

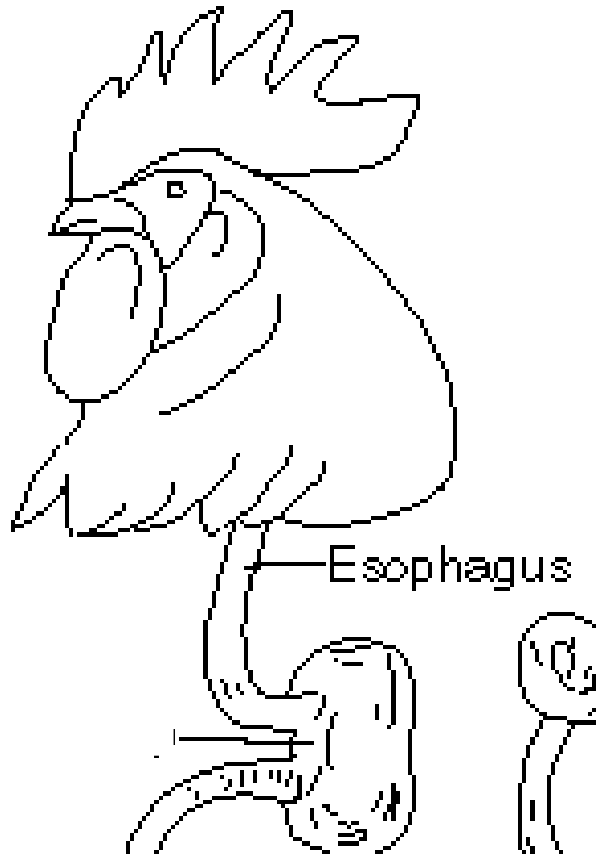
Unit B: Anatomy and Physiology of Poultry

Lesson 1: Internal Anatomy of Poultry

Terms

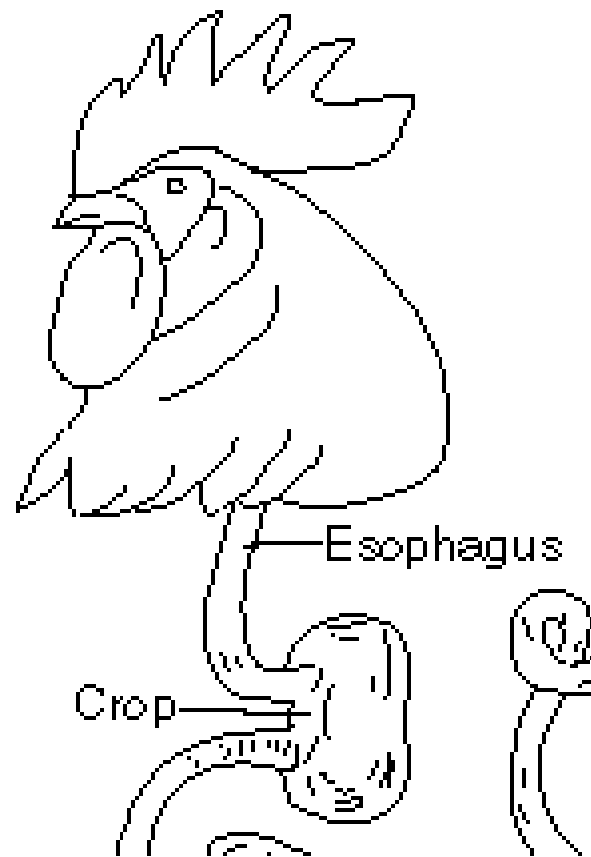
- abdominal air sacs
- air sacs
- bursa of Fabricius
- cervical
- cloaca
- colon
- coronary band
- crop
- diverticula
- duodenum
- esophagus
- gizzard
- glandular stomach
- goozle
- gullet
- ileum
- interclavicular air sac
- jejunum
- kidneys
- liver
- lungs
- muscular stomach
- ovary
- oviduct
- pancreas
- pericardial sac
- proventriculus
- rectum
- spleen
- syrinx
- testicle
- thymus
- thoracic
- trachea
- true stomach
- ureters
- uric acid
- vent
- ventriculus
- windpipe

- I. The digestive tract of the bird begins with the mouth, which does not contain lips or teeth.
 - A. As in mammals, the mouth is connected to the **esophagus**, also called the **goozle** or **gullet**.



B. In chickens the distal end of the esophagus has a specialized area for the storage of feed called the **crop**.

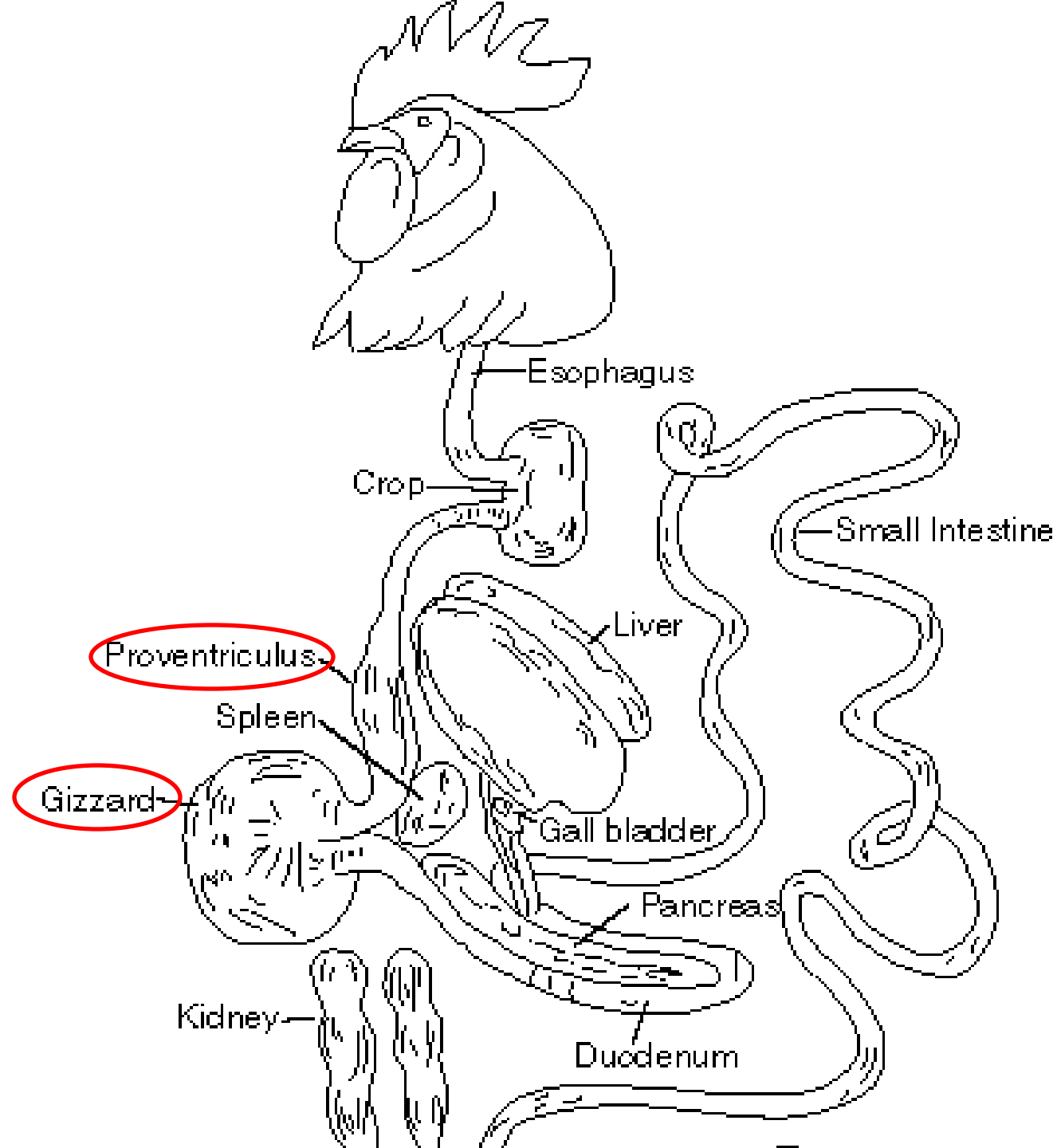
1. The **crop** is located at the base of the neck as it is viewed externally.



