Objectives

• To learn about different systems in a chicken’s body especially the digestive tract and respiratory tract…reproductive system will be in the last module with eggs, incubation and reproductive diseases
• How certain diseases affect the different systems of the chicken’s body especially the digestive, respiratory and reproductive systems
• Learn about some basic disease concepts
• How to prevent certain diseases with good management and biosecurity
• The importance of Biosecurity in keeping our chicken’s healthy, happy and productive
• The importance the role the National Poultry Improvement Plan (NPIP) plays with regard to Biosecurity and keeping poultry healthy, happy, and productive.
It is a good idea to know the basics of External & Internal Anatomy when describing the bird’s health.
Internal Anatomy
Digestive System

- Beak/mouth
- Esophagus
- Crop
- Proventriculus
- Gizzard
- Sm. intestine
- Cloaca
- Ceca
- Vent
- Small intestine
- Large intestine
- Cloaca
- Ceca
- Crop
- Proventriculus
- Gizzard

12 inches
Mouth

Beak or Bill of a bird will determine the type of feed they eat.

Mouth will pick the feed up and start it down the tract.

Oropharynx – Combined oral & pharyngeal cavities

No sharp distinction between mouth & pharynx – mentioned w/ regard to samples taken for AI.

CHOANA – longitudinal fissure roof of mouth, connects oral & nasal cavities (Choanal or palatine cleft).

INFUNDIBULAR CLEFT – the back of the longitudinal fissure, connects to auditory tubes.

Tongue - aids in the collection, manipulation and swallowing of food.

Salivary Glands - add enzymes to start the break down food.

Saliva mixed with food is called a bolus.

Taste Buds (300 in a chicken)
Esophagus and Crop

**ESOPHAGUS**
- Tube lined with smooth muscle
- Moves food toward the true stomach (Proventriculus)
- Bird Swallows food whole
- No Esophageal Sphincters – therefore the bird needs plenty of good, fresh, clean water to move the food down the tract

**CROP**
- Food Storage
Proventriculus and Gizzard

Proventriculus (True Stomach)
- True or Glandular Stomach
- Acid Secretions (HCl, Pepsin, Mucous)

Gizzard (“Bird’s Teeth”)
- Muscular Stomach
- Mechanical Digestion
- Lined w/ a cuticle (Koilin produced by mucosal glands)
- Protects against acid secretions
Small Intestine

Made up of 3 parts:

1. Duodenum
   - Duodenal Loop
   - Pancreas – secretes amylase, lipase, proteolytic enzymes & sodium bicarbonate

2. Jejunum
   - Meckel’s Diverticulum – separates jejunum from ileum
   - Major site of calcium & phosphate absorption

3. Ileum
   - Intestinal Wall contain Villi which increases surface area for ABSORPTION
   - Zig Zag Pattern slows ingesta
   - Passage rate for food in a chicken is 8-10 hours
Ceca, Large Intestine (Colon) Cloaca

- **Ceca**
  - Has Villi
  - Aid w/ Absorption of Amino Acids
  - Increase Metabolizability of food (makes food easier to digest)
  - Digestibility of Crude Fiber

- **Large Intestine (Colon)**
  - Have Villi
  - Water Reabsorption takes place here

- **Cloaca**
  - Excretory, Digestive and Reproductive Tracts come together here
  - Last little bit of Water Reabsorption (birds don’t have a urinary bladder)
  - poop is semi-solid
Digestive System

Liver – controls food intake
Monogastric – single tube, that uses enzymes primarily to breakdown food, not bacteria
Absorption is important to the bird to get the nutrients it needs from the feed

Passage Rate Affected by:
- Age – passage through the intestines increases w/ age
- Lipid (fat) in diet – increases passage time
- Protein in diet – increases passage time
- Environmental Temperature – slow transit time in cold temperatures, high temperatures will increase passage
- Particle Size – larger particles are retained longer
- Genetics – leghorns retain food in crop, proventriculus, & gizzard longer than broilers
5-9 hours is normal passage rate

