

Emerging respiratory diseases: Avian influenza — Part I

John A. Molinari, PhD



It is interesting to observe and note how drastically perceptions surrounding "the flu" have changed in recent years. What was typically considered by many to be a transient, non-life-threatening viral infection has become a source of increasing worry and concern. This is primarily due to accumulating evidence documenting the emergence, spread, and severity of avian influenza, commonly referred to as "bird flu." This widespread reaction is expected in light of recent, highly publicized, microbial disease outbreaks, such as SARS (Severe Acute Respiratory Syndrome), West Nile Virus — both caused by viruses — and Mad Cow disease, caused by prions. Health professionals are among those who are following developments for avian influenza. One factor to be considered in understanding the scientific and clinical evidence relating to the potential threat of avian influenza is that it allows us to continue monitoring the effectiveness of our routine infection control precautions against the variety of occupational bacterial, viral, and mycotic microbial challenges confronted during provision of patient care. The following discussion will be the first of a two-part series considering issues surrounding avian influenza.

Influenza is transmitted from infected persons via microbial-laden secretions in respiratory droplets. Infectious virions can survive evaporation of respiratory particles and remain suspended for extended periods. Therefore, they can be readily passed to susceptible individuals, even across rooms, to those who are not in close proximity to the original infected source. Contrary to popular belief, influenza viruses have caused multiple, recurrent seasonal epidemics and periodic pandemics for more than 400 years throughout the world. The worst of these was the Spanish flu of 1918-1919, which killed more than 500,000 people in the U.S. and 20 to 50 million people worldwide. The ability of influenza viruses to adapt and undergo antigenic variation is one of the most unique characteristics of these RNA viruses responsible for microbial virulence. The routine mutation and exchange of genetic material between different strains eventually allows new strains of

influenza viruses to be introduced into the human population, possessing the capability to infect individuals with little or no protective immunity. Due to the limited space available here, only a brief summary will be presented regarding the status of the current avian influenza threat to humans. More information can be found on the Internet, including www.pandemicflu.gov.

Long-term investigation of influenza viruses has shown us that all influenza viruses originate in birds, with most strains staying in those hosts. Natural hosts are wild birds, such as wild ducks and other migratory birds. These animals do not become sick like domestic fowl, but instead are carriers, able to pass viruses to other birds via fecal droppings or respiratory secretions. Avian viral strains also far outnumber human influenza strains. Normally, an influenza strain infecting birds does not attack humans because of the inability of the virus to infect and grow in human respiratory epithelial cells. However, due to mutation and exchange of genetic material by either antigenic drift (minor point mutations) or antigenic shift (major changes seen with type A influenza viral strains), new strains may emerge which can infect human hosts. Resultant outbreaks of influenza can manifest themselves in one of two forms. The most common is seasonal influenza that is responsible for approximately 36,000 deaths annually in the U.S. as a result of patient complications from the flu. In contrast, a worldwide pandemic flu can occur when a new influenza type A virus subtype emerges, which has never previously circulated through the human population. The new virus causes serious human disease and is easily transmitted from person to person.

It is important to note here that, at this time, there is no human influenza pandemic in the world. The most recent outbreak, which began in 2003, is currently a pandemic of birds, with rare transmission to humans from close contact with infected birds. The follow-up to this article will examine current epidemiology and disease projections. **DE**

Editor's Note: References available upon request.

Dr. John A. Molinari received a PhD in microbiology from the University of Pittsburgh School of Dental Medicine. He is a professor and chairman of the Department of Biomedical Sciences at the University of Detroit Mercy School of Dentistry. He has published and lectured in the areas of infectious diseases, clinical immunology, and infection control. He also addresses these areas as a consultant to the CDC, ADA Council on Dental Practice, and Council on Scientific Affairs. Contact him at (313) 494-6632, or molinaja@udmercy.edu.