Avian Flu for the General Public and Healthcare Providers

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Avian flu: Avian influenza (bird flu) was identified over a century ago. Infections are normally very mild, making wild fowl (usually ducks) ideal reservoirs for carrying the disease wherever they fly. Infected birds shed the flu virus in their saliva, nasal secretions, and feces. Other birds become infected when they contact virus-containing excretions or surfaces contaminated with the excretions. Close human contact with infected birds (alive or dead) provides the opportunity for the virus to infect man. Concern heightened in 2005 after a large outbreak of avian flu occurred in northern Russia. The flu is spreading among wild and domestic birds as infected flocks fly along migration routes. As increasing numbers of birds become infected and enter more densely human populated regions, the probability for successful transmission to man is increased.

When a human becomes infected with avian flu, their immune system does not recognize this "bird virus" (Type A, H5N1 in this case) as anything it has previously encountered. Thus, the virus multiplies, virtually unchecked as the right virus-specific human defenses cannot be generated fast enough. The body tries to respond, but the infection progresses so rapidly that vital organs are usually severely damaged before there is sufficient opportunity to mount an effective defense. The result is a very high mortality rate, currently exceeding 50%.

The fear that this avian flu may become a highly lethal pandemic has recently been heightened with new research evidence suggesting strongly that the 1918 flu pandemic, responsible for 20 to 40 million deaths globally, was caused by an avian-human hybrid virus (H1N1). However, at this time, the H5N1 avian flu virus has not sustained person to person transmissibility.

SARS compared to avian flu: Severe Acute Respiratory Syndrome (SARS) was caused by a completely different virus (coronavirus). The avian flu virus has a shorter incubation period, is much more capable of rapid mutation, can be transmitted before the onset of symptoms (from birds) and is anticipated to have a much higher death rate (avian flu at greater than 50%; SARS at less than 10%).

Transmission to humans

Currently: Direct contact with poultry or surfaces and objects contaminated by their droppings or saliva, are considered the main routes of human infection. Exposure risk is considered highest during slaughter, defeathering, butchering, and preparation of poultry for cooking.

With very rare exceptions, bird flu is incapable of being transmitted from person to person. However, like all Type A influenza viruses, this Type A (H5N1) has a tremendous ability to mutate – rapidly. Therefore, it is possible that just the right mutation will occur to facilitate human to human transmission. The probability of this occurring is significantly increased if the avian flu infected individual is also infected with a human flu virus (seasonal flu). This provides the opportunity for the avian virus to exchange genetic information with the human virus, including the ability to transfer from human to human. Just as human influenza is extremely easy to catch by inhalation of droplets (created by coughing, sneezing, speaking, etc.), or by touching the droplets after they land on surfaces (such as furniture, door knobs, telephones, skin, clothes, soiled tissues) and then touching your mouth, nose or eyes, the avian-human hybrid virus could spread very rapidly. Unlike human influenza, there is some evidence that this virus may also be spread via the airborne route. Seasonal human influenza infectious droplets are greater than 5 micrometers in diameter. Due to their size and weight, seasonal flu droplets have a 3 to 6 foot

trajectory from the mouth before falling. There is a possibility that evaporated droplets (smaller than 5 micrometers) containing avian flu virus are still infectious as they are carried on air currents for significant distances. This is referred to as airborne transmission which presents a greater threat for rapid spread and is more difficult to protect against.

It does appear that this H5N1 virus has become more capable of causing disease (pathogenic). Infected ducks now excrete greater numbers of virus for longer periods of time and often show no signs of illness. The virus is also more capable of remaining infectious in the environment for an extended period. It is also adapting more readily to mammals as the virus has been found to infect pigs, dogs and felines (house cats, tigers and leopards). As pigs can be infected with both avian and human influenza, they may serve as effective mixing vessels for the creation of avian-human hybrid viruses.

Prevention

Food preparation:

Poultry. There is no evidence that properly cooked poultry (170 F°; 77 C°) can be a source for infection. Eggs should be cooked thoroughly. However, it is very important to properly clean surfaces and wash hands after handling uncooked poultry, prior to preparing any food that will not be subsequently cooked. Fortunately, disinfection with most common disinfectants is very effective in killing the influenza virus as discussed under the section on Cleaning and Disinfection.

Pork. Avian flu has been isolated in infected pigs. It is not known at this time whether food preparation activities of infected pork can spread the infection. Because influenza is easily killed by the heat required to cook pork adequately, there should be no possibility of the survival of infective influenza virus – avian or otherwise. The same attention to hand washing and surface cleaning applies to pork as it does to poultry, and should be followed in the preparation of any meat, fish or poultry products at any time regardless of the threat of infection.