C. Following the crop is another short section of esophagus ending in the stomach.

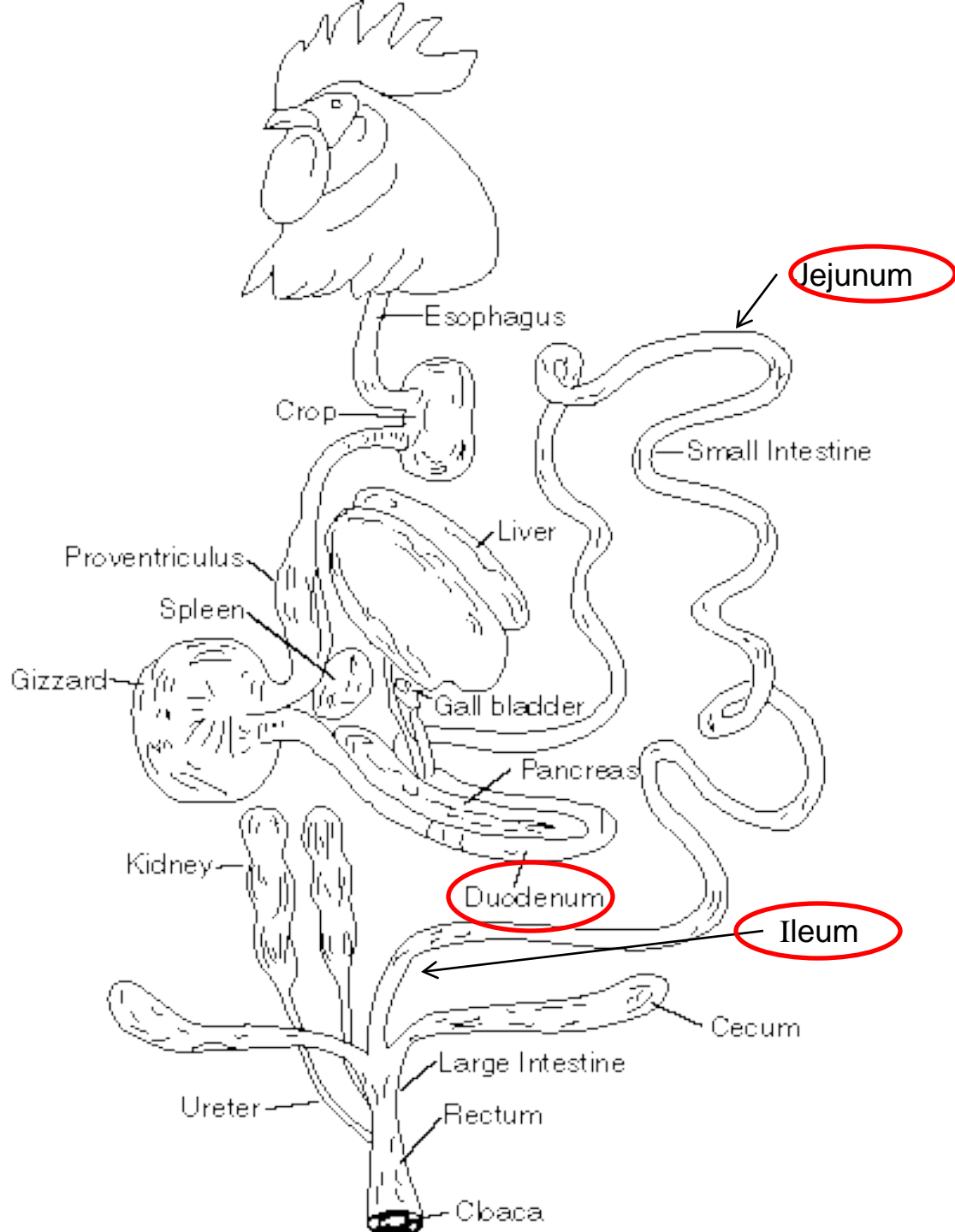
1. In birds the stomach consists of two parts.
2. The **proventriculus**, also called the **glandular stomach** or **true stomach**, is located near the end of the crop.
 - a. It secretes hydrochloric acid and pepsin, which are used to aid in protein digestion.

3. The **ventriculus**, also called the **gizzard** or the **muscular stomach**, is near the end of the proventriculus, and is much larger and more muscular in appearance when compared to the proventriculus.
 - a. The major function of the ventriculus is to grind the food.
 - b. This grinding action prepares the food for digestion.



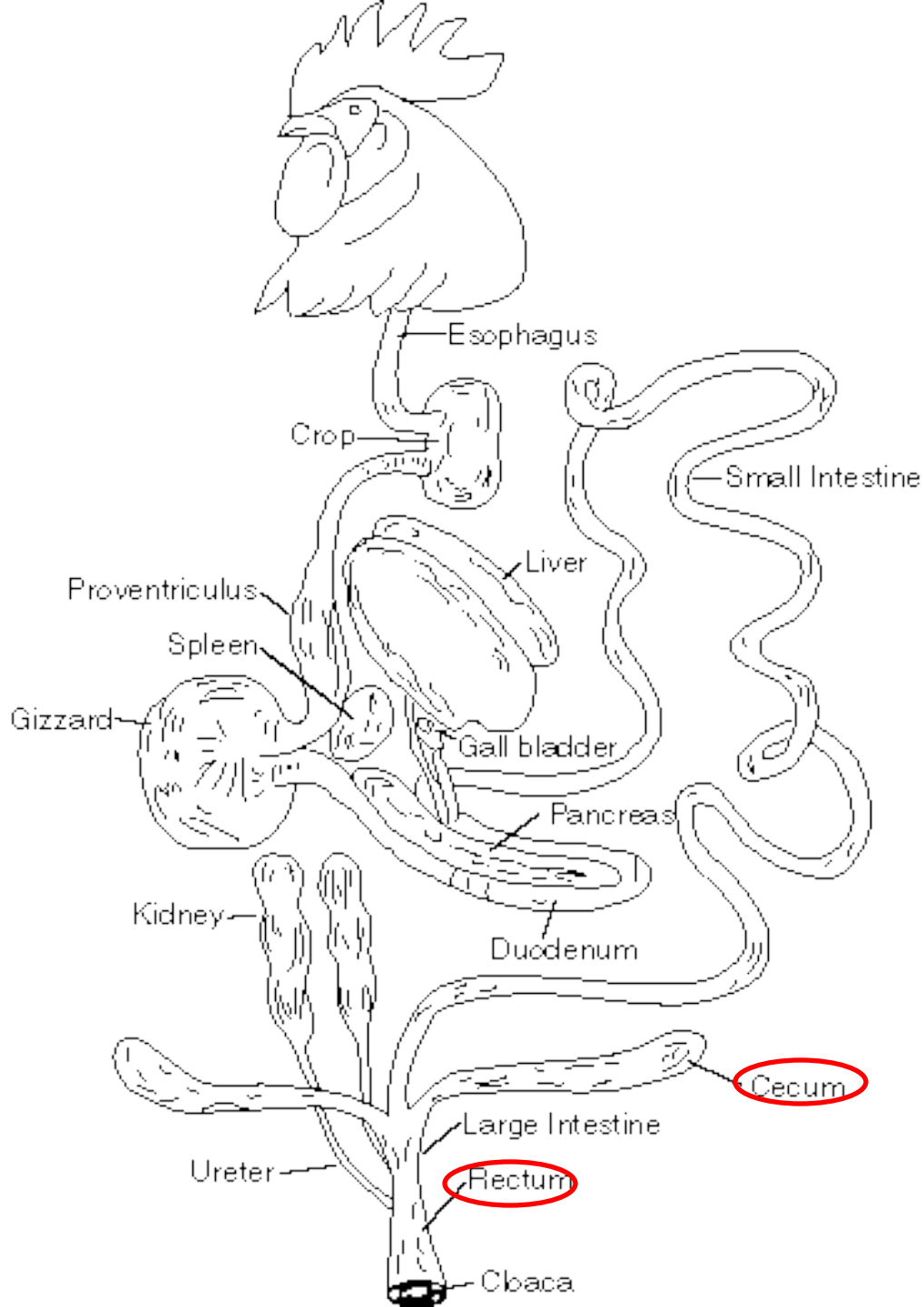
D. The ventriculus empties into the small intestine, which consists of the **duodenum**, the **jejunum**, and the **ileum**.

1. The duodenal portion is the most cranial, and is significant because the **pancreas** is located in the duodenal loop.
2. The secretions of the pancreas contain enzymes, which enter the duodenum through the pancreatic ducts.



