Welcome to today's MeCHAP Webinar:

"Backyard Poultry Basics: Diagnostic and Treatment Considerations"

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BACKYARD POULTRY BASICS: DIAGNOSTIC AND TREATMENT CONSIDERATIONS

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MeCHAP Veterinary CE Presentation

OUTLINE

- General bird/flock health considerations
- Common differential diagnoses by body system
  - Diagnostic testing options
- Additional diagnostic testing considerations
- Treatment options for backyard poultry
- Disease prevention

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START WITH A CLINICAL CASE…

- 5-month old backyard chicken presents to your clinic

- Clinical signs:
  - Depression
  - Torticollis
  - Unable to stand/bear weight
  - Weight loss/poor body condition

Image credit: Manual of Poultry Diseases, 2015

APPROACH TO CLINICAL CASES

- What body system(s) is(are) affected?
  - Nervous system
  - Possibly musculoskeletal?
- Acute or chronic disease?
  - Weight loss suggests chronic disease
- Differential Diagnoses
  - D - Degenerative
  - A - Anomalous
  - M – Metabolic, Malformation
  - N – Neoplastic, Nutritional
  - I – Infectious, Inflammatory, Immune, Iatrogenic, Idiopathic
  - T – Traumatic, Toxic

APPROACH TO CLINICAL CASES

- Rule-outs for neurologic/musculoskeletal disease:
  - Neoplasia: Marek's Disease
  - Infection: viral or bacterial
  - Trauma
  - Nutritional

- What diagnostic testing options exist?
  - In-clinic diagnostics: physical exam, CBC/chemistry, radiographs, ultrasound, etc.
  - Diagnostic laboratories:
    - Necropsy
    - PCR, serology, bacterial/fungal cultures, virus isolation, histopathology

- What treatment options do I have?
  - Antibiotics if bacterial infection
  - Symptomatic treatment/supportive care
  - Euthanasia

DISEASES OF BACKYARD POULTRY

- Poultry are prey species: good at hiding the fact that they're sick
  - Owners often don't notice clinical signs until the advanced stages of disease

- Majority of clinical signs and lesions are **NOT** specific for a particular disease
  - Multiple diseases that can present similarly
  - Diagnosis typically requires laboratory testing

- Sick poultry often have concurrent infection with multiple pathogens

QUESTIONS FOR BIRD/FLOCK HISTORY

- Clinical sings
  - Sudden or gradual onset?
  - Duration of illness?
- Age of the bird
- How many birds are affected?
  - How many birds total on premise?
  - Other bird species on the premise?
  - Any recent additions to the flock?
- Biosecurity
  - Any recent visitors to the flock?
  - Has the owner/caretaker visited other birds recently?
  - Have birds been taken to any shows/fairs/etc.?
- Vaccination History
- Medication History
- Feed
  - Appropriate for species and life stage?
  - Any change in feed/water consumption?
- Housing
  - Coop
  - Pasture access

PHYSICAL EXAM AND NORMAL VITAL SIGNS

- Physical exam
  - Similar approach as for any other species
  - "Normal" may vary depending on species, breed/strain, and production type

- Heart Rate: 140-400 beats per minute
  - Can increase significantly with stress from handling
- Respiratory Rate: 12-37 breaths per minute
- Temperature: 103-110°F

Image credit: https://www.kissclipart.com/sick-duck-clipart-chicken-clip-art-jc57nm/

GENERAL "SICK BIRD" SIGNS

- Depressed
- Hunched
- Ruffled feathers
- Huddling
- Decreased feed/water consumption
- Weight loss/emaciation with chronic disease
- Decreased egg production/abnormal eggs
  - Diseases of many body systems often indirectly affect egg production
    - Sick birds conserve resources

Image credit: AAAP Avian Disease Manual 7th Ed.


Image credit: E Wallner-Pendleton

AVIAN RESPIRATORY SYSTEM

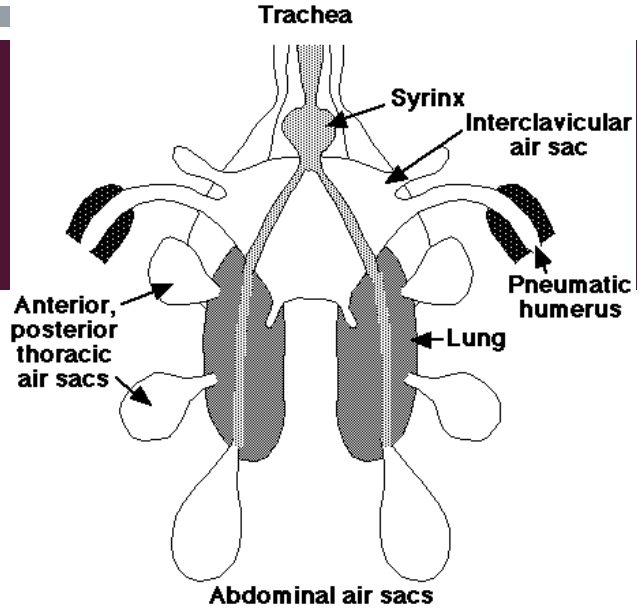
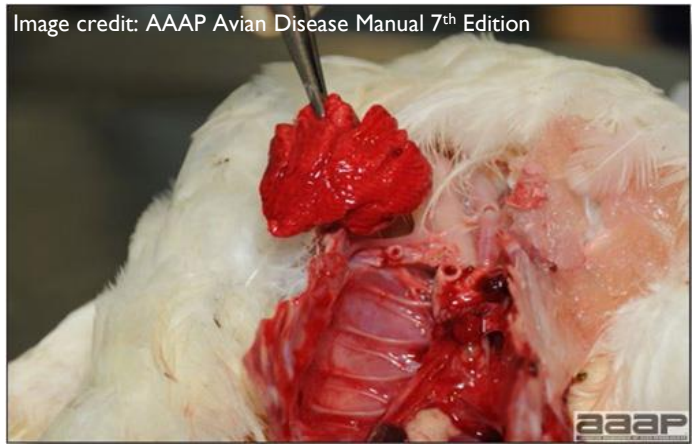
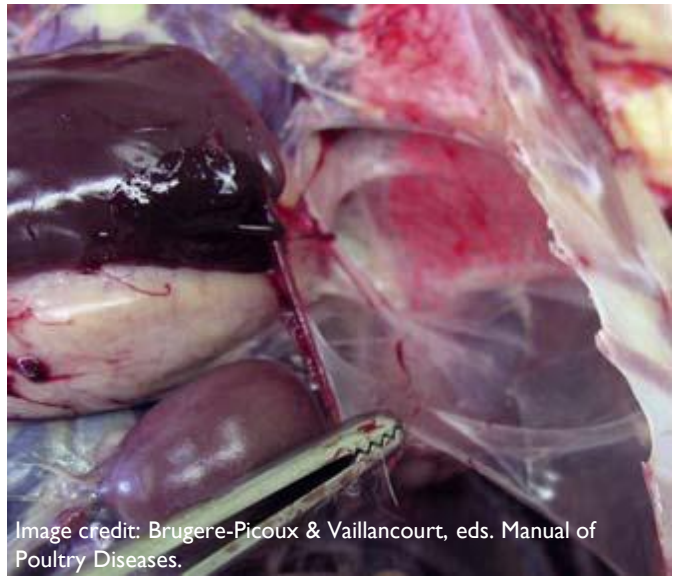


Image credit: http://people.eku.edu/ritchisong/birdrespiration.html

- Lungs embedded along ribs, do not expand/contract
  - Birds don't have a diaphragm like mammals
- Airsacs located throughout the body cavity
  - Unidirectional airflow through the lungs
- Pneumatic (hollow) bones – communicate with the airsacs
  - Can see bone infections secondary to respiratory bacterial infection





RESPIRATORY DISEASES

- Signs of respiratory disease
  - Open-mouth breathing
    - Extension of the neck when breathing
  - Snick (sneeze)
  - Cough
  - Swollen sinuses
  - Red/swollen eyelids
  - Discharge from eyes/nostrils
    - Dirt/staining at base of wing from rubbing face
  - Dark/bluish discoloration of the face

Image credit: AAAP Avian Disease Manual 7th Edition

Image Credit: AAAP Avian Disease Manual 7th Ed.


Image credit: F.W. Pierson

RESPIRATORY DISEASES


Image credit: Backyard Poultry Medicine and Surgery, 2015

- Viral
  - Avian Influenza
    - Low Pathogenic Avian Influenza (LPAI) – often asymptomatic; waterfowl species natural reservoir host
    - Highly Pathogenic Avian Influenza (HPAI) – significant mortality
  - Newcastle Disease
    - Low virulent strains – endemic in US
    - Virulent strains – can cause significant mortality in unvaccinated birds; clinically indistinguishable from HPAI
  - Infectious Bronchitis
  - Infectious Laryngotracheitis
  - Avian Metapneumovirus – turkeys only; rare in the US
- Bacterial
  - *E. coli*
  - *Mycoplasma gallisepticum* (MG), *Mycoplasma synoviae* (MS), *Mycoplasma meleagridis* (MM – turkeys)
  - *Avibacterium paragallinarum* (Infectious Coryza)
  - *Bordetella avium* (Turkey Coryza)
- Fungal
  - *Aspergillus spp.*
- Parasitic
  - Gapeworm (*Syngamus trachea*)
- Management
  - Ventilation/ammonia, dusty bedding
  - Sudden variations in temperature


E. coli
Image credit: ME Lighty

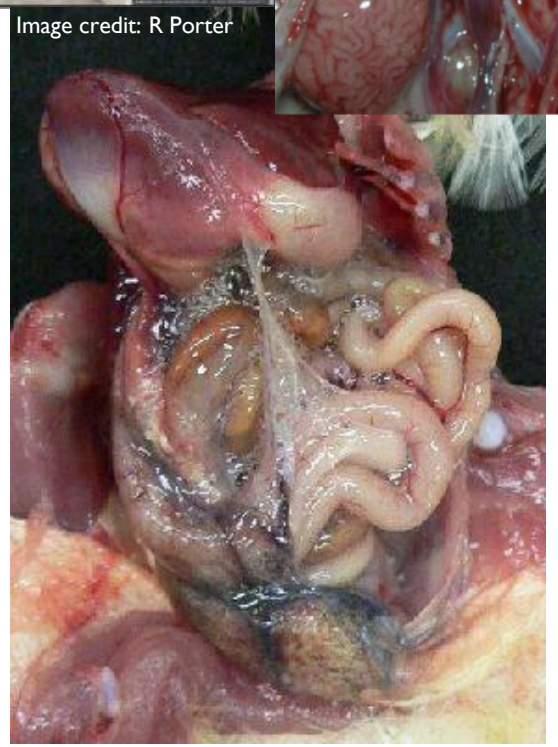
INFECTIOUS BRONCHITIS (IBV)

