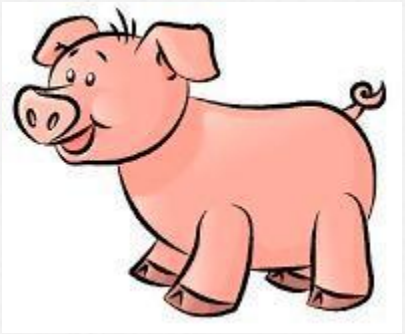


Fetal Pig Dissection

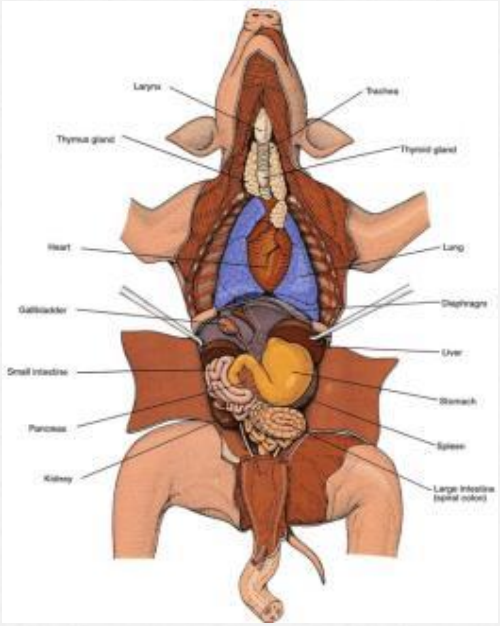
What do you think humans have in common with the pig?

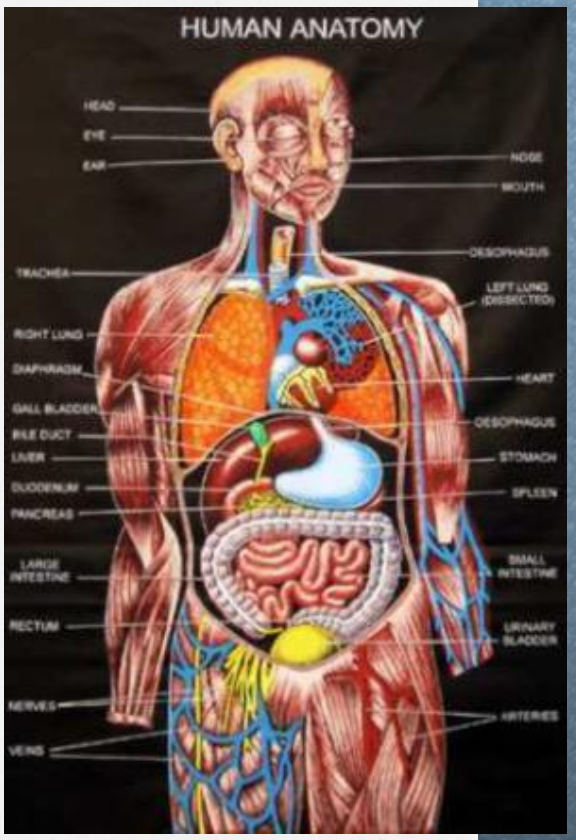
https://ferrebeekeeper.files.wordpress.com/2014/03/farmer-clip-art-4.gif

http://www.clipartpanda.com/categories/pig-in-mud-cartoon

Humans and Pigs may be closer than you think!

- ✓ Both are mammals
- ✓ We share common body systems
- ✓ The anatomy of the pig is close to that of humans
- ✓ The fetal pigs will tell us more about our own bodies and give us a way to explore!





http://www.fanpop.com/clubs/human-anatomy/images/10358267/title/human-anatomy-photo

