



BIRD ZONOOSES



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Avian Zoonoses

- Type of avian population
 - **Caged birds – companions:** 4.6 million households owned pet birds in the USA in 1996. Estimated pet bird population > 40 million in 1996. Pet birds owned by about 10% of US households in 2001.
 - **Commercial Poultry**
 - **Wild birds**
- Do not share many pathogens
 - **Risk to humans relatively low**

Avian Zoonoses

- **Host determinants that reduce risk to humans**
 - **Excellent immune system**
 - **Higher body temperature**
 - **Strain specificity**
- **Young birds are at higher risk**

Avian Influenza

- **Birds: Mainly Asymptomatic, if sympt.**
 - **respiratory/gastro-intestinal disease**
 - **mortality (variable)**
 - **drop in egg production**
- **Recombination / mutation common**
- **Wild waterfowl - principal reservoir**
- **Virus resistant in environment**
- **Control through biosecurity**



Avian Influenza H5N1- Hong Kong, 1997

- Initial outbreaks on 3 farms (3/97-5/97).
 - **70% Mortality in poultry (68,000 birds)**
- First human case 5/97 (3 year-old child)
- Severity of clinical signs. 18 human cases, 6 deaths (including index case) from 5/97 to 12/97.
- Human and chicken isolates identical
- 1.6 million chickens de-populated.
- No human-to-human transmission.
- New concerns in May 2001, re-emergence of virus in poultry and retail market slaughtering. No human cases. Similarly in 2002.



Avian Influenza H9N2- Hong Kong, 1999

- **Two human cases 3/99 (1 and 4 year-old children)**
- **Isolation of Virus H9N2.** These are the first confirmed human infections with influenza A(H9N2) viruses. The influenza A(H9N2) virus is different than the influenza A(H5N1) viruses which caused an outbreak of influenza (the "Avian Flu") in Hong Kong in 1997.
- **Influenza A(H9N2) is an avian flu virus** and usually infects birds. However, influenza A(H9N2) does not appear to cause high rates of death in poultry as did influenza A(H5N1) in Hong Kong. It is not known how the 2 children in Hong Kong became exposed to influenza A(H9N2). **Both children were hospitalized but recovered fully. Subsequently, five additional human H9N2 infections were reported in southern China and a relatively high seroprevalence rate for H9 antibody was documented among Hong Kong poultry workers**



Avian Influenza H5N1- Hong Kong, 2002-2003



- Large culling of chicken in Hong Kong in late 2002. some 900 000 chickens
- **At least two confirmed cases of avian flu (H5N1) in Hong Kong in February 2003** among members of a same family who all got sick. The 33-year-old man and her 8 year old daughter died of influenza A(H5N1) virus related to this outbreak. The man was the father of the 9-year-old boy reported as having tested positive for influenza A (H5N1).
- **This is the second recorded occurrence of apparent direct transmission of an avian influenza virus to human hosts, unmodified by reassortment of viral genes or by adaptation to an intermediate mammalian host.**

Avian Influenza H5N1, Asia, 2003/04



An epidemic of highly pathogenic avian influenza caused by H5N1 began in mid-December 2003 in the Republic of Korea and outbreaks have been confirmed among poultry in Cambodia, China, Hong Kong (in a single peregrine falcon), Japan, Indonesia, Laos, S. Korea, Thailand & Vietnam.

- **H5N1 variants demonstrated a capacity to directly infect humans in 1997, and have done so again in Viet Nam in January 2004.** The spread of infection in birds increases the opportunities for direct infection of humans.
- **Genetic sequencing of A(H5N1) virus samples from human cases in Vietnam and Thailand show antiviral resistance to amantadine and rimantadine, two of the antiviral drugs commonly used for influenza.** The remaining two antivirals (oseltamavir and zanamavir) should still be effective against this strain of H5N1.

Avian Influenza H5N1, Asia, 2003/04

- Confirmed Human Cases of Avian Influenza A(H5N1)

Country/Territory	Cases	Deaths
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Thailand	12	8
Viet Nam	22	15
Total	34	23

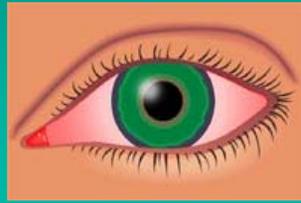
(5 April 2004)

- Epidemics of H7N3 virus in poultry In Canada (BC; a few mild human cases in poultry workers (conjunctivitis/upper resp. symptoms) and USA in 2004



Newcastle Disease (paramyxovirus)

- Avian c/s = respirat., neurol., digest.
- Domestic and wild poultry reservoirs
- Human dz = conjunctivitis, flu-like
 - primarily vaccine related



Viral Encephalomyelitides

- Complex life cycle.
- Life cycle: Wild fowl <--> mosquito.
- Severe clinical disease in horses and humans (incubation period: 4-10 days).
- West-Nile: Bird deaths
- Non-indigenous birds can show clinical disease (Pheasants, emus).
- No threat to pet bird owners.