- A coronavirus (not related to COVID-19)
- Acute, highly contagious viral pathogen of chickens
  - Incubation period can be as short as 48 hours
- All ages susceptible
  - Young chicks
    - Coughing, snicking (sneezing), rales, nasal/ocular discharge
    - Morbidity often approaches 100%, severity of signs can be variable
      - Often mild, self-limiting disease
    - Mortality often negligible unless complicated by other infectious agents or nephrogenic strains
  - Older birds
    - Coughing, snicking (sneezing), and rales common; nasal/ocular discharge generally NOT seen
    - Marked drop in egg production
    - May see swollen, pale kidneys and urolithiasis with nephrogenic strains

Image credit: AAAP Avian Disease Manual 7th Edition

Image credit: AAAP Avian Infectious Bronchitis Slide Study Set

Image credit: R Porter

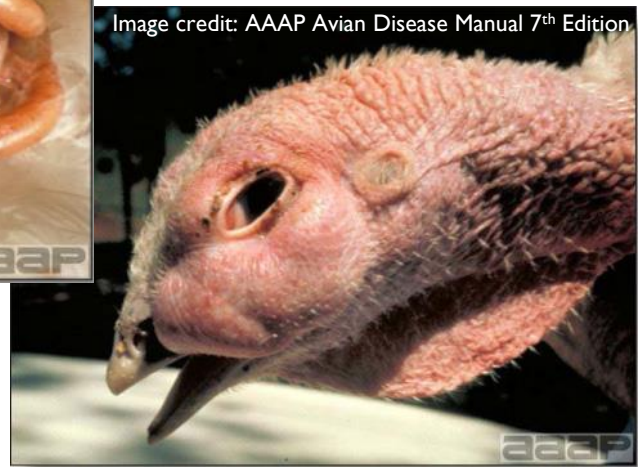


INFECTIOUS LARYNGOTRACHEITIS (ILT)

- Caused by a herpesvirus
  - Recovered chickens may become chronic carriers with intermittent shedding
    - Latent infections with reactivation following periods of stress
  - Horizontal transmission; spreads more slowly through flocks than many other viral respiratory pathogens
- Clinical signs
  - Marked dyspnea, often with loud gasping/wheezing sounds and coughing
  - Severely affected birds often raise/extend head and neck during inspiration
  - May see expectoration of bloody mucus, hemorrhagic conjunctivitis, swollen sinuses
  - Decreased egg production
  - High morbidity (50-70%), mortality generally 10-20%
    - Disease often persists for 2-4 weeks
- Gross Lesions
  - Edema and congestion of conjunctiva, nasal/sinus epithelium, tracheal mucosa
  - May see tracheal mucosal hemorrhage and fibrinonecrotic exudates

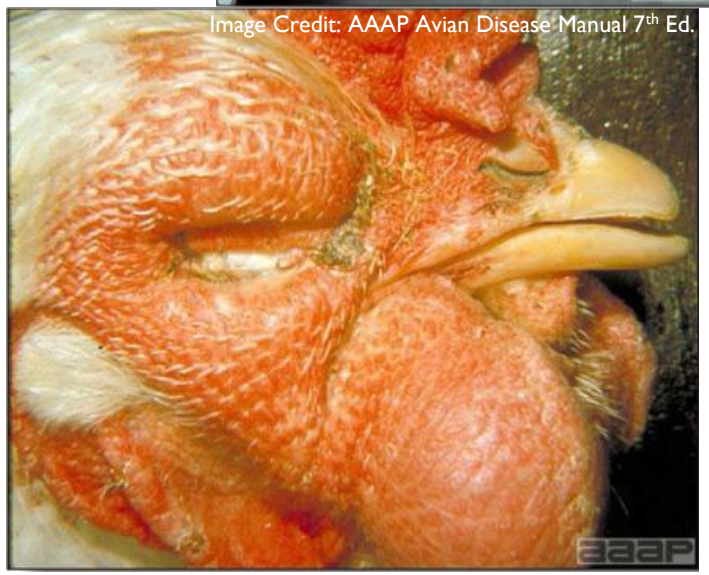
MYCOPLASMA

- Chronic infections are common
- *Mycoplamsa gallisepticum* (MG)
  - Signs usually develop slowly in flocks; may persist for weeks or months
  - Coughing, snicking (sneezing), rales, ocular/nasal discharge, swollen sinuses (especially turkeys)
  - Drop in feed consumption and egg production
  - Mortality usually low in adult layers
- *Mycoplasma synoviae* (MS)
  - Often subclinical in chickens
  - Respiratory infections often asymptomatic
  - Infectious synovitis – swelling of hocks and/or footpads
  - Slight, transient drop in egg production
- Diagnosis
  - Fastidious organisms, difficult to culture
  - Many labs now only offering PCR or serology



INFECTIOUS CORYZA (*AVIBACTERIUM PARAGALLINARUM*)

- Bacterial disease of chickens caused by *Avibacterium paragallinarum*
- Chronic and asymptomatic carrier infections contribute to persistence in flocks
- Short incubation period (often 24-48 hours)
  - Often rapid onset of disease in affected flocks
- Clinical signs
  - Usually rapid onset, high morbidity in flock
  - Feed consumption, egg production, or growth often noticeably reduced
  - Oculonasal discharge, conjunctivitis, facial edema, respiratory noises, swollen sinuses
  - Considerable variation in severity and course of outbreaks
  - All ages susceptible
    - Disease usually less severe in juvenile birds



COLIBACILLOSIS (*E. COLI* INFECTIONS)


Image credit: ME Lighty


Image credit: ME Lighty

- *E. coli* is a common secondary respiratory pathogen (opportunistic pathogen)
  - Normal flora in GI tract of birds and mammals; ubiquitous in the environment
  - All ages and species susceptible
- Clinical signs:
  - Variable depending on which organ(s) affected and underlying primary disease/management issue
- Gross lesions:
  - Sudsy, caseous (cheesy), and/or fibrinous exudate
  - Airsacculitis, pneumonia
  - Polyserositis – pericarditis, perihepatitis, peritonitis
- Treatment concerns:
  - Antibiotics rarely effective if don't also address underlying primary issue
  - Antibiotic resistance is common in *E. coli* isolates
    - Drug selection should be based on antibiotic sensitivity testing

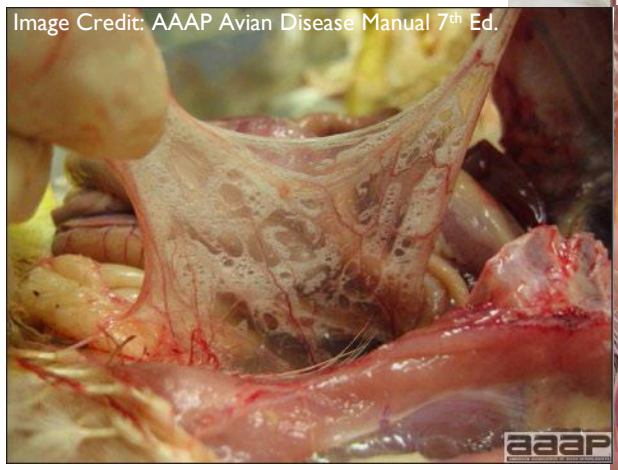


Image Credit: AAAP Avian Disease Manual 7th Ed.


Image credit: ME Lighty

LABORATORY DIAGNOSTICS

- Tracheal/choanal swabs
  - PCR (presence of genetic material)
    - Tests available for:
      - Avian Influenza (AI)
      - Newcastle Disease Virus (NDV)
      - Infectious Bronchitis Virus (IBV)
      - Infectious Laryngotracheitis (ILT)
      - Infectious Coryza (*Avibacterium paragallinarum*)
      - *Mycoplasma spp.* (MG, MS)
    - Recommended swab = polyester tip on a plastic shaft
      - Cotton tip and wooden shaft NOT recommended – treated with formaldehyde
    - Check with the diagnostic lab for preferred transport media
      - BHI preferred for Avian Influenza and Newcastle (dry swabs NOT acceptable for AI/NDV)

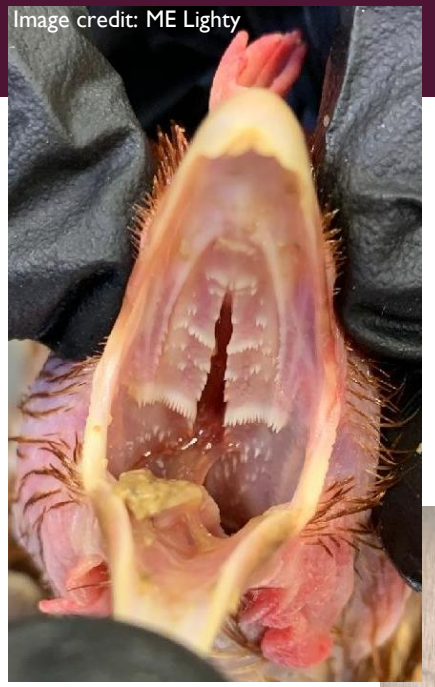


Image credit: ME Lighty

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LABORATORY DIAGNOSTICS

- Tracheal/choanal swabs
  - Virus Isolation
    - BHI, Viral Transport Media (VTM), etc.
  - Bacterial Culture
    - Choanal/tracheal swabs tend to yield mixed cultures/contamination; often non-diagnostic

- Swollen sinuses: aspirate of sinus fluid
  - Bacterial culture
  - PCR for *Avibacterium*, *Mycoplasma spp.*