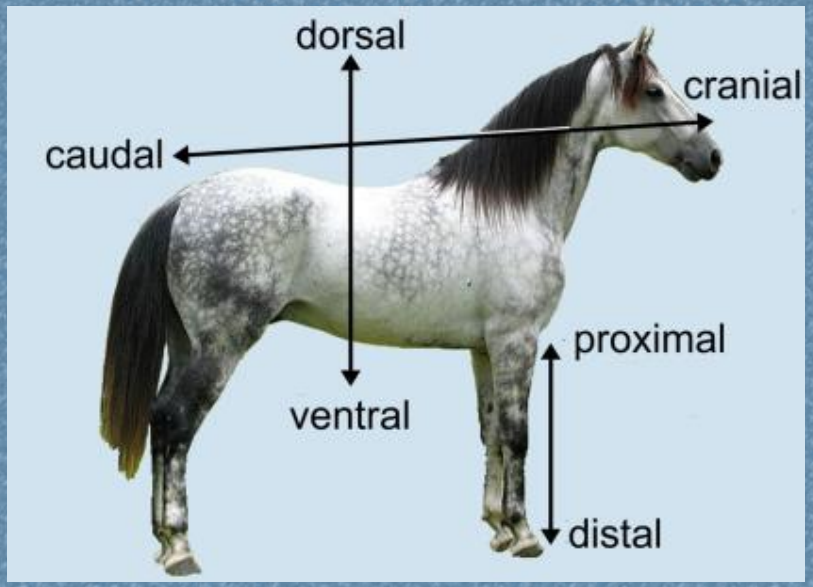
http://www.biologycorner.com/pig/fetal_pig02.jpg

SAFETY FIRST!

- NEVER point sharp objects at yourself or others
- Always cut/make incisions away form yourself and others
- No horseplay in the lab
- Properly mount specimens to the dissection pan
- Wash hand at the end of each class period
- Don't remove any specimens from the classroom
- Properly dispose of any materials
- Clean up area

- Descriptive words are used to describe “where” on an animal.

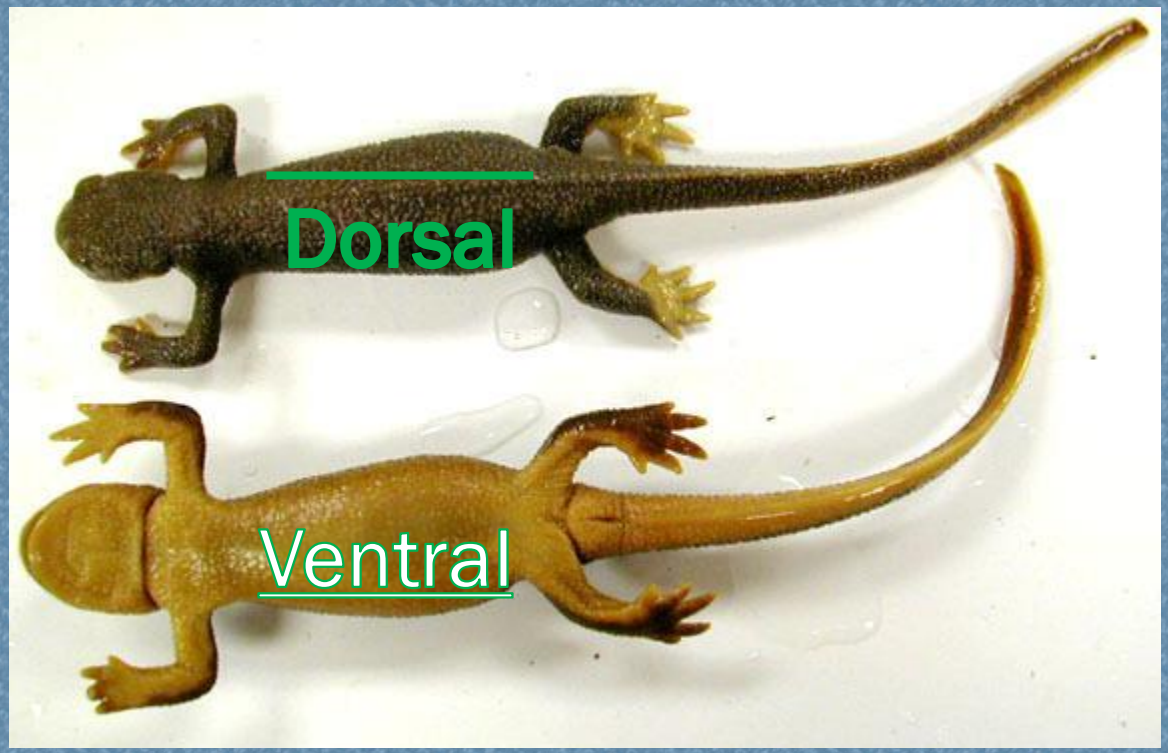
- Like using North, South, East, or West for locations on a map.



