Avian Influenza and Upland Gamebirds: Protection through Biosecurity

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Outline

- Avian Influenza and its pandemic potential
- Field experience
- Upland gamebird biosecurity plan development
- Course work
- Conclusions

Avian Influenza and its Pandemic Potential

Avian Influenza

- Segmented genome RNA virus
- Four genera of influenza viruses: A, B, C, and D
- Subtypes of AI based on surface glycoproteins
  - 18 hemagglutinin subtypes
  - 11 neuraminidase subtypes

Avian Influenza

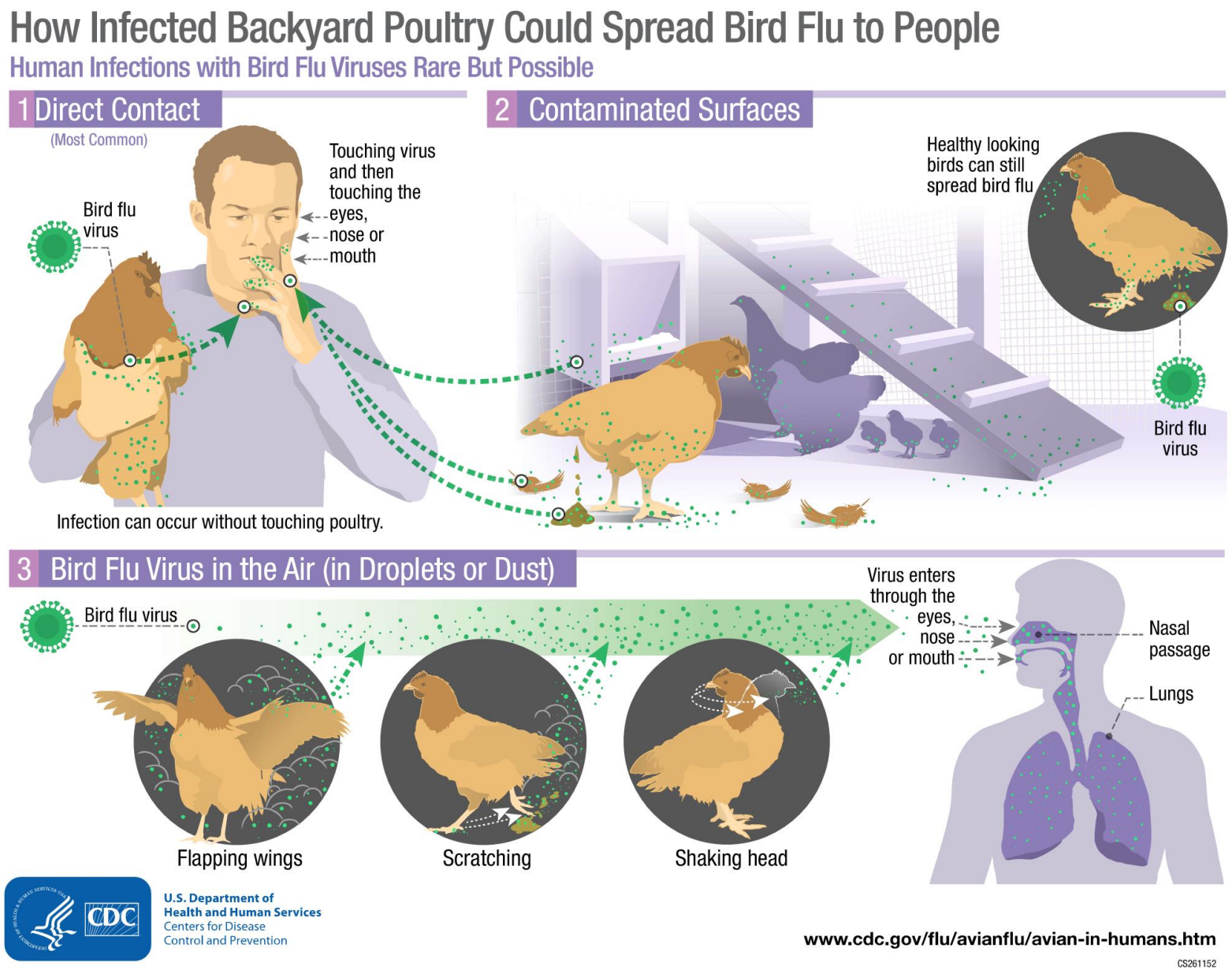
- High or low pathogenic avian influenza
  - Determined by disease effect on chickens and cleavage site
    - *Cleavage site is necessary for infectivity of the virus, tissue tropism, and virulence*
  - HPAI: up to 100% mortality
  - LPAI: mild or subclinical infections
- HPAI caused only by some types of H5 and H7 subtypes