AVIAN DIGESTIVE SYSTEM

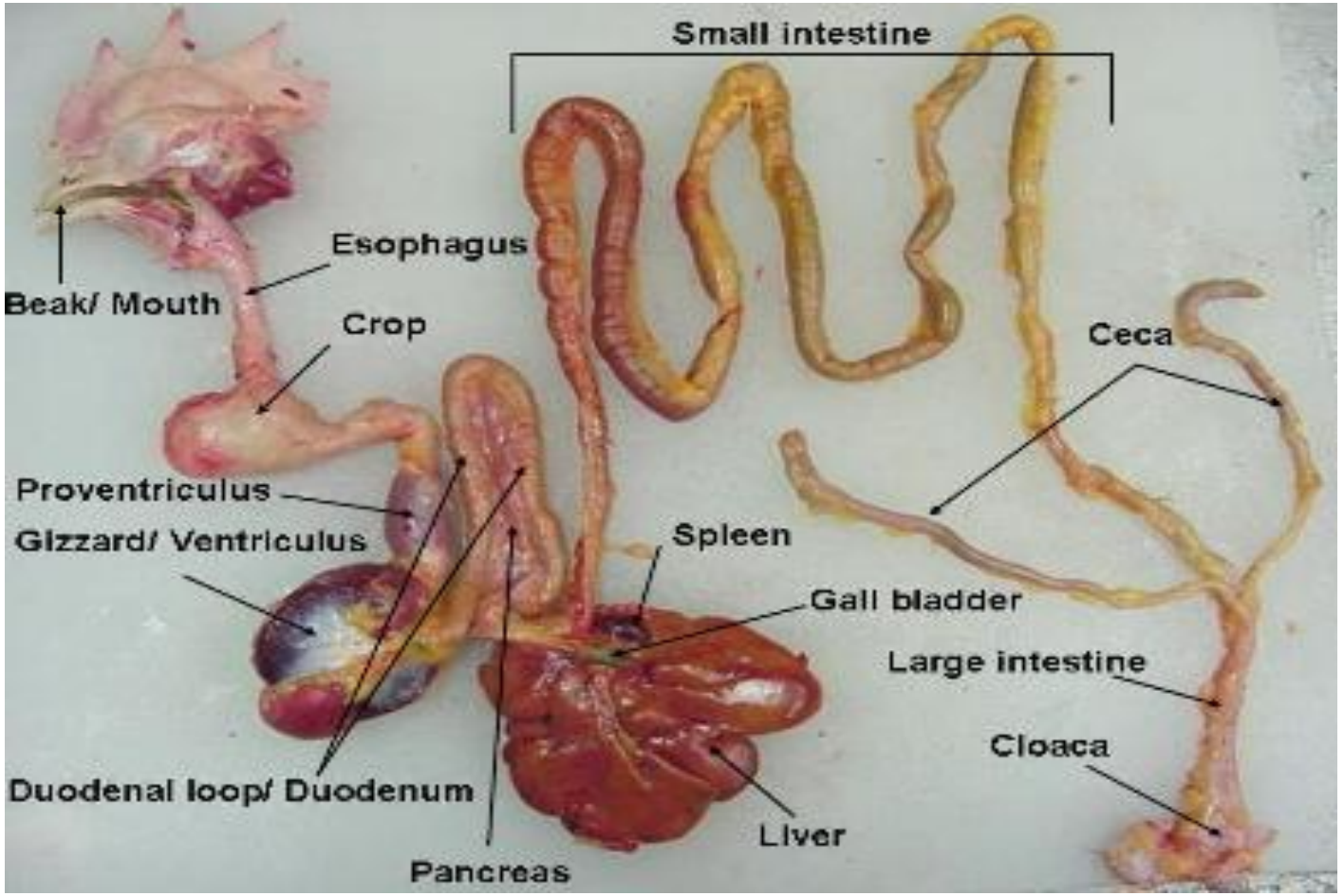


Image credit: https://poultry.extension.org/articles/poultry-anatomy/avian-digestive-system/

ENTERIC DISEASES

- Signs of enteric disease
  - Abnormal feces color
    - Bloody feces
  - Watery feces
    - Note: cecal flushing normal (generally once/day)
    - Pasty vent
  - Poor body condition/wasting

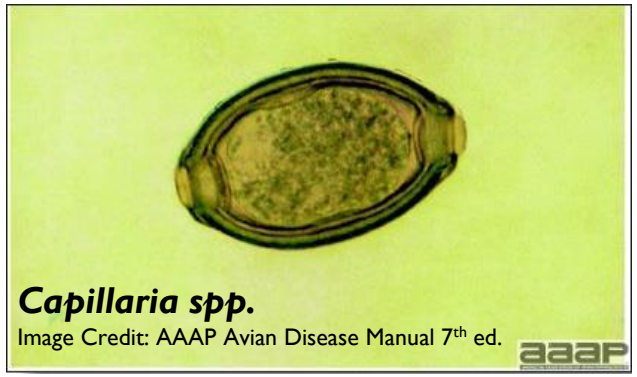
ENTERIC DISEASES

- Viral
  - Not a common/significant issue for backyard chickens
- Bacterial
  - Salmonella – clinical disease in young chicks/poults; adults often asymptomatic carriers
  - *Clostridium perfringens*: necrotic enteritis
    - Often secondary to coccidiosis
- Fungal
  - Crop mycosis (*Candida albicans*)
- Miscellaneous
  - Pendulous/Dropped Crop

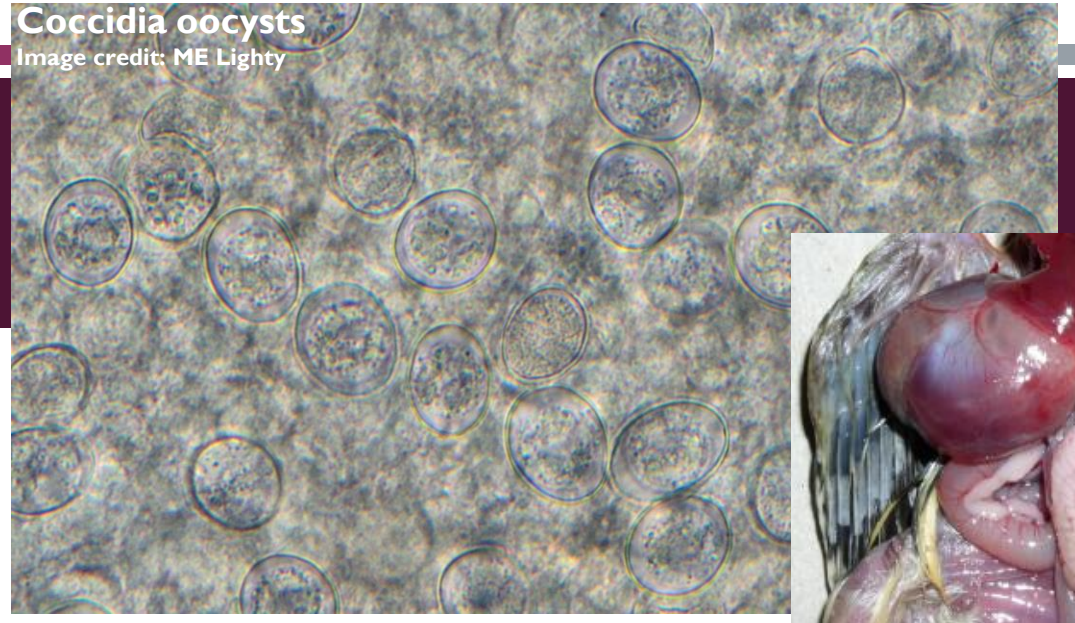

Image Credit: Backyard Poultry Medicine and Surgery

ENTERIC DISEASES

- Parasitic
  - Worms – rarely cause significant clinical disease/mortality alone, especially in adult birds
    - Roundworms (*Ascaridia spp.*)
    - Cecal worms (*Heterakis*)
    - *Capillaria*
    - Tapeworms



ENTERIC DISEASES


Coccidia oocysts
Image credit: ME Lighty

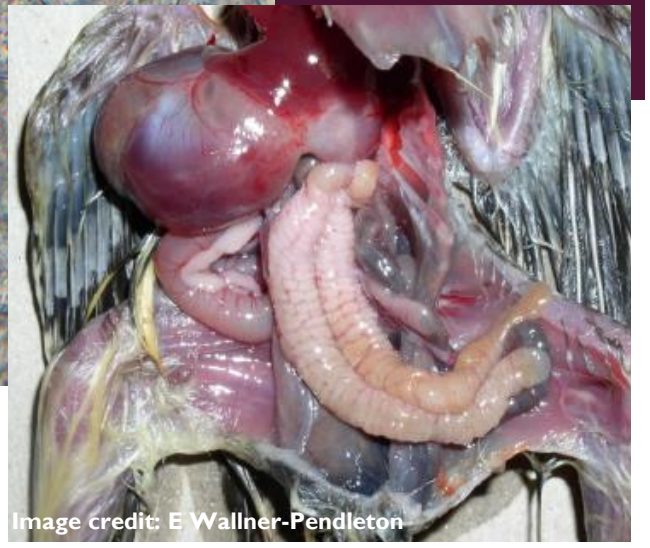


Image credit: E Wallner-Pendleton

- Parasitic
  - Protozoa
    - Coccidia (*Eimeria spp.*)
      - Host-species specific
      - Can cause diarrhea +/- mortality in young birds; rarely causes severe clinical disease in adult birds
      - Gross lesions variable depending on species of *Eimeria*
    - Flagellated Protozoa
      - Cochlosoma
      - Hexamita
      - Trichomonas
      - Histomonas – Blackhead

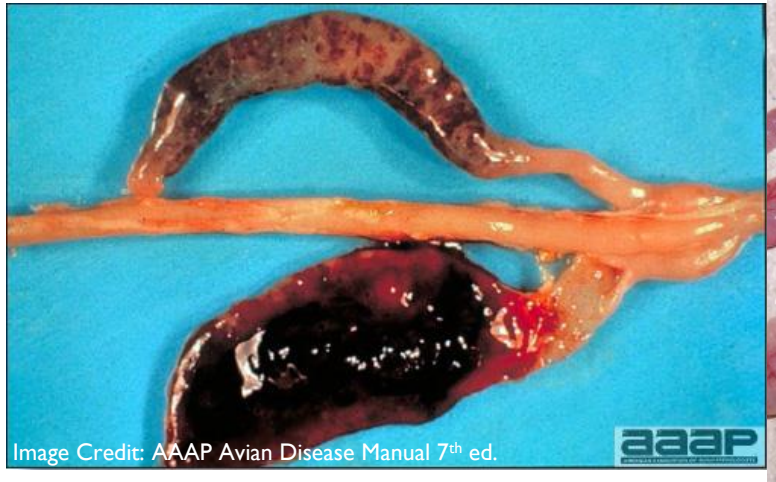


Image Credit: AAAP Avian Disease Manual 7th ed.