Anatomical Descriptive Terms

Dorsal/Ventral:

- Dorsal -- toward the back
- Ventral -- toward the front/belly
- Separated by the frontal plane

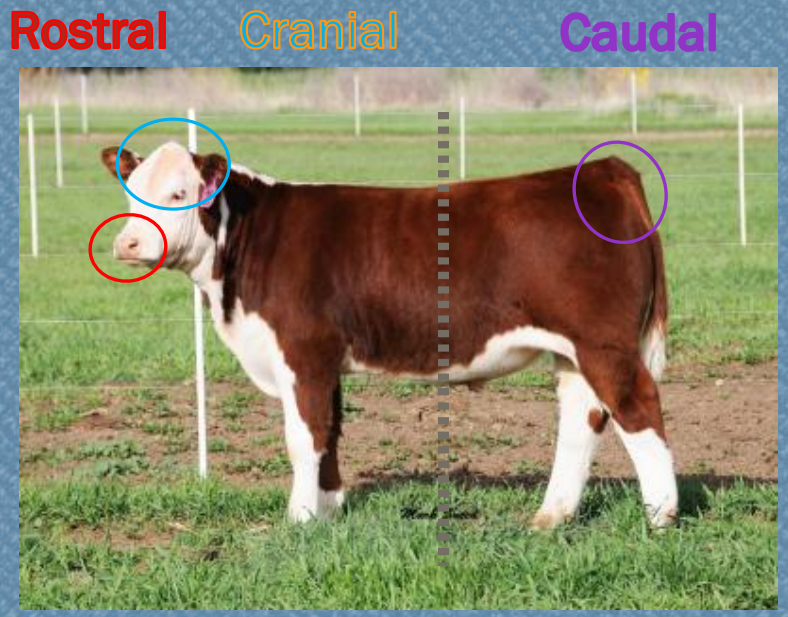


Dolphin's Dorsal fin

Ventral

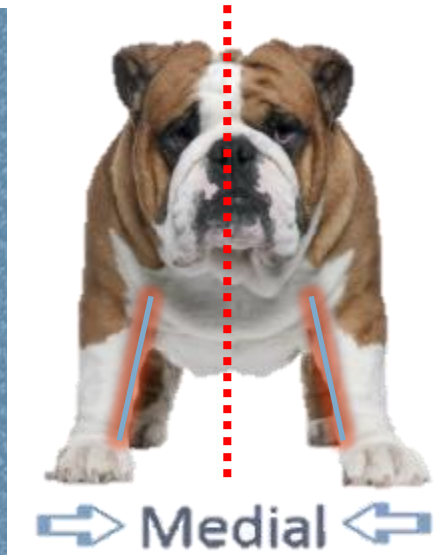
Cranial/Rostral/Caudal:

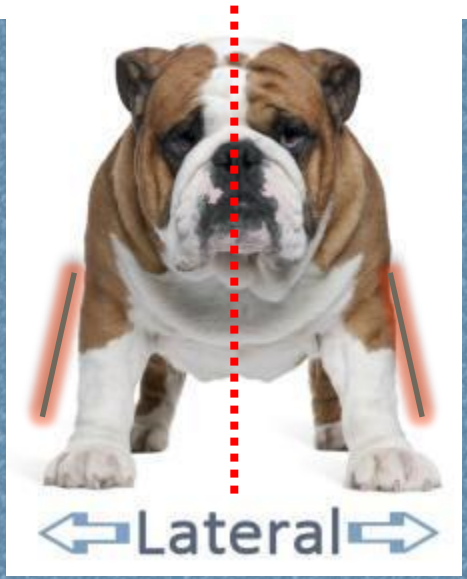
- Cranial -- toward the head
- Rostral -- toward the nose/beak
- Caudal -- toward the tail
- Separated by the transverse plane



Medial/Lateral:

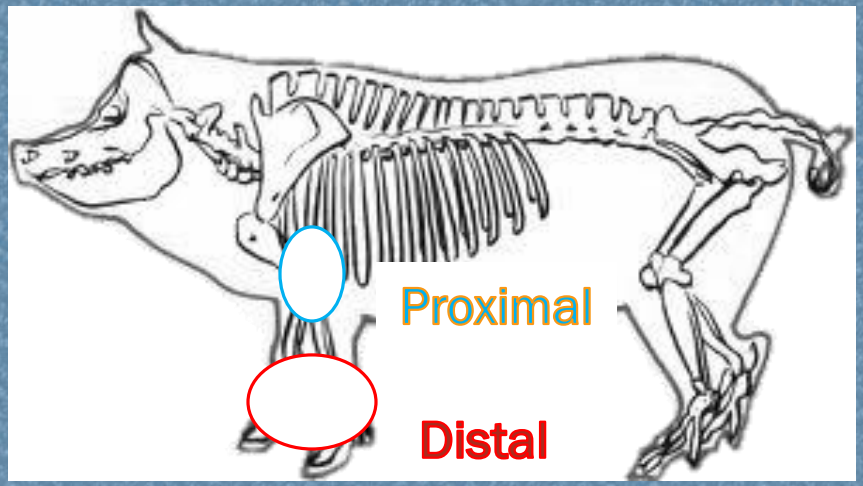
- Medial – directed *toward* the midline (sagittal plane)
- Lateral -- directed *away* from the midline (sagittal plane)





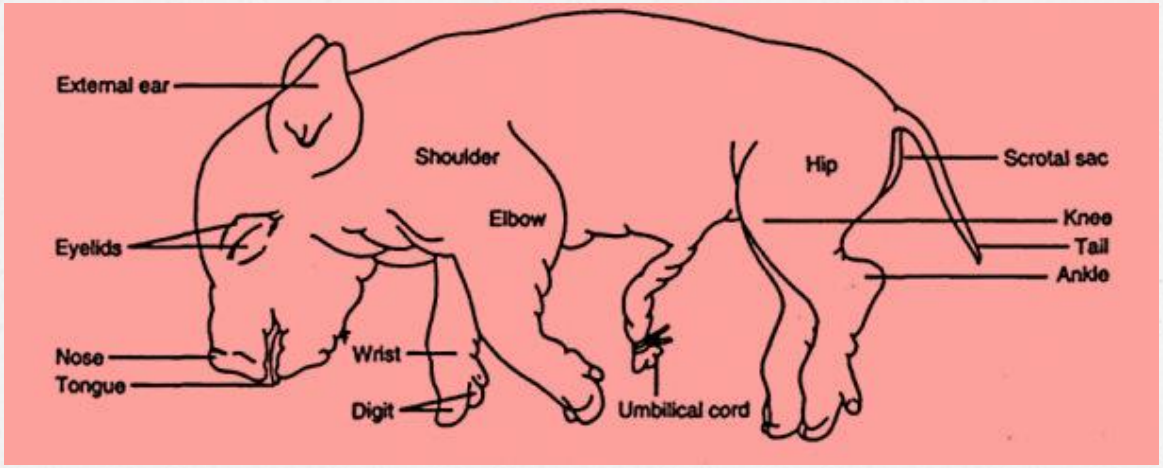
Proximal/Distal:

- Proximal -- located *close to* the sagittal line of the body.
- Distal -- located *away from* the sagittal line of the body



