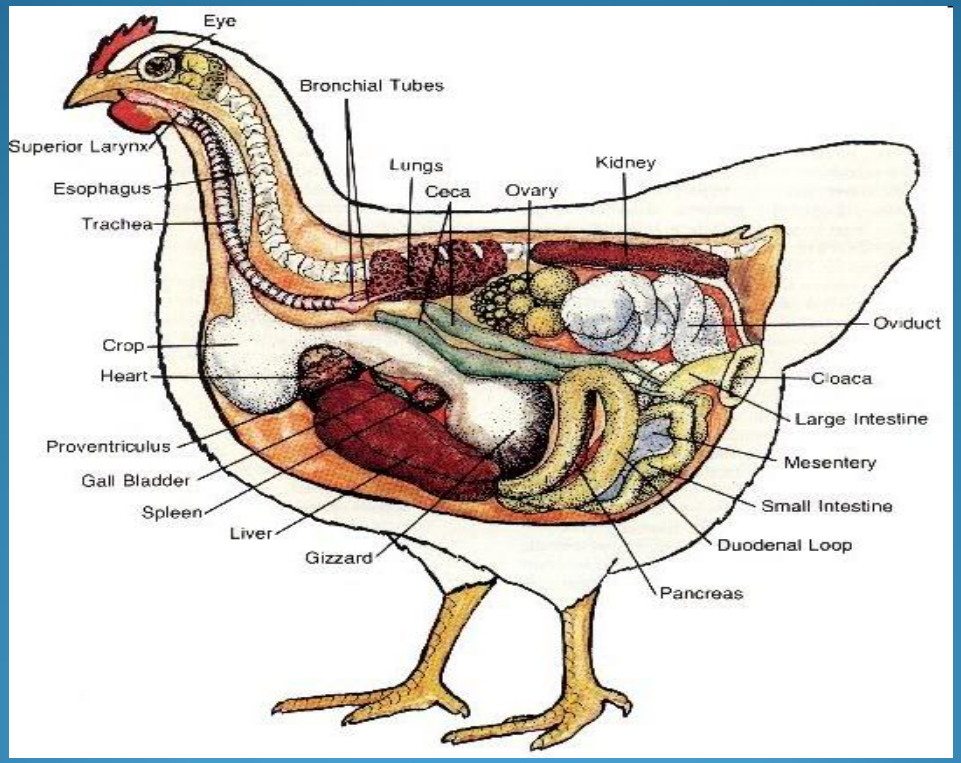
Anatomy and Physiology of Poultry



Parts and Purpose

What is different about the bird compared to mammals?

- Feathers
- Lack teeth
- Lay eggs
- Float and fly
- Waste excreted from only one orifice

What is Anatomy?

- Anatomy: the science of the structure of animals.
- Derived from the Greek work “to cut up.”

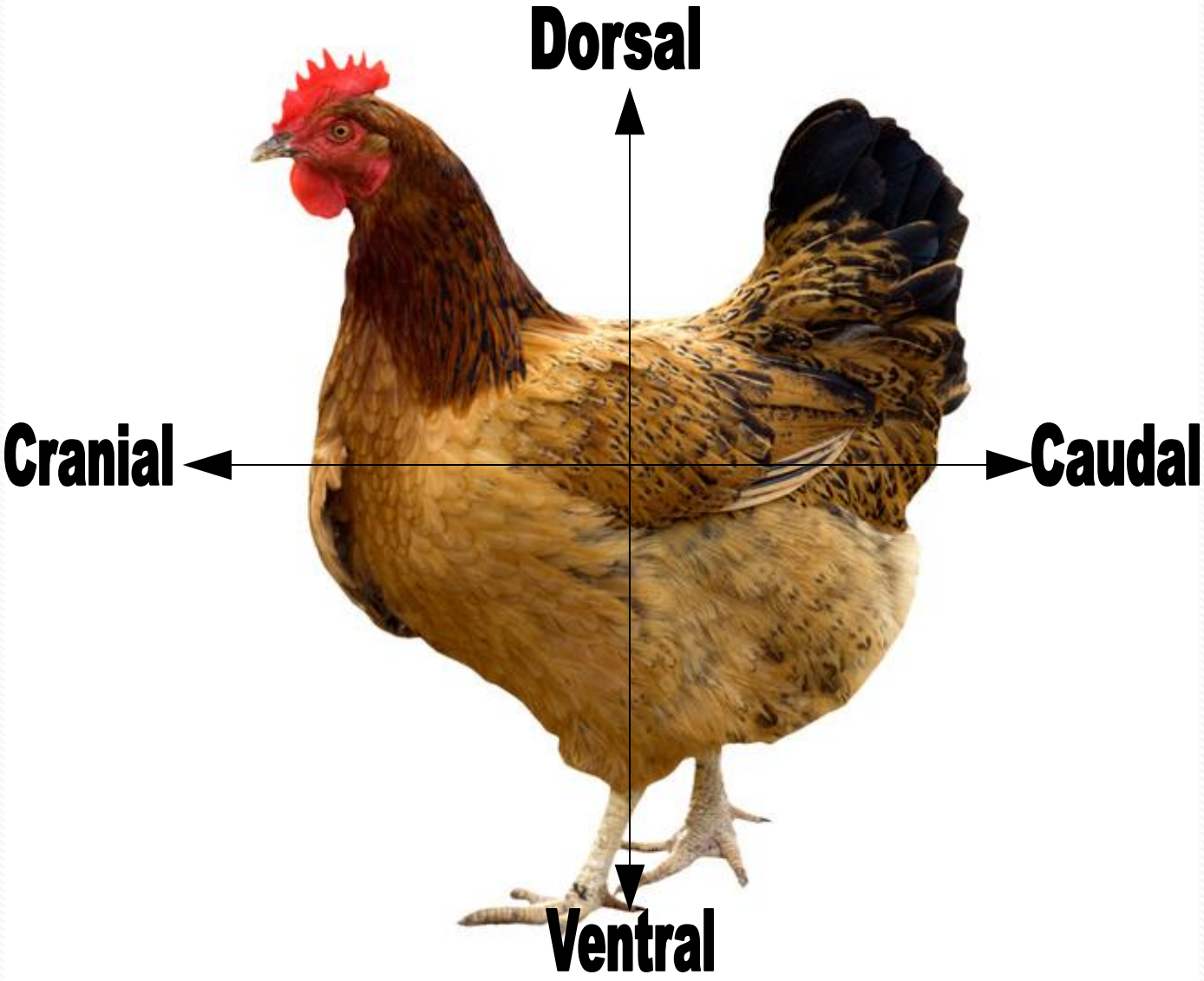
What is Physiology?

- Physiology: the science that deals with the functions of the living organism and its parts.

Anatomical Terms

- The following terms are used to describe locations on the animal body.
  - Dorsal: pertains to the upper surface of the animal.
  - Ventral: relates to the lower and abdominal surface.
  - Cranial (or anterior): applies to the front or head.
  - Caudal (or posterior): pertains to the tail or rear.

Anatomical Directional Terms



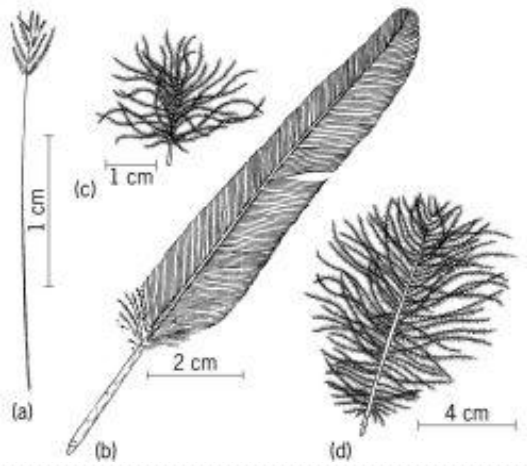
Body Systems of Poultry

- Integumentary
- Respiratory
- Skeletal
- Digestive
- Circulatory
- Urinary
- Reproductive

Integumentary System

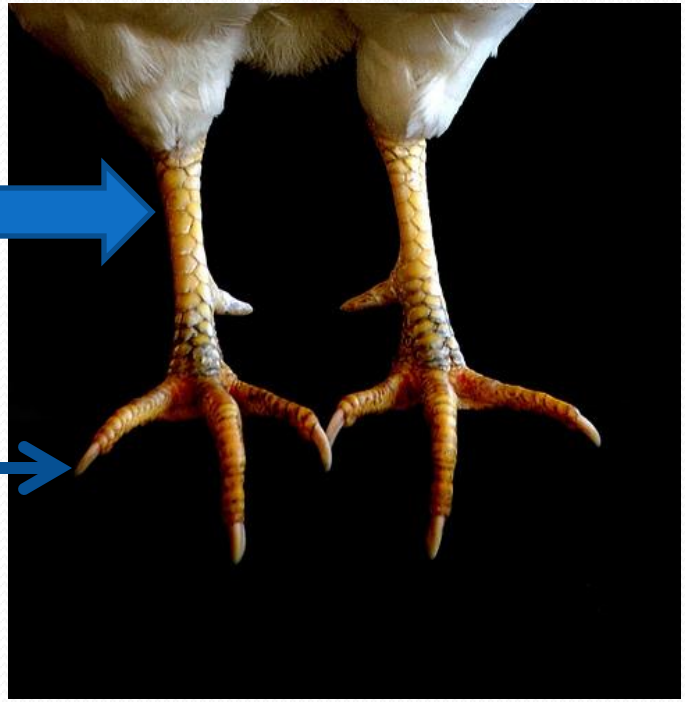
- The skin, feathers, and beak.
  - Function: to protect the bird from external harm.
- Skin
  - Much like humans, with the exception of plumage production.
  - **Plumage**: the outer covering of a bird's body.
    - Feathers, scales, filoplumes.
      - **Filoplumes:** hair-like structures located at the base of feathers.
  - ***Wattle:*** a red growth underneath the beak, which works in conjunction with the ***comb***, an excess of skin on top of their head.
    - Function: circulation of blood between the two regulate the temperature of the bird.
    - The size of the comb is an indication of the levels of testosterone in the body. If the comb is large, then this means more testosterone is present, often meaning the sex of the bird is male.