Image credit: E Wallner-Pendleton

FECAL EXAMINATION

- Fecal Flotation
  - Coccidia
  - Roundworms
  - Not great for tapeworms

- Gut scrapings (mortality)
  - Coccidia
  - Worms
  - Flagellated protozoa
    - Freshly euthanized birds give best chance for identification


Image credit: ME Lighty


Image credit: ME Lighty

HISTOMONAS (BLACKHEAD)

- Severe, often fatal disease in turkeys
  - Morbidity and mortality high, may approach 100% in younger flocks
  - Older birds more resistant; clinical disease less common in chickens
- Necropsy required for diagnosis
  - Characteristic lesions
    - Liver: “target” or “bullseye” lesions
    - Ceca: thickened wall with firm white/tan cores of necrotic material
- Complex Life Cycle
  - *Histomonas* can live inside the *Heterakis* cecal worm
  - *Heterakis* cecal worm can live inside of earthworms, other insects
- Major reason not to raise both chickens and turkeys on the same premise
  - Chickens relatively resistant to *Histomonas* and *Heterakis*
  - Serve as “incubator” to multiply parasite load in the environment

SKIN AND FEATHER DISEASES

- Signs of external disease
  - Proliferative growths
  - Feather loss
  - Scaly legs
  - Scratches, scabs
  - Ulcers

Exudative Dermatitis (Biotin Deficiency)
Image credit: AAAP Avian Disease Manual, 7th ed,

Vent Pecking
Image credit: E. Behnke

Hyperkeratosis (Scaly leg mite)
Image credit: AAAP Avian Disease Manual, 7th ed,

SKIN AND FEATHER DISEASES

- Viral
  - Avian pox
  - Marek's Disease
- Bacterial
  - Secondary to scratches/trauma
- Parasites
  - Lice
  - Mites
    - Northern Fowl Mite
    - Red Poultry Mite (Chicken Mite)
    - Scaly Leg Mite
- Trauma/Pecking
- Contact Dermatitis
  - Footpad Ulcers

REPRODUCTIVE DISEASES

- Hen Reproductive System
  - Normally only the left side develops
    - May see small cystic right oviduct

- Signs of reproductive disease
  - Drop in egg production
    - Important to note if gradual or sudden
  - Misshapen, wrinkled eggshells
  - Soft eggshells
  - Bloody vent/vent trauma

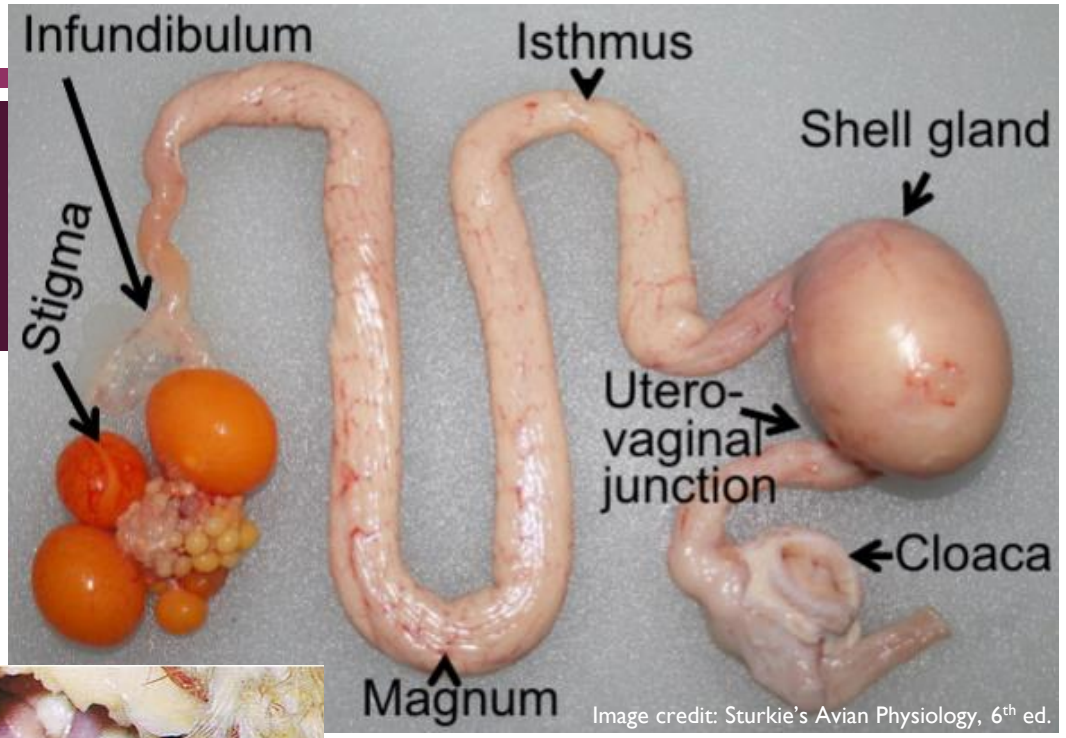


Image credit: Sturkie's Avian Physiology, 6th ed.

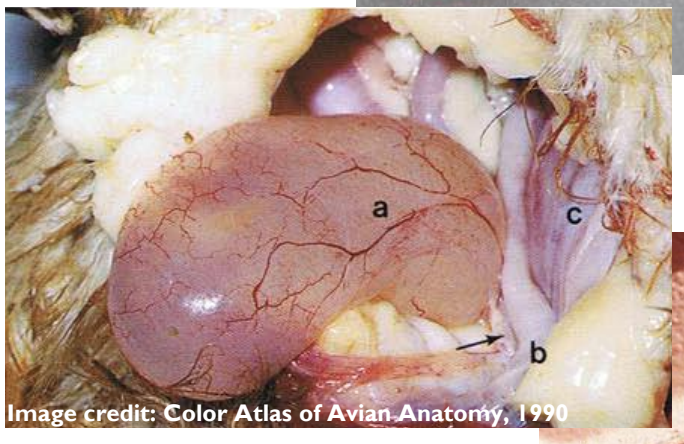
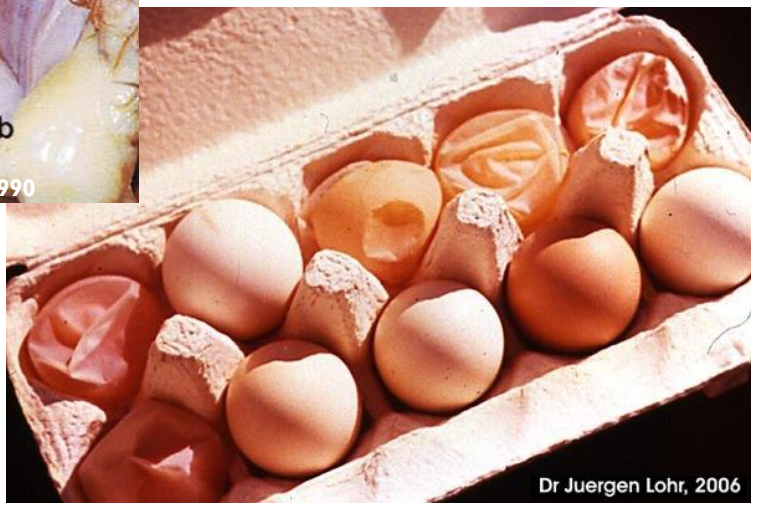


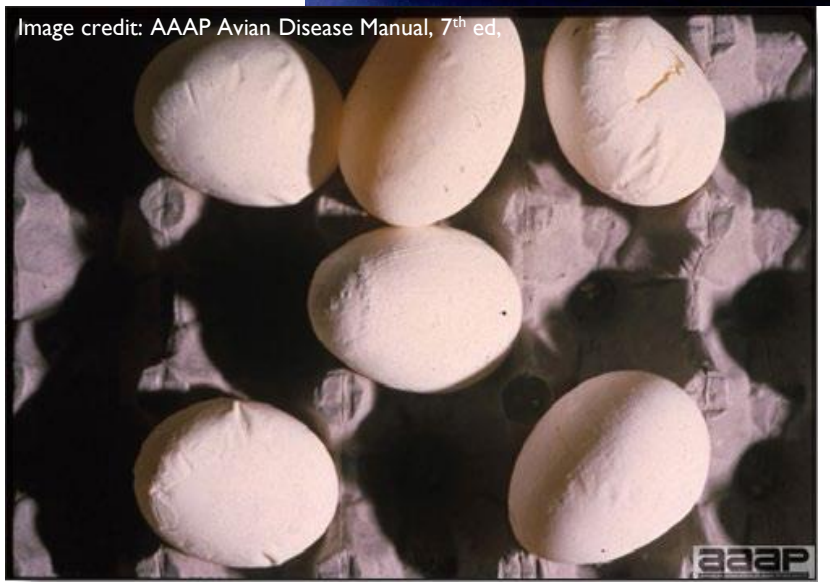
Image credit: Color Atlas of Avian Anatomy, 1990



REPRODUCTIVE DISEASES

- Many diseases will indirectly affect egg production
  - Sick birds conserve resources to fight off infection

- Viral
  - Avian Influenza
  - Newcastle Disease
  - Egg Drop Syndrome (Adenovirus)
  - Infectious Bronchitis
- Bacterial
  - Salpingitis: ***E. coli*** and others
- **Non-infectious**
  - Internal Layer
  - Egg Bound
  - Prolapse/Trauma – vent pecking
  - Ovarian/oviductal neoplasia



BACTERIAL SALPINGITIS

- 2 main routes of infection
  - Ascending infection from cloaca
    - Caudal portion of reproductive tract normally everts temporarily during oviposition
    - Trauma/pecking
  - Descending infection from coelomic cavity or secondary to septicemia
- Affected birds also frequently have bacterial peritonitis
- May find "laminated" mass of caseous material free within coelomic cavity
  - Retro-peristalsis from oviduct or rupture of oviduct wall


Image credit: C Robinson


Image credit: C Robinson


Image credit: P Dunn

YOLK PERITONITIS

- Gross lesions
  - Diffuse, non-odorous, yellow fluid to viscous (+/- coagulated) yolk material within coelomic cavity
    - Must be differentiated from caseous material seen with bacterial peritonitis
- Etiology
  - Rupture of ovarian follicles
    - Trauma
    - Bursting atresia during acute ovarian regression
  - Yolk material induces strong inflammatory response – sterile peritonitis

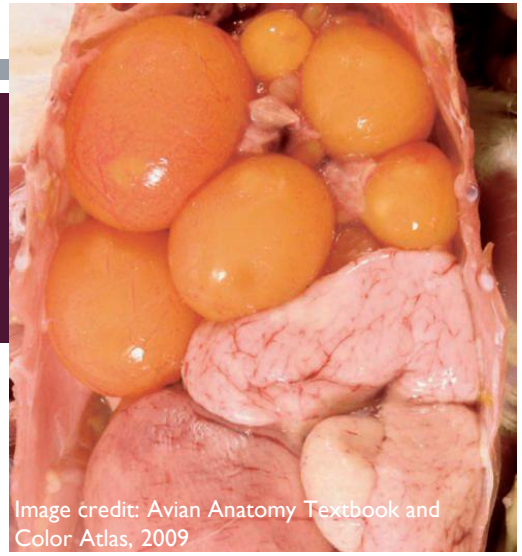


Image credit: Avian Anatomy Textbook and Color Atlas, 2009


Image credit: AAAP Gross Pathology of Avian Diseases, 2018


Image credit: AAAP Avian Disease Manual, 7th ed.