E. The large intestine consists of a pair of caecae and a short straight intestine, called the **colon** or **rectum**.

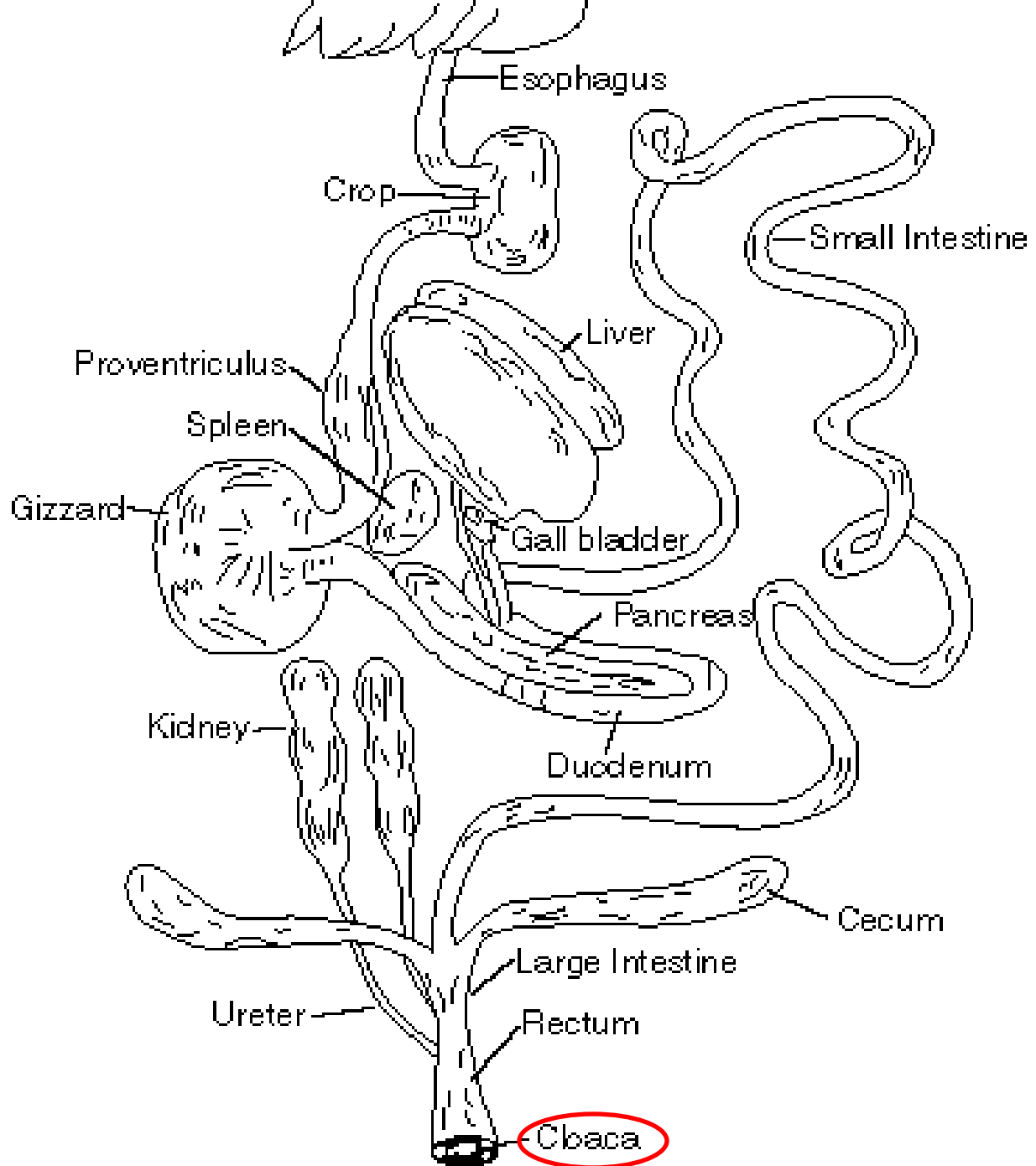
1. This section of large intestine is similar to the rectum of mammals.



F. The **cloaca** is the termination of the digestive system.

1. This portion of the digestive system represents a common passage for digestive, urinary, and reproductive systems.

2. The cloaca opens externally in what is called the **vent**.



G. The **bursa of Fabricius** is located as a diverticulum in the dorsal wall of the cloaca.

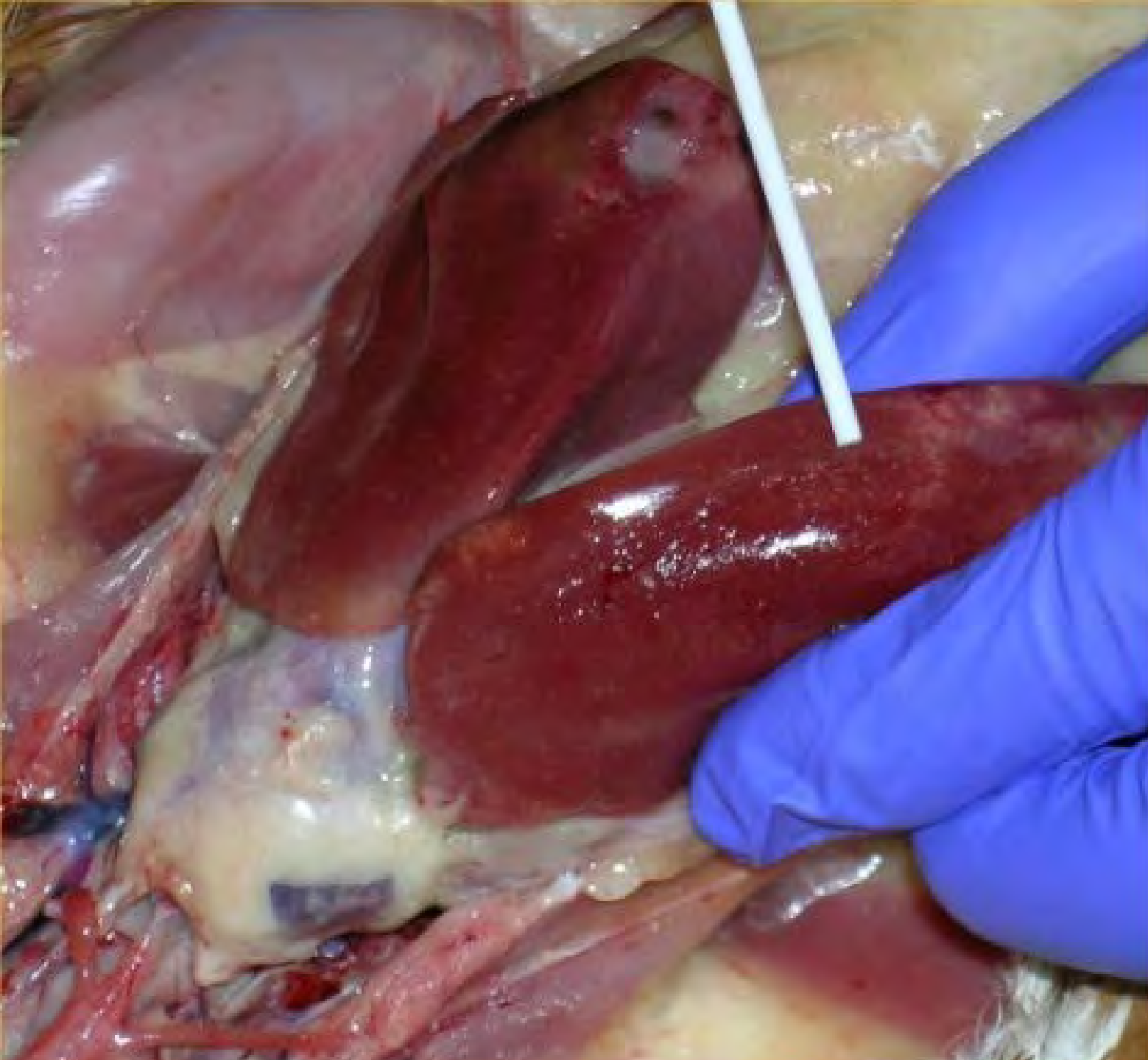
1. This bursa contains lymphatic tissue and has a function related to immunity and antibody production.
2. It regresses in size and disappears as the bird matures.
3. It appears as a small sac on the side of the cloaca.

