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
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

• **Prevention**
  – Sick birds are sleepy and weak
  – Chicks huddle near heat source
  – Chicks that survive become carriers

– Purchase birds and hatching eggs from National Poultry Improvement Plan (NPIP) participants
Mycoplasma Gallisepticum (MG)

**Background**
- Affects primarily chickens and turkeys, but can affect 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

- Accelerated and labored breathing
- Diarrhea
- Anorexia
- Dehydration
- Increased thirst
- High mortality

**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
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