NEOPLASIA

- Numerous types of neoplasia can affect the reproductive tract
  - Adenocarcinoma, adenoma, leiomyoma, leiomyosarcomas, fibrosarcoma, granulosa cell tumors, etc.
- Clinical signs variable and non-specific
  - Coelomic swelling
  - Dyspnea
  - Ascites
  - Poor/altered reproductive performance
  - Lethargy
  - Lameness – usually left-sided, mass compressing lumbar/sacral plexus
- Diagnosis
  - Necropsy & histopathology
  - Radiography, ultrasonography, CT, MRI, exploratory celiotomy & biopsy
- Prognosis
  - Often guarded to poor unless complete surgical removal of neoplastic tissue


Image credit: AAAP Gross Pathology of Avian Diseases, 2018

Image credit: AAAP Gross Pathology of Avian Diseases, 2018


Image credit: Backyard Poultry Medicine and Surgery, 2015

MUSCULOSKELETAL DISEASES

- Signs of musculoskeletal disease
  - Lameness
    - May progress to complete inability to walk
  - Ulcerated and/or swollen footpad
  - Swollen joints
  - Bruising

- Note: often difficult to distinguish clinical signs from "neurologic" diseases


Image credit: Manual of Poultry Diseases

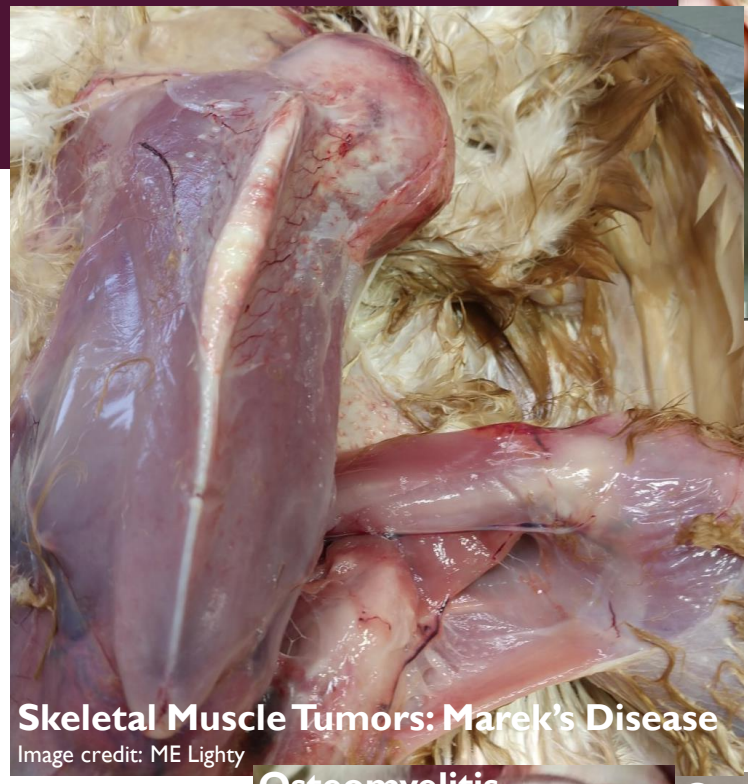

Image credit: AAAP Avian Disease Manual, 7th ed.


Image credit: AAAP Avian Disease Manual, 7th ed.

MUSCULOSKELETAL DISEASES

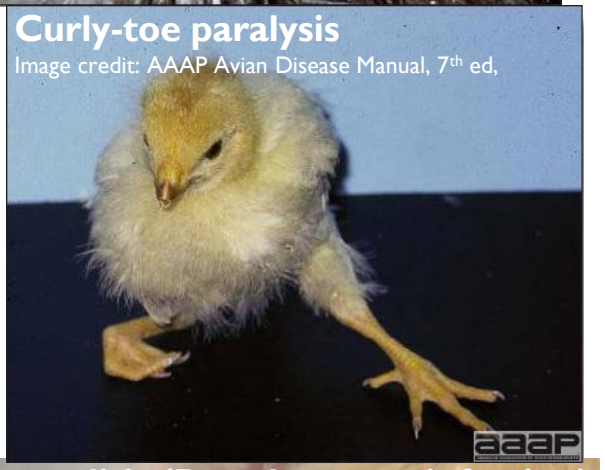
- Viral
  - Marek's Disease
  - Reovirus
- Bacterial
  - *E. coli*
  - *Pseudomonas aeruginosa*
  - *Staphylococcus spp.*
  - *Streptococcus spp.*
  - *Clostridium spp.*
  - *Mycoplasma synoviae*
- Nutritional
  - Rickets: Vitamin D, Calcium, and/or Phosphorous deficiencies
    - Relative amounts are crucial
      - Excess of one can result in relative deficiency of another
  - Riboflavin Deficiency (Curly toe paralysis)

Rickets
Image credit: AAAP Avian Disease Manual, 7th ed.



Skeletal Muscle Tumors: Marek's Disease
Image credit: ME Lighty

Curly-toe paralysis
Image credit: AAAP Avian Disease Manual, 7th ed,

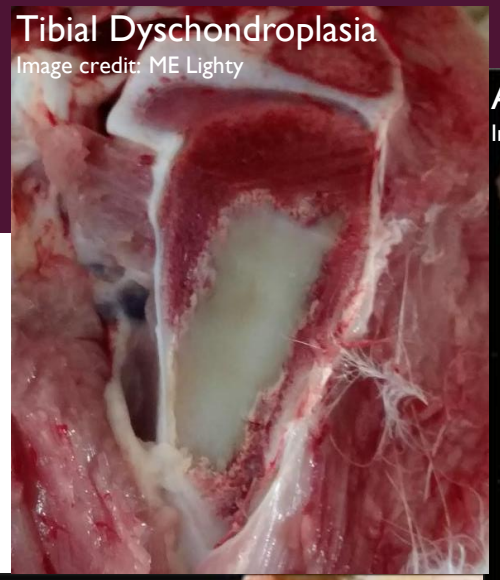


Osteomyelitis
Image credit: ME Lighty

Osteomyelitis (Pseudomonas infection)
Image credit: ME Lighty

MUSCULOSKELETAL DISEASES

- Miscellaneous
  - Angular limb deformities
  - Tibial dyschondroplasia (TD)
  - Slipped tendon
  - Splay leg
  - Tibial rotation
  - Ionophore toxicity
  - Trauma



Tibial Dyschondroplasia
Image credit: ME Lighty

Angular Limb Deformity
Image credit: AAAP Avian Disease Manual, 7th ed,

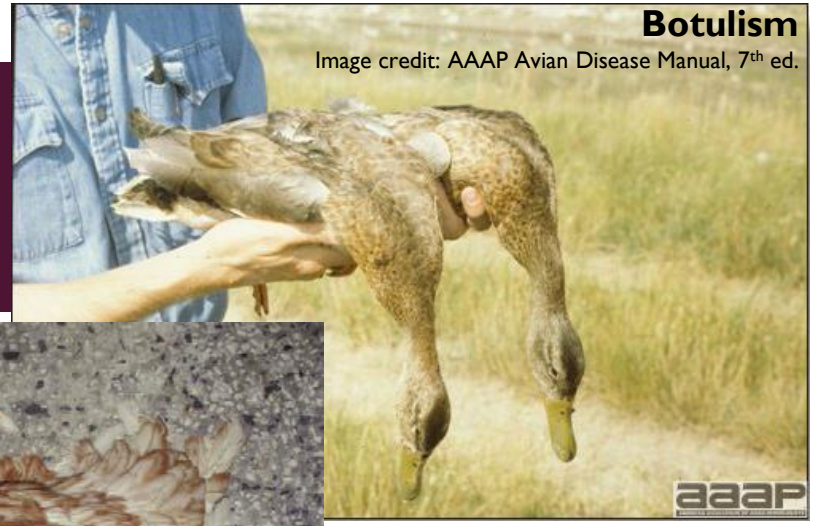
Tibial Rotation
Image credit: AAAP Avian Disease Manual, 7th ed,

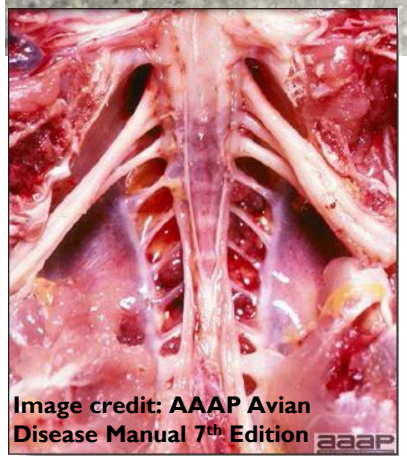
NEUROLOGIC DISEASES

- Signs of neurologic diseases
  - Circling, paddling
  - Torticollis (head twisted upside down)
  - Paresis (reluctant to move), paralysis (unable to move)
  - Head tremors
  - Weakness
  - Incoordination

NEUROLOGIC DISEASES

- Viral
  - **<u>Marek's Disease – chickens</u>**
  - Highly Pathogenic Avian Influenza (HPAI)
  - Virulent Newcastle Disease
  - Avian encephalomyelitis
- Bacterial
  - *Enterococcus cecorum* (Kinky back)
  - *Streptococcus spp.*
  - *Salmonella spp.*
  - *E. coli*
  - *Listeria monocytogenes*
  - Botulism *(Clostridium botulinum)*
- Fungal
  - *Aspergillus spp.* – young chicks/poults
- Nutritional
  - Vitamin E/Selenium deficiency – young birds



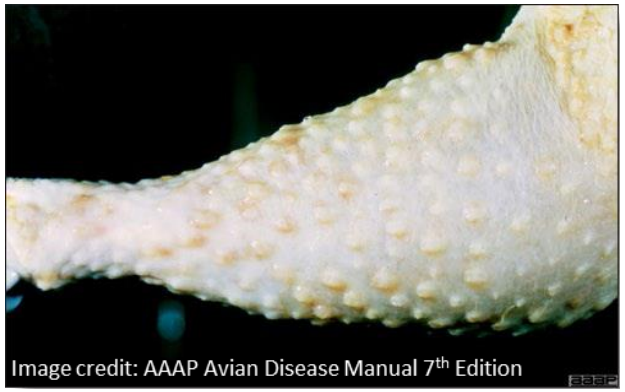


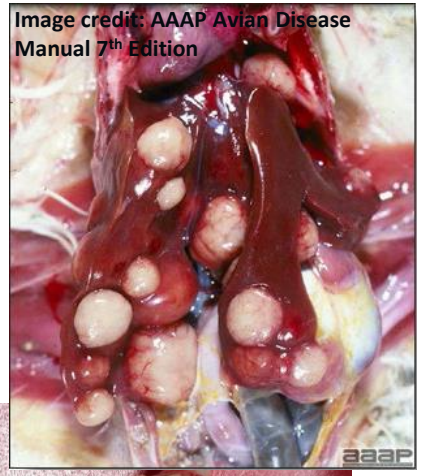
MAREK'S DISEASE

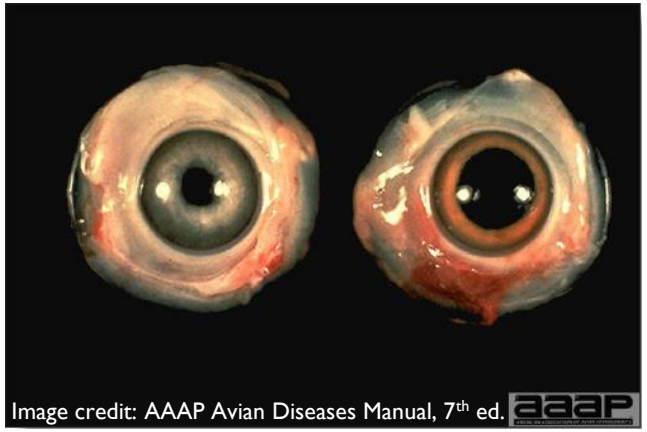
- Disease of chickens, very common in the US
- Caused by a herpesvirus
  - Retroviral-induced neoplasia (tumors)
  - Most common in sexually immature birds between 2-7 months of age
    - Can occur in any chicken over 3 weeks of age
- Infected birds shed virus in feather follicle dander
  - Can be asymptomatic carriers
  - Infected birds shed intermittently throughout the rest of their lives
  - Infection via inhalation of virus in feather dander
- Virus can survive for months/years in the environment
  - Feather dander protects the virus from disinfection

