NASA HEALTH PROMOTION AND WELLNESS COMMITTEE
Avian Influenza

Minutes for: September 1, 2005 ViTS

Welcome: Good afternoon. My name is Mae Hafizi. Today's ViTS is devoted to the topic of avian influenza. We have two guest speakers from the CDC, Dr. Carolyn B. Bridges and Dr. Tim Uyeki. In the interest of time I will give the floor to Dr. Bridges who will be discussing Influenza Pandemic and Interpandemic Epidemiology.

Influenza Pandemic and Interpandemic Epidemiology, Prevention and Control
Carolyn B. Bridges, MD
National Immunization Program
Centers for Disease Control and Prevention

Influenza

- A highly contagious respiratory illness caused by the influenza virus
- Yearly winter epidemics
- Sporadic, unpredictable pandemics
- Characterized by
  - Abrupt onset fever, chills, muscle aches, headache, fatigue
  - Cough lasting 2-6 weeks, pharyngitis, rhinnitis
  - Gastrointestinal symptoms in children
- Complications
  - Primary viral or secondary bacterial pneumonia
  - Worsening of underlying illnesses
  - Laboratory testing is needed to confirm diagnosis
- Clinical diagnosis often non-specific
  - Even at peak influenza season, nationally about 30% specimens tested for influenza are positive
  - Diagnosis may be more difficult in elderly since fewer with fever
  - Infants can present with sepsis-like syndrome or Failure to Thrive

Laboratory Testing for Influenza

- The Gold Standard is a Viral culture but results take 7+ days
- RT-PCR is the most sensitive test but not widely available.
- RT-PCR is the test utilized for avian influenza
- Point-of-care tests are generally 70% sensitive and 90% specific. They take anywhere between 15-30 minutes to produce results.

Transmission of the Influenza Virus

Important information to consider for community control measures to prevent spread

- Droplet and fomite spread through coughing, sneezing and talking
- Possible risk of airborne transmission exists
- Incubation is 1-4 days
- Infectious from 1 day before to 3-7 days after onset of symptoms, virus is shed while the person is asymptomatic
- SARS acts differently because incubation period is longer and the infected person does not shed virus while asymptomatic

Influenza Virology

- Single Stranded RNA (ss RNA) viruses with 8 separate gene segments characterized by the ability to change either:
    1. Continually resulting in yearly epidemics or
    2. Drastically resulting in sporadic pandemics
- The influenza virus has the ability to infect multiple species and has the ability to jump from species to species. It is this function that concerns experts about the avian flu H5N1. If this virus undergoes an antigenic shift, it will have the potential to develop a pandemic when it reaches sustainable person to person contact.
- An antigenic drift is a continual point mutation that results in the yearly epidemics and the need to update vaccines annually.

Influenza Virus Type A

- Subtypes of influenza A are based on the two surface glycoproteins, Hemagglutinin (H) and Neuraminidase (N).
- The current human subtypes are: H1N1, H1N2 and H3N2
- However, influenza A infects multiple species besides humans such as birds, swine, horses, whales and seals. The virus can have low pathogenic or high pathogenic effect on the infected animal. For example, H9N2 doesn't cause mortality in domestic chickens but H7 and H5 strains do. Birds serve as reservoirs for new subtypes of H1 - H15

Influenza Virus Type B

- Humans are the only reservoir for influenza B
- Influenza B causes less mortality than influenza A and it is only associated with endemics not pandemic.
- Pandemics are caused by subtypes and extended mutations within the subtypes

Criteria for pandemic strain

- New influenza A subtype in humans
- Little or no immunity in the population
- Causes clinical illness
- Sustained person to person transmission

H5N1 avian flu meets the top three criteria but not the last and the most crucial

Past influenza pandemics and associated strains

- 1918-1919 Spanish flu H1N1
- 1957-1958 Asian flu H2N2
- 1968-1969 Hong Kong flu H3N2