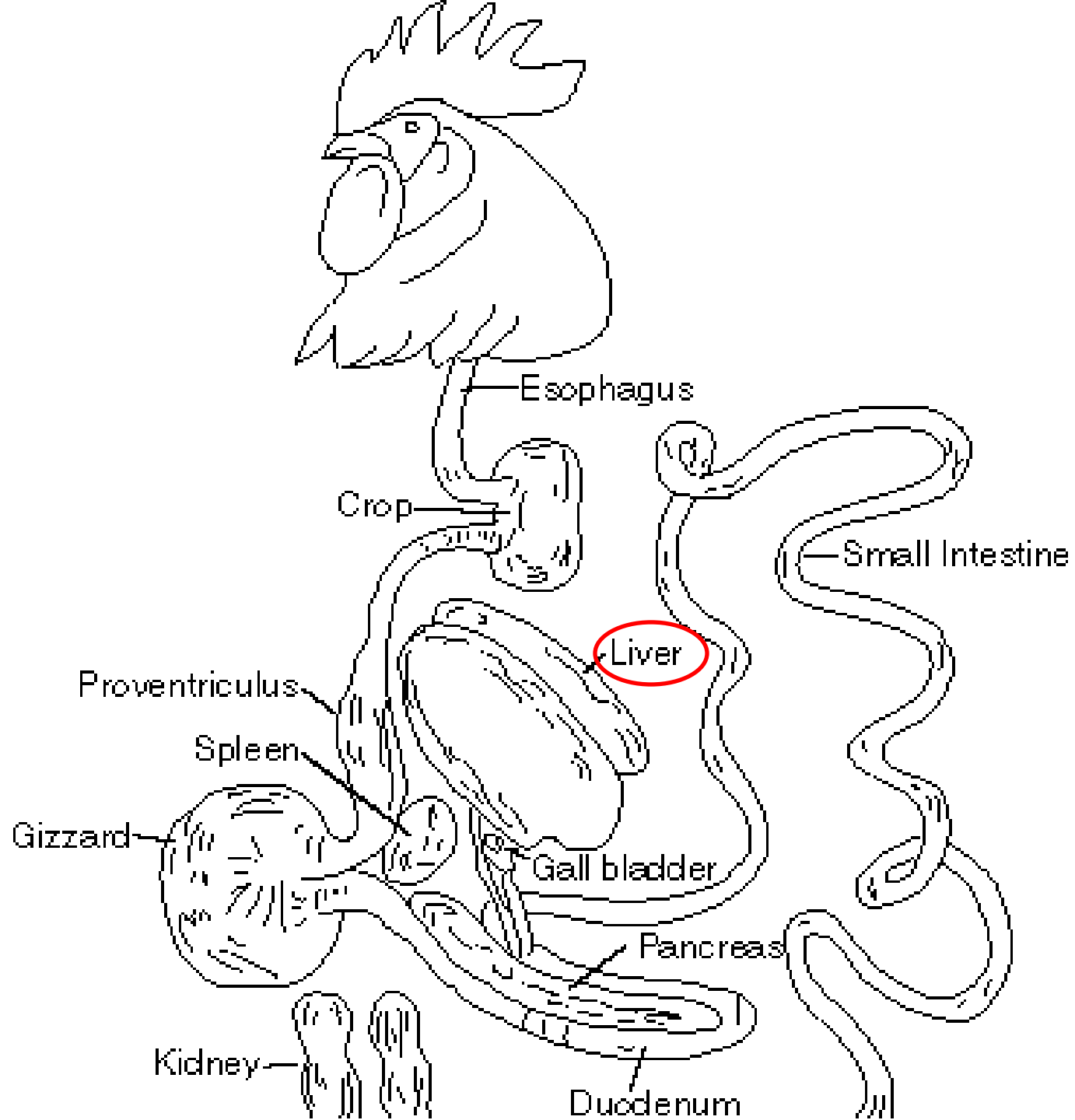


H. Birds that are healthy and well-nourished will usually deposit substantial amount of fat throughout their tissues.

1. The abdominal area and vent flaps are major fat depots, as are the areas surrounding the **gizzard** and the **coronary band** of the heart.
2. There may be considerable variation in the color of poultry fat.
3. Diet, age, health status, and breed are all factors that can influence this color.

- I. The normal **liver** is a single organ which has two lobes.
1. The color varies somewhat depending on the fat content.
 2. Each lobe of the liver is drained by a bile duct.
 3. The duct from the right lobe is enlarged to form the gallbladder.
 4. Both ducts enter the small intestine together.





II. The parts of the circulatory system includes all organs that move, filter and produce blood and are as follows:

A. The heart of the chicken is four-chambered, like those of mammals, and beats at a rate of 250 beats per minute for larger breeds and up to around 350 beats per minute for smaller breeds.

1. In contrast, the heart rate for human beings is typically around 80 beats per minute.

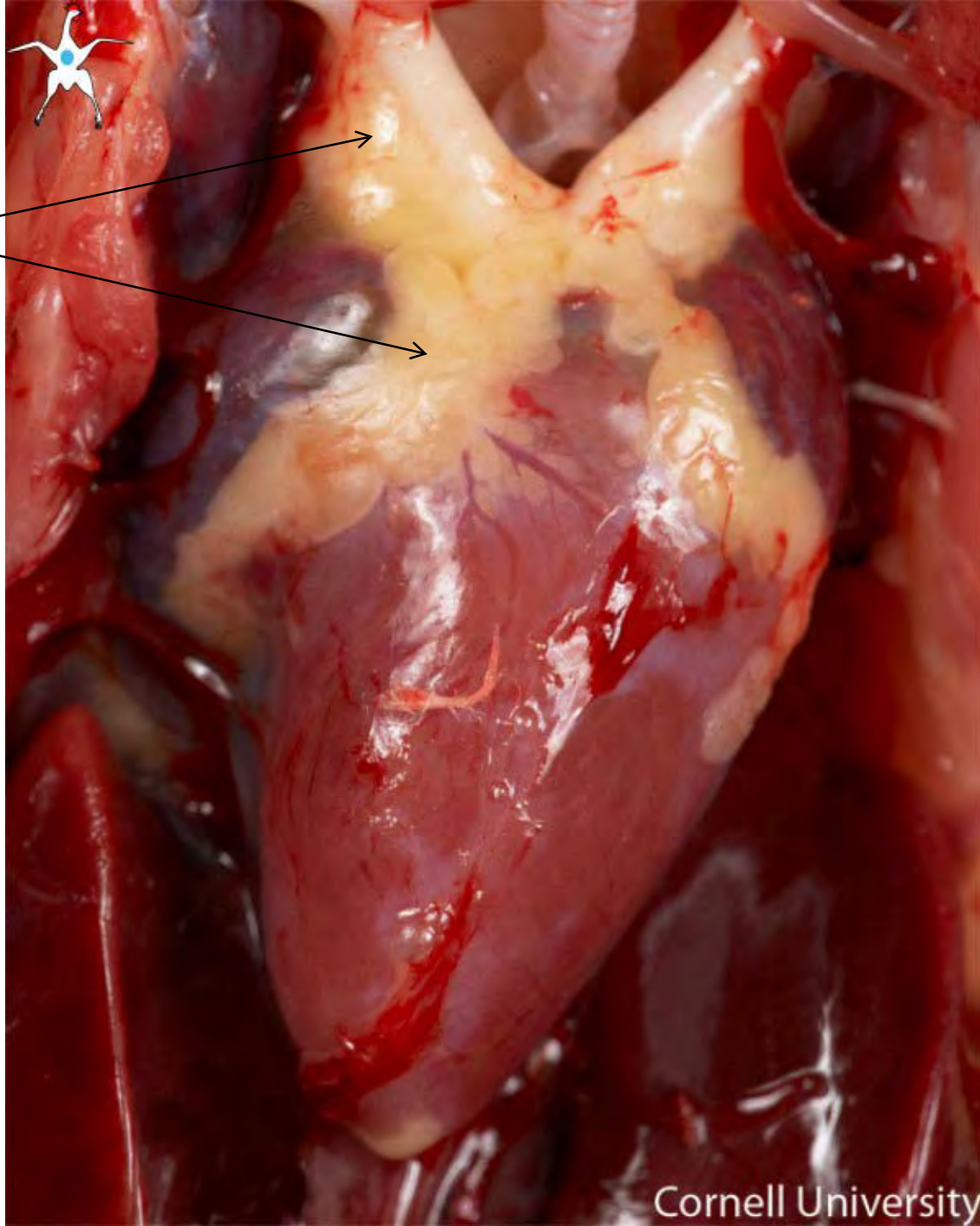
B. The deep body temperature of a chicken is around 41 degrees C, versus that of mammals which is typically between 36.6 and 38.8 degrees C.

C. Avian red blood cells, or erythrocytes, are nucleated, whereas mammalian red blood cells are not.

D. Some points to remember about the heart are that the heart's **coronary band** (around the top portion) has a normal fat structure that may show changes in quantity and appearance when a systemic disease occurs.

E. Other points to remember are that the **pericardial sac** is the thin membrane that encloses the heart, and that the heart normally has a small deposit of fat at the tip as well as around the coronary band.