MAREK'S DISEASE

- 4 Clinical Patterns of Disease
  - Enlargement and/or yellowing of peripheral nerves
    - Often affects the sciatic nerve in the leg – asymmetric partial paralysis
    - Can also affect the brain, spinal cord, and brachial plexus (wing)
    - Vagus nerve paralysis – dilation of the crop
  - Visceral tumors: liver, heart, spleen, gonads, kidney, proventriculus, etc.
    - Depression, weakness, decreased appetite & weight loss
  - Enlargement of feather follicles +/- reddening of skin
  - Discoloration of the iris of the eye (blindness)







CLINICAL CASE FROM START OF PRESENTATION:

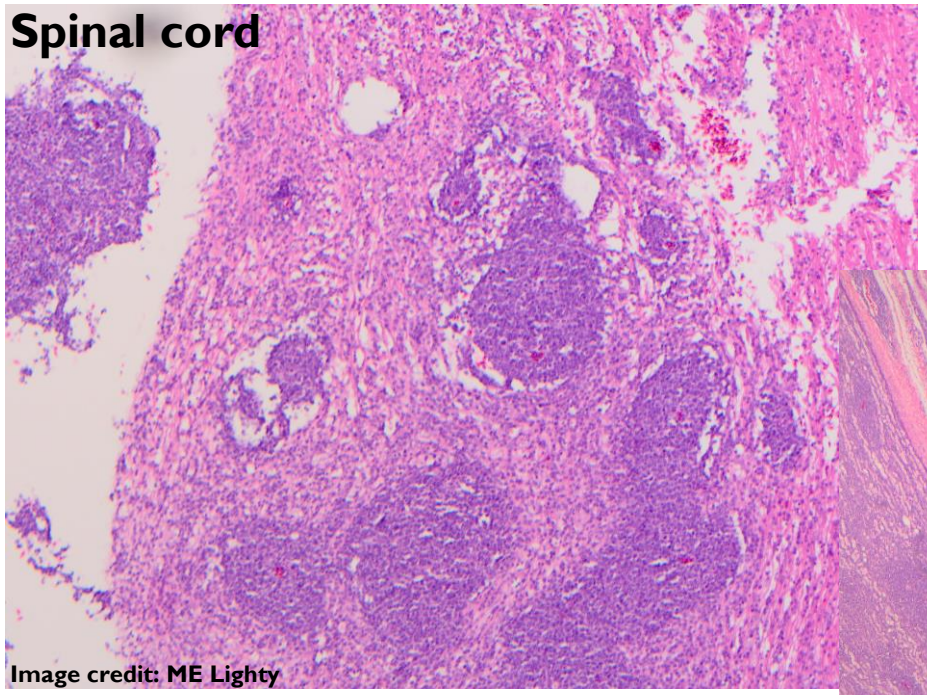
- 5-month old chicken with neurologic signs and weight loss

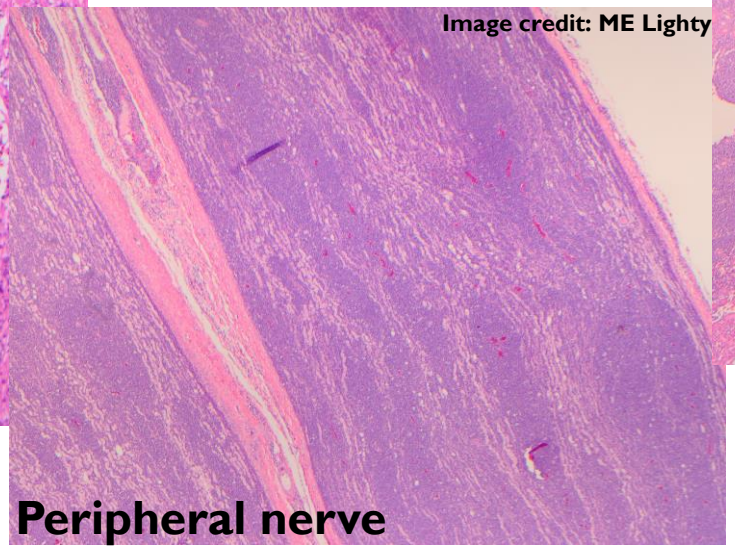
- Gross lesions included:
  - Thin body condition
  - Enlarged sciatic nerve, sciatic nerve plexus, and brachial nerve plexus
  - Enlarged, pale kidneys

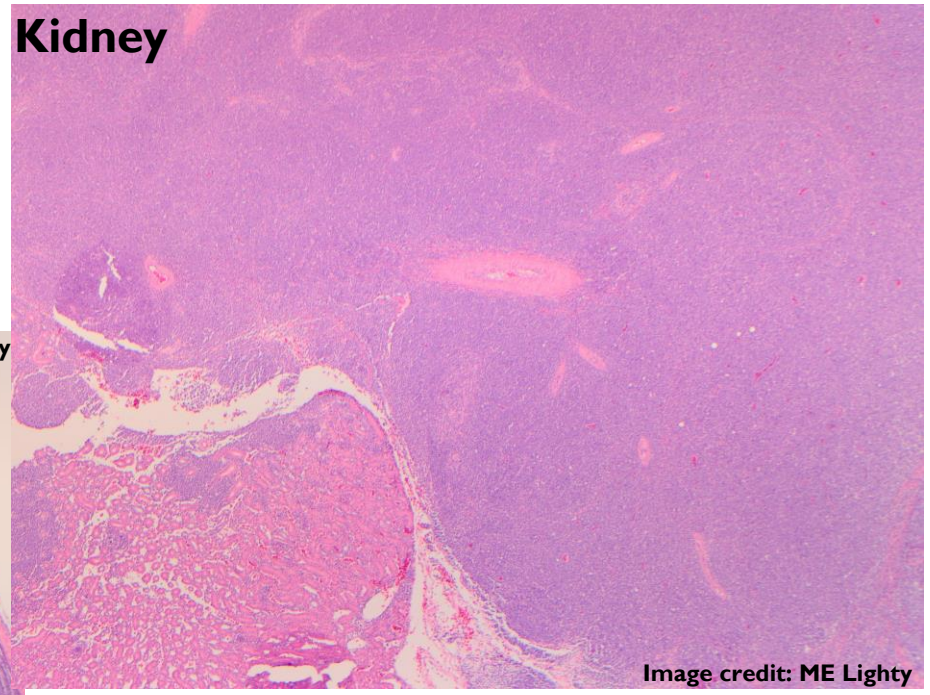
- Gross lesions suspicious for Marek's Disease
  - Histopathology for confirmation

MAREK'S DISEASE

Multifocal coalescing accumulations of pleomorphic lymphoid cells (lymphocytes and lymphoblasts), often replacing normal tissue architecture







MAREK'S DISEASE

- Diagnosis:
  - Clinical signs, history, age of onset, and gross lesions can often give presumptive diagnosis
  - Laboratory testing for confirmation
    - **Histopathology**: primary method for diagnosis
    - PCR: detection of viral DNA
      - Serotype 1 Marek's PCR
        - UGA Poultry Diagnostic and Research Center; cost >$100/sample
        - NC State Poultry Tumor Diseases Laboratory; cost >$100/sample
      - Generic Marek's PCR – will almost always be positive regardless of clinical status
- Treatment: none
- Prevention: vaccination

MAREK'S DISEASE

- Vaccination
  - Recommended for **ALL** chicken flocks
    - Virus is everywhere – it's not practical/realistic to expect Biosecurity to "keep it out"
  - Vaccination prevents clinical signs but does not prevent infection/shedding
    - Vaccinated birds can be infected by field strains and serve as a source of infection for unvaccinated birds
  - Hatchery vaccination is best
    - Takes 7-10 days for immunity to develop following vaccination
      - Need to keep chicks isolated from older birds during this period
    - Booster vaccines are not needed, immunity is life-long

MAREK'S DISEASE

https://backyardpoultry.iamcountryside.com/feed-health/how-to-administer-the-mareks-vaccine-to-poultry-chicks/

- 2 options for vaccines
  - Cell-associated vaccines
    - Require storage on liquid nitrogen
    - Some hatcheries/chick suppliers will vaccinate – must specifically request vaccinated chicks when placing order
  - Cell-free vaccines
    - More convenient to use (freeze-dried), but less effective
    - Can be purchased from livestock supply websites
      - Smallest vial size available contains 1000 doses
    - Vaccine not stable once mixed, must be used within 1 hour after mixing
    - Must be administered via subcutaneous injection in back of neck
      - Ideally given within 24 hours of hatch/placement

LABORATORY DIAGNOSTICS

- Mortality
  - Submit whole bird to lab for necropsy
    - Refrigerate, do **NOT** freeze
  - Either drop off at the lab or send via overnight shipping (UPS or FedEx)
    - Double bag samples and label clearly
    - Place in insulated cooler with ice packs (NOT regular "wet" ice)
    - Complete submission form, including as much history as possible
      - Place paperwork in Ziplock/Whirlpak bag to keep it dry
      - Make sure to let lab know if bird was euthanized and via which method
    - Check lab hours
      - Don't ship on a Friday if the lab isn't open on Saturday
  - Your local state diagnostic lab will likely be the most cost-effective option for general necropsy
    - Full necropsy may be cheaper than "à la carte" testing (depending on the lab)

LABORATORY DIAGNOSTICS

- Advanced diagnostic testing
  - Animal/veterinary diagnostic labs in states with large commercial poultry industry will often have more options for PCR or serology
  - Most of these labs have additional charges for out-of-state submissions

