Influenza – People, Poultry, Pets
THE BASICS

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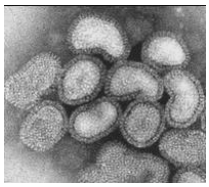
Influenza viruses

- Family *Orthomyxoviridae*
- Type A, B, C
  - Based on NP and M antigens
- Type A occurs in humans, pigs, horses, seals, many birds
- Types B and C occur in humans only

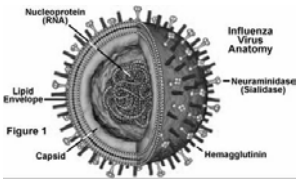


the virus

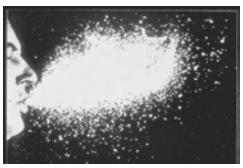
Type A influenzas

- Classified according to Hemagglutinin (16) and Neuraminidase (9) types
- Hemagglutinin – responsible for attachment to cell surface
- Neuraminidase – responsible for release from cell
- All human influenzas are H1, H2, H3
- All serious avian viruses are H5 and H7

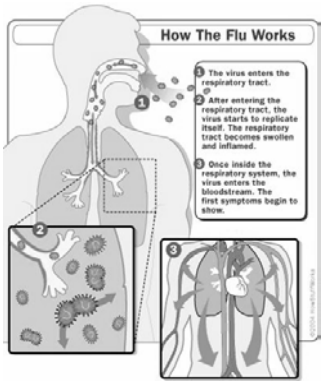
the virus



Type A influenza in humans

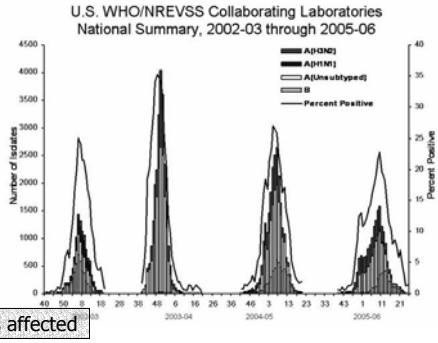


Hemagglutinin binds to sialic acid with alpha2,6 linkage to galactose



Type A influenza in humans

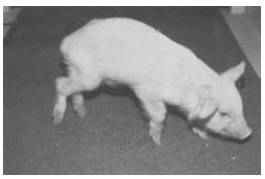
- 30,000 – 50,000 deaths per year in the US

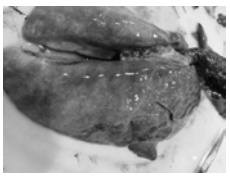


the species affected

Type A influenza in swine

- Economically important respiratory disease of swine
- Present globally
- Main types: H1N1, H3N2, H1N2

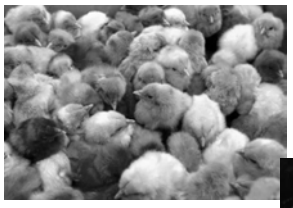




the species affected

Hemagglutinin binds to sialic acid with alpha2,3 or alpha2,6 linkage to galactose

Type A influenza in birds



All H and all N types have been isolated from birds

Hemagglutinin binds to sialic acid with alpha2,3 linkage to galactose

the species affected

Host Range

- **Many birds, especially aquatic**

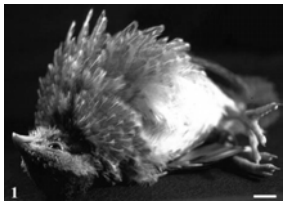
Waterfowl have sialic acid with alpha2,3 linkage to galactose throughout their GI tract

"Highly pathogenic" avian influenza (HPAI)

- **Lethal after i-v inoculation of chicks**
- **OR specific amino acid sequence of hemagglutinin cleavage site**