Feces
- White Cap (Protein Digestion)
Respiratory System

- Trachea
- Cervical air sac
- Clavicular air sac
- Cranial thoracic air sac
- Lungs
- Caudal thoracic air sac
- Abdominal air sac
- Trachea
- Syrinx
- Interclavicular air sac
- Anterior, posterior thoracic air sacs
- Pneumatic humerus
- Lung
- Abdominal air sacs
Respiratory System

Purpose of the Respiratory System

Gas Exchange
- Delivering Oxygen from Environment to the Tissues
- Removing Carbon Dioxide from tissues

Thermoregulation – keeping the bird’s body temperature constant at 106F
- By Evaporative water loss
- Bird will open their mouth and pant if it gets too hot

Vocalization
Parts of the Respiratory Tract

Nares
Trachea
Bronchi
Lungs (2) which do NOT expand and contract
Air Sacs (9)
  Interclavicular (1)  Cranial Thoracic (2)
  Caudal Thoracic (2)
  Cervical (2)  Abdominal (2)

Pneumatic Bones – hollow bones which help air exchange
  Skull  Keel
  Humerus  Pelvic Girdle
  Clavicle  Lumbar & Sacral Vertebrae
Circulatory System

Heart (4 Chambers) like human heart
  2 Atria
  2 Ventricles

Nucleated Red Blood Cells – unique to birds
Homeothermic – conserve or remove body heat (106.1 F body temperature of the chicken)
What Causes Disease in Birds

- **Viruses** – cannot be seen with a microscope, an infectious agent that needs living cells to replicate and has a protein coat (covering) for protection
- **Bacteria** – are single cells found in the soil, air, water on plants and animals with a cell wall
- **Mycoplasma** – don’t have a cell wall but a membrane which surrounds them and are found in the environment, are smaller than bacteria but larger than a virus
- **Fungus** – can be picked up from the environment
- **Parasites** – can affect absorption in the digestive tract, worms, protozoa like coccidia
- **Nutrition** – mostly from deficiencies in the diet
- **Management Problems** – primarily lack of biosecurity, cleanliness, increase in the number of pests in the environment
Signs of Digestive Tract Diseases

Diarrhea
Weight Loss
Drop in Production
“Sick Bird Syndrome” or ADR “Ain’t doin right”

A Common sight in many different diseases of poultry, bird is ruffled up, pasty vent with poop, hunched over, eyes closed, overall droopiness, and down on its haunches
Common Diseases of the Digestive System

Bacteria

• Salmonella
  • *Salmonella pullorum* – causes pullorum disease
  • *Salmonella typhimurium* – causes typhoid disease
  • Pullorum-typhoid can be identified by one test
  • Monitored by the National Poultry Improvement Plan (www.poultryimprovement.org)

• Necrotic Enteritis caused by *Clostridium perfringens*

• Yeast
  • Crop Mold (Candida)

• Parasites
  • Worms (Round and Tape)
  • Protozoa (Coccidia)
Digestive System Bacterial Diseases

Salmonella

• Large group of enteric (intestinal) bacteria -- over 2,000 different types
  • 20-40 types can cause disease in poultry
  • The two we are most concerned about are:
    • Pullorum Disease -- Salmonella pullorum
    • Fowl typhoid -- Salmonella gallinarum
    • Commonly known as Pullorum-Typhoid

• Clinical Signs can be:
  • None, birds appear to be healthy but are carriers
  • Diarrhea in young poultry, pasty butt
  • High death rate in young poultry
  • Decreased egg production & hatchability
  • Decreased feed & water consumption
Pullorum-Typhoid (P-T)

• Can be from many sources (like other Salmonella):
• Can be transmitted Vertically
  • Breeder flock hen to chick
  • Hatchery through the fluff and poop in incubators/hatchers
• Can be Transmitted Horizontally
  • In the Environment from pests especially rats and mice
  • Feed
  • From bird to bird
  • From fecal contamination (poop)
• Eradicated from poultry flocks by testing through the National Poultry Improvement Plan (NPIP)
• Reservoir birds can still keep disease alive thus why birds that are brought together for show or sale need to be tested
Pullorum-Typhoid Testing

• Exposure to Pullorum-Typhoid → body makes antibodies

• Rapid whole blood test (plate test) using PT antigen
  • On-farm testing
  • For show testing
    • If the bird is a reactor it means that it has been exposed to the disease and will form antibodies
    • By mixing a loopful of whole blood from birds and adding to the Antigen a reaction (clumping) will take place as seen in the next slide
Results Pullorum-Typhoid (P-T) Rapid Whole Blood Test

**Negative Test**

Done on the Farm to test breeders and also done before poultry shows & sales to confirm the bird has not been exposed to P-T.

