Avian Flu in Humans: The Challenge of Preventing a Pandemic

Jacquelyn Jeffrey
Health Administration Student
Columbia Southern University
Orange Beach, AL

Deryl E. Gulliford, PhD, FAAMA, FACCA
Diplomate in Healthcare Administration
CEO
Holdenville General Hospital
Holdenville, OK

1. BACKGROUND

Avian flu endemic in S.E. Asia

A strain of highly pathogenic avian influenza (HPAI) currently endemic in Asia is causing worldwide concern as the human toll of this flu rises. HPAI is a highly lethal generalized viral disease of domestic poultry. In 1997 in Hong Kong the virus was observed to have crossed the species barrier, infecting some people who came in close contact with affected domestic birds. In humans the disease manifests as an influenza-like illness with upper respiratory or gastrointestinal manifestations, renal failure, and pneumonia. In 2004 human infections and deaths from this vector borne virus were reported in Vietnam, Hong Kong, Cambodia, and Thailand. The H5N1 subtype of the virus, with a current estimated human mortality rate of approximately 67 percent, is believed to have the potential to start a pandemic that could top the toll of the 1918 pandemic that, with an estimated death rate of 2 percent, had claimed between 20 and 50 million people worldwide.

Recent outbreaks

Recent outbreaks among humans of HPAI have been observed in Hong Kong in 1997-1998. In 2004 people also died from the H5N1 virus in Cambodia, Thailand, and Vietnam. An epidemic of avian flu was registered in 2003 in The Netherlands, Belgium, and Germany. Avian flu has also been reported in Australia, Pakistan, Italy, Chile, and Mexico, and it has drastically reduced poultry populations in regions across Asia, including Indonesia, South Korea, Japan, and China.

Prevention and containment: challenges for the WHO

Widespread poverty and reliance on poultry farming for exports, a lack of proper sanitation practices in the handling and slaughtering of the birds, a lack of appropriate medical facilities and trained personnel for accurate testing and treatment, faulty surveillance and detection systems, incomplete disclosure and reporting by the governments of the affected countries, and geographical distances are complicating international containment and prevention efforts. The medical community is also voicing concerns about the feasibility of inoculating potentially vulnerable populations given the possible cost of such widespread vaccinations, the current deficit of vaccine, which is still in the experimental stage, and the likelihood that the virus may swap genes with a common flu virus and reassort or mutate into a strain that may not be responsive to the vaccine. This critical time will test the effectiveness of the World Health Organization and other multilateral institutions in preventing a pandemic of unprecedented proportions.

2. FACETS OF THE THREAT

Widespread bird to human transmission through wet markets

Today's human victims of the H5N1 strain of the AI virus appear to have been infected through prolonged contact with chickens, ducks, and turkeys. However there is evidence, in the form of one case where a child presented with diarrhea and encephalitis but no respiratory symptoms, that the virus is transmitted by feces. In addition there have been reports of infections that were traced back to visits to outdoor live poultry markets (wet markets) that are extremely common throughout Southeast Asia, China, and Hong Kong, where customers select live birds that are then slaughtered on the spot. Containing the spread of the virus would necessitate the prohibition of this practice and close monitoring of poultry markets, as well as massive education efforts to improve sanitation at all stages of bird handling.

Fears that virus will mutate and become airborne and/ or more pathogenic in humans

Writing in *Lancet* in 1998 a group of Hong Kong scientists investigating human infection with the H5N1 avian flu virus reported that there is serological evidence for human exposure to avian influenza viruses (including H5 viruses) in Hong Kong as well as Southern China and posited that "[T] he H1N1 virus responsible for the human pandemic of 1918 may have been a direct introduction of an avian virus into human beings." If the "killer flu" of 1918 indeed started as a mildly pathogenic or non-pathogenic strain circulating in wild birds that came in contact with domestic poultry, its history of mutation into a highly virulent and lethal human disease is bad news in 2005 Further, a research team of avian flu scientists determined that the same precursor virus is likely responsible for the 1997-1998 Hong Kong epidemic and the current H5N1 strain. This information is unwelcome for two reasons. First, there is reason to fear the virus will become airborne, which would dramatically increase transmission rates, especially if the virus also became more pathogenic in humans Second, the vaccine currently in development would probably not protect against mutated or reassorted strains, and the potential new strain of flu may render useless the immunity built up by some people who survived previous infections

Human to human transmission

So far there has been only one reported case of human to human transmission of H5N1, between a mother and her baby in Thailand, and new cases in Vietnam were found across a large area rather than clustered around a single province, which indicates the virus is not yet moving from person to person. Yet if the HPAI virus infected a person who already has the common flu, a hybrid airborne highly pathogenic virus could arise.