Viral Encephalomyelitides

- Severe clinical disease humans (incubation period: 4-10 days). Mild to severe neurologic deficits in survivors
- EEE: about 153 human cases since 1964 in US. Approximately one-third of all people with clinical encephalitis caused by EEE will die from the disease and of those who recover, many will suffer permanent brain damage with many of those requiring permanent institutional care.
- . WEE: more than 500 human cases since 1964; Children, especially those under 1 year old, are affected more severely than adults and may be left with permanent sequelae, which is seen in 5 to 30% of young patients. The mortality rate is about 3%.



Viral Encephalomyelitides

- **St Louis:** Since 1964, there have been 4,437 confirmed cases of SLE with an average of 193 cases per year (range 4 - 1,967). However, less than 1% of SLE viral infections are clinically apparent and the vast majority of infections remain undiagnosed. Illness ranges in severity from a simple febrile headache to meningoencephalitis, with an overall case-fatality ratio of 5-15 %. The disease is generally milder in children than in adults, but in those children who do have disease, there is a high rate of encephalitis. The elderly are at highest risk for severe disease and death.
- **La Crosse Encephalitis:** During an average year, about 75 cases of LAC encephalitis are reported to the CDC. Most cases of LAC encephalitis occur in children under 16 years of age.

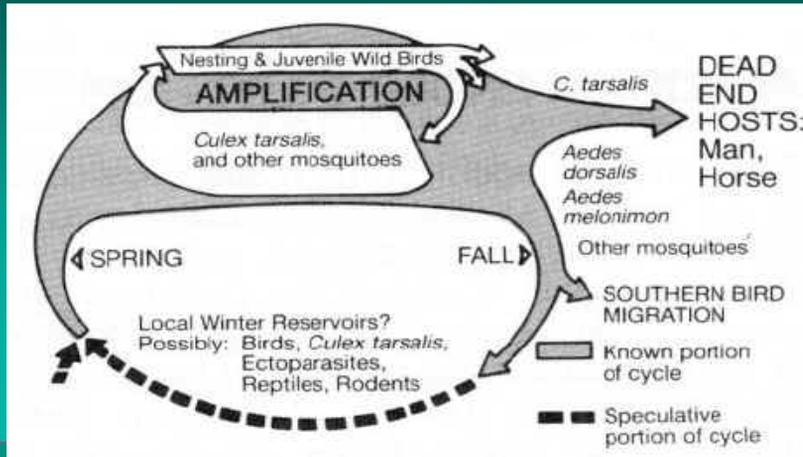
Viral Encephalomyelitides

- **USA:** Eastern Equine Encephalitis (birds/ *Culiseta melanura*; birds, mammals/*Aedes sollicitans*, *Coquilletidia perturbans*) and Western Equine Encephalitis (birds/*Culex tarsalis*, *Aedes melanimon*) , Saint Louis encephalitis (birds/ *Culex* sp.).
- **Japanese encephalitis:** Asia, India. reservoir: birds, pigs and mosquitoes (*Culex* sp.)
- **Murray Valley and Ross river encephalitides:** Australia, New Guinea
- **West-Nile Virus:** Africa, Middle-East, Asia, Europe, North America.



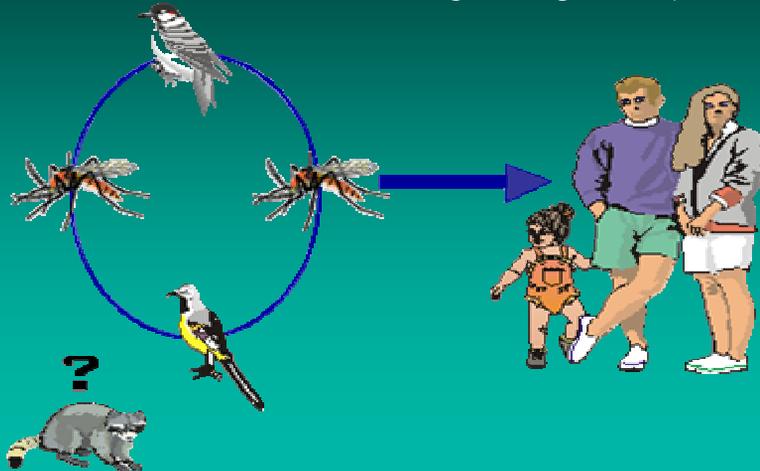
Viral Encephalomyelitides

- USA: Western Equine Encephalitis (birds/*Culex tarsalis*, *Aedes melanimon*)