Fatty
deposits



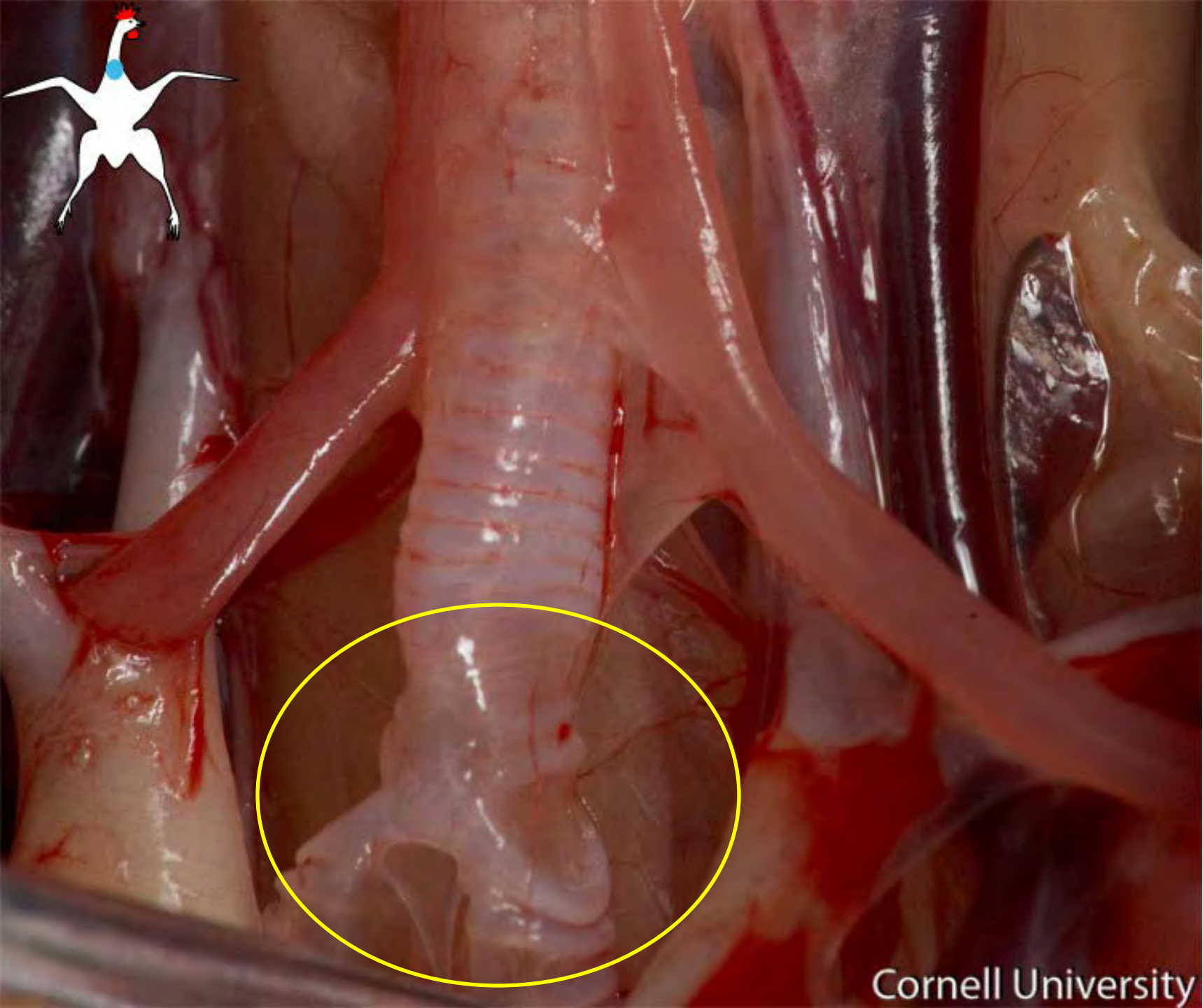
III. The respiratory system of birds is more complex than the mammalian counterpart.

A. For our purposes, the respiratory system in the bird is comprised of the **trachea, syrinx, lungs, and air sacs.**

B. The trachea, or windpipe, is the structure through which air enters the bird, and has cartilaginous rings along its length.



- C. The **syrinx** is located where the trachea bifurcates (splits into two separate branches), and is similar to the larynx (voice box) of mammals.
1. Air passes through the trachea and at the terminal portions of the trachea the air sac structures bud out.
 2. These are very thin, colorless membranes that, when inflated with air, resemble tiny balloons inside the body cavity.



D. The function of the lungs is to facilitate gas exchange, as it is in mammals.

1. However, because avians have air sacs, air flows through avian lungs on both inspiration and expiration.
2. As well as functioning in respiration, air sacs may also regulate intrabody pressure and body temperature.

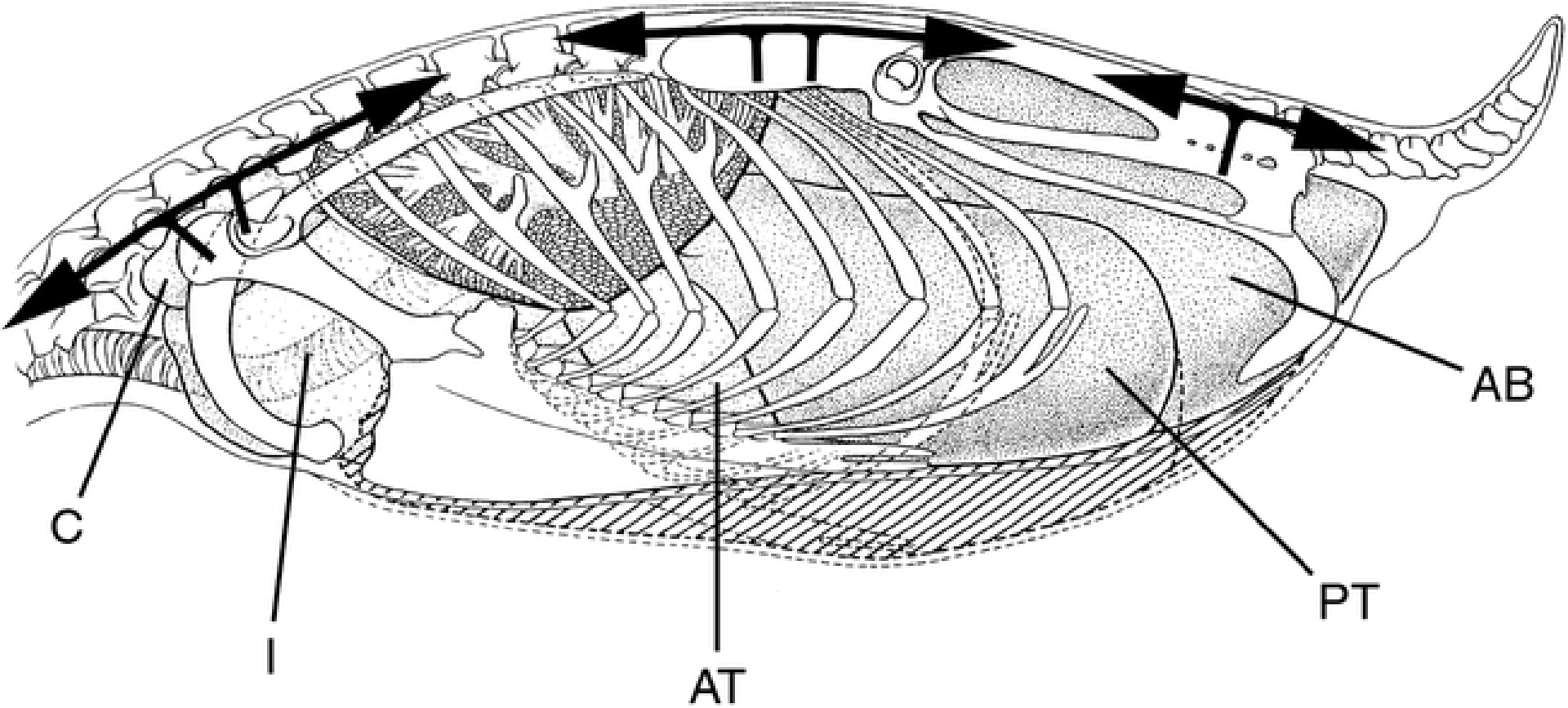
E. The number of air sacs varies in different species.

1. The most anterior air sac is the **cervical**.

a. It lies, as the name implies, in the neck area and is not observed during postmortem inspection.

2. The next air sac, moving in a caudal direction, is the **interclavicular air sac**.
 - a. Some information to remember about this particular air sac is that it lies between the clavicles (as the name implies), is the most anterior air sac observed on postmortem inspection, and has communication with other tissues, including bone, through **diverticula** (tiny fingerlike projections).

3. The **thoracic** air sacs are next and lie in the rib cage area.
- a. In chickens and ducks there are two pairs- anterior and posterior- whereas the turkey only has one pair of thoracic air sacs.
 - b. The **abdominal air sacs** are paired and are located in the abdominal part of the body cavity.