Filoplume



Scales

Nails



Comb

Beak

Wattle

Plumage

Scales and Plumage

- Scales are located on the legs and feet.
- The plumage is always for altered shape.
  - Function: body cooling and heating for maintenance of body temperature, protects against abrasions and bruises when birds are in groups or lying on the ground.
  - Plumage shape is particularly important for cooling since birds lack sweat glands.
  - Although it is not common for production birds to fly, plumage type and form is an important determinant in flight for aerial species.

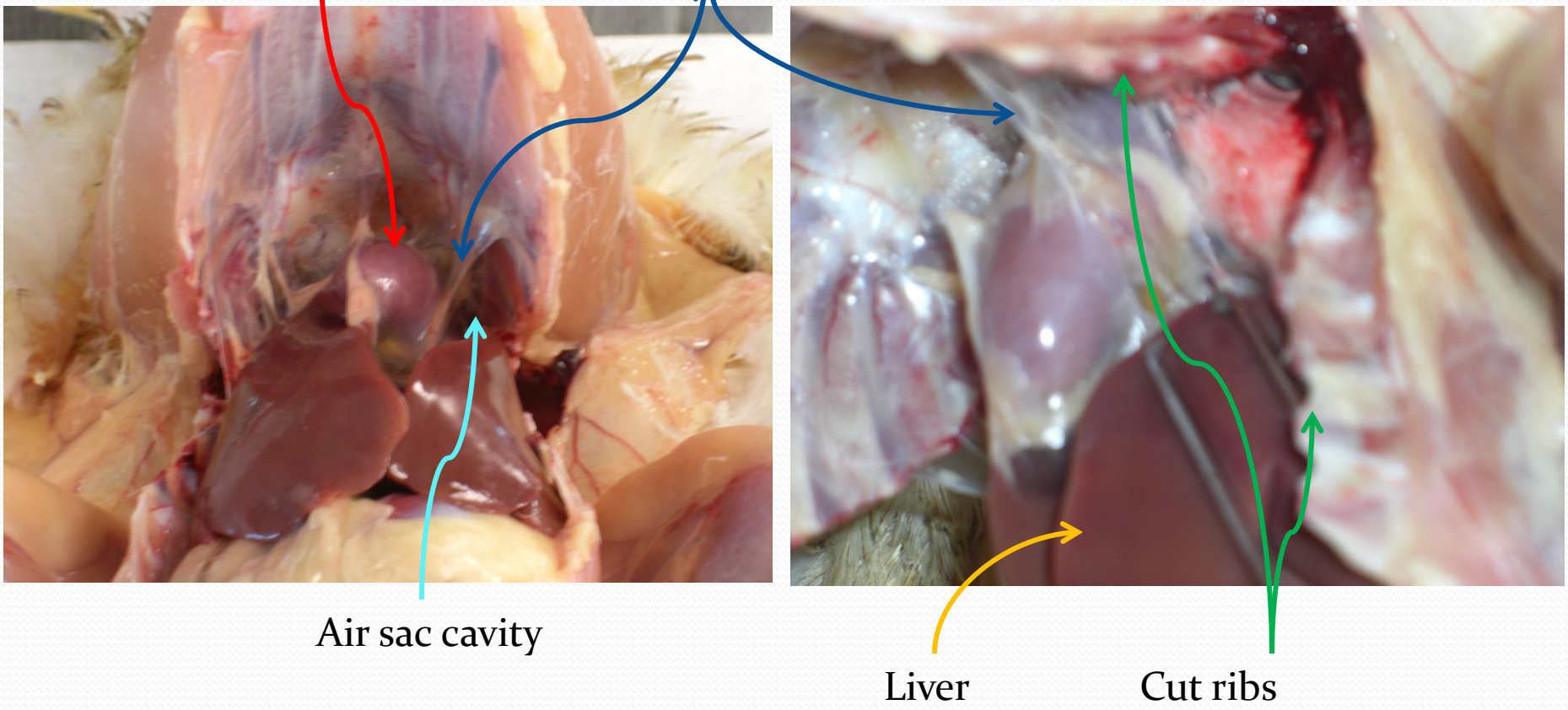
Beaks vs. Lips and Teeth

- Birds have beaks as opposed to lips and teeth.
- The beak is used for eating and drinking, as well as in self-defense and protection from other animals.

http://www.youtube.com/watch?v=ir81HfA6AoI

Respiratory System

- Vastly different than the mammalian respiratory system.
- Unlike mammals, birds lack a diaphragm to inflate and deflate the lungs.
  - Instead, birds have nine ***air sacs*** located in the neck region and body cavity that function to inflate the lungs.
  - Gas exchange occurs in the Avian lung and the air sacs function to move air in and out of the respiratory system.


Heart
Air sac membrane
Air sac cavity
Liver
Cut ribs

- Breathing process has two phases: inhalation and exhalation.
  - ***Inhalation***: when the bird breathes in, air bypasses the lungs and enters the posterior air sacs. At the same time, air in the lungs from the last exhalation phase exits the lungs and enters the anterior air sacs.
  - ***Exhalation***: the bird releases air from the posterior air sacs, which enters the lungs. The air that filled the anterior air sacs from the inhalation phase is then released from the body through the trachea.
- ***Nares*** are the nostrils located on the beak. Their purpose is the passageway for air to be breathed in and out of the trachea.

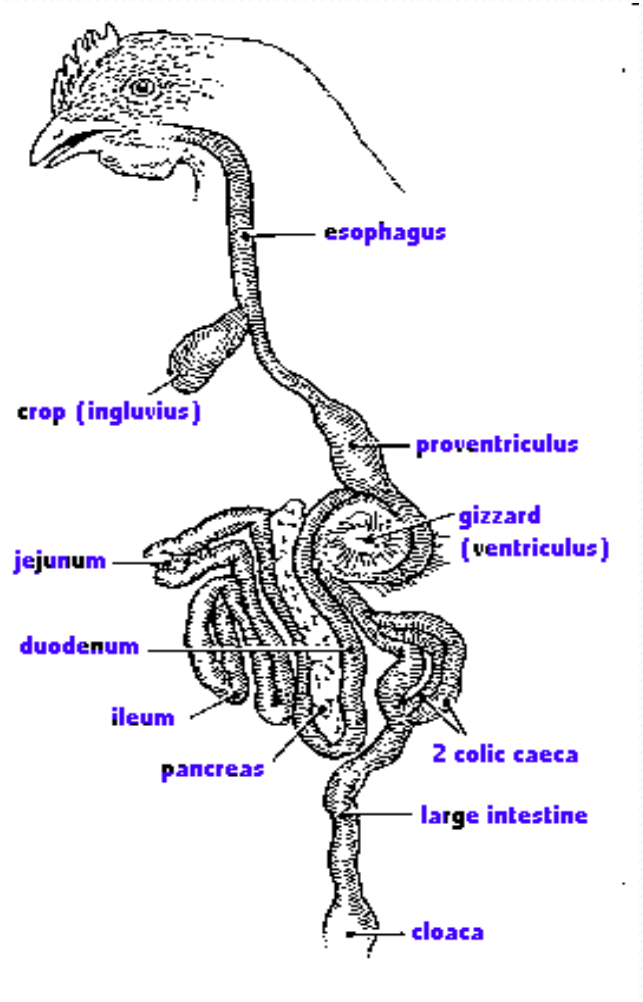
http://www.youtube.com/watch?v=LbJUoocOKdo