**Positive Test**

Clumping of Antibodies with Antigen
Prevention of Pullorum-Typhoid

- Purchase eggs and chicks from NPIP Participants
- Monitor Breeder Birds:
  - Blood test breeder birds & setters annually
  - Culture eggs, fluff, poop, and litter
- Good Biosecurity
  - Sanitation and Hygiene
  - Rodent and Insect Control
  - Good traffic control watch who comes onto the farm and do you visit other farms
  - Keep things isolated: separate different ages of birds
  - Have a separate set of clothes/shoes for working in your coop
Necrotic Enteritis

- Inflammation of intestines and breakdown of lining which looks like a towel inside
- *Clostridium perfringens*, a Bacteria Produces a toxin
- Can be found in Poop, soil, dust, contaminated feed, litter, Digestive tract contents

**Signs of the disease:**
- Sick Bird Syndrome (ADR)
- Diarrhea
- Death

**Prevention and Control**
- Appropriate antibiotics (need to Test which ones will work w/ antibiotic sensitivity Test
- GOOD BIOSECURITY: Clean out litter between Flocks and under roosts daily
- Routine Cleaning & disinfection
- Acidic litter treatments
- Control Coccidia
Yeast (Crop Mold or Thrush) from Candida

- Candida is a yeast
- Result of bird being infected with another disease that weakens their system and makes them susceptible to Crop Mold
- Using too many antibiotics which kill the good bacteria in the digestive tract
- Signs of Crop Mold
  - Poor Growth
  - Ruffled Feathers
  - Listless – just don’t move around
- Prevention & Treatment
  - Biosecurity: Clean and disinfect regularly
  - Prevent overcrowding
  - Don’t use antibiotics
  - Copper Sulfate in the water

Normal Crop should be see through but w/ Crop Mold becomes cloudy
Common Internal Parasites in Poultry

Roundworms

- Nematodes/Ascarids
- Are Spindle-shaped & Non-segmented
- Have a Smooth Cuticle (covering)
- The Most common internal parasite
- Do Greatest Damage in birds
- Especially Young Birds Under 2 Mos. Of Age
- Prevent the absorption of nutrients from the feed
- Live in central portion of small intestine
- Host Specific – Ascaridia galli (chickens)
- Life Cycle = 35 Days (female produces about 5000 eggs/day
- Litter-borne Parasite – likes warm & moist & live for months
Roundworms

• Signs
  • Weight & Growth Depression due to poor absorption of nutrients from feed
  • Migrate Up Reproductive Tract & Become Trapped in an Egg
  • Affect Immune Response can predispose birds to other diseases
  • Diarrhea
  • Anemia in Heavy Infestations

• Prevention
  • Good Biosecurity
  • Clean out litter
  • Use acidifiers in litter
  • Use Diatomaceous Earth (DE)
  • Clean pens regularly
  • Monitor weight of your birds
Tape Worms

White or Yellow Ribbon-like
Segmented Flat Worms
Eight Species Affect Poultry
Life Cycle

• Attach to Intestinal Wall
• Grows & Breaks Off
• Pass From Bird
• Segments Are Filled With Eggs
• Eaten by Intermediate Host such as
  • Snails
  • Slugs,
  • Beetles
  • Ants
  • Earthworms
  • Housefly
  • Grasshopper
Tape Worms

• **Signs**
  - Enteritis inflammation of the intestines which prevent the absorption of nutrients in the food
  - Bird is Unthrifty since the tape worms are competing for the nutrition from the food
  - Paralysis – birds unable to move
  - Death
  - Tapeworm Segments in poop which get picked up by other birds pecking

• **Prevention**
  - NO overcrowding
  - Good Biosecurity
  - Diatomaceous earth spread in the pens
  - Acidic litter treatment
  - Monitor your birds: check to make sure they are gaining weight
Coccidiosis

