Lecture title: Avian influenza

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Avian influenza, or "bird flu," is a contagious viral disease of domestic and wild birds. It's a major threat to the poultry industry, animal health, trade, and the economy worldwide.

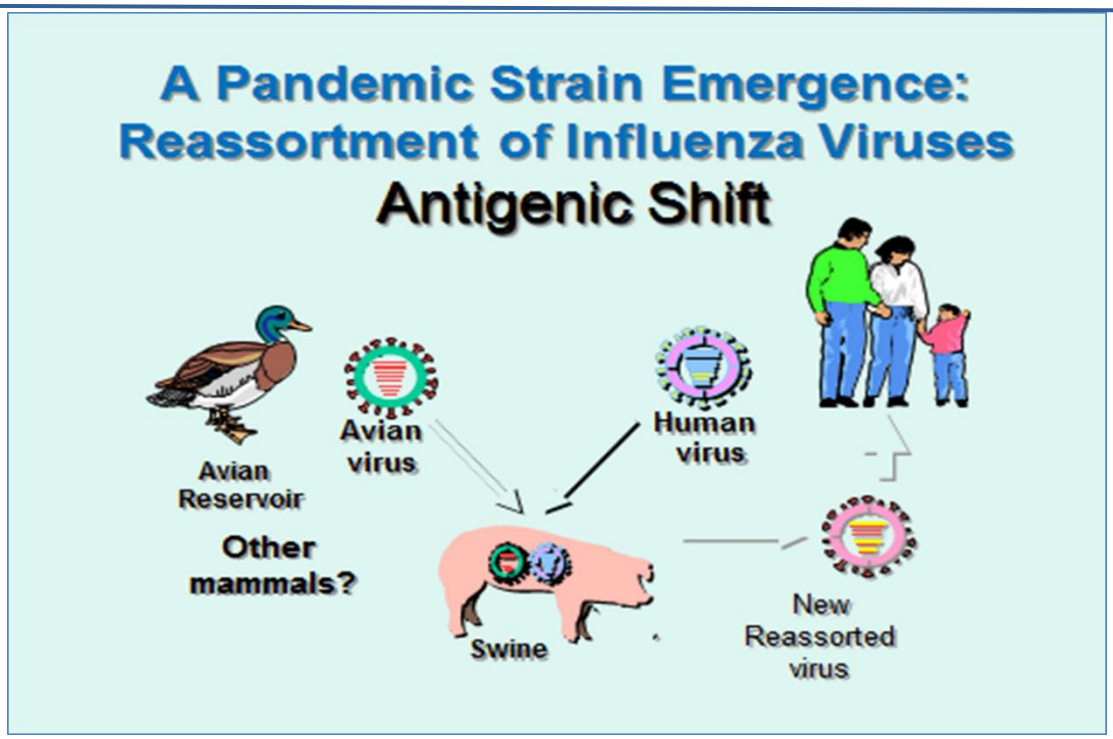
Causative agent

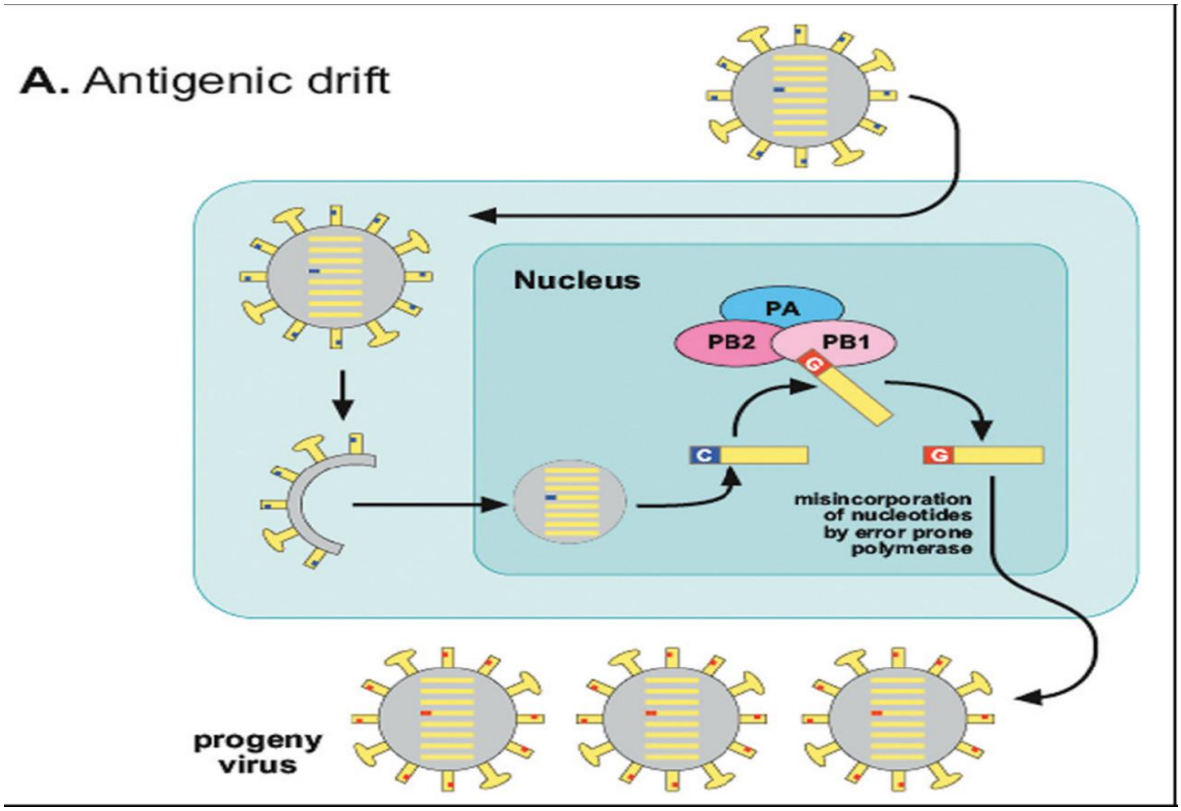
Avian influenza is caused by a orthomyxovirus (family: Orthomyxoviridae). Several virus subtypes exist, which are divided on the bases of the antigenic relationships in the virus glycoproteins haemoagglutinin (H) and neuraminidase (N).

Transmission

Airborne virus particles from the respiratory tract, droppings, and people-carrying virus on their clothing and equipment are the main routes of transmission.

- Species affected
- Turkeys and ducks are mainly affected but chickens, geese, and wild birds can also be infected.
- Economic Significance:
- Economic losses from AI have varied depending on