Viral Encephalomyelitides

- USA: Eastern Equine Encephalitis (birds/ *Culiseta melanura*; birds, mammals/ *Aedes sollicitans*, *Coquilletidia perturbans*)

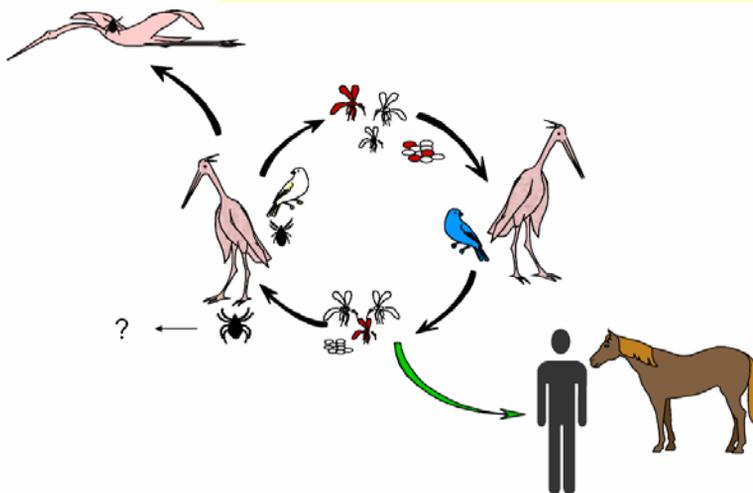


West-Nile Encephalitis

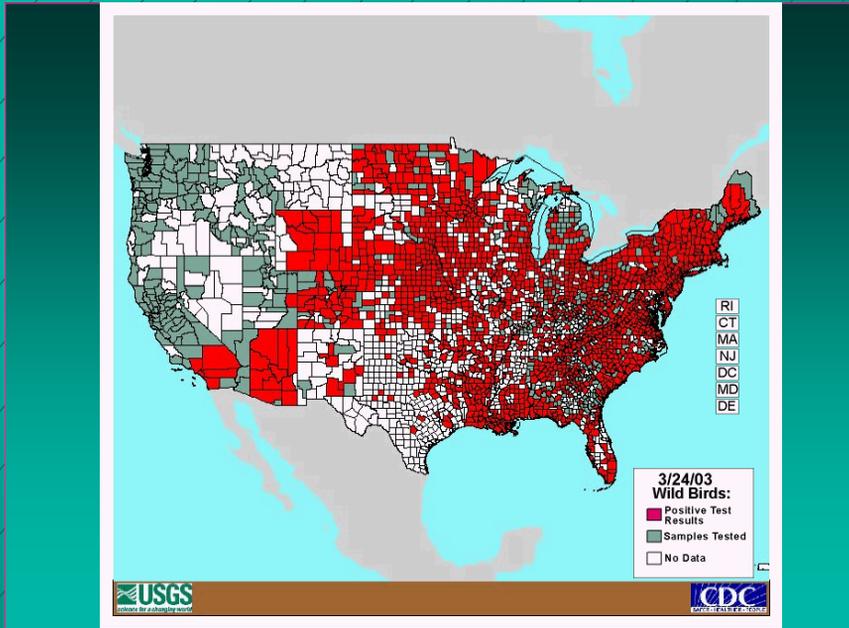
- Wild fowl <--> mosquitoes, (ticks).
- Severe disease in horses and humans. Deaths in birds (geese, Israel; crows, USA).
- Appeared for 1st time in 1999 in USA. Bird deaths in crows and zoo birds. 62 humans cases (7 deaths), 25 horses (8 dead/euth.)
- 2000: 21 human cases (2 deaths), 60 horses (38% dead/euth.), 4,323 pos. birds in 12 States + DC.
- No threat to pet bird owners.



