On the other hand, outbreaks of influenza virus B occur every two to four years and it has two lineages (B/Victoria and B/Yamagata) [5 - 6].

The possibility of the infection of influenza arises when wild bird flu virus is passed from bird to a human through domesticated bird, or a pig. It has been demonstrated that tracheal epithelial cells of the pig express both sialic acid-alpha-2, 3-terminal saccharides (SA-alpha-2,3), the receptor for avian virus, and sialic acid-alpha-2, 6-terminal saccharides (SA-alpha-2, 6), the receptor for swine/human virus [7 - 9]. Therefore, pigs have been considered to promote avian and human viral genetic re-assortment in order to produce a novel variant of the influenza virus [10].

Influenza Update No432, based on data up to 30 October 2022, of World Health Organization (WHO) FluNet surveillance platform showed that influenza activity increased in globally, and H3N2 subtype has been predominated [11]. It has been also reported that overall influenza activity in Europe is increasing trend with H3N2 subtype viruses, whilst high influenza activity with B/Victoria-lineage viruses predominating in central Asia [12]. However, there is now concern about the predictions of influenza outbreak. Some scientists believe that wide spread social distancing measures due to the COVID-19 pandemic would be effective at reducing influenza transmissions [13]. During the COVID-19 epidemic in the United States, the number of people infected with the influenza virus has decreased by 98 % compared to an average year. Moreover, the numbers of infected individuals with seasonal influenza which have been reported in Japan was also significantly lower [14]. The fixed-point prevalence of influenza infections was 0.01 which is hundred-times lower from epidemic judgment. In the

northern hemisphere (Australia, Chile and South Africa), the same significantly low counts of positively tested individuals have been reported, also [15 - 16]. On the other hand, others scientists predict that there is possibility of influenza outbreak as the situations in COVID-19 restrictions for social distancing and travel settled down globally [5 - 7]. Moreover, it also has been demonstrated that the low levels of influenza in past two winters would decreased population immunity against influenza virus, which in turn could result high level seasonal influenza outbreak in winter 2022 to 2023 [17]. Therefore, Advisory Committee on Immunization Practices of US Centers for Disease Control have recommended combining vaccination for both COVID-19 and influenza. The WHO recommended following quadrivalent formulation of egg-based influenza vaccines for northern hemisphere in 2022 - 2023 influenza season:

- an A/Victoria/2570/2019 (H1N1) pdm09-like virus
  - an A/Darwin/9/2021 (H3N2)-like virus
  - a B/Austria/1359417/2021-like virus (B/Victoria lineage)
  - a B/Phuket/3073/2013-like virus (B/Yamagata lineage)
- and cell culture- or recombinant-based vaccines:
- an A/Wisconsin/588/2019 (H1N1) pdm09-like virus
  - an A/Darwin/6/2021 (H3N2)-like virus
  - a B/Austria/1359417/2021 (B/Victoria lineage)-like virus

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