Nares

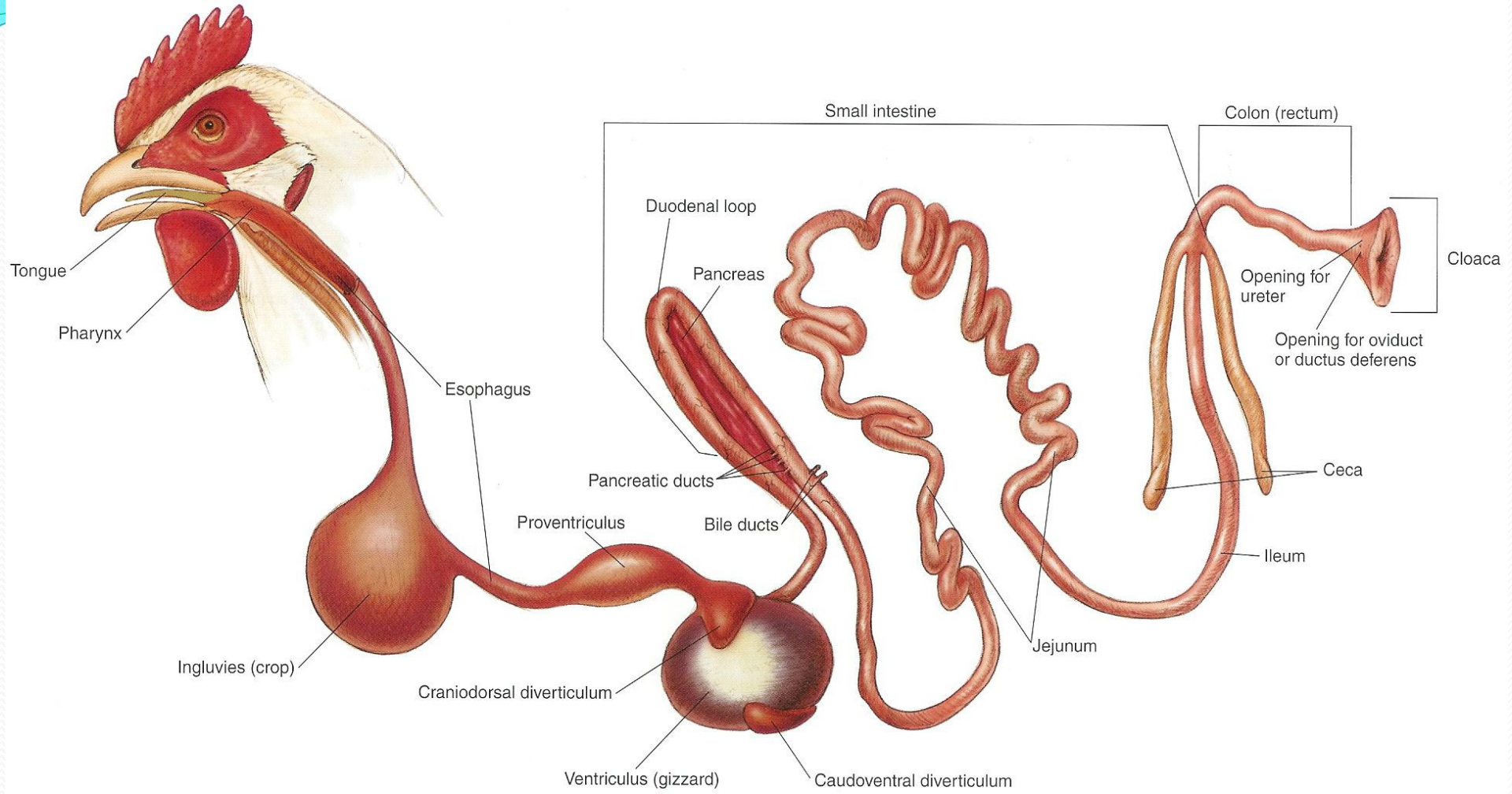
Skeletal System

1. Pneumatic Bones
   - Poultry have ***pneumatic***, or hollow, bones.
   - Connect with the respiratory system.
   - Their light weight is an adaptation for flight.
2. Medullary Bone
   - ***Medullary*** bone contains high amounts of calcium.
   - Storage source is used by the *female hen* to produce the egg shell during reproductive periods.
3. Fused Bones
   - Bones in the foot, or ***shank***, are fused.
   - Cause birds to walk upright.
   - Many vertebrate along the backbone are fused for the purpose of flight.

Digestive System

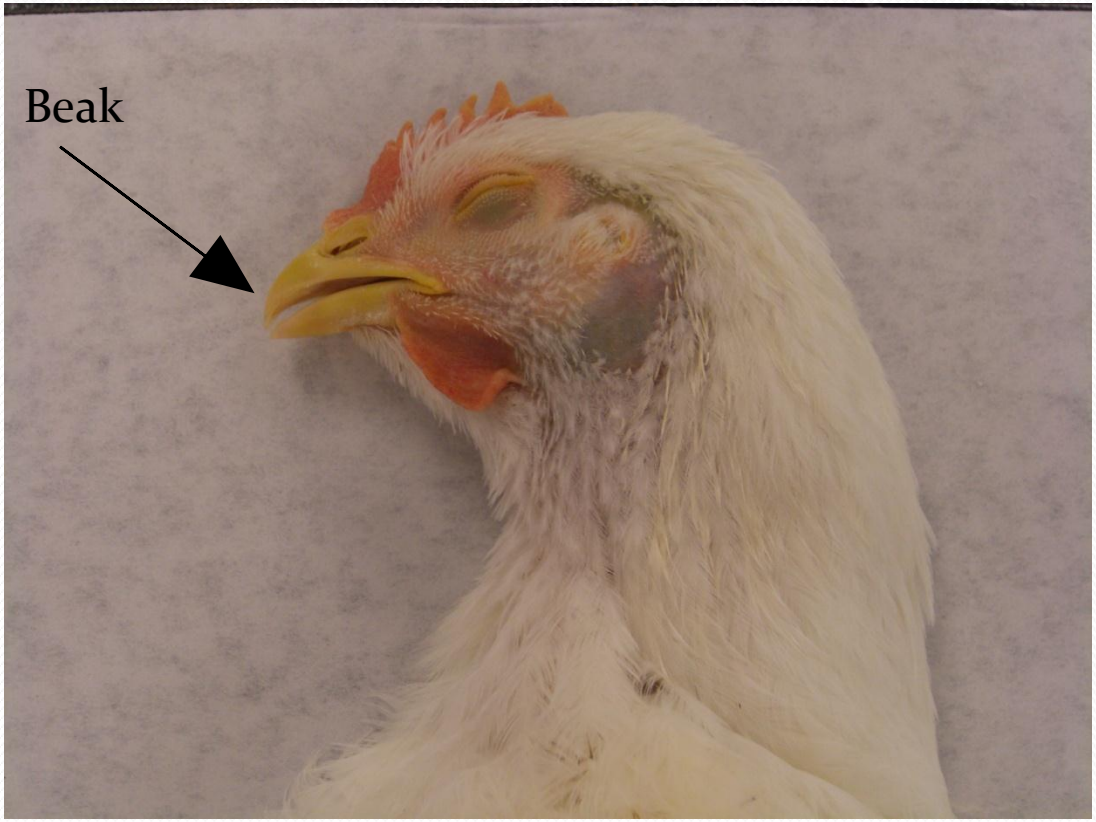


The University of Arizona: species info. Chickens and Turkeys 2008


Small intestine
Colon (rectum)
Duodenal loop
Pancreas
Tongue
Pharynx
Esophagus
Opening for ureter
Cloaca
Opening for oviduct or ductus deferens
Ceca
Pancreatic ducts
Bile ducts
Proventriculus
Ileum
Jejunum
Ingluvies (crop)
Craniodorsal diverticulum
Ventriculus (gizzard)
Caudoventral diverticulum