External Anatomy

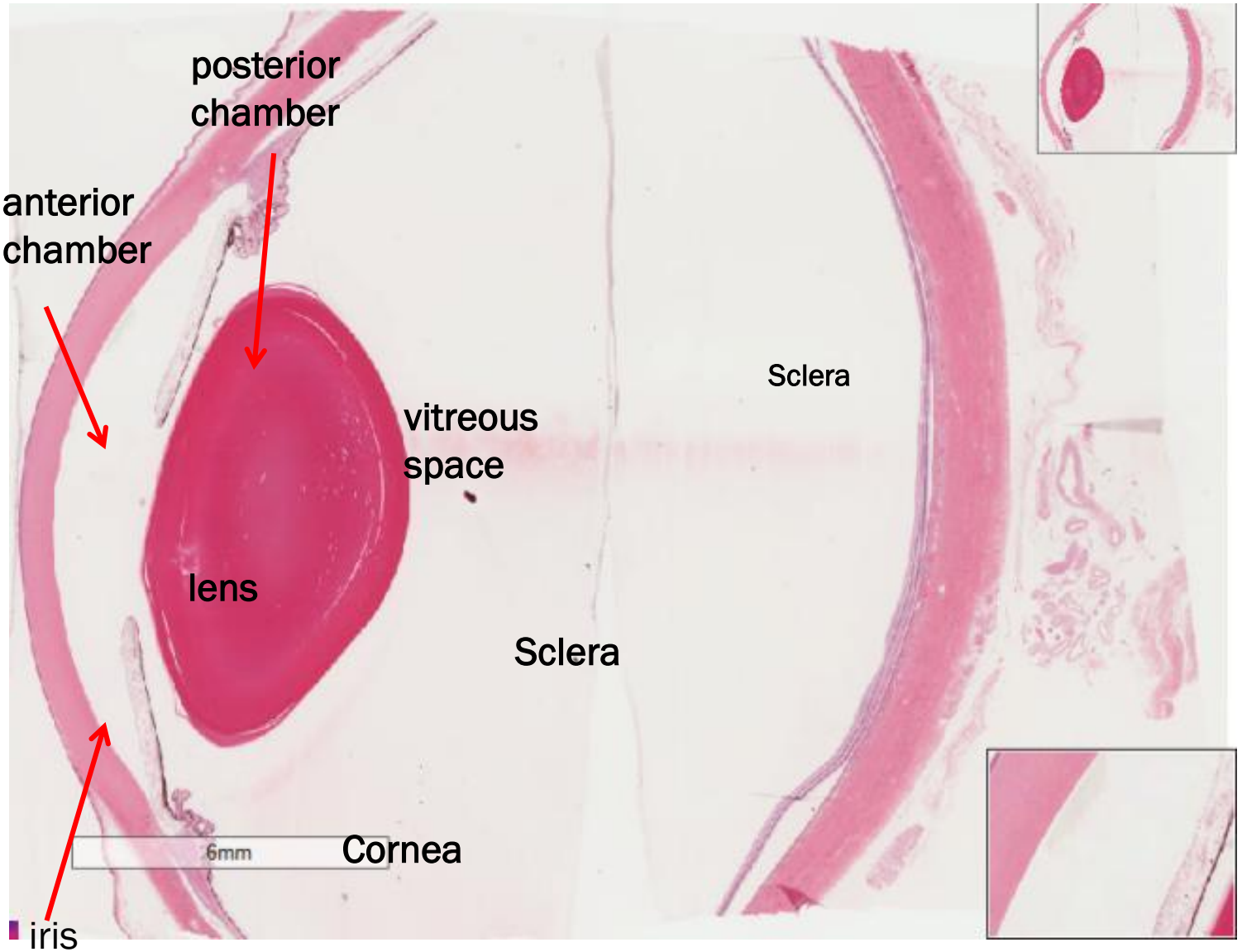
- Skin
- Nose
- Tongue
- Eyelids
- External Ear
- Digits
- Umbilical Cord
  - 2 umbilical arteries
  - Umbilical vein
- Teats
- Anus



- Identify the Sex
  - Male – Scrotal Sac (ventral to anus) and Urogenital Opening
  - Female – Urogenital opening (ventral to anus) and genital papilla

DEMO SLIDE BOX 23 Commercial slide. Eye, monkey

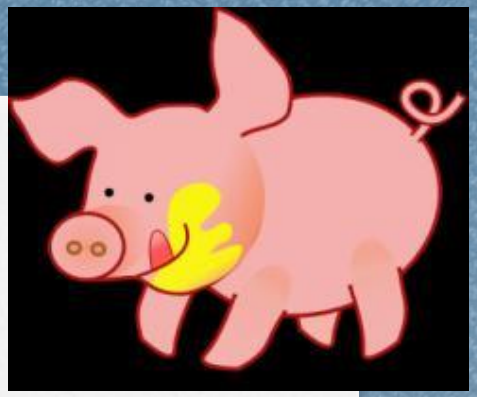
Alternative human eye



Let's take a Closer Look!

- Skin
- Skin
- Umbilical cord
- Tongue
- Fetal and Placental membranes
- Eye
- Fingertip

Digestive Tract (Gastrointestinal Tract)



Goal: To get nutrients into the body via the breakdown of food into smaller molecules and to excrete waste

- Mouth
  - Teeth
  - Tongue
  - Parotid Gland
  - Sublingual Gland
  - Mandibular Gland
  - Epiglottis