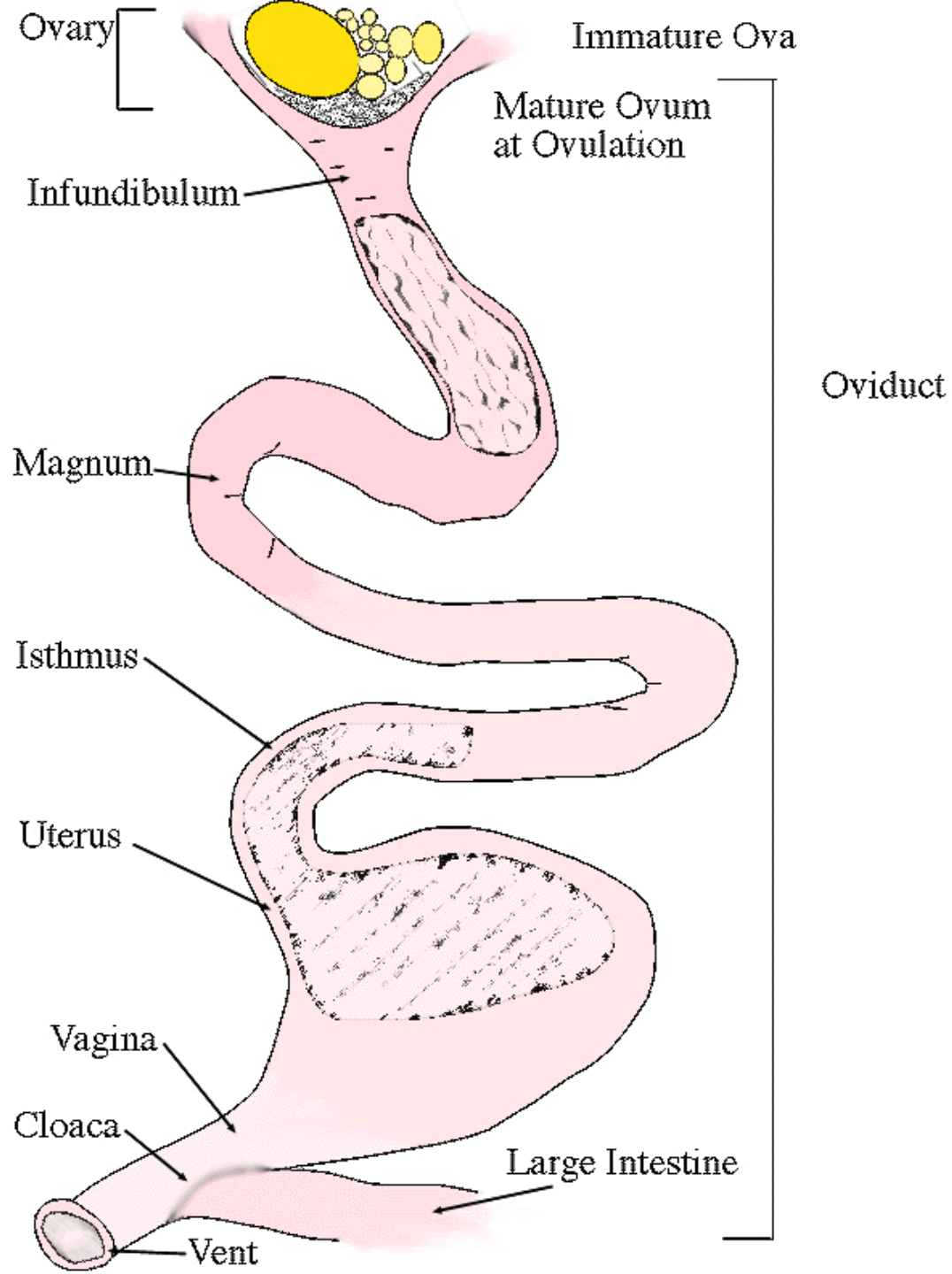


cervical (C), interclavicular (I), thoracic (AT and PT), and abdominal (AB) air sacs

IV. The reproductive parts of poultry differ between male and female.

A. The female reproductive system consists of the left **ovary** and **oviduct**.

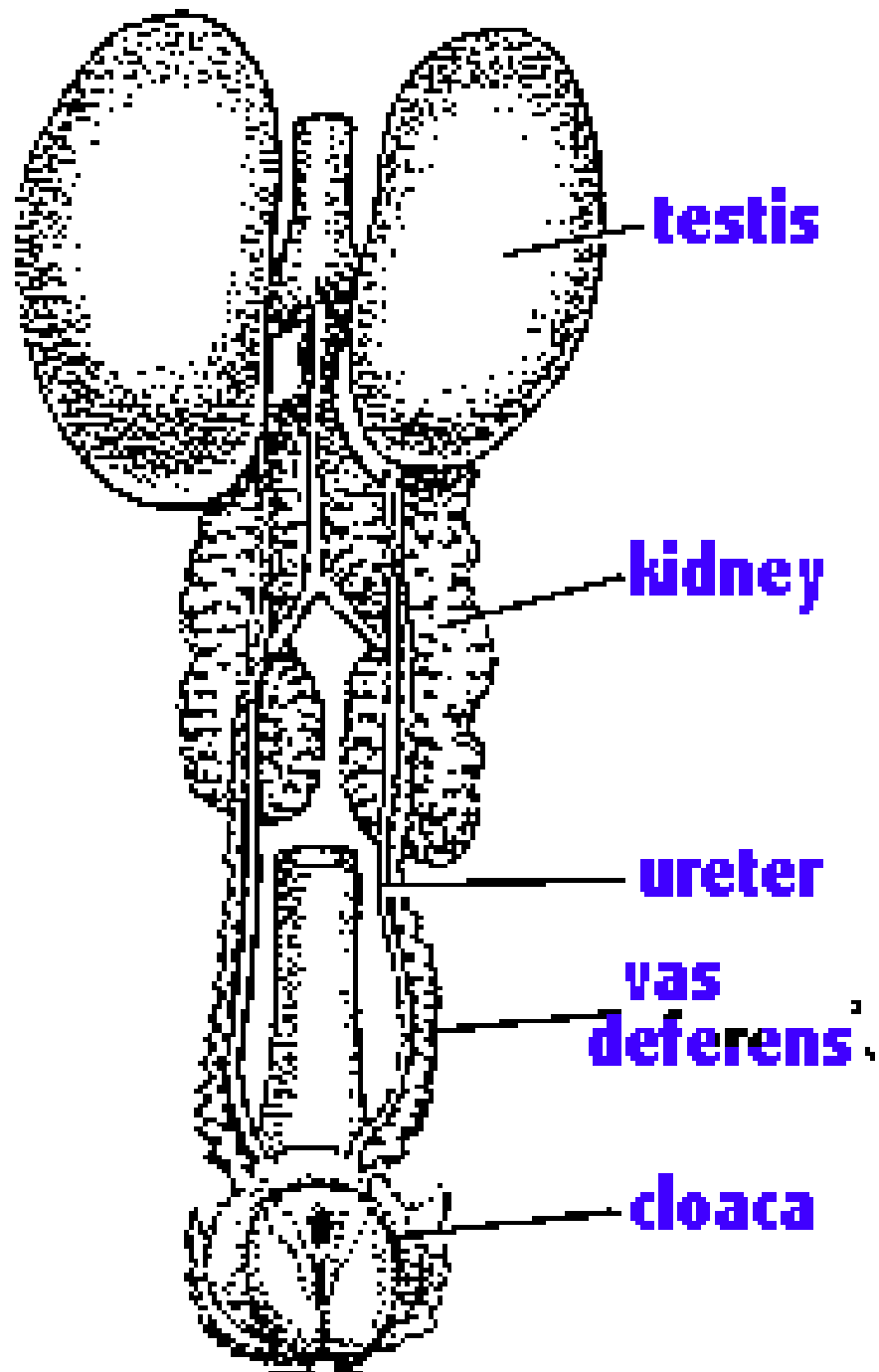
1. Although present in the embryo, the right ovary and oviduct fail to develop.
2. The oviduct terminates in the cloaca.



B. The male reproductive system consists of two **testicles**, which secrete semen through a vas deferens.

1. The vas deferens terminates in the cloaca.

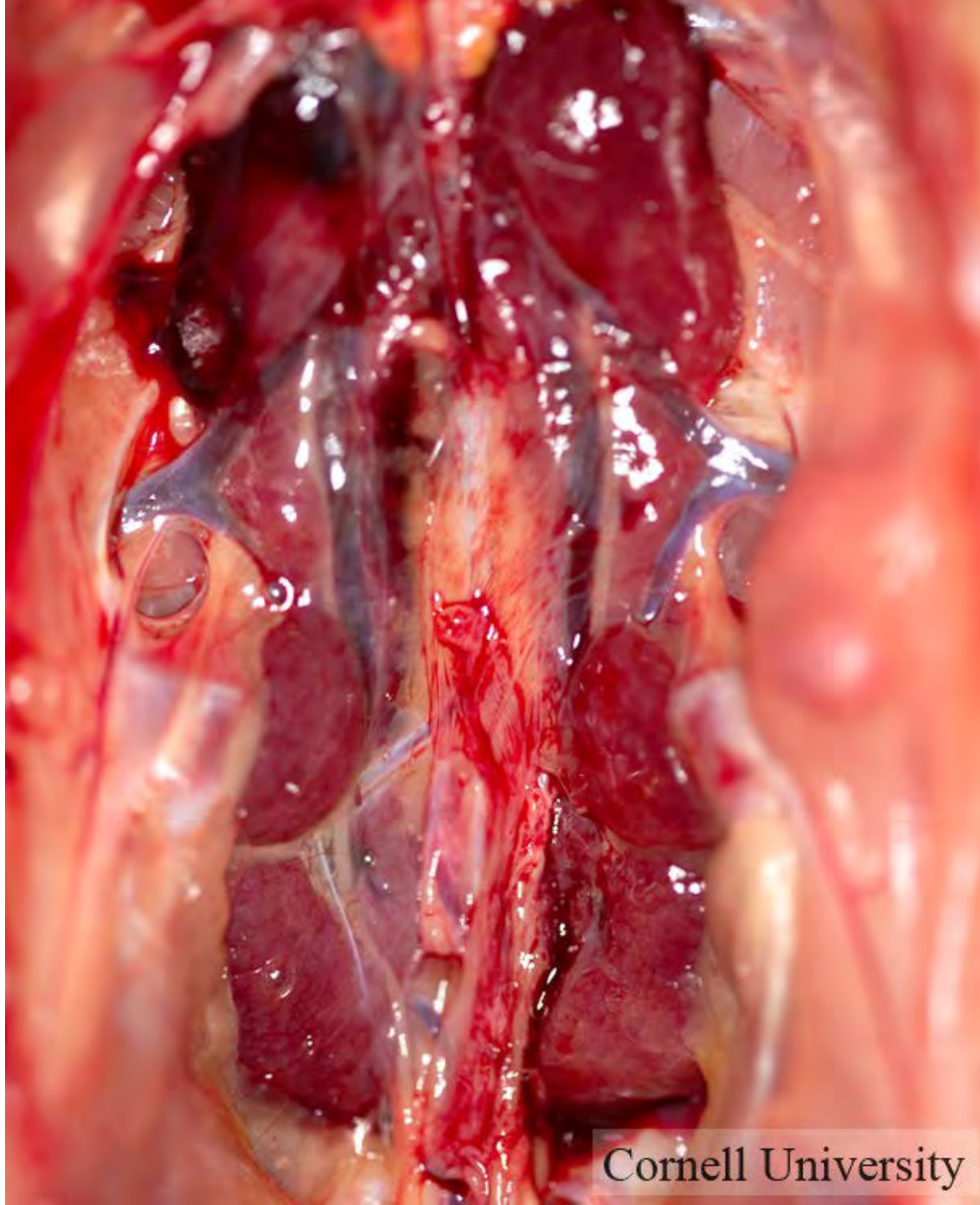
2. The chicken has a rudimentary penis.