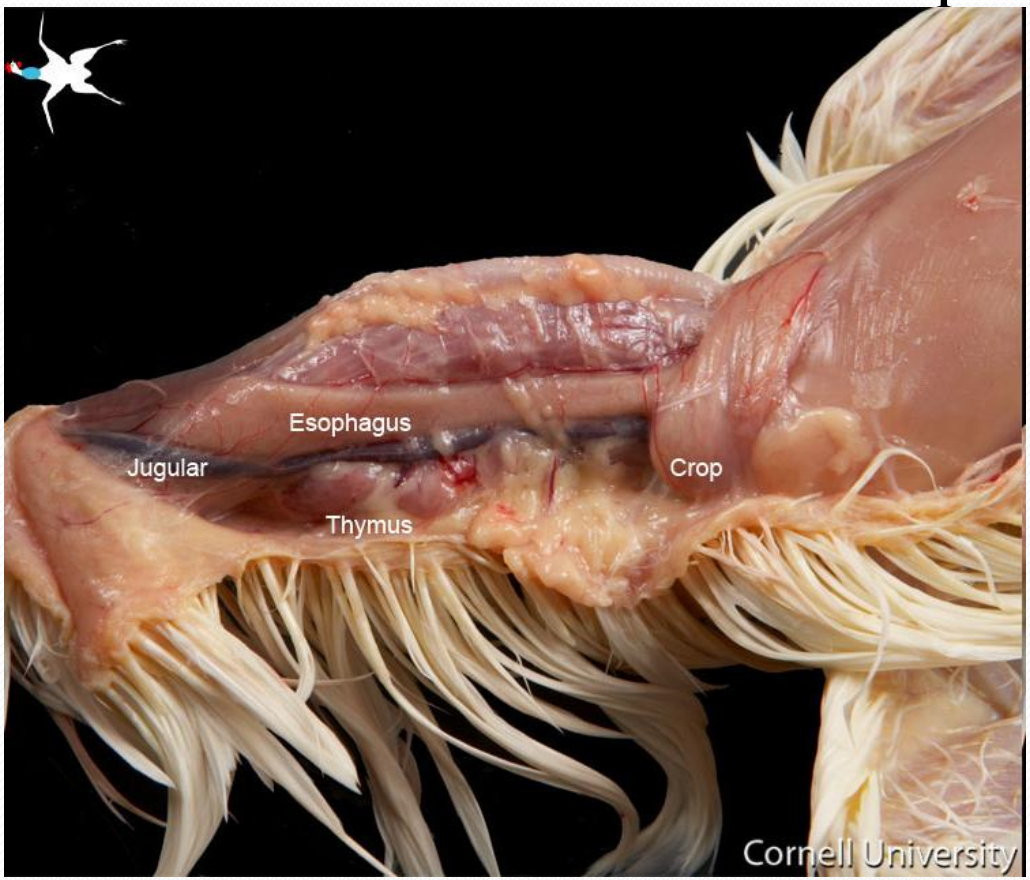
Parts of the Mouth

- Tongue
- Beak
- Taste buds



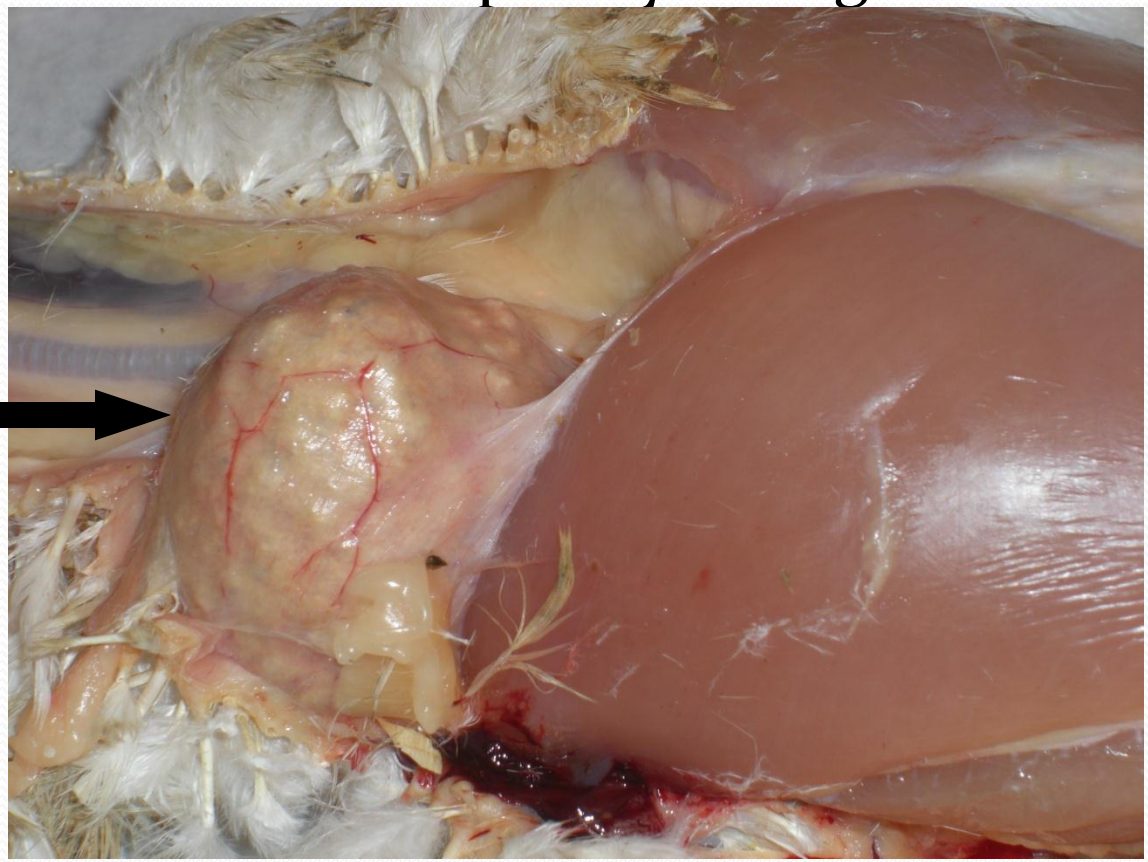
Esophagus

- Flexible tube that connects mouth to the crop.