- Poultry Diagnostic Labs:
  - Pennsylvania Animal Diagnostic Laboratory System (PADLS)
    - Penn State Animal Diagnostic Lab
    - University of Pennsylvania New Bolton Center
  - University of Delaware Lasher Lab
  - Maryland Salisbury Animal Health Laboratory
  - Virginia Animal Health Laboratory System – Harrisonburg lab
  - North Carolina Rollins Veterinary Diagnostic Lab
  - Georgia Poultry Diagnostic and Research Center (PDRC)
  - Minnesota Poultry Testing Lab (MPTL) and UMN Veterinary Diagnostic Lab
  - Iowa State Veterinary Diagnostic Lab
  - Indiana Animal Disease Diagnostic Lab (Purdue)
  - California Animal Health & Food Safety Laboratory System – Turlock and Tulare labs

LABORATORY DIAGNOSTICS

- Serology – detection of antibodies
  - Indication that bird/flock was exposed to a particular pathogen
    - Titers do not necessarily mean that pathogen is responsible for current clinical disease
    - Does not differentiate between vaccination and field exposure
  - Collection of serum samples at first sign of illness and again ~10 days later
    - Rising antibody titers indication of recent/ongoing infection

LABORATORY DIAGNOSTICS

- Common Serologic Tests
  - AGID
    - Avian Influenza
  - Plate Agglutination
    - Mycoplasma (MG, MS, MM)
    - Pullorum – NPIP regulatory testing

- ELISA
  - Avian Influenza
  - Newcastle Disease Virus (NDV)
  - Infectious Bronchitis Virus (IBV)
  - Infectious Bursal Disease (IBD)
  - Reovirus
  - Avian Encephalomyelitis (AE)
  - Mycoplasma (MG, MS, MM)
  - Hemorrhagic Enteritis Virus (HE)
  - *Bordetella avium*
  - *Ornithobacterium rhinotracheale* (ORT)
  - Note: ELISAs are typically validated for use in certain species (ELISAs developed for use in chickens may not be reliable if used for other species)

TREATING BACKYARD POULTRY

- Effective treatment requires accurate diagnosis
- Few drugs approved for use in poultry species, especially laying chickens
  - Vetgram website – search for approved treatments by species
    - http://www.farad.org/vetgram/search.asp
- FDA considers **ALL** chickens and turkeys to food-producing animals regardless of whether the owner views the bird as a pet
  - Withdrawal times for consumption of eggs/meat from treated birds
  - Restrictions on extra-label drug use

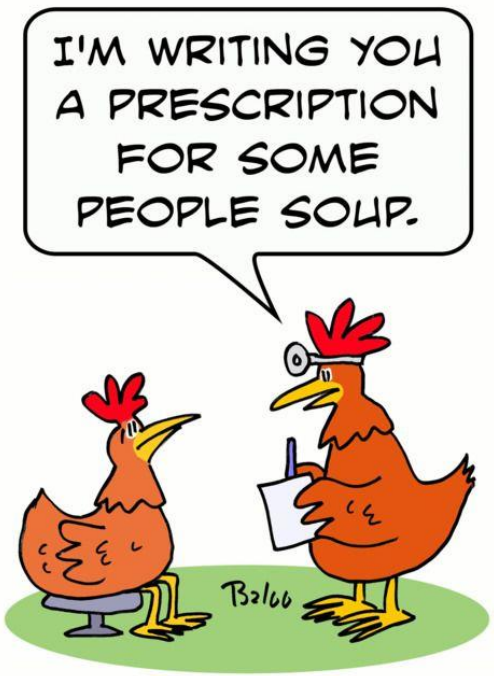
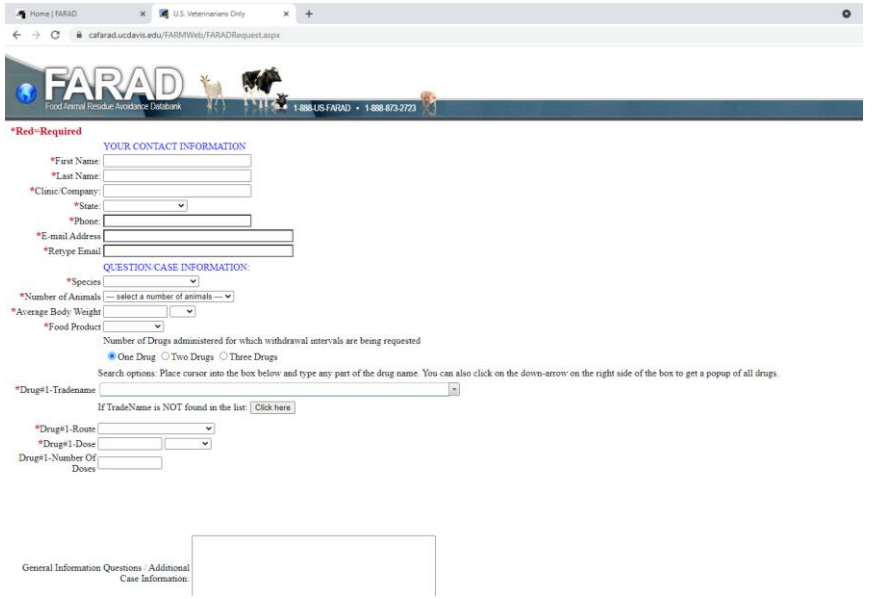


Image credit: https://www.cartoonstock.com/cartoonview.asp?catref=rman12706

TREATING BACKYARD POULTRY

- Extra-label drug use (ELDU)
  - Extra-label use includes any use that differs from label with regards to:
    - Species, dose, volume, route, interval (frequency), duration, and/or indication
  - Must follow Animal Medicinal Drug Use Clarification Act (AMDUCA) regulations
    - Food Animal Residue Avoidance Databank (FARAD)
      - https://cafarad.ucdavis.edu/FARMWeb/
    - Note that formulation/route of administration can drastically alter withdrawal times
  - Extra-label use of certain drugs is prohibited in food-producing animals
    - http://www.farad.org/prohibited-and-restricted-drugs.html
    - Extra-label use of medicated feeds is **prohibited**
      - VFD medications can only be used in accordance with label directions



TREATING BACKYARD POULTRY

- Viral Diseases
  - No antiviral drugs approved for use in poultry in the US
    - Extra-label use is **PROHIBITED** in chickens, turkeys, and ducks

- Bacterial Diseases
  - Antibiotics **MAY** help
    - Prescription required for most water-soluble and injectable antibiotics
    - Veterinary Feed Directive (VFD) required for most in-feed antibiotics
    - Need to know which bacteria involved to select appropriate drug
    - Antibiotic resistance issues
    - Complicated infections (e.g. coinfection with viruses)
  - Extra-label use **prohibited** for:
    - Chloramphenicol
    - Fluroquinolones: includes enrofloxacin (Baytril)
    - Glycopeptides: includes vancomycin
    - Nitroimidazoles: includes metronidazole
    - Nitrofurans

Image credit: https://sunnysideupfarmhome.files.wordpress.com/2018/12/first-aid-kit-for-chicken-2.jpg

TREATING BACKYARD POULTRY

- Parasitic Diseases
  - External parasites (e.g. lice, mites, etc.)
    - Topical & premise insecticides regulated by the EPA
      - Extra-label use is **PROHIBITED** in the United States
      - Read the label carefully!!
    - Carbaryl (Sevin Dust) and Fipronil are **PROHIBITED**
      - FDA recommends lifetime withdrawal for eggs/meat if accidental exposure
    - Need to consider the life cycle of the parasite
      - May need to treat both the bird and the environment
      - Repeated treatment often necessary since most products are not effective against all life stages of the parasite

TREATING BACKYARD POULTRY

- Parasitic Diseases
  - Internal parasites
    - Worms
      - Fenbendazole (Safeguard) – only dewormer labelled for use in poultry that is currently available in the US
        - Water-soluble formulations approved for use in chickens (Safeguard AquaSol)
        - Feed formulation approved for use in turkeys
        - Effective against roundworms (*Ascaridia spp*.), cecal worms (*Heterakis*), and *Capillaria*
      - No approved treatment for tapeworms
      - Can use other products extra-label, some have long withdrawal times
    - Coccidiosis
      - Ionophore and chemical coccidiostats (feed) – prevention
        - Multiple different products available; rotation of products important to minimize development of resistance
      - Amprolium (feed or water) – prevention/treatment
        - Examples: Amprol, Corid
      - Sulfonamide antibiotics
    - Other protozoa (histomonas, trichomonas, hexamita, cochlosoma)
      - No treatments approved for use in the US
      - Extra-label use of metronidazole is **PROHIBITED**

TREATING BACKYARD POULTRY

- Antifungals
  - Copper sulfate – treatment of crop mycosis
  - Others – extra-label use; often cost-prohibitive
- Supportive Care
  - Electrolytes
    - Can help with dehydration, heat stress
    - Do not use for more than 3-4 consecutive days: will cause "flushing"
  - Vitamins
    - Water soluble (B and C)
    - Fat soluble (A, D, E, and K): risk of toxicity
      - Vitamin D – use D3 products
  - Pain relief, anti-inflammatory
    - Aspirin or sodium salicylate – formulations labelled for poultry
    - Meloxicam – extra-label use
  - Isolate sick birds to protect from pecking/harassment; also minimize spread of infectious diseases
  - Temperature control
    - Increase temperature if birds huddling
    - Prevent drafts on sick birds

TREATING BACKYARD POULTRY

- Many non-FDA approved products that many owners like to use, limited (if any) research on dosing and efficacy
  - Probiotics (good bacteria)
  - Prebiotics (e.g. yeast extracts)
  - Essential oils
    - Oregano, garlic
  - Diatomaceous earth
  - Supportive care products

- Full effects/side effects of many medications are unknown for poultry species

TREATING BACKYARD POULTRY

- Water medications
  - pH and presence of sanitizers/disinfectants can affect the solubility/efficacy of many medications
    - Mixing different medications can also affect solubility/absorption
  - Dosing based on daily water consumption for the flock
    - Need to know estimated water consumption
    - Treated water needs to be the only available source of water
      - No access to ponds, puddles, etc.
  - Oral gavage may be easier if dealing with small number of birds

Image credit: E Wallner-Pendleton

Image credit: http://www.supa-aquatics.co.uk/products/small-animal/poultry/premium-poultry-drinkers/

