The goal of this course is to provide you with a basic understanding of poultry.
Anatomy and Physiology of Poultry
Birds vs. Mammal

• Birds:
  – Feathers instead of fur
  – No teeth
  – Lay eggs
  – Float and fly
  – Excrete waste through one orifice only

Photo by Kimberly Engelkes
Anatomy vs. Physiology

- Anatomy: The science and structure of animals
- Physiology: The science dealing with how an organism functions
Body Systems of Poultry

- Integumentary
- Respiratory
- Skeletal
- Digestive
Integumentary System

• The skin, feathers and beak
  – Protect the bird from external harm

• Skin
  – Plumage: outer covering of the bird’s body
    • Feather, scales and filoplumes
      – Filoplumes: hair-like structures at the base of the feathers
    – Wattle: Red (usually) growth under the beak, works with the comb, growth located on top of their head
      • Wattle and comb circulate blood to regulate body temperature
        – The size of the comb is an indicator of the level of testosterone.
          » Large comb = more testosterone present
Scale and Plumage

• Scales
  – Located on feet and legs

• Plumage
  – Protects against cuts and bruises
  – Helps regulate body temperature
    • This is important because birds do not have sweat glands
Respiratory System

• Unlike mammals, birds lack a diaphragm to inflate and deflate the lungs
  – Birds have air sacs located in their neck and body cavity that inflate their lungs
  – Gas exchange occurs in the lungs and the air sacs function to move air in and out of the respiratory system

• Nares: Nostrils located on their beak
Skeletal System

• Pneumatic (hollow) Bones
  – Connect with respiratory system
  – Light bones allow for flight

• Medullary Bone
  – Contain a high amount of calcium
  – Calcium is stored in the bones to assist with producing the shell of the egg

• Fused Bones
  – Bones in the feet are fused
    • Causes birds to walk upright
  – Bones in the back are fused for flight
Digestive System

- **Mouth**
  - Tongue
  - Beak
  - Taste buds
- **Esophagus**
  - Flexible tube that connects the mouth to the crop
- **Crop**
  - Moisten and temporary storage of food
- **Provenriculus**
  - Stomach
  - Uses acids to breakdown food
- **Gizzard**
  - Grinds up food particles
- **Small intestines (3 sections)**
  - Duodenum
  - Ileum
  - Jejunum
  - Absorbs nutrients from food
- **Ceca**
  - Ferments left over food and absorbs water
- **Colon (large intestine)**
  - Absorbs water
- **Cloaca**
  - Expels feces and urine through the vent
Commercial Broiler Breeds

• Broiler
  – Hybrids or combinations of different breeds
    • Developed for specific characteristics
      – Grow faster and larger
      – Large breast meat yield
      – More efficient feed conversion
      – More disease resistance
    • Used by commercial broiler producing companies
    • Weakness: Do not lay as many eggs as layer breeds
Commercial Broiler Breeds

- **Cornish Cross**
  - White Cornish x White Plymouth Rock
    - Reach 4 - 5lbs in 6 weeks
    - Reach 6 - 10lbs in 8 - 12 weeks
  - White Cornish
    - Broad and meaty
  - White Plymouth Rock
    - Docile and good dual purpose breed (layer and broiler)
Commercial Broiler Breeds

- Cornish Hen
- Cornish Cross
- White Plymouth Rock
Commercial Layer Breeds

• Layer
  – Genetically selected for high egg production
  – Small bodied birds
  – Two types
    • Birds that lay white eggs and birds that lay brown eggs
    • White ear lobes = White eggs
    • Red ear lobes = Brown eggs
Commercial Layer Breeds

- **White Leghorns**
  - Very good layers of white eggs

- **Rhode Island Red**
  - Very good layers of brown eggs
Examples of Non-Commercial Breeds