Avian Influenza

- Can infect all types of birds
- Transmission mostly fecal-oral
  - Indirect contact
  - Shared habitats
- Migratory waterfowl are the maintenance host
  - Also responsible for spread of AI
- Frequency of poultry infections depends on degree of contact with feral birds

Avian Influenza

- Feral waterfowl do not typically become severely ill
  - Primarily affects gastrointestinal tract
  - Limited respiratory effects



Avian to human transmission

Inhalation of droplets, contact with fomites, self-inoculation of upper respiratory tract or conjunctiva

Avian Influenza

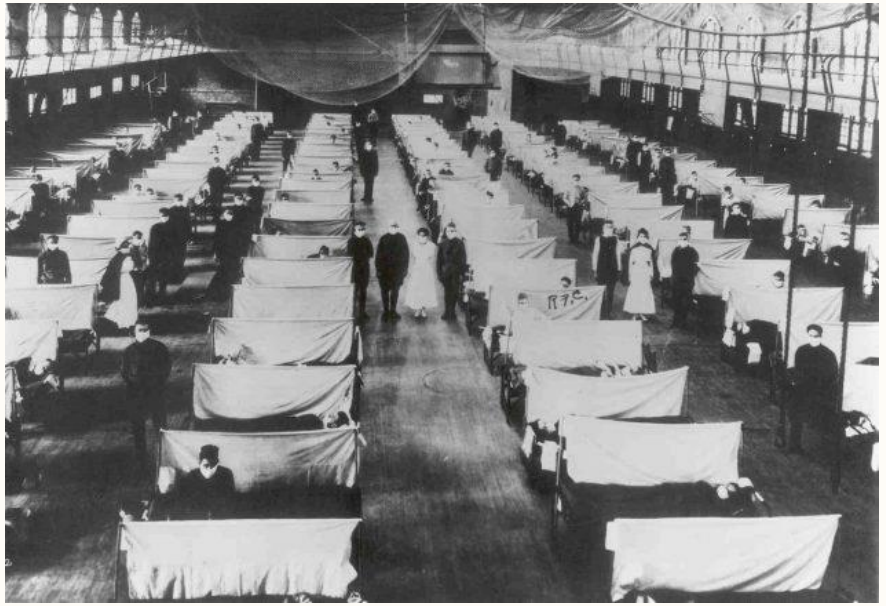
- Human infections
  - Hemagglutination glycoprotein mediates attachment
    - *Target cells deep in respiratory tract*
    - *Limited in mammalian species*
  - H7N9 causes mild disease in chickens, but severe respiratory disease in humans

Avian Influenza

- Higher human susceptibility to H7N9
- Relatively few human cases of H5N1
  - Biological barriers to transmission
  - Genetic component suggested
  - 2013 Indonesia 195 cases of H5N1
    - *163 fatal*

Avian Influenza

- Spanish influenza pandemic in 1918
  - H1N1
    - *Contained human and swine strains*
    - *More closely resembled AI*
  - 50 million people died from Spanish influenza



https://www.cdc.gov/flu/pandemic-resources/1918-commemoration/pandemic-timeline-1918.htm

Avian Influenza

- Domesticated poultry thought to be the intermediate host
  - Domestic ducks shed virus in large numbers but show no clinical signs
  - Large numbers of poultry may serve as a reservoir for AI
- Cowling et al.
  - 2/3 of patients with H5N1 or H7N9 reported contact with poultry
  - Direct transmission from avian-to-human possible

Avian Influenza

- Positive AI titers in high-risk populations (poultry and swine workers)
- H5N1 and H7N9 have a high mortality rate in humans
- 82% of hospitalized H7N9 patients reported contact with live animals
- Direct or indirect contact with dead poultry appears to be a route of transmission
  - 2003 Vietnam: contact with poultry was considered to be a risk factor for H5N1
- Tian et al. (2015): researchers found poultry H5N1 outbreaks proceeded human outbreaks by 1-4 months