HPAI – Clinical Disease

high morbidity, high mortality

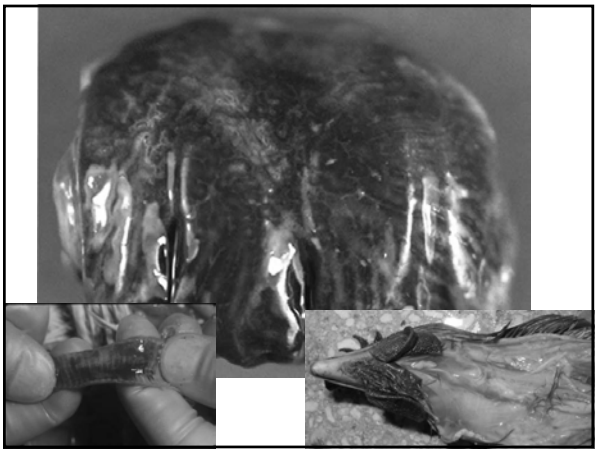


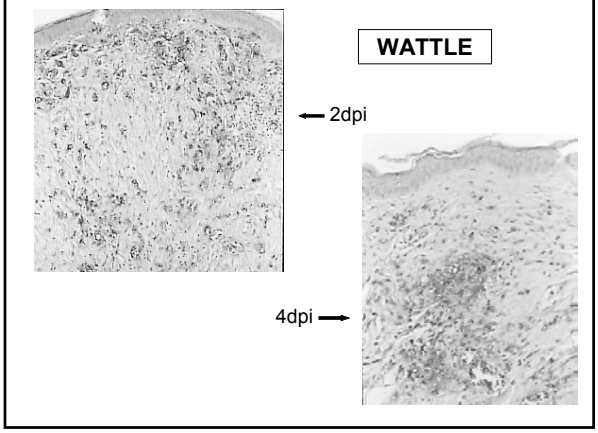
HPAI – Gross Lesions

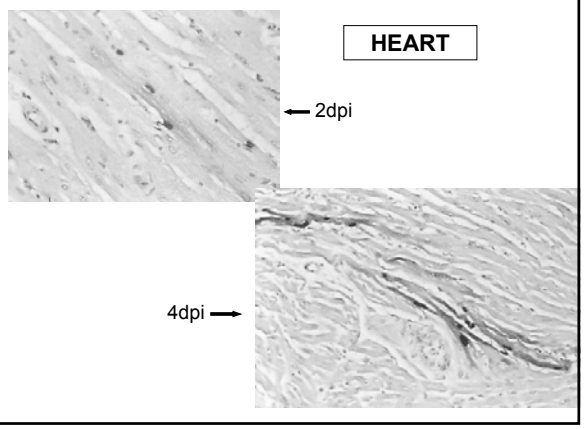
shank hemorrhage

subQ edema

Virus infects endothelium throughout the body.

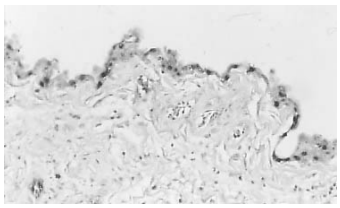






HPAI – Transmission

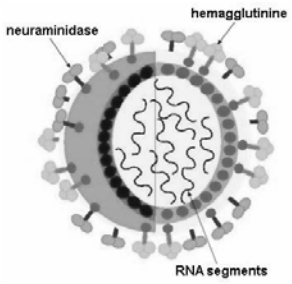
- Body fluids loaded with virus
- Fomites
- Aerosol
- Waterfowl