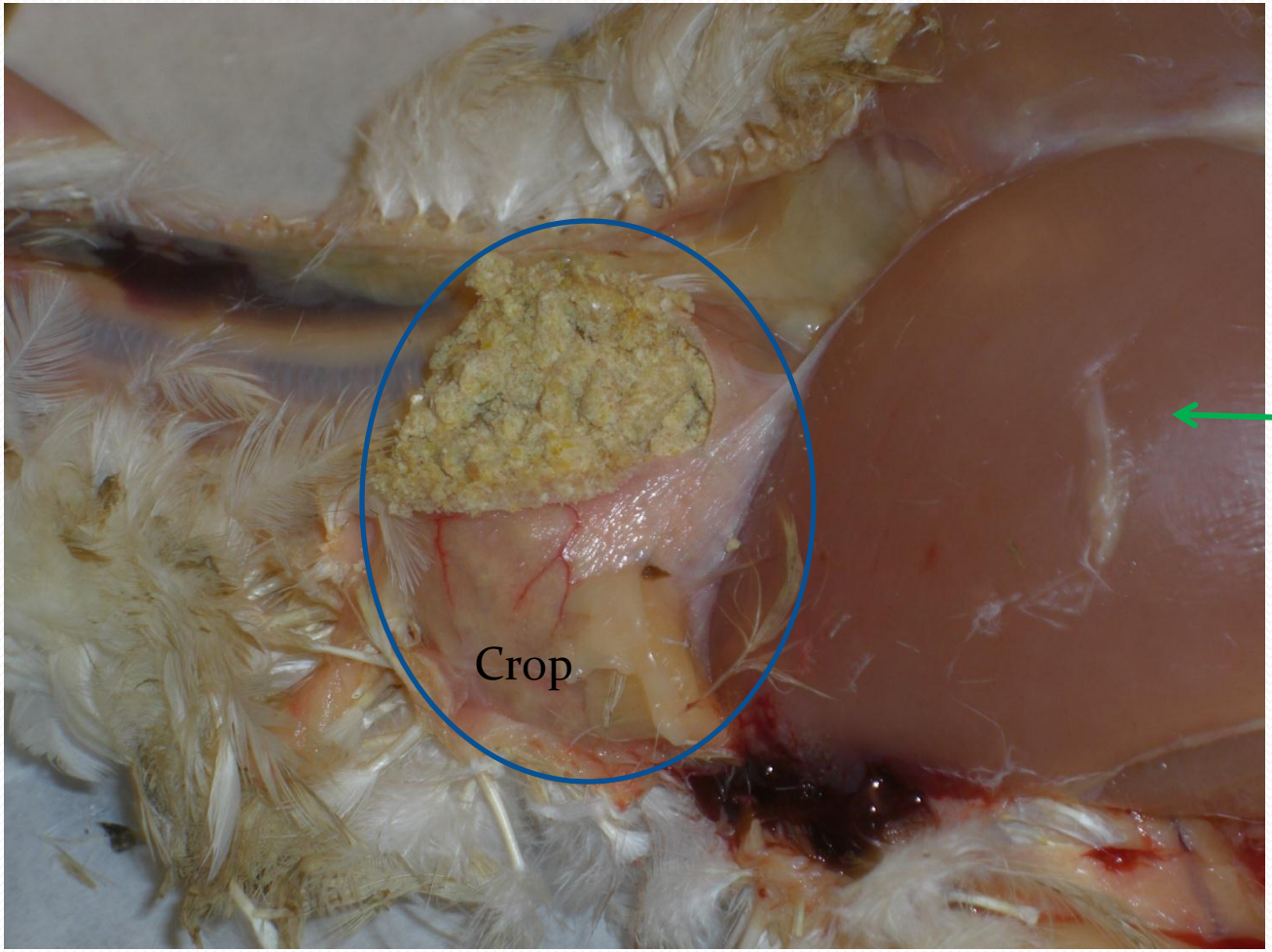


Crop

- Function: moisten and temporary storage of food

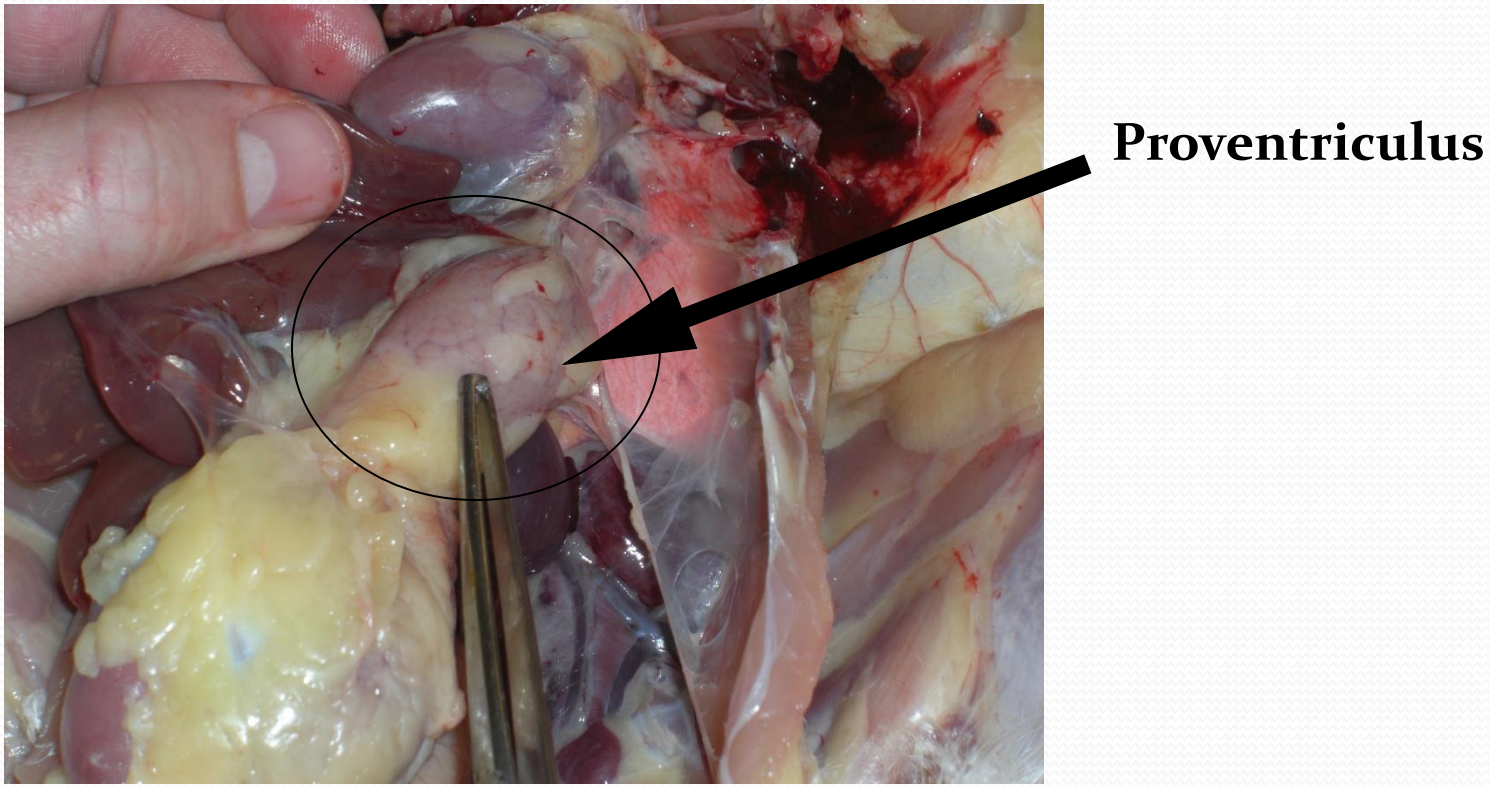


This is a picture of and opened crop. Notice the yellow feed pellets that have been moistened while they were stored in this chicken's crop.



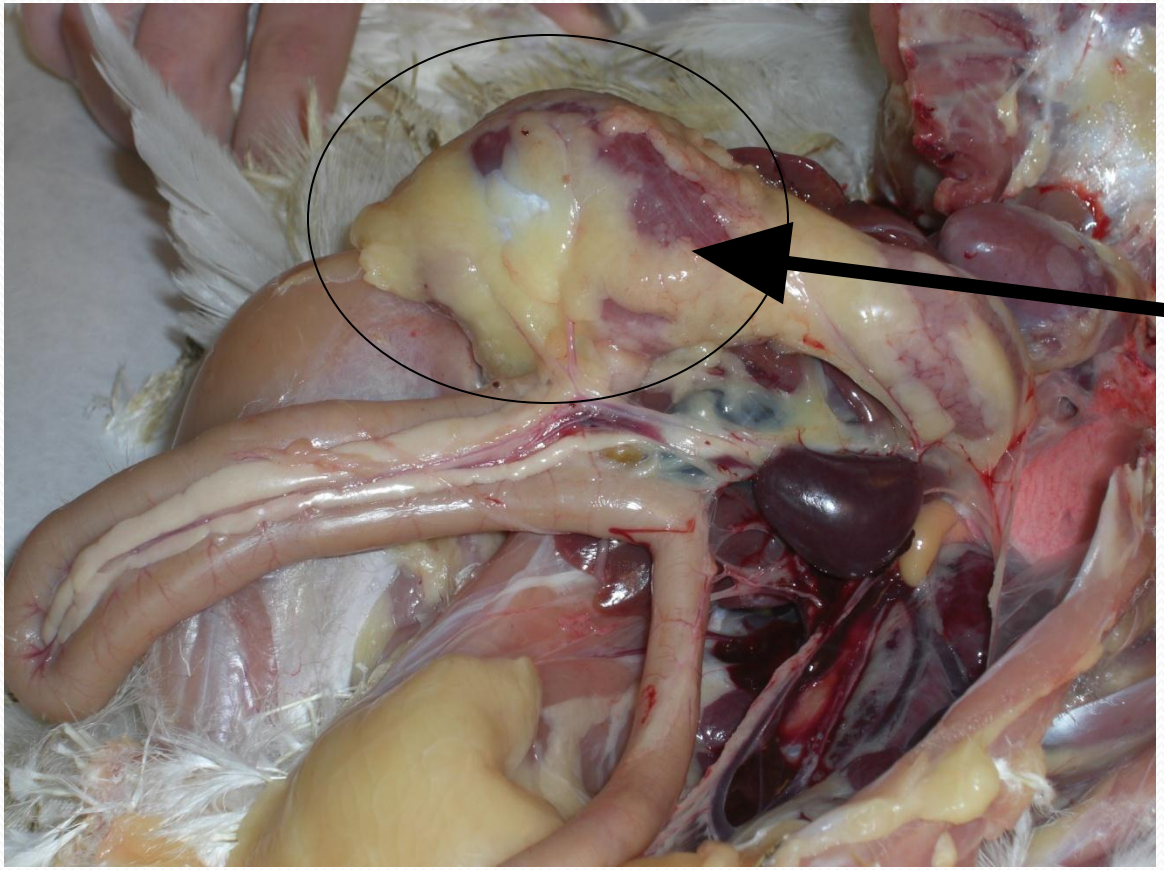
Proventriculus

- The stomach of the bird.
- Function: uses acids and digestive enzymes to breakdown food.

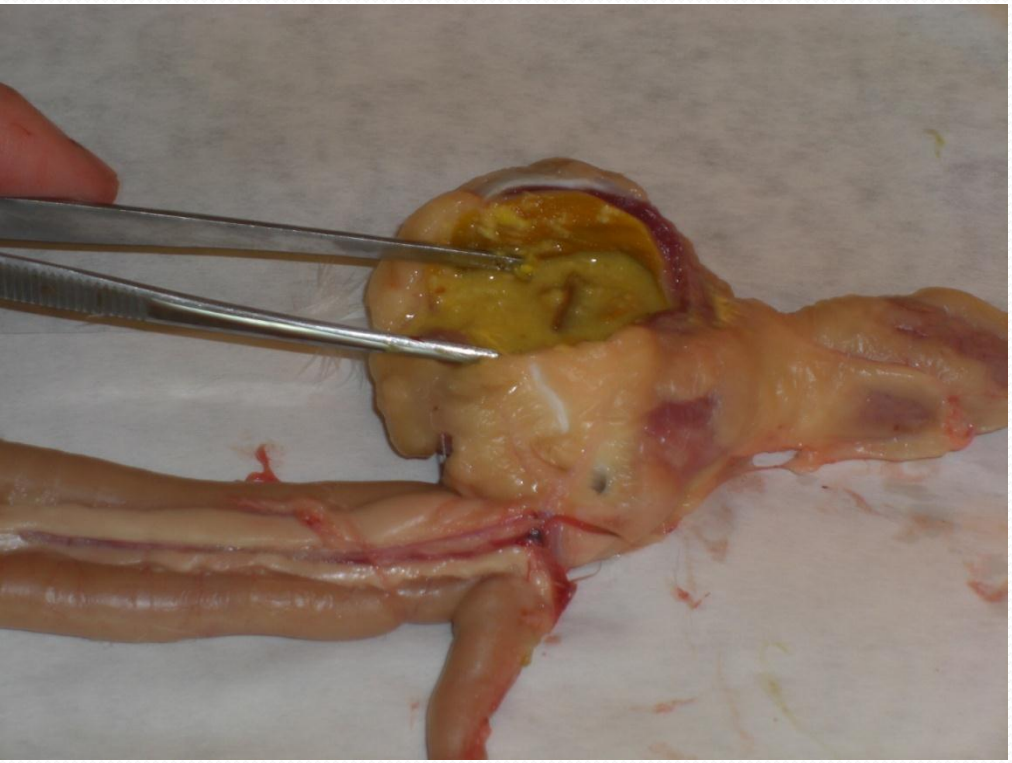


Gizzard

- Function: like “teeth,” it mechanically grinds up food particles.



These pictures show a gizzard that has been opened. Notice how the feed inside it has been further digested.