H2 and H3 originated as an avian flu virus

Possible Prevention Tools for Pandemic and Interpandemic Influenza

- Influenza vaccination
    1. Inactivated/injectable
    2. Live/nasal spray
    - Supply may be very limited at the beginning of a pandemic
- Influenza antiviral medications
    - 2 classes – adamantanes and neuraminidase inhibitors
    - Many H5N1 strains resistant to adamantanes
    - Supply also likely to be limited in a pandemic
- Prevention of transmission in healthcare facilities
- Considerations in a pandemic
    - Isolation and quarantine
    - Other community measures
        - e.g., school closures, cancellation of large gatherings, etc.

Vaccine production and use

- Time from candidate vaccine strain to first doses is ≥6 months
- Current optimistic U.S. production capacity for inactivated vaccine is 5 Million (M) doses per week
- Current capacity for live attenuated vaccine production is 1.5 M doses per week
- Bulk material is made in the U.K., not in U.S. so transporting the vaccine to the US may be an issue
- 2 doses per person likely needed for immune response
- Dept of Defense is on the high priority for vaccination which is close to 0.5 M-1.5 M persons
- Limited supply of antiviral medications will be a reality
- However, any prioritization scheme will likely require modification based on epidemiology of a new pandemic

Avian Influenza

Tim Uyeki, MD
National Immunization Program
Centers for Disease Control and Prevention

The natural reservoir for Influenza type A is wild water fowl. Type A has 16 different Hemagglutinin (H) surface antigens and 9 Neruaminidases (N) surface antigens with different degrees of pathogenesis in domestic birds. The avian virus affects the respiratory and the GI system of the bird. While the bird remains asymptomathic it can shed the virus in respiratory secretions or in feces. In cool temperatures and low humidity the virus has the potential to live for weeks.

H9N2, H7N2 and H7N7 have low pathogenesis in domestic chicken where the animal develops a mild illness. However, H7N3, H7N7 and H5N1 are highly pathogenic to domestic chickens and cause high mortality.

The country most affected in Asia is Vietnam and the main source is back yard chicken farms not industrial/commercial sites.

A pending question is: If the virus is endemic in wild birds do they also spread the disease? This question in not well understood but it is known that in Asia infected domestic poultry were the source of spread through the many countries such as Laos, Malaysia, Russia and Kazakestan not wild birds. S. Korea and Japan have controlled their outbreaks very well. There have been reports of infected pigs, tigers and leopards in China – a diverse population of animals - but only 112 human cases since January 2004. Symptoms have been typically high fever, cough, SOB and diarrhea with one atypical case of encephalitis. Fifty-seven (57) deaths on record with a mortality rate of 51%.

H5N1 was acquired by humans through direct contact with sick or dead poultry. Direct contact means holding, touching, ingesting. But transmission is not fully understood. There has been no sustained human to human transmission to date, if any, only limited. This is a probable case and has not been clearly identified.

All of the genes of H5N1 are in poultry and it is continuing to evolve. The concern as mentioned previously is genetic re-assortment but there has been no evidence for genetic reassortment of the virus at his time. No H5N1 vaccine is available at this time but trials are underway.

H5N1 does respond to the antiviral medication neuraminidase inhibitor (Tamiflu otherwise known as Oseltamivir). This medication has not been formally tested in humans for prevention but it is being used to mitigate severity of symptoms. The full dose or course of Oseltamivir is not fully learned and there have been no studies of the disease in asymptomatic or mildly symptomatic individuals. Oseltamivir remains the medication of choice for stockpiling. It is best if the medication is given very early in the course of the disease. The later it is given the greater the chance of the infected person shedding the virus. It is also thought that the virus may replicate in the GI track.

The risk to NASA employees and astronauts who are stationed in Russia is very, very minimal. As part of their job responsibilities NASA employees will not come in contact with sick poultry. Therefore, stockpiling or providing Oseltamivir as prophylactic medication is not necessary.