Avian Influenza

- AI outbreaks in U.S. in 1924, 1983, 2004, and 2014
- 2014-2015 outbreak
  - Over 48 million birds euthanized
  - Estimated economy loss to be $3.3 billion
  - Trade restrictions and reduced supply increased consumer price
  - No human infections found

Avian Influenza

- CDC issued recommendations for good hygiene, proper protective clothing, and health monitoring programs
- Guidelines developed for health care providers to monitor, diagnose and treat human infections
- A HPAI virus strain has been produced for vaccine use in humans

Field Experience with Dr. LewAnn Schneider

USDA APHIS VS

Topeka, KS

Field Experience

- PER 333
  - Isolation and Quarantine Response Strategies in the Event of a Biological Disease Outbreak in Tribal Nations
  - Prairie Band Potawatomi Nation
  - Kansas Department of Emergency Management
  - Community members

https://www.nafoa.org/tribes

Field Experience

- Livestock sale barns, feedlots, and slaughter houses
- AI and Salmonella testing at county fairs
- Scrapie surveillance
- Tuberculosis confirmation testing in dairy cattle
- USDA Topeka Field Office import and export

Field Experience

- Diagnostics of Endemic & Emerging Diseases: Beyond the Status Quo Workshop
  - Center of Excellence for Emerging and Zoonotic Animal Diseases
  - KSVDL
- Joint APHIS/KDA summer 2018 meeting
  - Presentation with Emily Farmer
- Orientation meeting at Cobb-Vantress headquarters

Field Experience

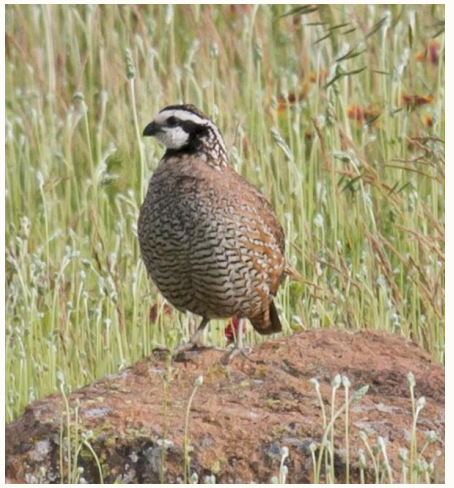
- Products Developed
  - Biosecurity plan template (upland gamebirds)
  - Custom biosecurity plans for 8 upland gamebird producers
  - Poster for producer meetings
    - *“Upland Gamebirds & Improving Your Biosecurity”*

Biosecurity Plans for Upland Gamebird Producers

MPH Field Experience Project

- Upland gamebird producers
  - > 25,000 birds/year
  - Met with myself and a USDA or KDA veterinarian
  - Limited tour of facility
  - Discussed current operation

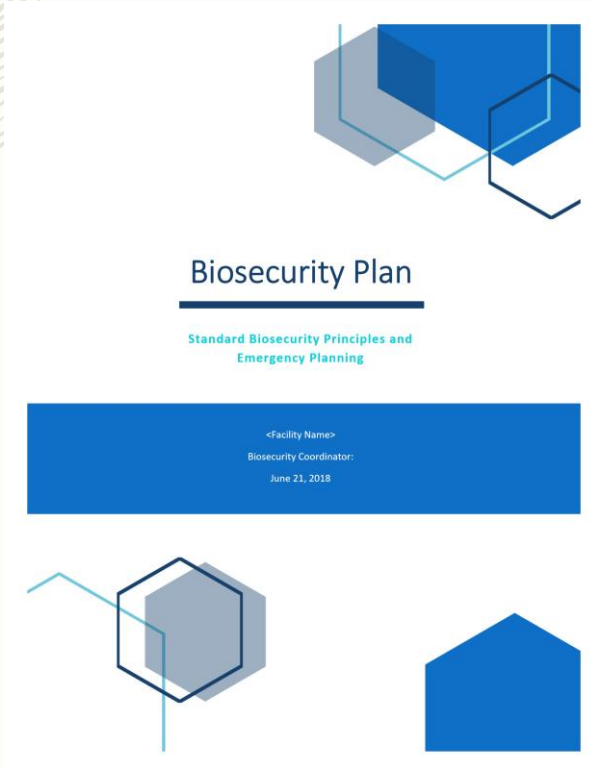
https://commons.wikimedia.org/wiki/File:Pheasant.jpg