Small Intestines

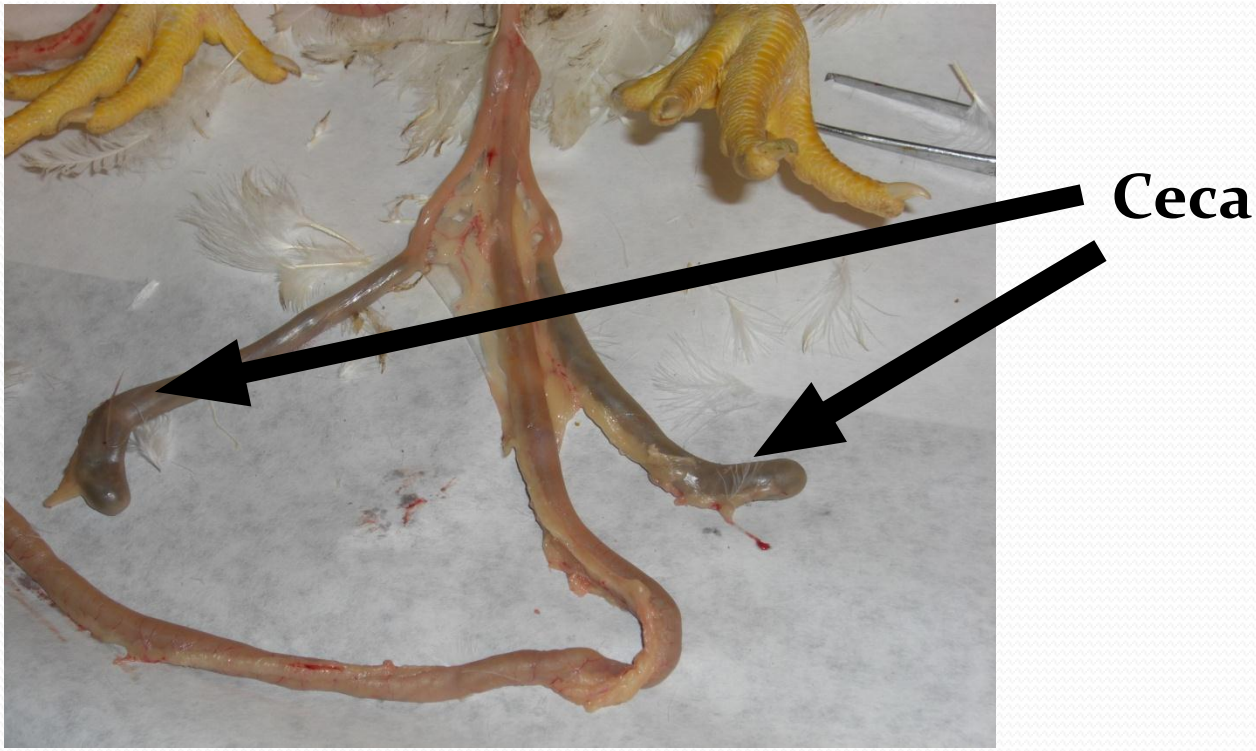
- Three sections:
  - Duodenum
  - Ileum
  - Jejunum

Function: absorption of nutrients from food.

Small Intestines

Ceca

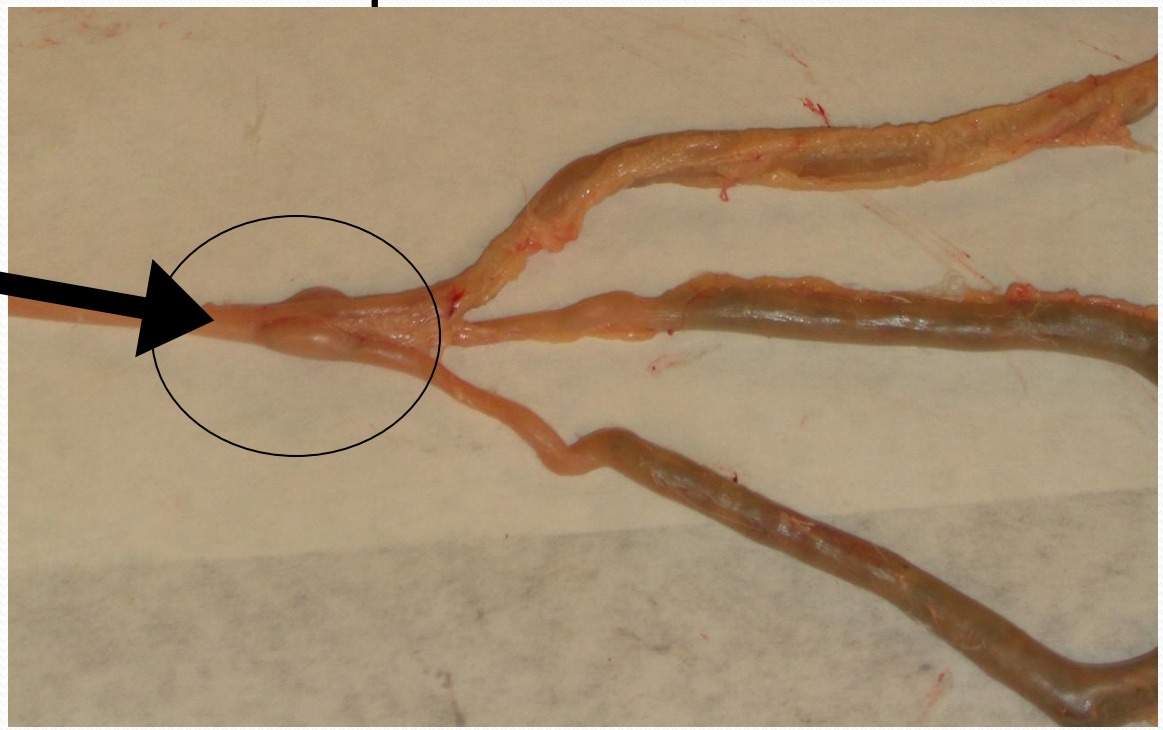
- Two ceca that are terminal pouches.
- Function: fermentation of any left over food particles/ water absorption.



Colon

- A.K.A. Large intestine
- Function: Further water absorption

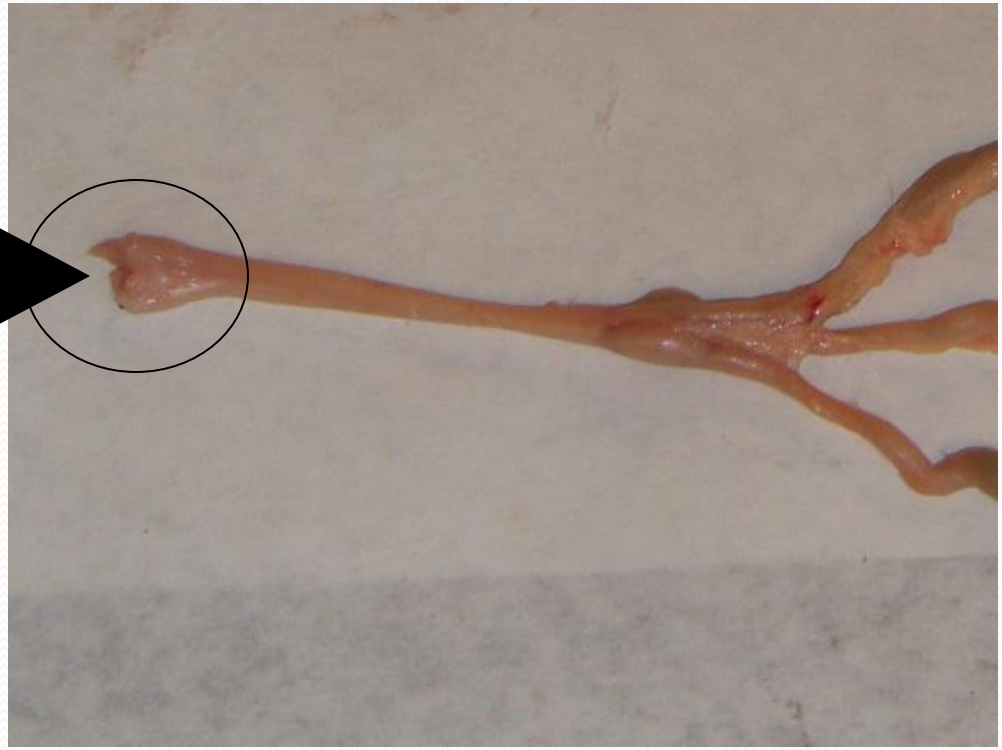
Large Intestine



Cloaca

- Also known as the vestibule.
- Function: responsible for expulsion of feces and urine through the vent.