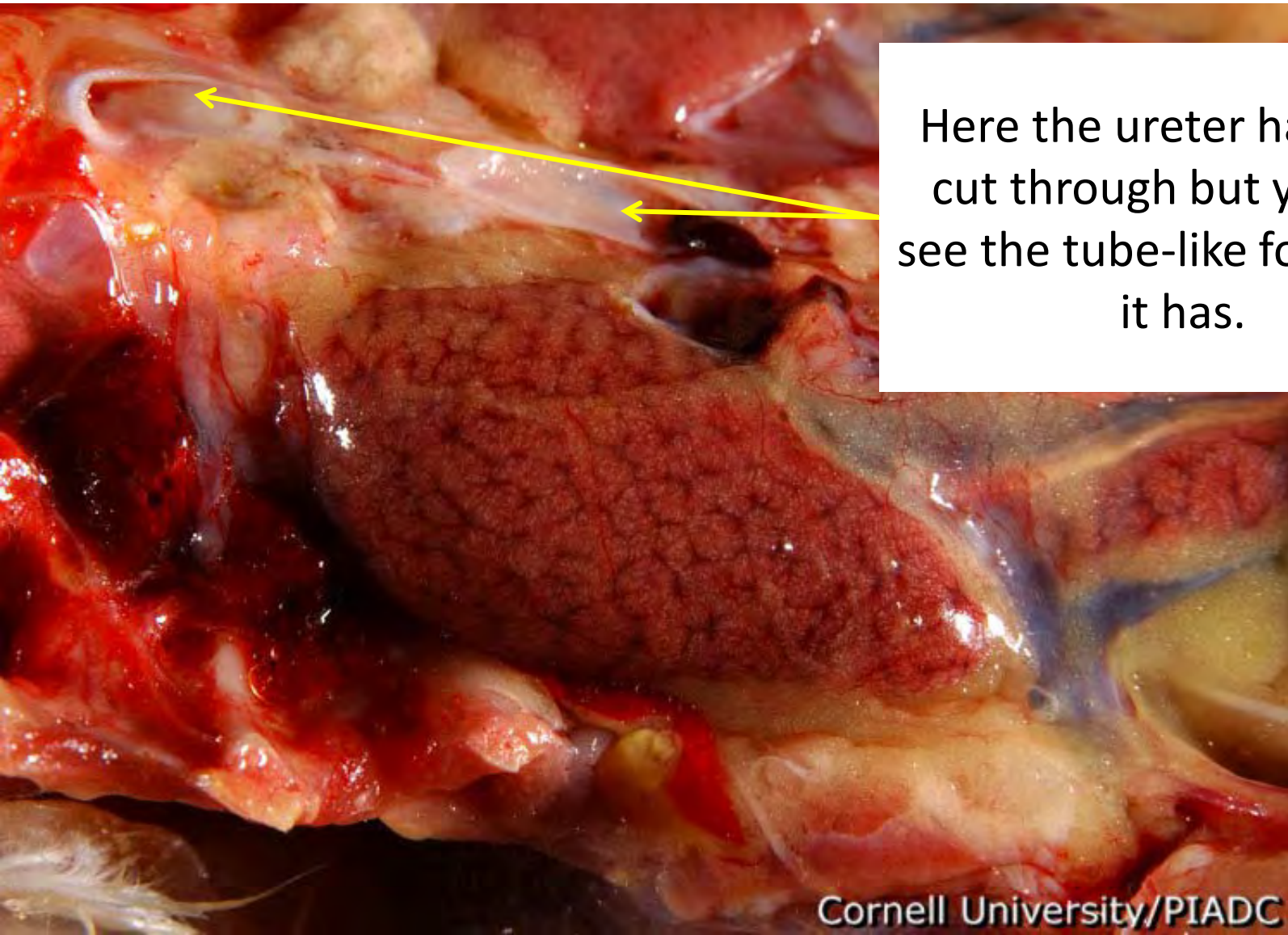
V. The urinary system of the birds does not contain a urinary bladder.

A. There are two tri-lobed kidneys, one on each side of the ventral surface of the vertebral column.

B. This pair of **kidneys** is embedded in the deep bony crypts of the pelvic and synsacral area of the skeleton.



C. Ureters carry the urinary waste to the cloaca.



Here the ureter has been cut through but you can see the tube-like formation it has.

- D. The **uric acid** is discharged into the cloaca and excreted with the feces.
- E. The white pasty material in chicken droppings is considered to be urinary system excretion.
- F. Birds excrete their nitrogen waste as uric acid, whereas mammals excrete it in the form of urea.

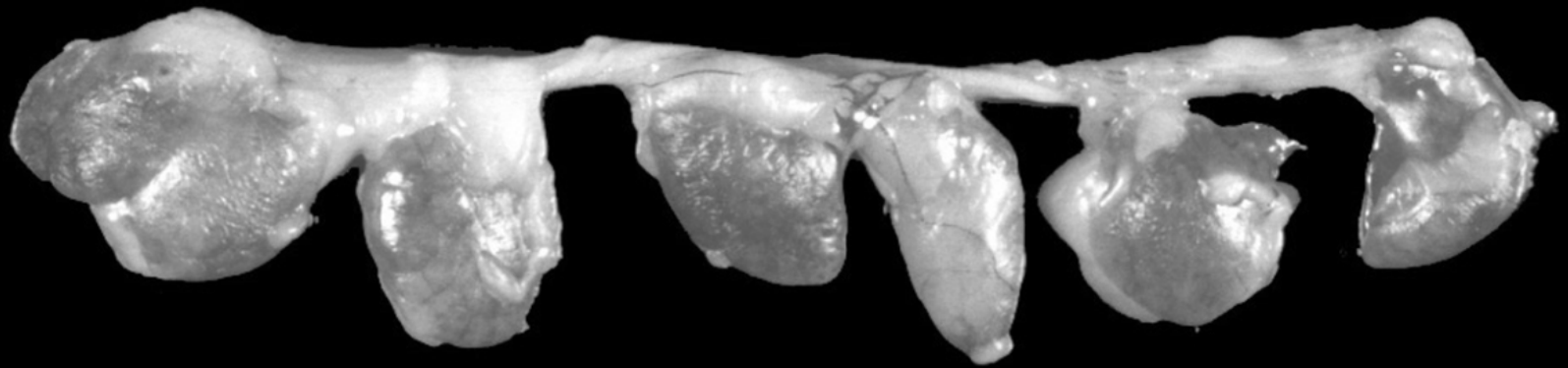
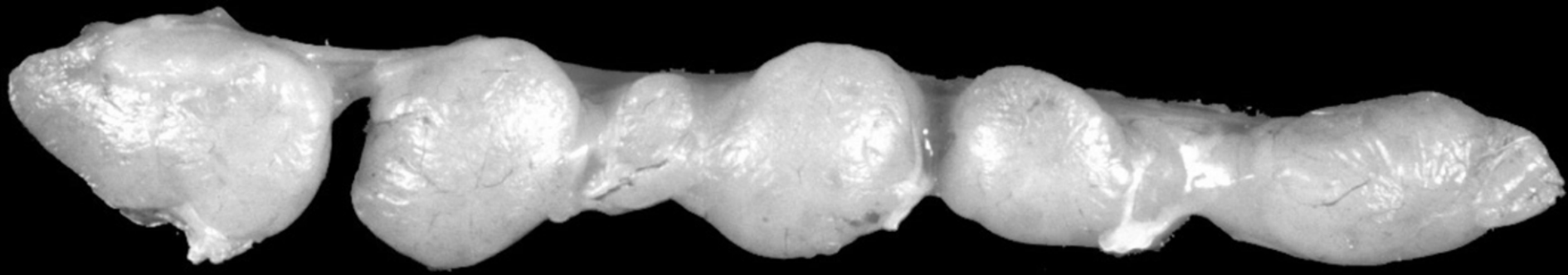
VI. The lymphatic system of chickens does not contain lymph nodes and in general is poorly developed when compared with mammals.