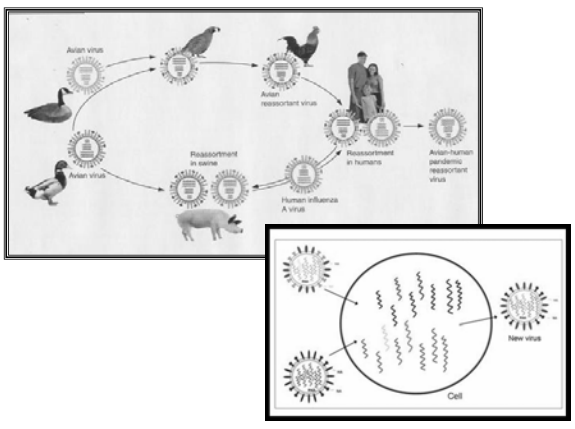


Influenza pandemics

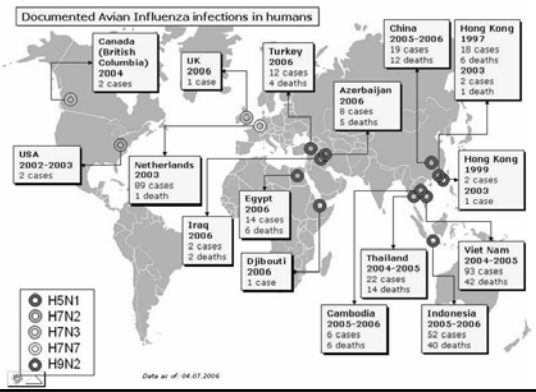
- **1918 – "Spanish" flu – H1N1**
  - **Killed 40M people**
- **1957 – "Asian" flu – H2N2**
- **1968 – "Hong Kong" flu – H3N2**

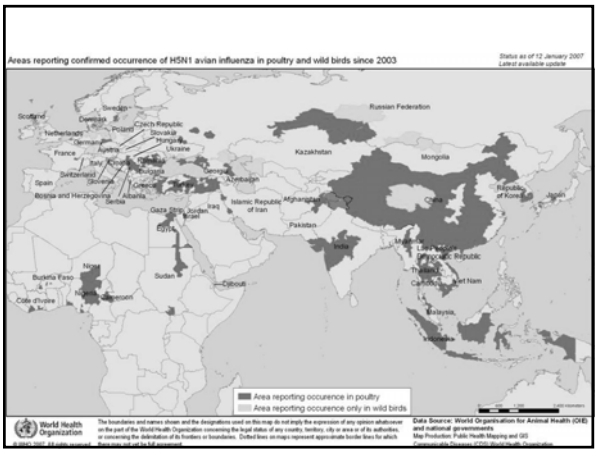
How have pandemics happened?

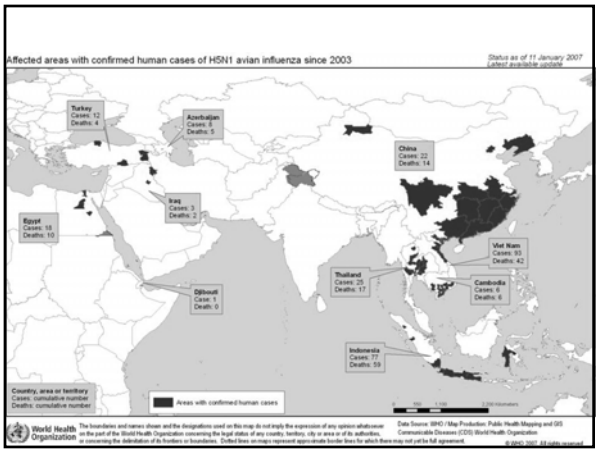




Can avian influenzas infect humans? YES







World Health Organization

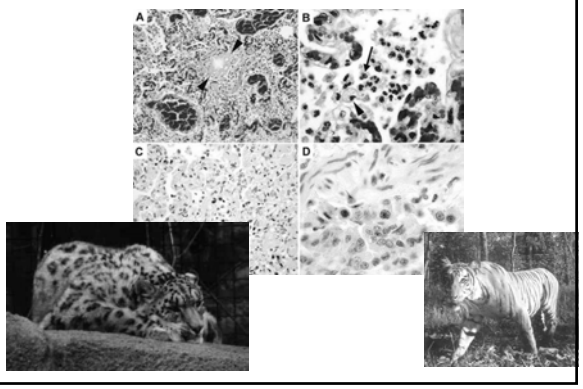
Cumulative Number of Confirmed Human Cases of Avian Influenza A/(H5N1) Reported to WHO