Upper GI

- Esophagus
- Liver
- Stomach
- Gallbladder
- Pancreas
- Spleen

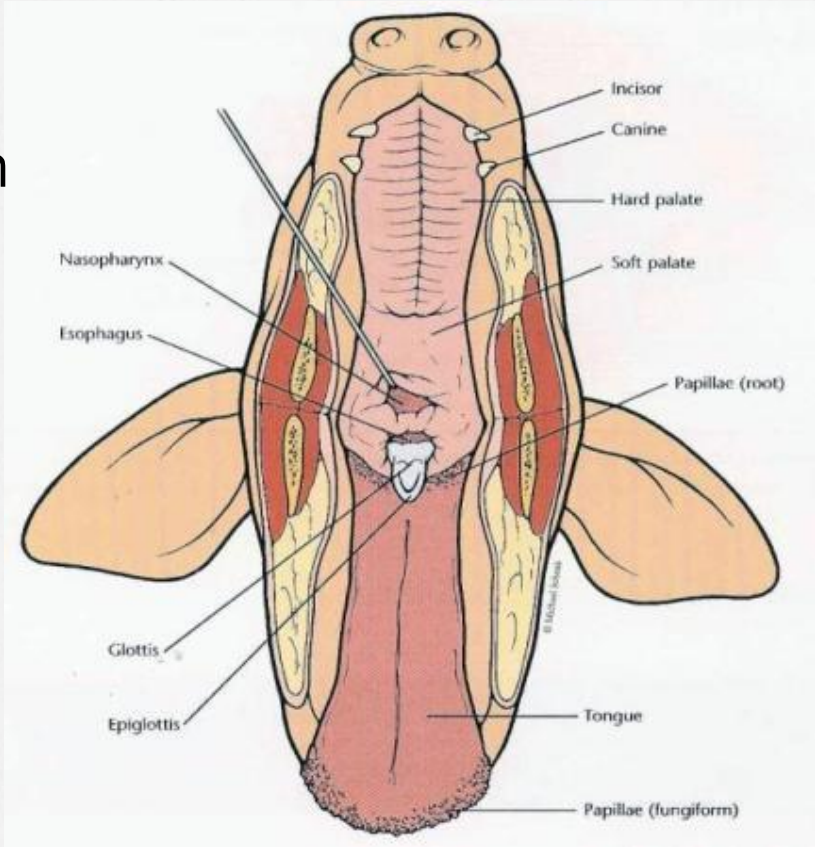
Lower GI

- Small intestine
- Larger Intestine
- Rectum
- Anus

http://www.clker.com/clipart-15593.html

Mouth

- **Teeth**: Helps aid in chewing of good
- **Tongue**: Muscle covered in mucous membranes with areas used for tasting. Papillae are the small bumps on the tongue (taste buds)
- **Epiglottis:** Flexible flap at the larynx. Acts as a switch to allow air into the larynx and food into the esophagus.