- **Laying breeds**
  - **Ameraucana**: Lays blue eggs
  - **Araucana**: Lays blue to bluish green eggs
  - **Maran**: Lays large dark brown eggs
    - Dual purpose bird
  - **Plymouth Rock**: Dual purpose bird
  - **Welsummer**: Lays dark, deep red eggs

- **Meat breeds**
  - **Brahma**: One of the largest breeds, good winter layer
  - **Delaware**: Good for small scale operations
  - **Jersey Giant**: Good disposition for backyard flocks
  - **Orpington**: Good dual purpose bird
  - **Wyandotte**: Good dual purpose bird, and does well in the cold
Examples of Non-Commercial Breeds

• Ornamental breeds
  – **Cochin**: Good winter layer and popular show bird
  – **Langshan**: Good dual purpose bird that lays brown eggs
  – **Polish**: A favorite as a pet chicken, and known for its topknot of feathers
  – **Silkie**: Unique looking, ideal as a pet chicken, and excellent broody hen
Pathogens

• Bacteria
  – Salmonella Pullorum
  – Mycoplasma Gallisepticum
  – Botulism

• Fungi
  – Aspergillosis

• Viruses
  – Avian Influenza
  – Fowl Pox
  – Infectious Bronchitis
  – Infectious Bursal Disease
Pathogens

– Parasites
  • Internal
    – Worms
      » Round Worms
    – Protozoa
      » Coccidia
  • External
    – Lice
    – Mites
Salmonella Pullorum

• **Background**
  - Infections occur in chickens, turkeys, and game birds
  - Spread through parent to chick

• **Symptoms**
  - Characterized by white diarrhea & high mortality rate in birds
  - Sick birds are sleepy and weak
  - Chicks huddle near heat source
  - Chicks that survive become carriers

• **Prevention**
  - Purchase birds and hatching eggs from National Poultry Improvement Plan (NPIP) participants
Mycoplasma Gallisepticum (MG)

• Background
  – Affects primarily chickens and turkeys, but can effect game birds and waterfowl
  – Can be transmitted through the egg
    • Can be coughed into the air, contaminating feed, water & the environment
    • Infection may be dormant until the birds are stressed

• Symptoms
  – Coughing
  – Sneezing
  – Nose and eye discharge
  – Drop in egg production and consumption of food

• Prevention
  – Purchase birds and hatching eggs from MG-free breeders (usually NPIP participants)
Botulism

• **Background**
  – Caused by ingesting the toxins of *Clostridium botulism*
  – *C. botulism* can be found in dead poultry, and rotting feed and food

• **Symptoms**
  – Symptoms occur within a few hours to a few days
  – Drowsiness
  – Weakness
  – Loss of control of legs, wings, neck
  – Ruffled feathers
  – Diarrhea (broilers)

• **Prevention**
  – Prevent access to *C. botulism*
  – Dispose of dead birds properly
  – Do not feed birds spoiled food or feed
Aspergillosis

**Background**
- Occurs in chickens, turkeys and game birds
- Chicks and poults may become infected during hatching
  - Due to inhaling spores from contaminated machines or litter
- In older birds, infection may be caused primarily by inhalation of contaminated dust

**Symptoms**
- Gasping

**Prevention**
- Keep feed and litter dry so mold doesn’t grow
- Clean out feeders regularly
- Avoid wet litter under the feeders and waterers
- Provide good ventilation in the poultry house
Avian Influenza (AI)

**Background**
- 2 types of AI
  - Low-Path
  - High-Path
- Low-path AI is commonly found in wild waterfowl
- AI viruses are further divided into 15 hemagglutinin (H1-15) and 9 neuraminidase (N1-9) subtypes
- Most AI viruses (H1-15 subtypes) are of LP
  - However, some H5 and H7 subtypes can mutate into high-path in domestic chickens, turkeys, and game birds

**Symptoms**
- Low-Path
  - Coughing
  - Sneezing
  - Depression
  - Inflammation of the sinuses
  - Nasal and eye discharge
  - Decrease egg production
- High-Path
  - Sudden mortality
    - Mortality can reach up to 100%
  - Respiratory signs may be present, but not always
  - Bluish wattle and comb
  - Discoloration of feet and legs
  - Blood-tinged mouth and nose discharges.
Avian Influenza (AI)