- Coccidiosis is a Protozoal Disease caused by coccidia (*Eimeria species*)
- Coccidia are Species & Site Specific: areas of the small intestine and Ceca are affected by particular coccidia
- 9 Types Affect Chickens
- Life Cycle which has many stages is 9 Days
- THE most Costly Disease because birds can live with it but are unthrifty
- Litter-borne disease
- Affects Intestines & Ceca especially the Epithelial Cells of Mucosal Lining of the intestines and ceca prevents the bird from absorbing the nutrients of the feed
Eimeria acervulina

Eimeria necatrix

Eimeria brunetti

Eimeria tenella

Eimeria maxima

Coccidia prevent absorption of nutrients from the feed making birds unthrifty
Prevention of Coccidiosis

- **Vaccine:**
  - Coccivac (Sporulated Coccidia)
  - For Natural Producer given one time

- **Biosecurity**

- **Good Sanitation & Litter Management**
  - Prevent Wet Litter
  - Replace Damp Litter
  - Change Litter clean under roosts daily
  - Use Diatomaceous earth in the litter or acidic litter treatments

- **Coccidiostat (Amprolium)** in starter Feed then transition them to a non-medicated laying diet – always give young birds a good start
E. coli

- Bacteria: *Escherichia coli* found commonly in the digestive tract of birds
- *E. Coli* infections are often found after the bird has been affected by another disease or problem and the bird’s defenses are down
- Due to: a virus, another bacterial infection, parasites, or environmental conditions
- Signs:
  - Sick Bird Syndrome: ADR
  - Lameness
  - Eye Infections
  - Nervous symptoms like a staggered gait
  - Respiratory problems
E. coli Prevention

• **Good Biosecurity**
  • Collect Egg frequently
  • Keep nests clean and free of poop
  • Keep incubators and hatchers clean and sanitized
  • Good ventilation
  • Good clean, fresh feed
  • Clean waterers
  • Pest and rodent control

• **Reduced stress**
• Prevent overcrowding
• Prevent respiratory diseases
Common Respiratory Diseases

• Viruses
  • Avian Influenza
  • Infectious Bronchitis
  • Laryngotracheitis (LT)

• Bacteria
  • Infectious Coryza
  • Fowl Cholera
  • Mycoplasma

• Fungus
  • Aspergillus
Respiratory Diseases in Poultry

• **Signs**
  - Sneezing
  - Nose and eye discharge
  - Swollen eyes, sinuses, comb, wattles
  - Gasping for breath
  - Dirty Shoulders
  - Rales or noisy breathing
  - Drop in Egg Production
  - Sick bird syndrome (ADR)
  - Drop in egg production
Respiratory Viruses

Avian Influenza (Bird Flu)

- **Two forms:** High Pathogenicity and Low Pathogenicity
  - Pathogenicity: ability of an organism to cause sickness so high would make the bird very sick and low the bird maybe a carrier of the disease but show no signs of the disease

- **Signs:**
  - No signs
  - Severe depression – birds don’t move, feel bad
  - Swollen head, wattles, comb, head turns blue
  - due to lack of oxygen
  - Torticollis – head is twisted
  - Death

- **Transmission**
  - Bird to bird through nasal secretions, poop
  - Fecal contamination of Equipment
  - Litter
Treatment & Prevention of Avian Influenza (AI)

- AI is a reportable disease: must notify the state veterinarian’s office
- Treatment: NONE
- Prevention
  - Quarantine of the farm
  - BIOSECURITY
  - Clean and disinfect all equipment and the barn
  - Properly dispose of dead birds
  - Properly dispose of litter
Infectious Bronchitis (IB) & Laryngotracheitis (LT)

- Transmission: Same as AI
- Signs of LT
  - Blood on feathers and walls
  - Open mouth breathing
  - Very quiet in the house with a characteristic whistle coming from the birds
- Signs of Infectious Bronchitis:
  - Open mouth breathing
- Treatment for IB and LT: NONE
- Prevention: Vaccine
Bacterial Respiratory Diseases

- Infectious Coryza caused by the bacteria *Hemophilus gallinarum*
- Fowl Cholera caused by the bacteria *Pasteurella multocida* which produces a toxin

