

H5N1 avian influenza virus – cause for another pandemic?

In human history, probably the worst case of pandemic occurred during 1918–19, caused by the ‘Spanish influenza virus’, estimated to have killed over 40 million people with about 675,000 in USA alone. Other lesser damaging pandemics occurred in 1957 and 1968 caused by ‘Asian influenza virus’ and ‘Hong Kong influenza virus’, killing almost 2 and 1 million people respectively. Now the world may be on the brink of yet another pandemic due to a lethal H5N1 avian influenza virus.

Pathogenic – in birds and humans

According to WHO, from 2003 till date, a total of 186 cases of human infection have been reported, among which 105 (56%) have died¹. In 2006, 29 out of 42 (62%) infected have died. Since 2003, 22 (76%), 14 (64%) and 42 (45%) people of the total reported¹ from Indonesia, Thailand and Vietnam respectively, have succumbed to H5N1¹. The first human infection was reported from Hong Kong in 1997. Out of 18 infected, six died. The outbreak was suppressed by culling over 150,000 domestic poultry in Hong Kong. According to WHO¹, three people died due to H5N1 in Vietnam in 2003, though the first case was reported² only on 8 January 2004.

The virus resurfaced in 2003, when it caused massive destruction in Korean poultry farms. The death of an estimated 6000 wild birds in April 2005 at Qinghai Lake in central China, a stopping place for migratory birds confirmed for the first time infection in wild birds. This highlighted the possible role of migratory birds in spreading infection. The incidence was reported to WHO in June 2005. Another outbreak at Erkhel lake in Mongolia in August confirmed to be by a highly pathogenic H5N1 was observed, but surprisingly no virus was found in the samples from live ducks, swans, etc.³. Till date, a total of 46 countries (23 from Europe, three from Africa, 20 from Asia and Pacific) have had infection shown in wild birds or poultry⁴.

In India, the outbreak was first observed during February 2006 at poultry farms, Navapur taluk, northern Maharashtra. With confirmation by the World Organization for Animal Health, request has been made to UNICEF to donate 25,000 Tamiflu tablets. Reserves of H5 and H7 veterinary vaccines have been stocked near the Indira Gandhi International Air-

port, New Delhi. This followed subsequent spread in Uchachhal, Gujarat.

According to the Centre for Disease Control & Prevention, Atlanta, H5N1 is similar to Spanish flu virus. Originally infecting birds, both appear to be mutant forms of avian virus, H1N1. The 1918 flu virus infected pigs by ingestion of droppings of infected chickens and later on mutated and became airborne flu virus. According to Food and Agricultural Organization (FAO), H5N1 infection spreads from virus in faeces and nasal secretion of infected birds. Although contamination among the birds is understood, the spreading mechanism among humans is not. Mostly the infected people were either in direct contact with the infected birds or with humans.

DIVA (differentiating infected from vaccinated animals), a strategy to fight against this crisis, has been devised by FAO. DIVA checks whether the infection is seen amongst the vaccinated birds⁵. This technique helps in reduction of virulence as the birds have already developed some resistance. India has planned its own mitigation measure. According to the Action Plan developed by the Union Government’s Department of Animal Husbandry, Dairying and Fisheries, instead of vaccination, on confirmation the birds within a range of 3 km of infected farms will be culled. Vaccination may be taken up for poultry farms falling within 3–10 km radius ‘surveillance zone’ of the infected farms. Trade from surveillance zone will be resumed only after a period of 3 or 4 weeks in case vaccination or no vaccination has been done respectively.

Though already pandemic for birds, it still leaves us with the possibility of preventing and dealing with a new pandemic in humans, should it occur. Among humans except six deaths in 1997, the virus has remained dormant till 2003 when it resurfaced claiming lives regularly. Though similar to pandemic Spanish flu virus, it behaves differently, causing massive destruction to wild birds also. The possibility of H5N1 virus mutating makes it more pathogenic than before. The unpredictable behaviour has raised worldwide concern for possible vaccination strategy for humans.

Vaccination profile

Although the US Food and Drug Administration (FDA) approves of four antiviral

medicines (Amantadine, Rimantadine, Oseltamivir and Zanamivir), according to Anthony Fauci of the National Institute of Allergy and Infectious Diseases, National Institutes of Health, USA, H5N1 flu virus is resistant to Amantadine – human antiviral vaccine². The UNFAO has confirmed that after the 1997 flu outbreak in China, the Chinese have tested Amantadine for suppression of flu in poultry and in the process making the virus potentially resistant to Amantadine. According to recent studies, an H5N1 virus isolate has also shown resistance to Oseltamivir^{6,7}. Resistance to Rimantadine is observed among humans in Southeast Asia and the United States.

Another option is to develop new drug. Steps in this direction have started as early as 1997. Due to Spanish influenza victims buried in Alaskan permafrost since 1918, the 1918 flu virus has been recreated by Tumpey and co-workers⁸ based on the DNA sequence characterized from RNA fragments isolated from the victims’ lung tissue^{9,10}. The genetic similarity between Spanish flu virus and H5N1 may help in the development of new antiviral drugs. Reconstruction of the 1918 flu virus is also significant because it may help uncover the truth behind jumping of this virus from birds to humans, as researchers are trying to find out what genetic changes caused a shift in the host.

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