Cleaning and surface disinfection:

- Detergents
- 70% alcohol
- Sodium hypochlorite: 1% in-use dilution created by diluting household bleach (which is 5% hypochlorite) by adding 1 part bleach into 4 parts clean water (This equals 10,000 ppm available chlorine.)
- EPA approved virucidal agents

Reduce possible exposure. Avoid close contact with people who have the flu or show symptoms of respiratory illness. Wash hands regularly. Avoid crowds and remain several feet away from individuals who are coughing. See Protective apparel for additional information.

Respiratory etiquette. Individuals with a fever and respiratory symptoms should 1) cough or sneeze into a tissue, 2) dispose of soiled tissue and 3) immediately wash hands or use an alcohol-based hand sanitizer. To prevent the spread of potentially infectious aerosolized droplets, wear a mask when it is necessary to be near other people.

Vaccination: Annual flu vaccinations will reduce seasonal flu-related illness and death. By limiting the number of people infected with human influenza, the possibility of creating a communicable avian-human influenza virus as a result of co-infection is decreased, thus reducing the risk of pandemic spread.

Vaccines against the avian H5N1 virus are being produced. The process requires the inoculation of fertilized chicken eggs in which the virus will multiply before they are killed to produce the vaccine. The process takes 5 to 6 months. Realistically, the amount of vaccine produced will fall far short of the amount needed if the avian flu becomes pandemic in 2006 or 2007. As the H5N1 virus must still mutate to become efficient at person to person transmission, it cannot be guaranteed that the vaccine under production will be protective against that communicable mutant viral strain. Therefore, it is extremely important that personal protection and other preventative measures be practiced. In fact, recent H5N1 vaccine trials in humans have been discouraging. The vaccine sparked a protective immune response in only 54% of those receiving two shots, 28 days apart, at the highest dose (12 times stronger than the seasonal flu shot).

Patient care and personal protection

Incubation period: The time between human exposure and onset of illness (incubation period) is usually 3 days (range 2 to 4 days).

Symptoms: Symptoms are usually those of a typical flu with fever, cough, sore throat, and muscle aches being the most prominent. However, some patients have presented with eye infections, severe diarrhea, acute respiratory distress, pneumonia, encephalitis or other severe and life-threatening complications. If you have suggestive symptoms **and** have been traveling in a country where avian flu has been reported, in contact with sick or dead birds, or been near persons with confirmed or suspected avian flu, seek immediate medical attention. It is critical that the possibly of avian flu be declared when first contacting medical providers so that diagnosis and treatment can begin immediately and you can be isolated as quickly as possible to prevent spreading the infection to others.

Anti-viral agents: Anti-viral drugs are normally used on infected patients and on individuals thought to be exposed. It is critical that the anti-viral drugs be given promptly after onset of symptoms to be effective (usually about 48 hours). This may be difficult due to the rapid progress of avian flu and the similarity of initial symptoms to those of other less harmful illnesses. There are four anti-viral drugs that have been shown to be effective against the H5N1. However, the capability of this virus to rapidly adapt by mutation has already been demonstrated with an acquired resistance to amantadine and rimantadine. Most recently, resistance to the anti-viral drug oseltamiviror (Tamiflu) has been identified in small numbers of patients. No resistance to anamavir (Relenza) has yet been detected, however the drug is much more difficult to administer.

Human transmission: Currently, human cases of avian flu have been acquired almost exclusively from birds. Although there are a few cases of suspected human to human transmission, there is no evidence of sustained transmission (the second person has not infected others). There is no data on human shedding of the infectious avian flu virus at this time.

Personal protection for health care providers and visitors:

As the accessibility and effectiveness of avian flu vaccines and antiviral drugs are very uncertain, the -selection, availability and appropriate use of personal protective equipment (PPE)[1] is essential. Emphasizing the importance of non-pharmacologic protection, the CDC issued a recommendation that health care facilities consider stockpiling enough consumable and durable

[1] Personal protective equipment (PPE) refers to the protective apparel worn by caregivers, lab technicians, emergency medical responders, health care professionals, hospital staff and any other individuals requiring protection from infectious or hazardous substances.

supplies for the duration of a pandemic wave (estimated to be 6-8 weeks). The following are listed in the CDC document (www.hhs.gov/panemicflu/plan/sup3):

- Consumable resources
  - Hand hygiene supplies (antimicrobial soap and alcohol-based, waterless hand hygiene products)
  - Disposable N95, surgical and procedure masks
  - Face shields (disposable or reusable)
  - Gowns
  - Gloves
  - Facial tissue
  - Central line kits
  - Morgue packs
  - Surface disinfectants should also be considered (as noted in another section of the CDC document)
- Durable resources
  - Ventilators
  - Respiratory care equipment
  - Beds
  - IV Pumps