Cloaca



Liver

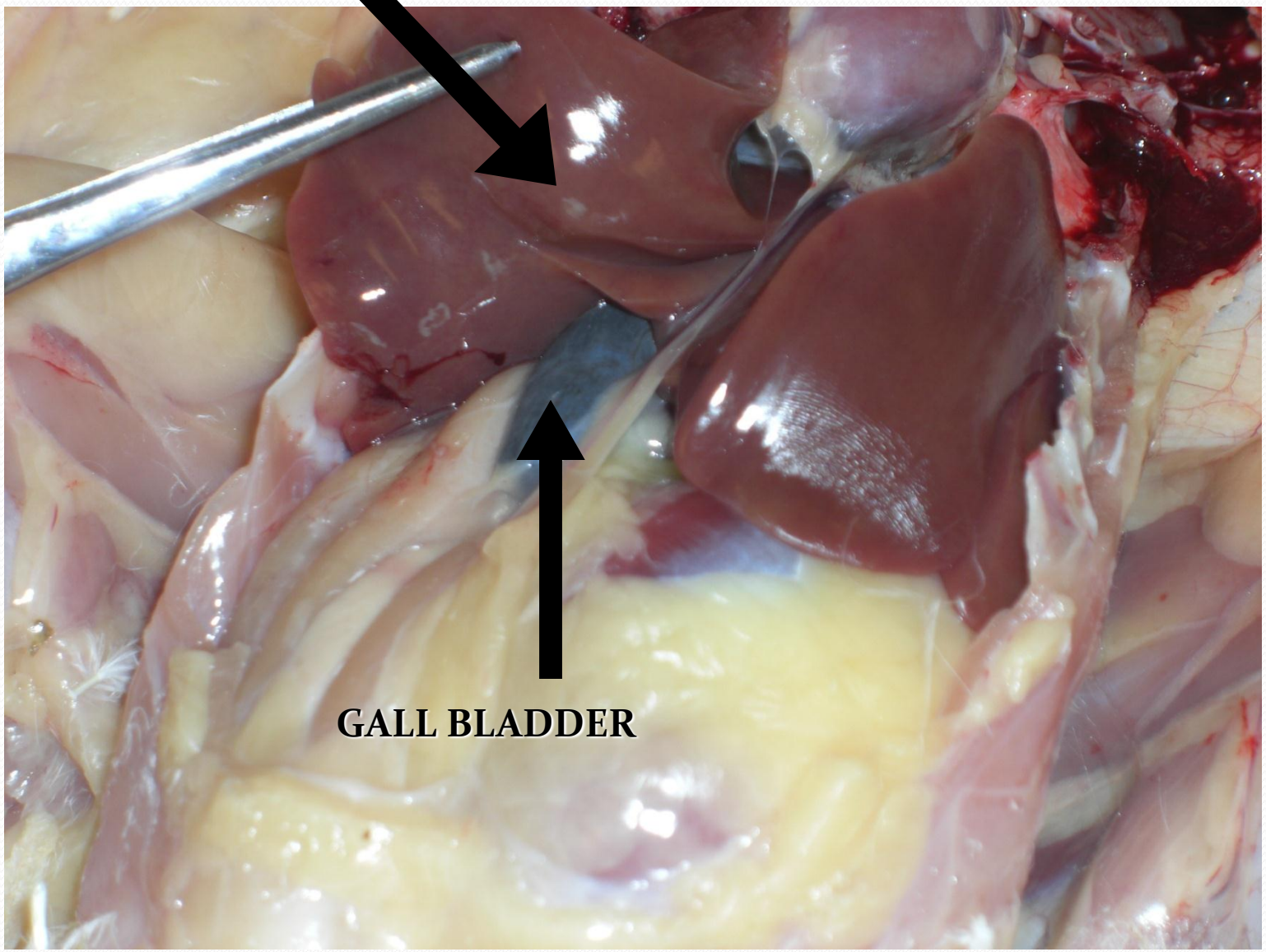
- Multi-lobed organ
- Functions:

  - produce bile to digest fats (stored in gall bladder).

  - detoxification

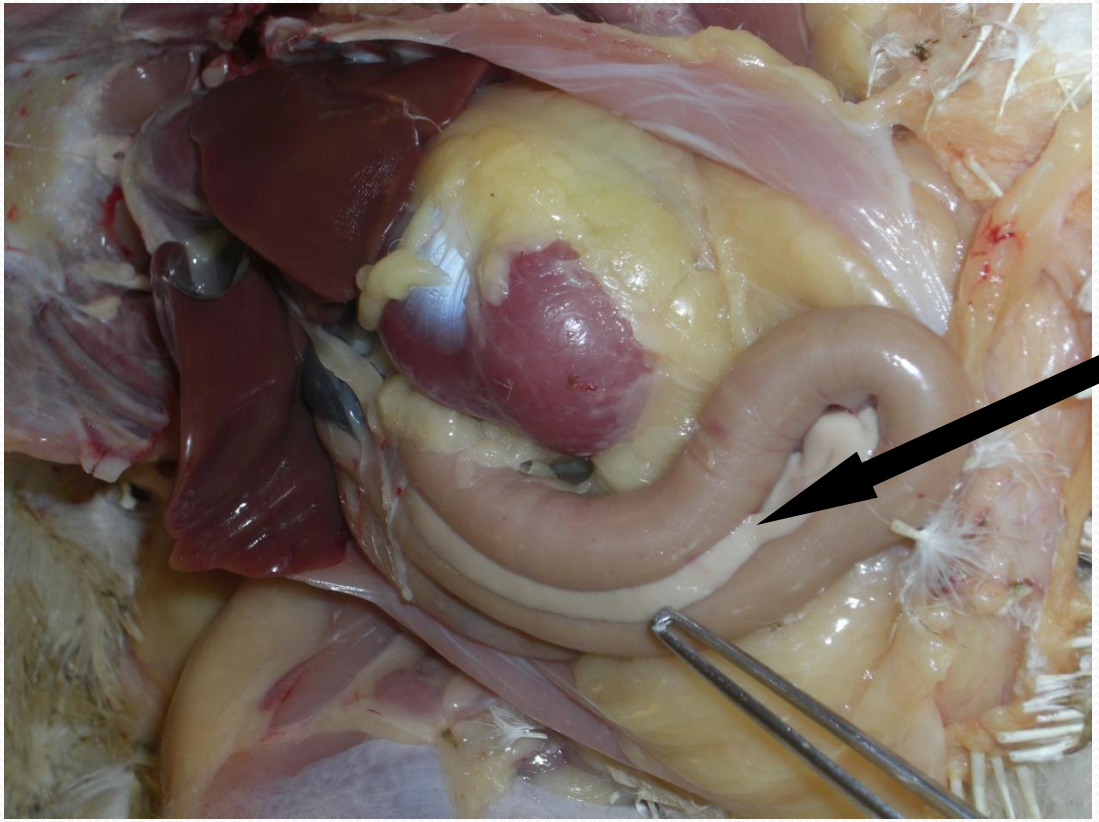
  - store fat and fat-soluble vitamins (i.e., A,D,E, K)

  - metabolize fats, carbohydrates, and proteins that are in the diet.

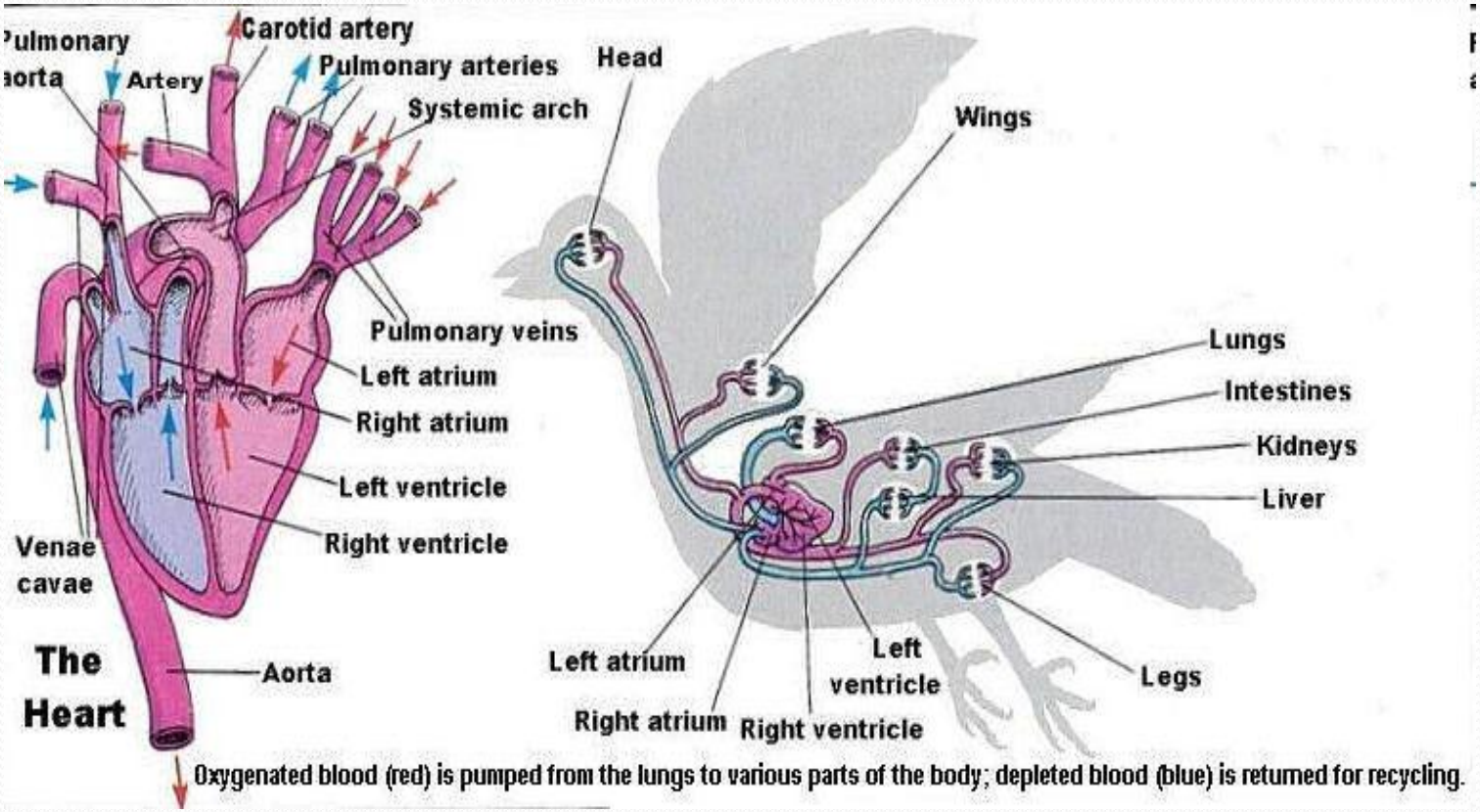

LIVER
GALL BLADDER

Pancreas

- Function: Produces insulin, useful in carbohydrate digestion.