22 January 2007

Country	2003		2004		2005		2006		2007		Total	
	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths
Azerbaijan	0	0	0	0	0	0	8	5	0	0	8	5
Cambodia	0	0	0	0	4	4	2	2	0	0	6	6
China	1	1	0	0	8	5	13	8	0	0	22	14
Djibouti	0	0	0	0	0	0	1	0	0	0	1	0
Egypt	0	0	0	0	0	0	18	10	1	1	19	11
Indonesia	0	0	0	0	19	12	56	46	5	4	80	62
Iraq	0	0	0	0	0	0	3	2	0	0	3	2
Thailand	0	0	17	12	5	2	3	3	0	0	25	17
Turkey	0	0	0	0	0	0	12	4	0	0	12	4
Viet Nam	3	3	29	20	61	19	0	0	0	0	93	42
Total	4	4	46	32	97	42	116	80	6	5	269	163

Total number of cases includes number of deaths.
WHO reports only laboratory-confirmed cases.
All dates refer to onset of illness.

Other species infected with H5N1



Feline friend or potential foe?

What role do cats play in the epidemiology of H5N1 avian flu virus? We don't yet have all the answers, but it's time to consider new precautions, argue **Thijs Kuiken, Albert Osterhaus, Peter Roeder** and their colleagues.

There are increasing numbers of reports from Asia and Europe of domestic cats dying from avian influenza H5N1 virus. The available evidence, albeit incomplete, suggests that cats are more than collateral damage in avian flu's deadly global spread and may play a greater role in the epidemiology of the virus than previously thought. Here we recommend that new precautions are taken by nations and agencies fighting avian flu to minimize the risk of cats becoming infected and spreading the highly pathogenic virus to

The jury's out

The 2004 outbreak in domestic cats showed striking similarities with an incident that occurred three months previously at a zoo in Suphanburi, Thailand, during a local outbreak of H5N1 virus infection in poultry. At this zoo, two tigers and two leopards died suddenly after feeding on fresh chicken carcasses. The probable cause of death was diagnosed as severe pneumonia due to H5N1 virus infection". Also in 2004, there was a second outbreak of H5N1 virus infection at another zoo in Thailand, again involving consumption of virus-infected chicken. This time, a total of 147 tigers died or were killed". These reports were surprising because both domestic cats and wild felids were considered to be resistant to disease from influenza A virus infection, of which H5N1 is a subtype.

Despite these unexpected events, the possible role of cats in the epidemiology of H5N1 virus infection has been largely overlooked by the human- and animal-health communities. As recently as 28 February 2006, a World Health Organization (WHO) press release stated: "There is no present evidence that domestic cats play a role in the transmission cycle of H5N1 viruses." A March press release from the World Organisation for Animal Health (OIE) stated: "The OIE stresses that as of today, all the natural cases in felines have not led to any change in the epidemiology of the disease that has fundamentally remained a bird disease, nor have they led to any recognized virus change in epidemiology or mutation leading to an increased virulence of the virus for felines or other mammals."

There are now several observations indicating a greater role for domestic cats than these cautious statements suggest. First, it has become evident that fatal infections among cats are common in countries such as Indonesia, Thailand and Iraq, where the virus seems

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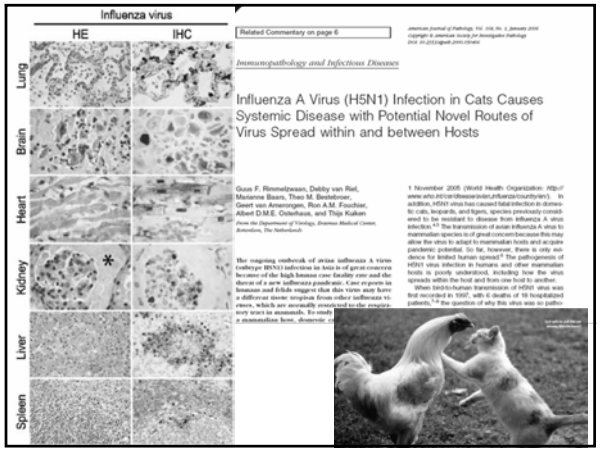
Long Thought Immune, Felines Contract Bird Flu



