Avian influenza and influenza pandemics

Stefano Lazzari[1] & Klaus Stöhr[2]

Well before the 31 influenza outbreaks recorded since the first pandemic was described in 1580, pandemic-like events were reported as early as the fifth century BC by the Greek physician Hippocrates. In the last century, the "Spanish flu" pandemic of 1918–19 killed 20–40 million people, while the "Asian flu" pandemic in 1957 and "Hong Kong flu" in 1968 each caused an estimated 1–4 million deaths.

Pandemics originate with the emergence of a new subtype of influenza virus able to cause disease, replicate in humans, and spread efficiently from one person to another. An avian influenza virus can improve its transmissibility in humans by adaptive mutation or genetic reassortment (the mixing of animal and human influenza viruses). Recent studies confirm that the 1918–19 pandemic probably originated from the reassortment of avian and human viruses (*1*).

Reports of human infections and deaths caused by avian influenza virus A(H5N1) in Hong Kong Special Administrative Region in 1997 (*2*) and 2003, and in Viet Nam and Thailand in 2004 are stark reminders of the threat of pandemic influenza. Outbreaks of avian influenza are increasingly frequent, probably as a result of intensive agricultural practices, high virus transmissibility and the presence of natural reservoirs in migratory birds. The ability of three of the 15 known subtypes of avian influenza viruses (H5N1, H7N7 and H9N2) occasionally to infect human beings makes them one of the most likely candidates to become the next pandemic virus.

The current influenza outbreaks in poultry are unprecedented in their scale, geographical spread and adverse economic effects among affected populations. Containment will require the mobilization of significant resources over several months, leading to continued exposure of many individuals to H5N1. In addition, resistance in current strains to one of the two classes of available antiviral drugs has been demonstrated in vitro. Because of its high pathogenicity in humans, there are growing concerns that if H5N1 were to become transmissible in humans, the heavy toll of the 1918–19 "Spanish flu" pandemic could be repeated (*3*).

Most experts believe that future influenza pandemics are inevitable and may be imminent (*4*). Nobody can be sure when a pandemic will happen, how quickly it will spread, and what morbidity, mortality and economic impact it will cause. Forecasting models predict a major disease burden, with 25–30% of the population falling ill and potentially enormous economic costs worldwide, especially in the poorest countries where resources for surveillance and health care are limited and population health and nutritional status are poor.

A comprehensive public health approach to influenza pandemics must include at least four key activity areas:

Limiting the circulation of avian and other animal influenza viruses. The main strategy for preventing the emergence of a pandemic virus is to reduce the opportunities for human exposure to animal viruses with demonstrated human pathogenicity. Human infections with avian influenza viruses and mutations leading to efficient human-to-human transmission are both rare events. However, large outbreaks in poultry magnify the possibility of human infection. Concerted efforts are required to eliminate the main source of the virus, including the mass culling of infected animals, poultry vaccination, surveillance and the consistent application of infection-control measures in people who are exposed.

Improving early warning. Early detection and isolation are essential for ensuring a rapid response to a pandemic influenza strain. The current global influenza surveillance system was designed to monitor genetic variations in order to update seasonal influenza vaccines; it now needs to be strengthened to allow for the early detection and characterization of a new pandemic virus and the collection of clinical and epidemiological information.

Strengthening pandemic preparedness and response capacities. An influenza pandemic is a major health emergency. Vaccination and antiviral drugs can reduce influenza morbidity and mortality, but their initial availability will be limited and the large-scale production of a new pandemic vaccine would take several months. If a new pandemic strain is detected early enough, selected public health interventions (including infection control and isolation of patients) could slow its initial spread, thus allowing more time for response measures to be implemented. National pandemic preparedness plans are being discussed in several countries though few have been finalized (*5*).

Strengthening and expanding control activities for annual influenza epidemics that account for significant morbidity, mortality and economic loss. The WHO Global Influenza Surveillance Network regularly monitors the variation of the influenza virus, issues recommendations on influenza vaccine composition, and provides prototype vaccine viruses to vaccine manufacturers. Only about 300 million doses of vaccine are distributed per year, however, and vaccination coverage could be improved (*6*). The World Health Assembly in May 2003 set targets for vaccination coverage of elderly people and people with underlying diseases of 50% by 2006 and 75% by 2010 (resolution WHA56/19). Increasing global vaccine production capabilities and working towards these targets would also ensure a broader and more equitable access to pandemic vaccines.

Influenza pandemics are natural events. However, the burden of disease they cause and their economic impact could be greatly reduced by the appropriate use of vaccines, antiviral drugs and public health interventions. Strengthening influenza surveillance, developing pandemic preparedness plans, improving control of avian influenza, and increasing coverage of annual influenza vaccination are the cornerstones of a safer world. ■

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[1] Coordinator, Risk Containment, Mapping and Drug Resistance, Communicable Diseases Surveillance and Response, World Health Organization, 1211 Geneva 27, Switzerland (email: lazzaris@who.int). Correspondence should be sent to this author.

[2] Project Leader, Global Influenza Programme, Communicable Diseases Surveillance and Response, World Health Organization, Geneva, Switzerland.

Ref. No. **04-012641**

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