https://get.pxhere.com/photo/grass-bird-prairie-wildlife-fauna-pheasant-galliformes-vertebrate-oklahoma-quail-larrysmith-wichitamountains-308538.jpg

https://commons.wikimedia.org/wiki/File:Alectoris-chukar-001.jpg

MPH Field Experience Project



- Custom biosecurity plan
  - Printed and in a binder
  - USB drive with digital copy and template
  - Supportive documents
    - *NPIP Audit Form & Guidelines*
    - *Sample VS Form 9-3*
    - *Map creation and editing directions*
    - *Blank log pages*

Biosecurity Elements

- Line of Separation
  - A physical barrier
  - Prevents contact between feral and captive birds
- Perimeter Buffer Area
  - Surrounds LOS
  - Area that producer reasonably controls access to

Biosecurity Elements

- PBA & LOS
  - Protocol for crossing
  - Who, what, how people/animals/equipment crosses
  - Yearly training
  - Clearly marked


DISEASE
PREVENTION AREA
STOP
AUTHORIZED PERSONNEL
ONLY

Biosecurity Elements

- Employees
  - Exposure to other animals or poultry at home or hunting
  - Need to shower and wear clean clothing and footwear
  - Disinfect shoes prior to entering PBA

Biosecurity Elements

- Pest control: rodents, insects, and wild birds
- Flight pen walls
  - Buried 12-24”
  - Lined with tin panels
  - Vegetation kept short
  - Hot wire along outside
- Repair flight pen netting
- Remove unused feed
- Bait stations

Biosecurity Elements

- Equipment
  - Consider what can and cannot return after leaving the PBA
    - *Under what conditions can return*
    - *Disinfect tires prior to returning*
    - *Trailers swept and washed*
  - Delivery crates
    - *Disposable*
    - *Washable*
  - Site specific if possible

Biosecurity Elements

- Feed
  - Delivery of feed
  - Removing unused or spilled feed
- Water
  - Do not use open water source
  - Prefer a municipal source, rural water district, or well
  - Disinfect lines
- Replacement birds
  - Should be from NPIP certified flocks
  - Keep records for minimum of 2 years

Biosecurity Elements

- Record keeping
  - Help identify gaps in biosecurity in case of increased mortality or morbidity
  - Shipping and receiving birds
  - Employee training
  - Pest control
  - Manure spreading
  - Visitors
  - Mortality records

Challenges

- Limited resources, time, and money
- Typically second or third source of income
  - Often a 1 or 2 man or family operation
- Flight pens made of netting
  - Contact with outside
  - Waterfowl flying overhead
- Must work within means of each producer to minimize risk

MPH Coursework

Core Competencies

Biostatistics

- Prepared for understanding the statistics and data trends in research papers
- Instrumental in preparing masters report

Environmental Toxicology

- No opportunities in the field
- Course more than prepared for use of material in the field

Core Competencies

Epidemiology

- Enrolled after field experience
- Beneficial in finding studies on avian influenza

Health Services Administration

- Field experience required working within and between organizations
- Provided outline for interorganizational function

Core Competencies

Social and Behavioral Sciences

- Focused on the principles of health behavior change
- Enabled better communication to encourage producers to make changes to their facilities

Select Courses

Veterinary Virology

- Covered the morphology and biology of viruses and the diseases they cause
- Important for designing biosecurity plans

Strategic Health Communication

- How to reach an audience and create an effective message
- Some producers wary of government help
- Dr. Schneider modelled effective communication techniques

Select Courses

Food Protection and Defense

- Discussed concepts in maintaining a secure food supply
- Beneficial when visiting livestock markets and slaughter houses

Trade and Agricultural Health

- Interconnectedness of world markets
- Impact of a disease outbreak on trade and economies
- Concepts, such as compartmentalization, introduced in this course

Select Courses

Toxicology

- Not specifically addressed during field experience
- Open-minded thinking that accompanies finding the source of a toxin