**Prevention**
- Keep wild waterfowl away from your birds
- Separate the species of birds (i.e. separate the chickens from the ducks)
- Clean and disinfect equipment that has been used around other birds
- Have your birds routinely tested for AI
- Purchase birds from NPIP AI Clean flocks
- Separate new birds from your flock for at least 3 weeks

Photo by Joan McClenny
Fowl Pox

- **Background**
  - Slow spreading virus
  - Affects chickens, turkeys and other species of birds
  - Can be transmitted through mosquitoes
  - Two forms of Fowl Pox
    - Cutaneous
    - Diphtheritic

- **Symptoms**
  - Cutaneous
    - Mild reduction in weight gain
  - Diphtheritic
    - Lesions in the upper respiratory system, digestive tract, nasal cavity
    - May lead to nasal or eye discharge
    - Low mortality

- **Prevention**
  - Fowl Pox vaccination
Infectious Bronchitis (IB)

• **Background**
  – A virus that occurs in chickens
  – Rapidly spreads and highly contagious
  – Spread through respiratory discharge and
    • Airborne droplets
    • Ingestion of contaminated feed and water

• **Symptoms**
  – Chicks
    • Coughing
    • Sneezing
  – Adult birds
    • Coughing
    • Sneezing
    • Drop in egg production
    • Soft-shelled or misshapen eggs

• **Prevention**
  – Vaccines can be used

• Nasal discharge
• Weakness
• Depression
• Huddling near heat source
Infectious Bursal Disease (IBD)

- **Background**
  - Occurs primarily in chickens
  - Clinical signs and mortality are more severe in birds 3-6 weeks old
  - Birds less than 3 weeks old do not show symptoms
  - Shed in feces

- **Symptoms**
  - Tremors or unsteadiness
  - Depression
  - Anorexia
  - Ruffled feathers
  - A droopy appearance
  - Diarrhea
  - Dehydration
  - Vent pecking
  - Low mortality

- **Prevention**
  - Vaccines are available
Roundworms

- **Background**
  - There are many different types of roundworms that can infect poultry
  - Younger birds are more likely to become ill
  - But can affect birds of any age
  - Spread through feces
  - Earthworms are common carriers of some roundworms

- **Symptoms**
  - Thin
  - Poor feather quality
  - Pale inside of mouth
  - Diarrhea or droppings pasted to their feathers near their vent
  - Birds can die from severe infections
  - If one or two birds are showing signs of roundworm, then the whole flock should be treated

- **Prevention**
  - Use feeders and waterers designed to minimize contamination
Round Worms

– Don’t allow birds to eat off of the ground
– Use deep litter in the coop so the birds do not eat feces
– Clean out coop frequently to remove feces

Photo by Sue Young
Coccidia

• **Background**
  - Protozoal disease of poultry
  - Caused by the protozoa *Eimeria*
  - 9 species of *Eimeria* in chickens & 7 in turkeys
  - Wide range of symptoms depending on the type of *Eimeria*
  - Shed in feces which can contaminate feed, water, dust, soil and litter

• **Symptoms**
  - Diarrhea (may have mucous or blood present)
  - Inflammation of the small intestines
  - Decreased growth rate
  - Decreased egg production
  - Dehydration
  - Listlessness
  - Weakness

• **Prevention**
  - Purchase feed with Anticoccidial Compounds
    - Does not affect all types of *Eimeria*
  - Vaccines are available
Lice

• Background
  – There are over 40 species of lice that are specific to domestic poultry
  – Examine the vent area, underside of the wings, the head, and legs to locate the lice
  – Most lice are straw-colored

• Prevention
  – Pesticide treatments
    • Use a treatment that is approved for use on birds
  – Lice do not live in the environment, so remove infected feathers from the premises
  – Inspect birds on a monthly or bi-weekly basis
Mites