Healthcare providers should practice Standard, Airborne, Droplet and Contact precautions until CDC or WHO direct otherwise. The following is a review of essentials. Use disposable protection whenever possible as the virus remains infectious on garments for long periods of time:

- **Hand hygiene.** Use soap and warm water for 15 to 20 seconds or an alcohol-based hand sanitizers (e.g. gels) according to manufacturers' directions.(Note: 60-95% alcohol content is specified by the CDC as lower and higher levels are significantly less effective)
- **Facial protection.** Because there is some evidence that H5N1 may be capable of airborne spread and the fact that it has such a high mortality rate, a fit-tested NIOSH approved disposable, particulate respirator of N-95 rating or higher is recommended at this time (NIOSH Particulate Filtration Efficiency (PFE) test challenge is approx. 0.3 micrometers). Similar respirator mask rating systems such as those designated as FFP2 or greater are utilized for airborne transmission protection in several countries. A surgical mask is a second alternative if respirators are unavailable; however, the mask should have a bacterial filtration efficiency (BFE) greater than 97% (ASTM F 2101 challenge aerosol is approximately 3 micrometers)**.** Because surgical masks do not fit as well as respirators and often do not have the same high level of filtration efficacy, they are not as protective.
- Caution**: Masks of cotton, gauze, wool, cloth, or paper are NOT effective barriers.**
- **Eye protection.** Wear goggles or a face shield (note: must still wear a mask) within 3 feet of the patient. Remember, if splashes, sprays, aerosols, or contaminated hands touch the eyes, the virus can cause an infection.
- **Gloves.** Wear clean, non-sterile gloves when entering the patient's room. Wash hands immediately after removing gloves.
- **Long-sleeved cuffed gown**. Wear a clean, non-sterile gown with long cuffed sleeves when entering the room if substantial contact with patient, environmental surfaces or items within the room is anticipated.
- **Cap.** A cap is appropriate in high risk situations where there may be increased aerosols or spray from the patient.

- **Limit patient movement.** If transport is necessary, mask the patient. All individuals involved in transport should be in full personal protective equipment (PPE). Clean areas contacted by the patient with 70% alcohol or disinfectant with virucidal capability.
- **Patient placement.** Place patient in a private, negative pressure, airborne isolation room. Cohort if necessary (persons with the same infection placed in the same room).
- **Removal of contaminated apparel.** Remove carefully to reduce the risk of self-contamination by remembering that the virus is alive on the surface of your PPE. Recommendations from the CDC and WHO follow:

CDC General Removal sequence	**WHO Avian Flu Specific Removal sequence**
Gloves	Gown
Face shield or goggles	Gloves
Gown	Alcohol-based hand rub or wash hands
Remove respirator after leaving room (do not touch front)	Remove cap and face shield
Alcohol-based hand rub or wash hands	Remove respirator (do not touch front)
Wash hands any time they become visibly soiled	Alcohol-based hand rub or wash hands
Wash hands or use alcohol based hand sanitizer if infectious contamination is suspected	Leave room
	Alcohol-based hand rub or wash hands

Pandemic prevention in summary

The most effective methods of preventing the spread of avian flu are:

1) Stop the reservoirs (sources) of the infection
   - kill infected animals
   - protect domestic fowl (e.g. chickens, turkeys, ducks) from contact with wild fowl
   - keep pigs separate from birds (wild and domestic)
2) Vaccinations
   - high public compliance with seasonal human flu vaccinations
   - develop and produce an effective H5N1 avian flu vaccine
3) Antiviral drugs
   - produce effective anti-viral drugs
4) **Utilize protective barriers and practices**
   - **store and wear adequate personal protective equipment appropriately**
   - **remove used protective equipment carefully**
   - **clean hands frequently**
   - **isolate patients/ groups/ communities with avian flu**
   - **Institute strict adherence with respiratory etiquette practices for staff, patients, and visitors**

For additional information see:

CDC at: www.cdc.gov/flu/avian/
WHO at: www.who.int/en/
FDA at: www.fda.gov/cdrh/ppe/fluoutbreaks.html

KIMBERLY-CLARK PERSONAL PROTECTIVE EQUIPMENT
(See test descriptions below)

FACIAL PROTECTION

NIOSH Certified N95 Respirator		ASTM (mmHg)	PFE (0.1 µm	BFE (3 µm)
46727	FLUIDSHIELD* PFR95* Particulate Filter Respirator and Surgical Mask, Regular (CE Marked)	160	≥99%	≥99%
46827	FLUIDSHIELD* PFR95* Particulate Filter Respirator and Surgical Mask, Small	160	≥99%	≥99%
46767	FLUIDSHIELD* PFR95* Particulate Filter Respirator and Surgical Mask with Safety Seal Film, Regular	160	≥99%	≥99%
46867	FLUIDSHIELD* PFR95* Particulate Filter Respirator and Surgical Mask with Safety Seal Film, Small	160	≥99%	≥99%
62126	PFR95* Particulate Filter Respirator and Surgical Mask, Regular	N/A	≥99%	≥99%
62355	PFR95* Particulate Filter Respirator and Surgical Mask, Small	N/A	≥99%	≥99%