West Nile: cycle of transmission



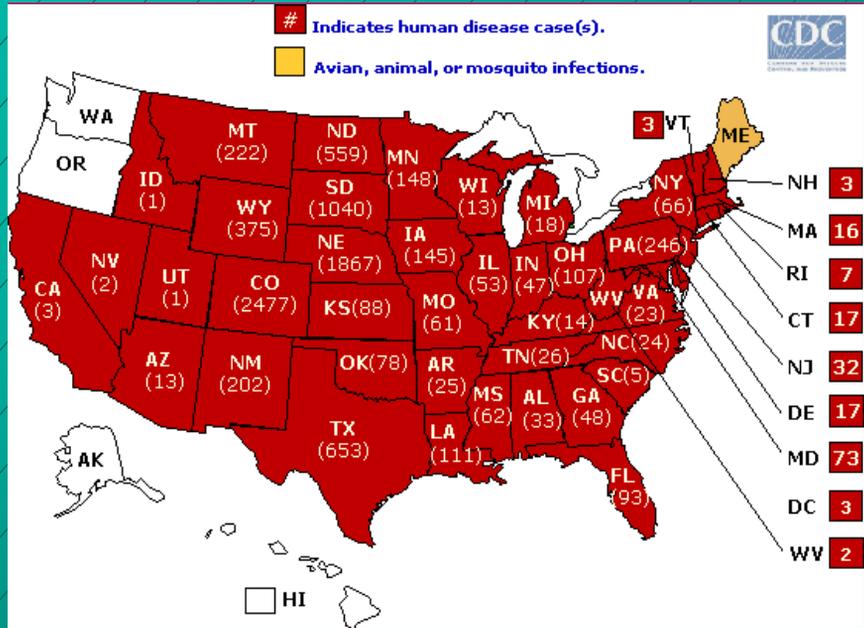
2003 West Nile Virus Activity, United States



WEST NILE VIRUS ENCEPHALITIS CASES & DEATHS IN HUMANS, U. S. A., 1999-2002

YEAR	Cases	Deaths (%)	LOCATION
1999	62	7 (11.3%)	New York
2000	21	2 (9.5%)	New York (14), New Jersey (6), Connecticut (1)
2001	66	9 (14%)	New York (15), Florida (12), New Jersey (12), Connecticut (6) Maryland (6), Pennsylvania (3) Massachussets (2), Georgia (1), Louisiana (1). Mainly in elderly (mean age:70 years old, range 36-90 years); 27 (56%) males.
2002	4,161	277 (6.6%)	44 states + DC. Mainly Illinois, Michigan, Ohio and Louisiana.
2003	9,389	246 (2.6%)	45 states

2003 West Nile Virus Activity in the United States



West-Nile Encephalitis

- 2002: 4161 human cases (277 (6.6%) deaths) in 44 states.
- 14, 717 horses with clinical WNV from 40 states.
- >14,000 pos. birds in 42 States + DC.



Psittacosis

Signs and Symptoms:

- Incubation approximately 5 - 14 days.
- From inapparent to systemic illness and pneumonia.
- Acute onset fever, chills, headache, malaise, myalgias.
- Nonproductive cough, chest tightness, dyspnea.
- X-ray may show lobar or interstitial infiltrates.
- Auscultation may underestimate extent of respiratory involvement

Ornithosis-psittacosis (*Chlamydophila psittaci*)



**Psittacines and other
Caged birds
often
inapparent**

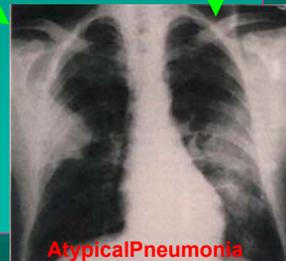


**Bird: sometimes systemic disease,
respiratory, digestive and neurological
Deadly in a few days**

Respiratory Tract

Humans:

- 1 to 2 weeks after contact
- pseudo-influenza signs
- ± atypical pneumonia



Atypical Pneumonia

Psittacosis



Salmonella

- Worldwide
- Wide prevalence in many species
- Worldwide economic importance
- Ubiquitous - can survive for years
- Carrier state important



Salmonella in Birds

- Acquire infection from feed/rodents
- Disease of young
- Adults immune but may carry/shed
- Intestinal organisms spread in processing
 - Waterbaths
 - High percent of surface contamination

Salmonella in Birds

- Two host adapted species
 - *pullorum, gallinarum*
 - pathogenic for birds, no significant public health threat.
- Systemic infection may lead to oviduct infection and shedding in eggs (*S. enteritidis*).
 - Very rare.
 - 1/300,000 eggs.