Conclusions

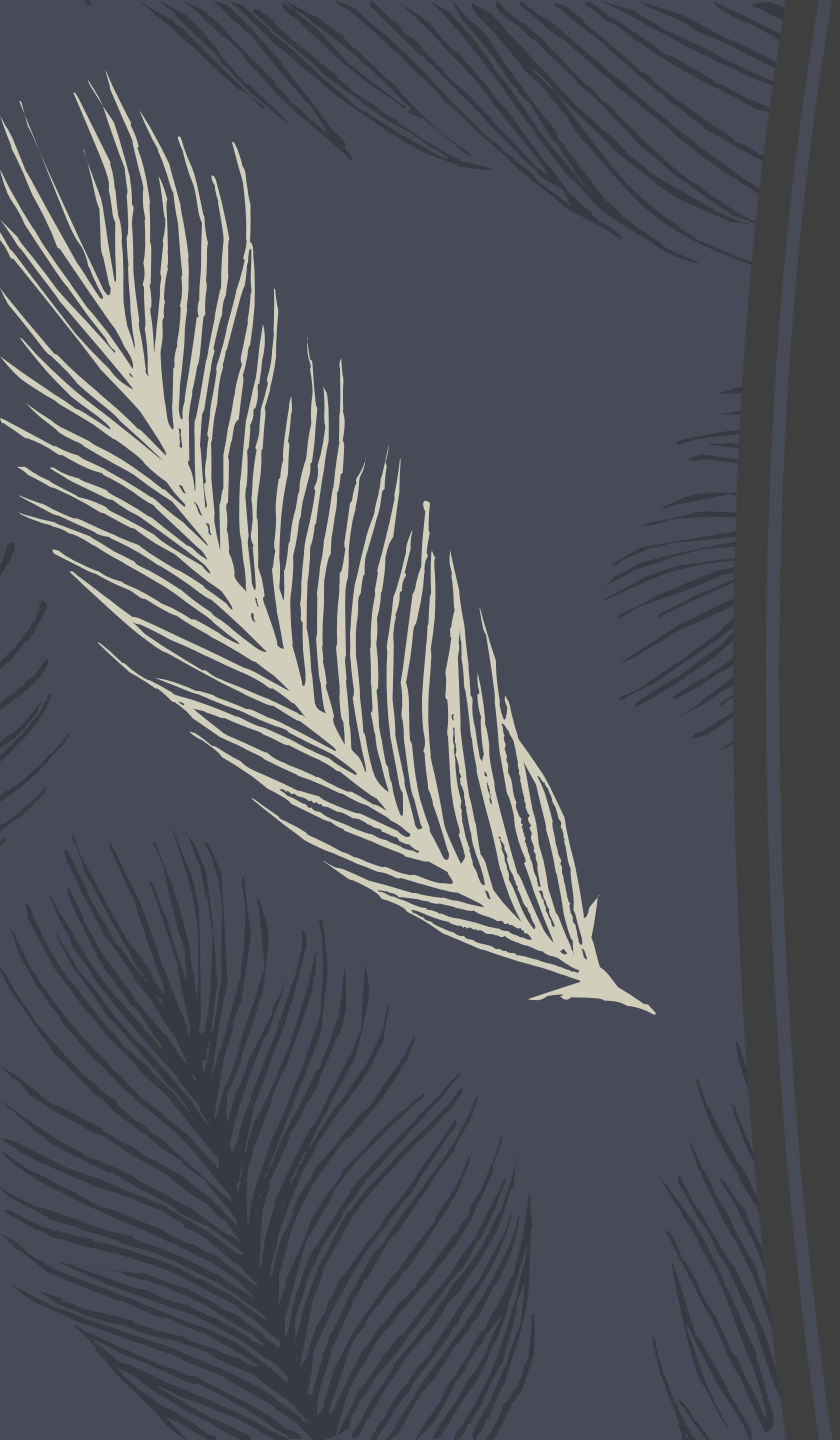
Conclusions

- A question of when the next AI outbreak will occur
- AI has human pandemic potential
- Best prevention is vigilance at the human-animal interface and continued surveillance of domestic and feral birds
- Biosecurity plans can protect gamebirds and those who care for them
- Veterinarians and public health officials must work with producers

Conclusions

- Field experience provided unique opportunities for learning
- Dr. Schneider exemplified professionalism and passion for continual education
  - Guidance working between the USDA and KDA
- Coursework helped in introducing concepts encountered in the field experience
  - Different ways of approaching and solving problems

Special thanks to Dr. Schneider and Emily Famer



Questions?