- Signs of these bacterial respiratory diseases
  - Swollen eyes, face, sinuses
  - Nasal discharge
  - Sneezing
  - Drop in egg production
  - Drop in feed and water consumption
  - With Fowl Cholera birds die without any signs

- Transmission
  - Bird to bird through bodily discharges
  - Fowl Cholera other animals can be intermediate carriers: rodents, possums, skunks, cats, wild birds, swine
Prevention & Control of Coryza and Cholera

• Biosecurity
  • Clean and disinfect equipment
  • Clean waterers daily
  • Change litter

• Proper Use of Antibiotics: have Veterinary Lab test to determine which work best

• Depopulate
Mycoplasma
Caused by *Mycoplasma synoviae* and *Mycoplasma gallisepticum*

- **Signs:**
  - Swollen sinuses
  - Rales: noisy breathing
  - Nasal Discharge
  - Coughing
  - Reduction in Feed Consumption
  - Weight Loss

- **Transmission:**
  - Vertical - Through the egg so monitored through NPIP
  - Horizontal
    - Bird to bird
    - Airborne dust, droplets
    - Contaminated Equipment
    - Humans
Mycoplasma

• Treatment
  • Proper Antibiotics – although it can persist in a flock

• Prevention: Biosecurity
  • Proper cleaning & disinfection
  • Replace litter

• Purchase only birds from NPIP participants
Aspergillosis (Brooder Pneumonia)

Aspergillus is a fungus

Signs
• Can affect hatching eggs
• Gasping
• Swollen eyes blindness
• Torticollis or twisted neck
• Cause nodules on the lungs which affects breathing

Prevention in the hatchery
• Set clean eggs
• Keep incubator & hatcher clean
• Avoid egg sweating before placing them in the incubator
• Good water management
Aspergillosis

Prevention in the barn

• Biosecurity
  • Clean DRY litter
  • Good Water management
  • Clean waterers daily
  • Keep everything clean and dry
Health Management Summary

Good Biosecurity: Keeping our birds healthy is our number one job in poultry management and is just one of the million little things we do to keep our birds healthy, happy and productive

- A good program for Cleaning and disinfection daily, weekly, monthly, yearly
- Good pest control
- Good Ventilation
- Good litter management
- Clean the poop from under roosts daily

Observe your flock daily are any birds standing by themselves

- Look for changes in behavior
- Look at the poop
- Pick your birds up: since birds are prey when they are sick they try to act like they are not sick so they will fluff up their feathers and make themselves seem bigger than they are so they don’t get picked on
Health Management Summary

The monogastric digestive system of birds relies heavily on absorption so interference with that absorption can mean life or death for a bird.

Digestive Disease Signs

- Sick Bird Syndrome or Ain’t Doin Right (ADR)
- Droopy
- Down on their haunches
- Diarrhea
- Poor growth
- Weight loss
- Drop in Egg Production
- Drop in feed and water consumption
Health Management Summary

• Since birds have a unique respiratory system with two stationary lungs that exchange blood gases + 8 air sacs + pneumatic bones which help with air exchange, the respiratory system of birds is very vulnerable.

• Respiratory Disease Signs
  • Swollen head, comb, sinuses, wattles
  • Difficulty breathing
  • Rales: noisy rattle in the lungs when breathing
  • Discharge from nares, mouth
  • Coughing
  • Gasing
  • Torticollis twisted neck
  • Dirty Shoulders
Sample Questions

Cloverbud
What is the true stomach of a chicken called?
   a. Proventriculus
   b. Crop
   c. Esophagus
   d. Gizzard

What is the treatment for Avian Influenza (Bird Flu)?
   a. Antibiotics
   b. Vaccine
   c. Sulfa drugs
   d. There is no treatment
Sample Questions

Junior

What causes Aspergillosis?

a. Bacteria
b. Virus
c. Fungus
d. Mycoplasma

What is the gizzard of the chicken lined with?

a. Grit
b. Koilin
c. Lipid
d. Enzymes
Sample Questions

Senior
What is one way to prevent Coccidiosis in Birds?

a. Antibiotics
b. Sulfur drugs
c. Vaccine
d. None of the above

What is another name for round worms?

a. Coccidia
b. Ascarids
c. Nematodes
d. B & C