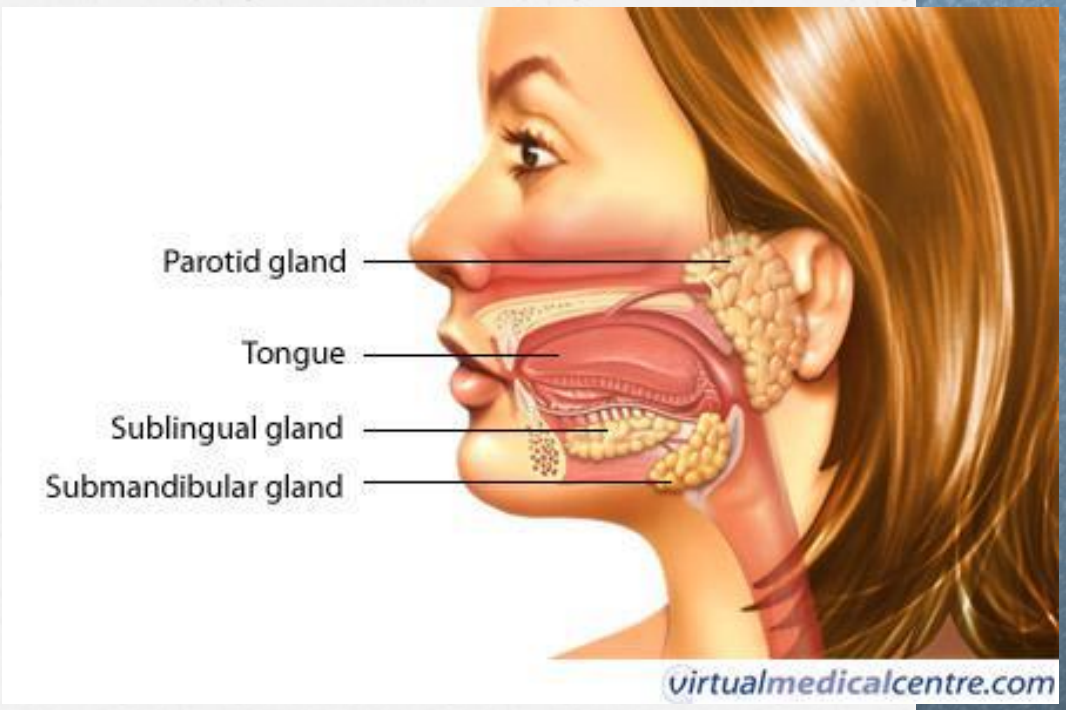


http://www.biologycorner.com/pig/fetalpig_mouth2.jpg

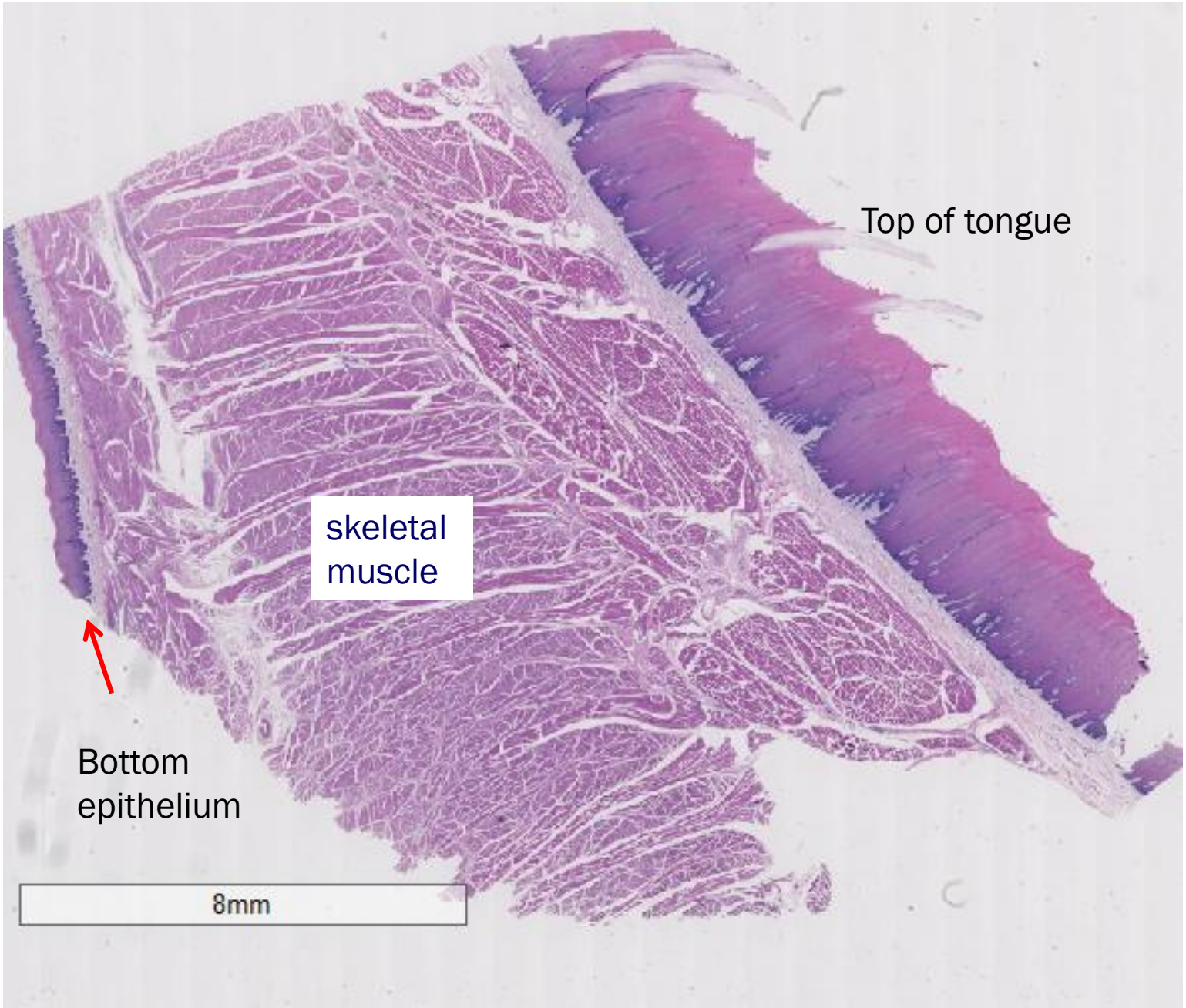
Glands of the Mouth

- **Parotid Gland :** Largest of the salivary glands located anterior and inferior to the ear.
- **Sublingual Gland:** One of the salivary glands; located under the floor of the mouth.