Related Commentary on page 6

Immunopathology and Infectious Diseases

Influenza A Virus (H5N1) Infection in Cats Causes Systemic Disease with Potential Novel Routes of Virus Spread within and between Hosts

Guus F. Rimmelzwaan, Debby van Riel, Marianne Baars, Theo M. Bestebroer, Geert van Amerongen, Ron A.M. Fouchier, Albert D.M.E. Osterhaus, and Thijs Kuiken

1 November 2005 (World Health Organization: http://www.who.int/csr/disease/avian_influenza/country/en/). In addition, H5N1 virus has caused fatal infection in domestic cats, leopards, and tigers, species previously considered to be resistant to disease from influenza A virus infection.[4,5] The transmission of avian influenza A virus to mammalian species is of great concern because this may allow the virus to adapt to mammalian hosts and acquire pandemic potential. So far, however, there is only evidence for limited human spread.[6] The pathogenesis of H5N1 virus infection in humans and other mammalian hosts is poorly understood, including how the virus spreads within the host and from one host to another.

When bird-to-human transmission of H5N1 virus was first recorded in 1997, with 6 deaths of 18 hospitalized patients,[7,8] the question of why this virus was so patho-

Other species infected with H5N1

javma News — global issues

AVMA journals > JAVMA News > Dog death — December 15, 2006

Dog dies of avian influenza

Printer-friendly version

Fatal avian influenza in a dog is the subject of a dispatch from Thailand appearing in the November issue of the journal Emerging Infectious Diseases.

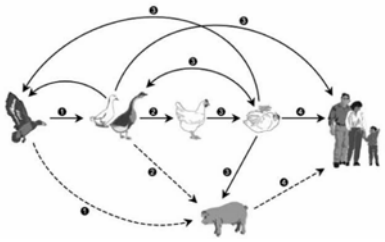
In October 2004, the Faculty of Veterinary Medicine at Kasetsart University re… for necropsy. The owner said the dog had eaten duck carcasses from an area … pathogenic avian influenza H5N1 infections in ducks. The dog developed high … lethargy about five days after eating the ducks and died the following day.

Case reports and research have provided evidence that H5N1 avian influenza c… barriers to infect cats as well as humans. Domestic cats and tigers have contr… after eating poultry harboring HPAI. Earlier this year, Germany reported fatal a… domestic cats (see JAVMA, April 15, 2006, page 1155). In Asia, large cats in … the disease.

Genetic comparison indicated that the dog isolate of the H5N1 virus was simila… researchers recovered from a tiger in Thailand during a mid-2004 outbreak.

The authors conclude that, like cats, dogs are at risk for H5N1 infection. They … of humans acquiring the H5N1 virus from contact with cats or dogs is a cause … highlights the need to monitor domestic animals during future outbreaks of H5…

Other species infected with H5N1



Serologic evidence of H5N1 infection in pigs in Asia

Experimental studies show limited replication but no pig-to-pig transmission

Next pandemic?