Circulatory System



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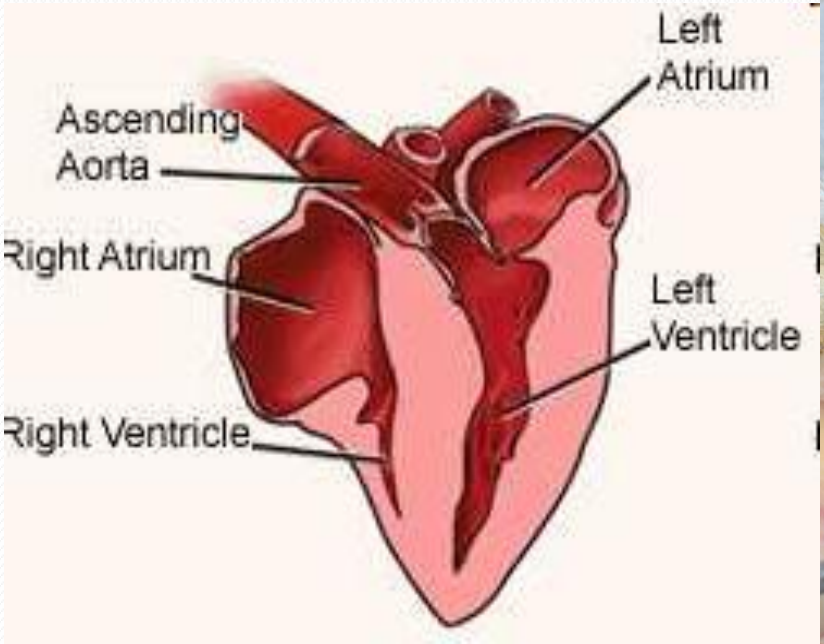
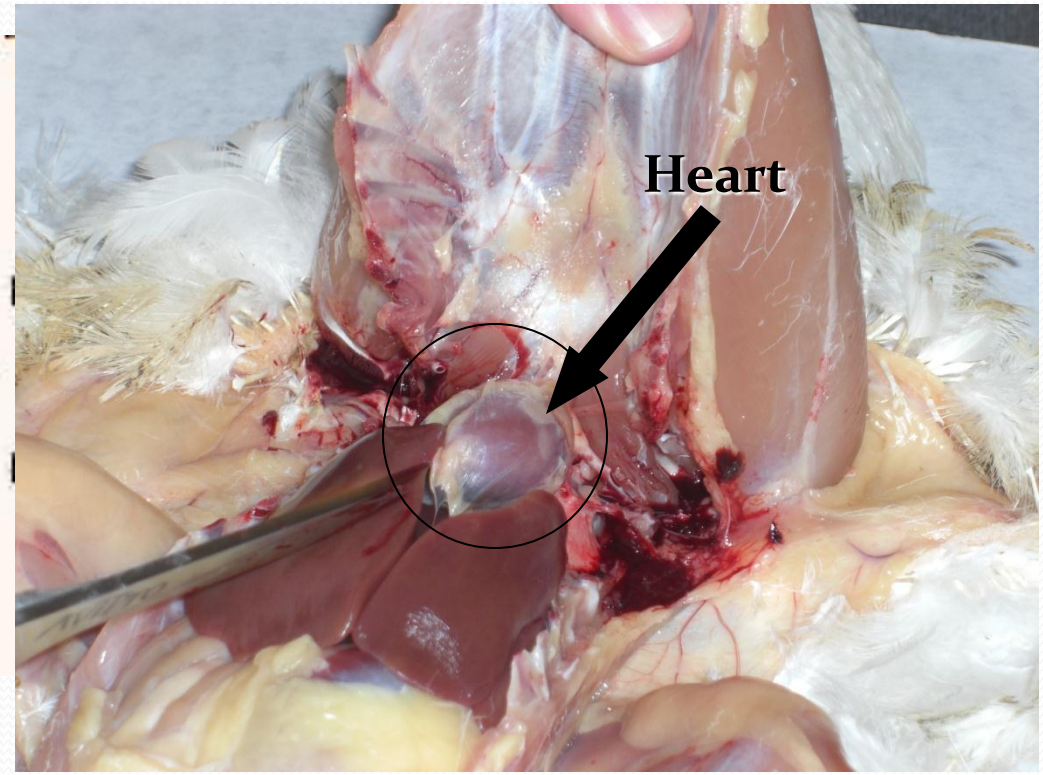
Heart

The heart pumps blood throughout the body to deliver oxygen and nutrients to tissues and to remove carbon dioxide and metabolic waste from tissues.



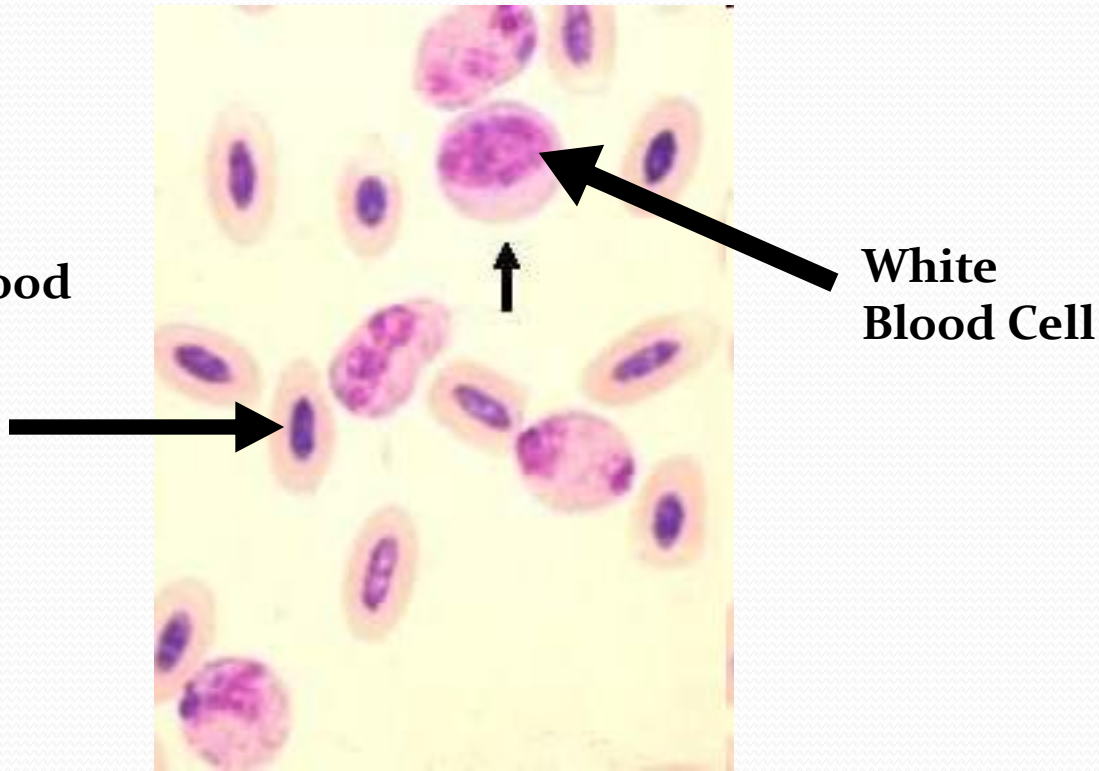


Blood Vessels

- Arteries: carries blood from heart & to the rest of the body.
- Arterioles: directs blood to certain tissues of the body.
- Capillaries: site of exchange between blood and tissues.
- Veins: brings oxygenated blood back to the heart.

Blood

- Components of Blood:
  - Red Blood Cells (erythrocyte)
  - White Blood Cells (leukocyte)
  - Plasma



Urinary System

- A. Kidneys
  - Two multi-lobular structures located in the rib cage.
  - Produce urine by removing waste products from the blood.
- B. Ureters
  - Transports the liquids kidney filtrate from the kidneys to the cloaca for excretion.
  - Birds do not have a bladder.
    - Urine is not stored, but rather excreted when produced.
- C. Cloaca
  - Feces and urine exit out of the bird's body through this region in the abdominal cavity.
- D. Uric Acid Excretion
  - Poultry excreta contain ***uric acid***.
    - Very high in nitrogen due to its lowered water content is semi-solid.

Male Reproductive System

1. Two testes located internally in the body.
2. ***Ductus Deferens***

- Deliver semen from the testes to the phallus.

3. ***Rudimentary phallus***

- Poultry have no external penis, but rather an internal protuberance termed a ***rudimentary phallus***.

Female Reproductive System

1. Ovary

   -Poultry have only one functioning ovary, usually the left ovary.

2. Oviduct

   a. Function: to produce albumen (egg white), shell membrane, and the shell around the yolk.

   b. Five regions

      1. Infundibulum: receives the follicle and is the location of conception where the male and female gamete come together.

      2. Magnum: produces the albumen.

      3. Isthmus: produces the inner and outer shell membranes.

      4. Uterus: plumps the egg, forms the shell and cuticle (seals pores of the egg shell) and determines the shell pigment.

      5. Vagina: produces some cuticle, and expels the egg and regulates timing of egg production.

Female Reproductive System

3. Cloaca

- Also known as the vestibule. The common chamber through which the egg passes is also responsible for the expulsion of feces and urine.

4. Vent

- the exterior opening through which passage occurs from the digestive system, the urinary tract and the reproductive tract.

5. Ovulation

- The releasing of the egg yolk from the ovary to begin its journey through the oviduct.

6. Oviposition -the process of laying the fully formed egg which is regulated by hormones.

Don’t be chicken… ☺