- The strain of virus
- species of bird infected
- number of farms involved
- control methods used
- the speed of implementation of control or eradication strategies.
- Incubation Period : 2-5 days (range 1-9 days)


A Pandemic Strain Emergence:
Reassortment of Influenza Viruses
Antigenic Shift
Avian Reservoir
Avian virus
Human virus
Other mammals?
Swine
New Reassorted virus


A. Antigenic drift
Nucleus
PA
PB2
PB1
G
C
G
misincorporation of nucleotides by error prone polymerase
progeny virus

Example of zoning: The case of China*

In this example, as initially used in China, premises with infected poultry or relevant slaughtering houses and other departments were considered *infected points*; areas within the 3-km radius were considered *infected zones*; and areas within 5 km around the infected zones were considered *threatened zones*.

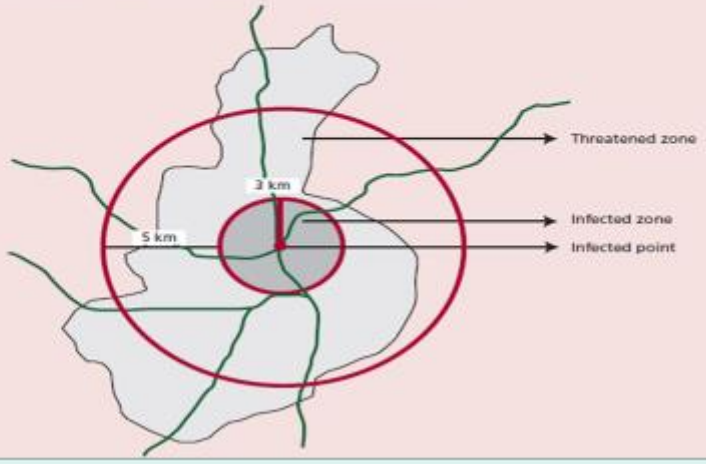
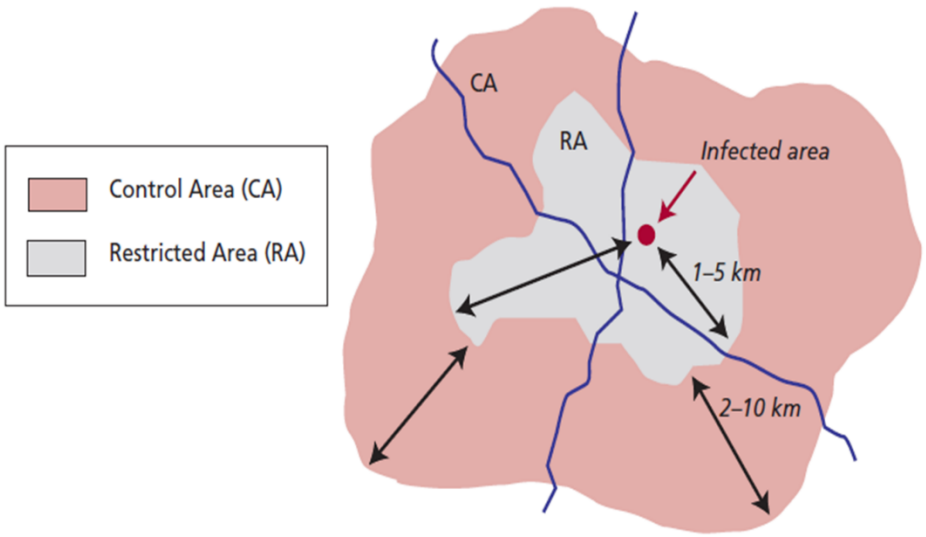