Human Infection

- 2-3 million cases/year; 45,000 isolates
- Mainly foodborne zoonosis, *S. enteritidis* is usually of avian origin, but rarely associated to pet bird exposure. (Must ingest large numbers of bacteria.)
- Immune impaired most susceptible
- GI defenses impaired by antacids and antibiotics
- Acute, self-limiting, febrile, diarrhea lasting 2 days to 1 week.
- Carrier state may develop

Human Infection

- 98% of all human foodborne illness is due to improper handling, storage and preparation.
- Increased susceptible populations
 - young
 - old
 - chemotherapy
 - immune deficiency



Human Infection

- **Increased risk**
 - **Lack of food preparation/handling knowledge**
 - **More people eating out**
 - **Lack of training for food workers**
 - **Poor personal hygiene**
- **Education is critical**



Campylobacter in Birds

- *C. jejuni*: Most common subspecies isolated from avian species.
- High prevalence of infection in both domestic and wild birds.
- Most birds asymptomatic, but may carry/shed. Anorexia, somnolence, diarrhea and emaciation; fledgling mortality common.
- Consumption of contaminated poultry source of human infection
- Intestinal organisms spread in processing
 - **Waterbaths,**
 - **High percent of surface contamination**

Yersinosis

- *Y. pseudotuberculosis*, *Y. enterocolitica*
- Natural wild reservoirs include birds and rodents.
- Human infection by fecal-oral route. Food and water contaminated by animal feces.
- Acute abdominal infection, simulating acute appendicitis, arthritis can occur.
- Treatment: doxycycline, ciprofloxacin

Mycobacterium avium and *M. tuberculosis*

- *M. avium*: May cause disease in immunocompromised individuals
- Disease of “Free-Ranging” birds. Losses possible in captive wild birds.
- Diagnosis made by necropsy or Tuberculin testing waddle
- *M. tuberculosis*: can occur in psittacines (parrot, Macaw,..)



***Coxiella burnetii* and Q fever**

- ***C. burnetii*: Survives well in environment. Usually transmitted by aerosols from infected ruminants.**
- **An outbreak associated to pigeons was reported in Europe.**
- **Atypical pneumonia in humans, flu-like syndrome, hepatitis. Chronic form: endocarditis.**
- **Diagnosis made by serology**
- **Treatment: tetracyclines, Doxycycline**

Histoplasma capsulatum

- **USA: endemic (20 to 80% persons skin test positive) in Mississippi, Missouri and Ohio River valleys.**
- **Soil main reservoir, especially fertilized by bird/bat guano**
- **Human infection through aerosols.**
- **Primary pulmonary histoplasmosis (Atypical pneumonia), chronic cavitary histoplasmosis, disseminated extra-pulmonary histoplasmosis in HIV patients; erythema nodosum, arthralgia in a few cases.**
- **Treatment: Amphotericin B or Ketonazole**

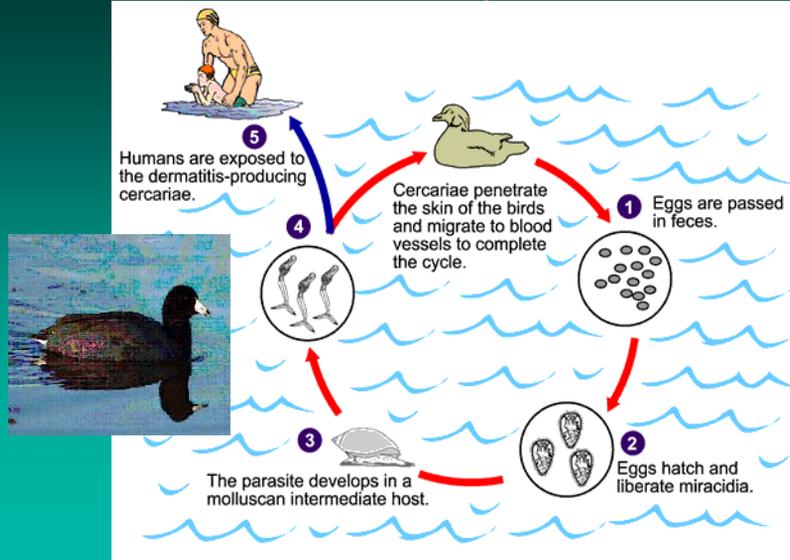
Cryptococcosis (*C. neoformans*)

- Yeast present worldwide
- Birds healthy carriers of the organism in their intestinal tract.
- Human infection through inhalation of contaminated dust or soil, especially if contain pigeon feces.
- Respiratory illness, extrapulmonary forms (CNS), severe disseminated forms in Immunocompromised persons.
- Treatment: Amphotericin B, fluconazole

Ectoparasites

- 1. *Dermanyssus gallinae*
- Feed on birds at night, infest buildings during the day
- Intensely pruritic papular urticaria
- 2. *Schistosoma dermatitis* (Swimmer's itch)
- Swimming in river or lake. Ducks natural hosts, snails intermediate hosts (cercariae). Pruritic skin rash

Schistosome dermatitis (Swimmer's itch)



BIRD ZONOOSES

The End