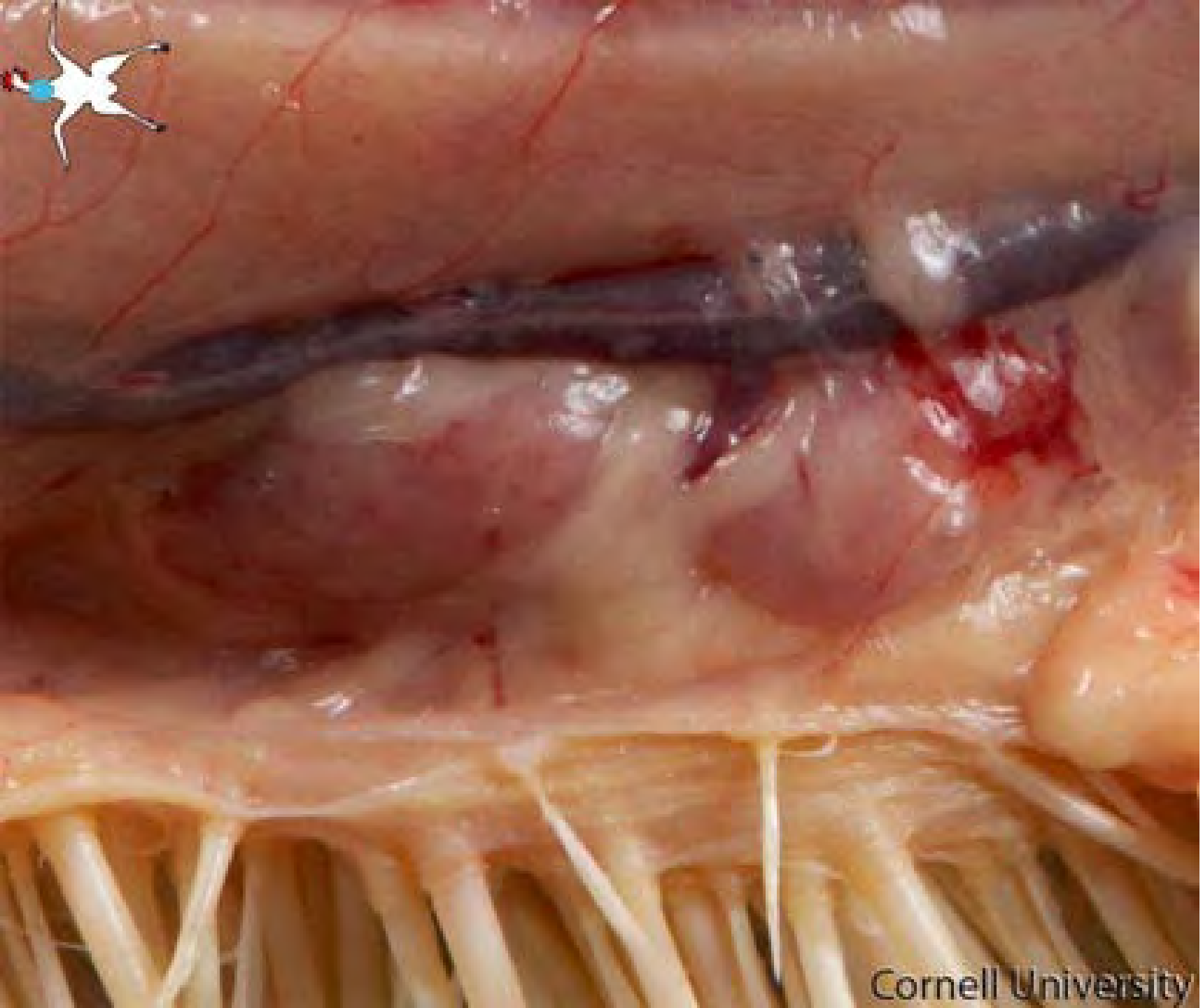
A. The lymphatic system is responsible for giving immunity to the bird to protect it from sickness.

B. There are several organs which contain lymphatic tissue- the **bursa of Fabricius**, the **spleen**, and the **thymus**.

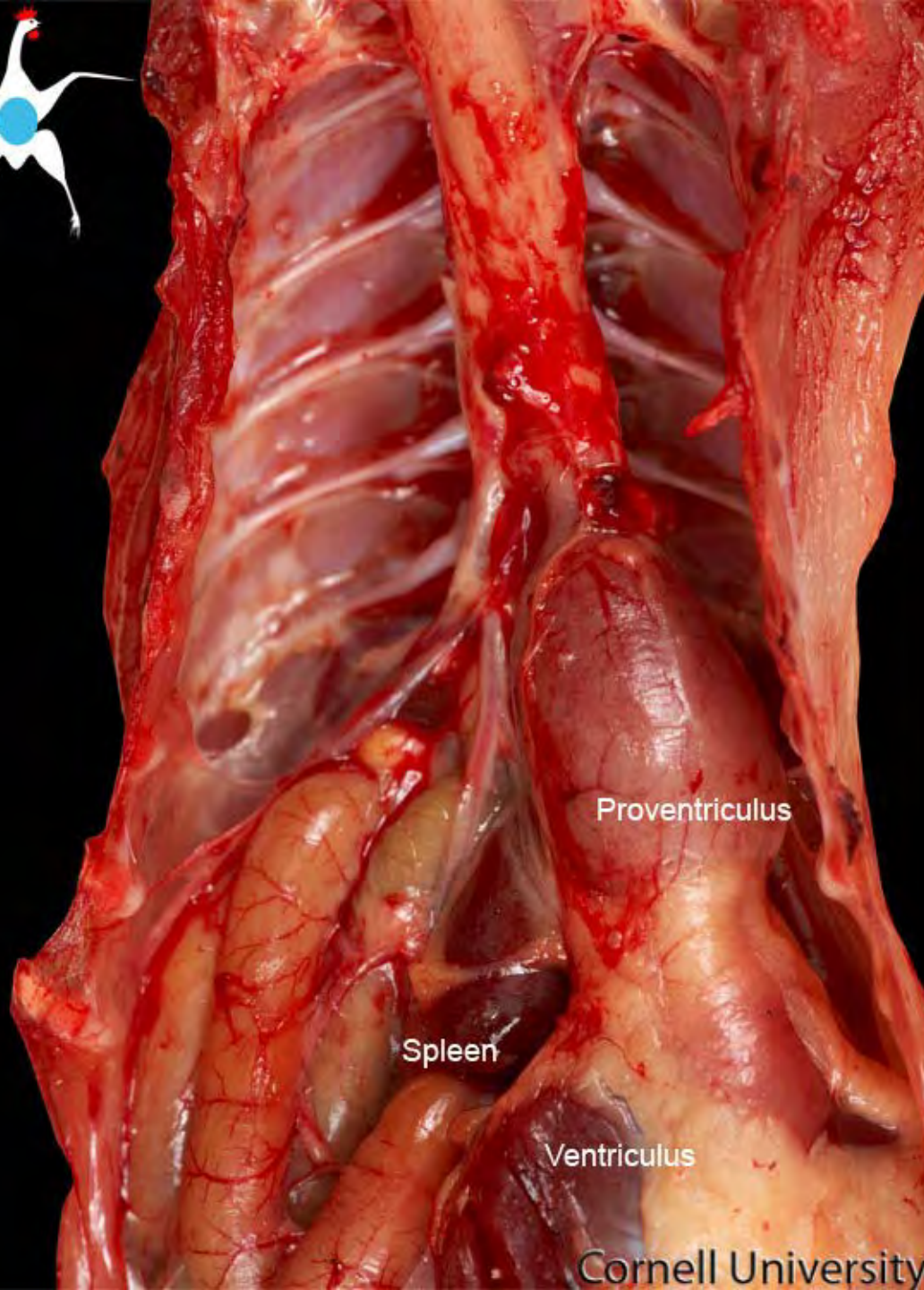
1. The **thymus** gland consists of about five pairs of pale pink, flattened, irregularly shaped lobes strung out along both sides of the neck, near the jugular veins.

a. The thymus decreases in size as the bird matures.





2. The **spleen** is a small, round, soft organ similar in color to the liver.
 - a. The normal spleen is about 19 millimeters in diameter, located near the ventriculus (gizzard) in the body cavity.
 - b. The functions of the spleen include phagocytosis of worn-out erythrocytes in red pulp, lymphocyte production in white pulp, and antibody production in both the red and white pulp.
3. The **bursa of Fabricius** was discussed in the digestive system.



Proventriculus

Spleen

Ventriculus

Cornell University

Review/Summary

1. What are the parts of the digestive system of poultry?
2. What are the parts of the poultry circulatory system?
3. What are the parts of the poultry respiratory system?
4. What are the parts of the poultry reproductive system?
5. What are the parts of the poultry urinary system?
6. What are the parts of the poultry lymphatic system?