FIGURE 12
Zoning strategy for the control of avian influenza



Pathotypes

Low pathogenic avian influenza (LPAI) Associated with mild illness in poultry Can evolve into highly pathogenic viruses Associated with poultry outbreaks worldwide

High pathogenic avian influenza (HPAI) Causes high mortality in domestic poultry Subtypes H5 and H7

Clinical signs

Clinical signs may vary, depending on the type of influenza virus. Respiratory disease with mortality in turkeys has been observed, but a drop in egg production without clinical signs has also been seen in chickens. Swelling of the head and neck, hemorrhage on the shank, swollen sinuses with nasal discharge can be seen with respiratory involvement. Mortality is usually low. Fowl plague, also an avian influenza, is an exception to the rule in that it causes high mortality in turkeys and chickens.

Post-mortem lesions

- Inflammation of sinuses, trachea, air sacs and conjunctiva.
- Ovarian regression or haemorrhage.
- Necrosis of skin of comb and wattles.
- Subcutaneous oedema of head and neck.
- Dehydration.
- Muscles congested.
- Haemorrhage in proventricular and gizzard mucosae and lymphoid tissue of intestinal tract.
- Turkey lesions tend to be less marked than those of chickens, while ducks may be symptomless, lesionless carriers of highly pathogenic virus.

- **The most accurate reports on losses have come from HPAI eradication programs . Direct losses in HPAI outbreaks include costs associated with**
- high morbidity and mortality in affected flocks
- depopulation
- disposal costs, cleaning and disinfection
- quarantine and surveillance costs
- cost of vaccination (if used)
- indemnities paid for birds that are culled.
- Indirect costs such as uncompensated losses to the poultry industry including temporary or permanent loss in poultry exports
- income lost by farmers and communities during the production downtime, increased consumer
- costs from reduced supply of poultry products
- losses from decreases in consumer purchases can easily dwarf direct losses 5–10 fold.
- The economic costs for eradication of HPAI have varied greatly, but eradication costs are high and appear to be proportional to the number of birds that died or were culled

Damage caused by AI viruses is the result of one of four processes:

(1) direct virus replication in cells, tissues, and organs

(2) indirect effects from production of cellular mediators such as cytokines

(3) ischemia from vascular thrombosis

(4) cardiovascular collapse from coagulopathy or disseminated intravascular coagulation.

Diagnosis

- A definitive diagnosis of AI is established by:
- direct detection of AI viral proteins or nucleic acid in specimens such as tissues, swabs, cell cultures, or embryonating eggs
- isolation and identification of AI virus.
- A presumptive diagnosis can be made by detecting antibodies to AI virus. During outbreaks of HPAI, mortality rates,
- clinical signs, and lesions may be useful as part of the case definition in deciding which farms to quarantine and possibly for depopulation of birds for eradication purposes.

Differential Diagnosis

- Because of the broad spectrum of signs and lesions reported with infections by AI viruses in several species, a definitive diagnosis must be made by virologic and serologic methods. For HPAI viruses, other causes of high mortality must be excluded such as velogenic Newcastle disease, septicemic fowl cholera. For LPAI viruses, other causes of respiratory disease and drops in egg production must be investigated such as lentogenic NDV, avian metapneumovirus, infectious laryngotracheitis, infectious bronchitis, chlamydia, mycoplasma, and various bacteria.

- Treatment and control
- There is no treatment for avian influenza. Antibiotics will help prevent
- secondary bacterial infections.
- Vaccination with inactivated vaccines as H9N2 , H9N2P , H5N2 , recombinant vaccine