EN 149:2001 Filtering Half Masks		Total Inward Leakage	Penetration		PFE (0.1 µm	BFE (3 µm)
			NaCL	Oil		
62354	PFR P1 Filtering Half Mask (CE Marked)	2.7	2.0%	8.7%	≥99%	≥99%
62408	PFR P2 Filtering Half Mask (CE Marked, NIOSH N95)	2.5	1.25%	1.4%	≥99%	≥99%
62360	PFR P3 Filtering Half Mask (CE Marked)	1.08	0.48%	0.56%	≥99%	≥99%

Fluid Resistant Masks		ASTM (mmHg)	PFE (0.1 µm	BFE (3 µm)
48247	FLUIDSHIELD* Fog-free Surgical Mask with Wraparound SPLASHGUARD* Visor	160	≥99%	≥99%
47147	FLUIDSHIELD* Fog-free Procedure Mask wit Wraparound SPLASHGUARD* Visor	160	≥99%	≥99%

Eye Protection	
41204	GUARDALL SHIELD* Face Shield, Full length (CE Marked)
42105	GUARDALL SHIELD* Face Shield, ¾ length (CE Marked)
SV50A	SAFEVIEW* Eyewear Assembled Glasses (CE Marked)

GLOVES

Nitrile Exam Gloves		Tensile Strength	Elongation
55081, 55082, 55083	SAFESKIN* PURPLE NITRILE* Exam Gloves, Small, Medium, Large	21 MPa	500%
50603, 50604, 50605	SAFESKIN* PURPLE NITRILE-Xtra* Exam Gloves 12” length, Small, Medium, Large	21 MPa	500%

COVER GOWNS

		Level of Exposure
69979	CONTROL* Cover Gown with Elastic Cuffs, Yellow, Univer	Light fluid contact/isolation
69600	Impervious Comfort Gown with Knit Cuffs, Universal	Heavy fluid contact

HEADWEAR

69057	Protective Bouffant Cap, Large

HAND SANITIZERS

93056	KIMCARE® Moisturizing Instant Hand Sanitizer

93060	KIMCARE® Instant Hand Sanitizer
SURFACE SANITIZERS	
06411	KIMTECH PREP* Wipers for the WETTASK® System , compatible for use with Bleach and Solvents

For additional information on Kimberly-Clark Healthcare products, you may visit
www.kchealthcare.com
For additional information on Kimberly-Clark Professional products, you may visit
www.kcprofessional.com

Particle Filtration Efficiency (PFE)
PFE measures the filtration efficiency of a face mask against small particles. These test results represent challenge particles at 0.1 micron. Reference ASTM F 2299.

Bacterial Filtration Efficiency (BFE)
BFE measures the bacterial filtration efficiency of a face mask. These test results represent challenge particles at 3.0 micron. Reference ASTM F 2101.

ASTM Fluid Resistance
The masks are evaluated at three pressures, 80, 120, and 160 mm Hg to simulate a challenge to the fluid resistant properties. The higher the pressure at which a mask passes, the greater the fluid splash resistance.

Total Inward Leakage
This test measures the combined effectiveness of three components (face seal, filter media, and exhalation valve, if applicable) to protect the wearer against infective agents. The results indicate the percentage of the test agent that was detected inside the mask after the test.

NaCl Penetration
This test measures the penetration of a sodium chloride aerosol through the filter media of the mask.

Oil Penetration
This test measures the penetration of a paraffin oil aerosol through the filter media of the mask.

Tensile Strength
Strength is measured in megaPascals (MPa) to assess the amount of force applied to a glove until it breaks. The lower the tensile strength, the more easily materials of the same thickness can break when snagged or pressure is applied.

Ultimate Elongation
The ability to stretch is determined by extending a strip of glove until it breaks. The percentage the strip is stretched until the break is the ultimate elongation.

AAMI Classification
The Association for the Advancement of Medical Instrumentation (AAMI) developed a system of classification for protective apparel based on liquid barrier performance.

Level 3: When tested for impact penetration and hydrostatic pressure, critical zone components must have a blotter weight gain of no more than 1.0 grams and a hydrostatic resistance of at least 50 cm.
Level 4: When tested for resistance to Bacteriophage Phi-X174, critical zone components must show an AQL of 4%.