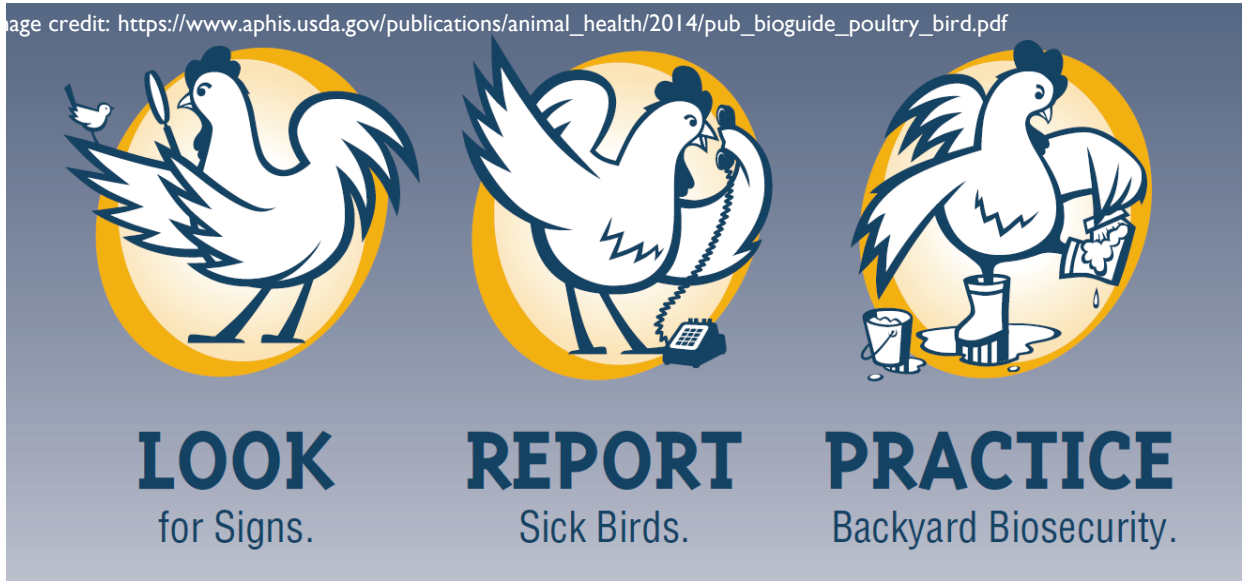
DISEASE PREVENTION

- Limited pre-mortem diagnostic and treatment options for many poultry diseases
- Prevention is Key!
  - Biosecurity
  - Vaccination
  - Good Husbandry/Management

Image credit:
https://academy.alchemysystems.com/?attachment_id=15032

BIOSECURITY

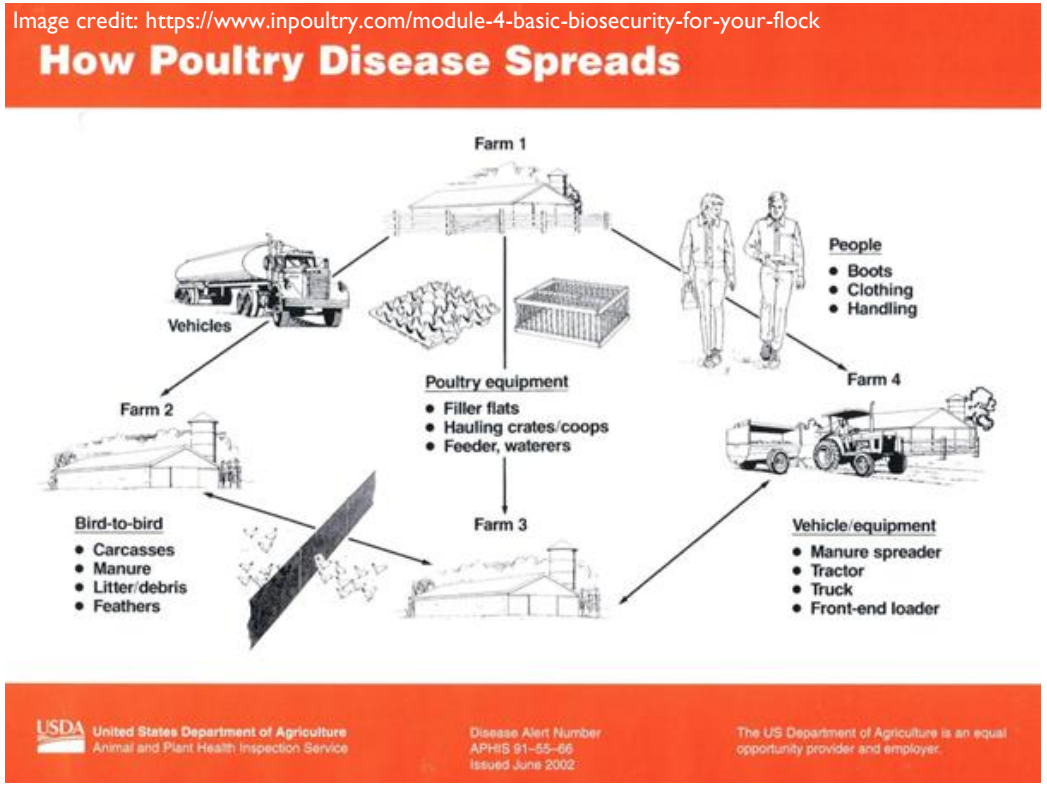
- The preventative measures to reduce the risk of infectious disease transmission into an animal population
  - Goal is to keep "outside out" and "inside in"
  - Principles can be applied to any size operation
- USDA Biosecurity Resources:
  - https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/avian/defend-the-flock-program/dtf-resources



BIOSECURITY CONSIDERATIONS

- People
  - Owner/caretaker
  - Visitors
- Other poultry/livestock/pet species on the farm
- Wild birds, rodents, and insects
- Equipment, tools, and vehicles
- Source of replacement poultry
  - National Poultry Improvement Plan (NPIP) participants preferred
- Feed and water
- Mortality disposal
- Manure
  - Bedding/litter management
  - Pasture management

Image credit: https://www.inpoultry.com/module-4-basic-biosecurity-for-your-flock



VACCINATION: CHICKENS

- **Marek's Disease**
  - Only vaccine routinely recommended for small/backyard flocks

- Numerous other vaccines available
  - Viruses: Newcastle Disease, Infectious Bronchitis, Infectious Laryngotracheitis
  - Bacteria: Mycoplasma (MG), Fowl Cholera, Infectious Coryza, *E. coli, Bordetella*
  - Protozoa: Coccidia
  - Not routinely recommended for small/backyard flocks unless history of a specific disease challenge on premise
    - Most require boosters; difficult to manage timing especially in open/multi-age flocks
    - Vial sizes designed for large commercial flocks (minimum 1000 doses)
      - Often not practical/cost effective for small flocks

VACCINATION: TURKEYS, DUCKS, GEESE

- None routinely recommended for small/backyard flocks
- Some vaccines are available if client has repeat issues with a specific disease

Image credit: https://www.azurefarmlife.com/farm-blog/mixed%20flock

HUSBANDRY/MANAGEMENT

- FLAWS
  - Feed
  - Light, Litter
  - Air
  - Water
  - Space/Social Interactions, Shelter/Security

Image credit: https://www.housebeautiful.com/lifestyle/kids-pets/a32615866/raising-chickens-backyard/

QUESTIONS?

- Dr. Megan Lighty
  - Email: mul132@psu.edu
    - General flock health or diagnostic questions
- Penn State Animal Diagnostic Lab
  - Main phone number: 814-863-0837
    - Urgent flock health or sampling questions
  - Website: https://vbs.psu.edu/adl/submit
    - Testing and submission info

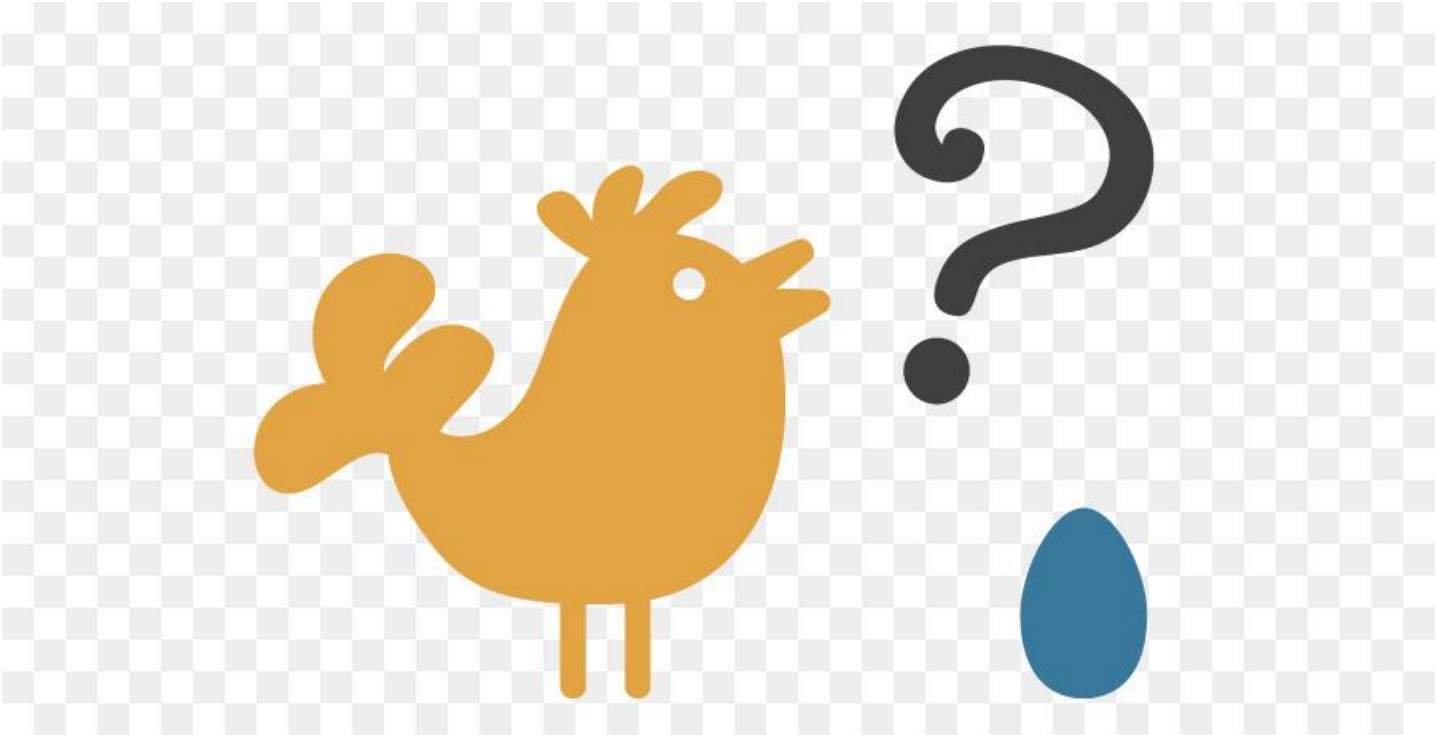


Image credit: https://www.cleanpng.com/png-chicken-or-the-egg-question-mark-alcohol-dependenc-3125560/