**Background**
- Mites feed on blood, feathers, skin, or scales
- Some mites are known or suspected of causing other diseases
- There are many different types of mites that affect poultry
  - A few are:
    - Chicken Mite-Red Mite
      - Can cause anemia and death (especially in young birds)
    - Northern Fowl Mite
      - Heavy infestations appear as blackened feathers
      - After handling the bird, the mites may transfer to humans
- Depluming Mites
  - Live on feathers or in the quills
  - Resulting in loss of feathers, causing inability to regulate temperature
- Scaly Leg Mites
  - Affected skin becomes thickened and crusty
  - Without treatment the bird can become crippled.

**Prevention**
- Insecticides can be used
  - Powders, sprays or dusts
Preventing Disease on the Farm

• Biosecurity is the main way of preventing the introduction of diseases onto your farm
  – Biosecurity reduces the risk of pathogens from forming, which prevents the spread of diseases from one flock to another
  – Preventing illness in birds and other animals, is very similar to preventing illness in humans
    • Good hygiene is imperative
Benefits of Biosecurity

• Biosecurity reduces the number of pathogens on a farm

• Biosecurity also:
  – Increases productivity and production
  – Decreases the use of medication (antibiotics)
  – Enhances the value of the flock
Biosecurity Steps

• Keep your birds in a protected area
  – Keep them fenced in to prevent animals and people from entering the pen
  – A hard roof or tarp will prevent wild birds from entering the pen
    • Keep wild waterfowl droppings out of the coop

• Fresh water should be available at all times
  – Nipple drinkers or rabbit type drinkers reduce the spread of disease
Biosecurity Steps

• When visitors visit your farm, provide them with boots or disposable booties
  – This will prevent the transmission of disease on your farm
  – Clean and disinfect the boots when they leave and dispose of disposable booties

• Do not let people that own birds enter your bird area.
Biosecurity Steps

• Clean and sanitize equipment and supplies
  – Sanitizing equipment and supplies reduces pathogens
    • This is especially important when vehicles, equipment or supplies have been near other birds (i.e. fairs, auctions, etc.)

• Wear coveralls or special clothing when working with your birds.
  – Clean your clothes after working with your birds

• Work from youngest to oldest birds
  – Young birds are highly susceptible of being infected with a pathogen
Biosecurity Steps

• Eliminate excess trees, grass, and debris around the chicken pen
  – These items can harbor rodents and other animals that can spread disease in your flock, or harm your birds
  – Control rodents in order to reduce the spread of disease in your flock

• Keep feed in a sealed container
  – Keeping feed away from rodents and other birds is essential when trying to keep your flock healthy
Biosecurity Steps

• Stir or rake bedding (litter) often so manure is evenly spread throughout and moisture is absorbed
  – This will reduce flies and odors
• Sick and dying birds should be separated from the flock immediately
• Thoroughly clean and disinfect poultry housing between flocks to ensure that there aren’t pathogens present
Report a Sick Bird

Contact the WSDA Avian Health Program if your birds are sick

1-800-606-3056

lbadcoe@agr.wa.gov

Or

Contact your local veterinarian
Helpful Contacts

Dr. Lyndon Badcoe (WSDA)
Avian Health Veterinarian
(360) 725-5763
lbadcoe@agr.wa.gov

WSU Avian Health Laboratory
(253) 445-4537
References

- Slides were adapted from the following resources:
  - The Poultry and Egg Institute “Poultry & Egg Production Curriculum”
    - http://www.poultryegginstitute.org/training/index.cfm
  - Merck Veterinary Manual
    - http://www.merckvetmanual.com
  - Roundworms in Poultry - Dr. Jeanne Marie Smith
    - http://animalscience.ucdavis.edu/phi PHI ROUNDWORMS%20PHI %20Handout%20from%20Dr.%20Smith.pdf