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Djibouti	0	0	0	0	0	0	1	0	0	0	1	0
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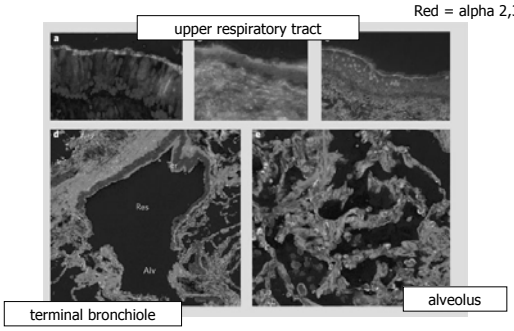
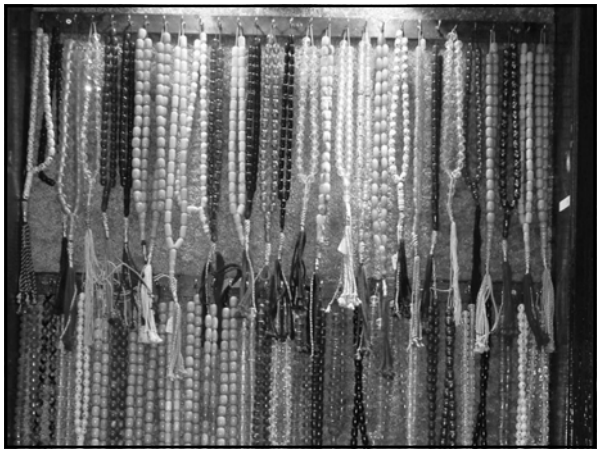
Kyoko Shinya, Masahito Ebina, Shinya Yamada, Masao Ono, Noriyuki Kasai and Yoshihiro Kawaoka,.*Nature* 440, 435-436 (23 March 2006)

Green = alpha 2,6

Red = alpha 2,3

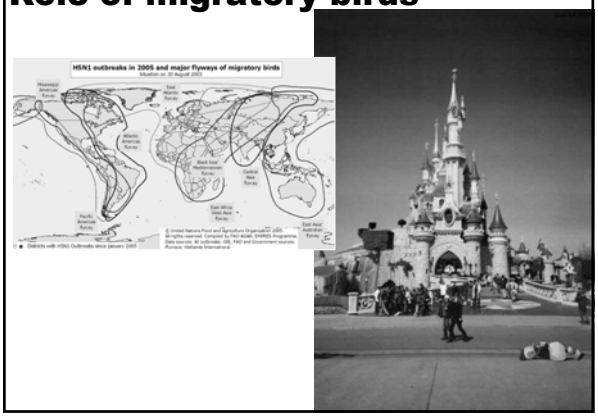




Control in poultry is essential

Live Bird Markets

Role of migratory birds



Vaccination?

Available for poultry

Under development for humans

PROFILE: ILARIA CAPUA

Italy's Influenza Diva

She set in motion a worldwide movement to share information on avian influenza. Italian bird flu scientist Ilaria Capua says what she thinks—and often gets what she wants

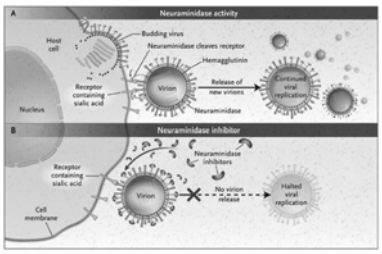
Antivirals

Neuraminidase inhibitors

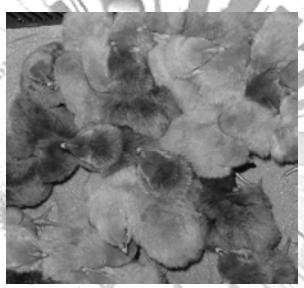
- **Olsetamivir - TAMIFLU**
- **Zanamivir**

Ion channel inhibitors

- **Rimantidine**
- **Amantadine**



The End and The Future!



Thank you!

The Next Few Teleclasses

February 15	***Fresh Produce and Human Pathogenicity*** … with Prof. Keith Warriner, Guelph University
February 21	***Infection Control in the Endoscopy Clinic*** … with Dr. Richard Everts, Nelson Marlborough Health Service
February 22	***Best Practice for Hospital Construction Management*** … with Andrew Streifel, University of Minnesota
March 6	***Tuberculosis in the Modern Age*** … with Evonne Curran, Health Protection Scotland
March 8	***Voices of CHICA*** … with CHICA-Canada Board Members & Guests
March 22	***A Year of Cleaner, Safer Care – A Worldwide Experience*** … with Dr. Didier Pittet, World Health Organization, Geneva … teleclass sponsored by: GOJO www.gojo.com

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For registration information www.webbertraining.com/howtoc8.php