3. CONTROL/ CONTAINMENT PROBLEMS AND SOLUTIONS

Obstacles to containment and prevention: lack of information, political will, money, monitoring systems

Some of the problems in containing the spread of the H5N1 virus are the lack of precise information about infection and death rates, the lack of adequate laboratory facilities, equipment, and trained technicians and inspectors, the distances between poultry farms and lab facilities being aggravated by a lack of good roads and express mail systems, and the lack of financial resources for aggressive monitoring of farms and markets, training enough qualified inspectors, and setting up lab facilities.

Governments are not forthcoming with information about HPAI epidemics from fears of losses from decreased tourism and trade. The WHO asserts that reports of new cases from Vietnam, for instance, arrive close to a month after the fact, and that the WHO and the CDC often get more timely information from Vietnamese newspapers than from the government. In addition, a lack of qualified personnel and faulty testing and surveillance mean that some infections are missed. This is especially dangerous because the virus may mutate. If it then goes undetected in some hosts as a subclinical infection it may spread like wildfire and render the potential vaccine useless.

The culling of millions of quail, ducks, geese, turkeys, and chickens across Asia has in some regions decimated the poultry industry, affecting the poorest farmers hardest. Many governments in Southeast Asia cannot compensate the farmers for the loss of their birds to disease and culling or for the impact of poultry embargos and low broiler prices. There is little incentive for the farmers to report sick birds to the authorities and little resources for overhauling the current practices of bird raising and sanitation. Containment and aggressive monitoring of far-flung markets and farms in remote rural areas require massive expenditures for facilities, supplies, technicians, and public education campaigns aimed at improving sanitation and changes in traditional farm practices that expose domesticated birds to infection from wildfowl and expose humans to bird waste.

Solutions and the role of multilateral institutions like the WHO

The WHO and some Western countries are slowly taking steps to deal with the possibility of an avian flu pandemic. These steps include the March 2005 meeting of the European member states of the WHO to discuss an international public health plan and an international meeting in Vietnam where doctor s and other scientists can exchange information regarding the effectiveness of different treatments and the role of testing the victims' contacts to assess a more accurate death rate for the disease. The USA, Italy, and France have plans to stockpile a few million doses of H5N1 vaccine. Antiviral medications are available that are used for prophylaxis as well as treatment of human influenza: amantadine, rimantadine, oseltamivir. When taken in the first two days from the onset of illness, these drugs can increase chances of survival.

However, for the millions of poor who are likely to be most affected by the potential pandemic, prompt access to medical care may be impossible or unaffordable. The available vaccine would cover only a fraction of the world population, and subtle antigenic shifts in the virus through mutation would make the vaccine useless. As the 2004 World Health Report notes regarding the HIV pandemic that hit hardest in the poorest areas of the world, "the debate about whether treatment or prevention is more cost effective has been made redundant…." Prevention is the most important way to avert the kind of tragedy that resulted in the deaths of millions in the Spanish influenza pandemic of 1918.

The WHO must allocate as much immediate attention and resources to the threat of the avian flu pandemic in 2005 as it has to the problem of HIV/AIDS in 2004. According to a 2003 report, however, the current WHO system encompassing global outbreak alert and verification process, epidemic preparedness plans, and stockpiles of essential medicines and vaccine is "fragmented and suffers from chronic under-funding." Low-income countries that could become the epicenter of the pandemic, like Vietnam and Cambodia, and countries with large low income populations like Thailand and Indonesia urgently require a combination of financial and technical support for strengthening national disease surveillance systems, "push-pull" initiatives to encourage investment in global research and development based in multilateral institutions like the WHO, the World Bank, UNDP, and UNAIDS, and strategies for helping the governments, private companies, and individual communities work together to make access to adequate health care affordable for those with low income. In the long term, international commitment to cooperation and full disclosure, economic development and financial safety nets for the world's poorest, accessible health care, and sound disease detection and prevention systems are the main defenses against the threat of global pandemics.

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