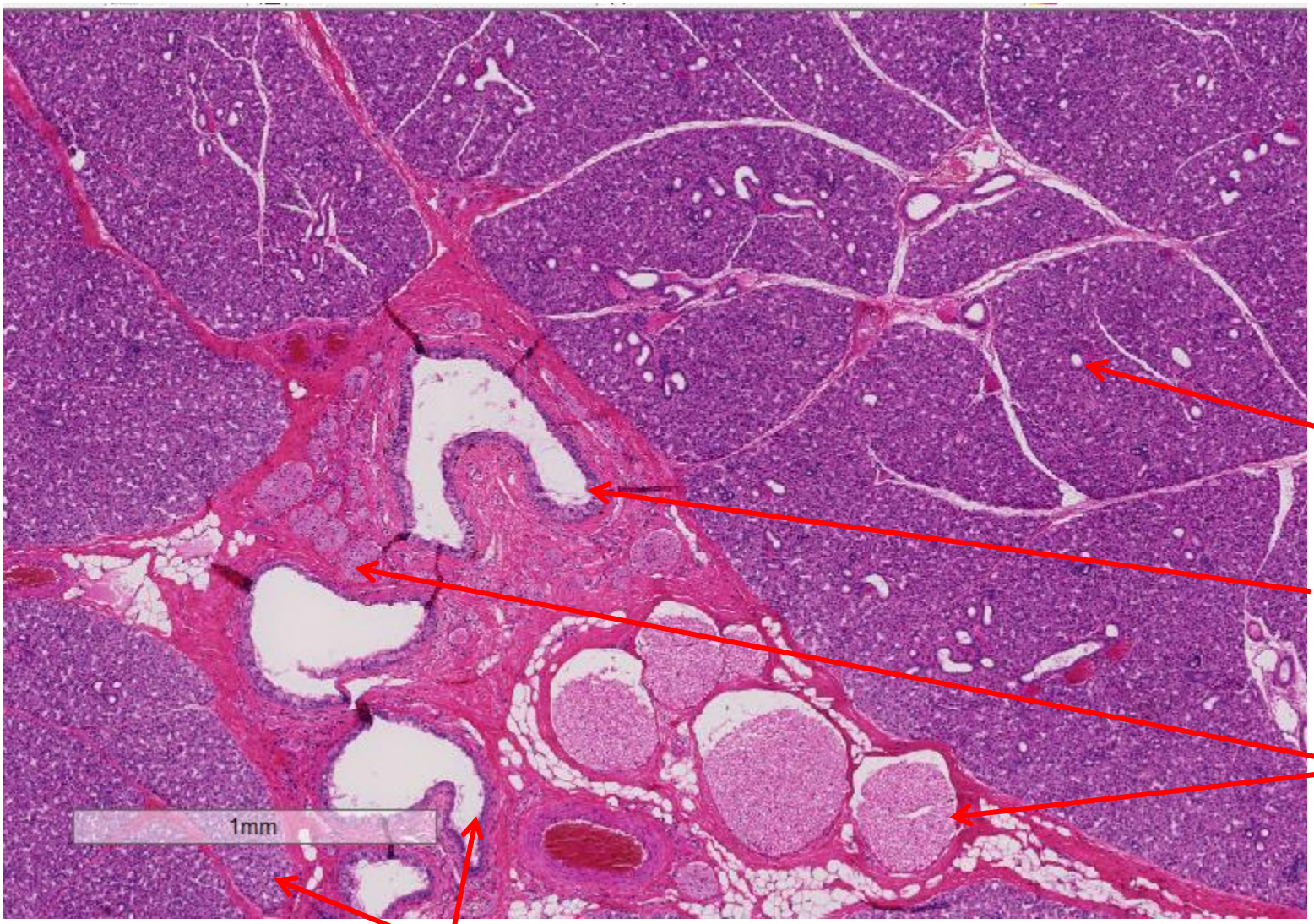
  Mandibular Gland: One of the salivary glands inferior to the mandible.



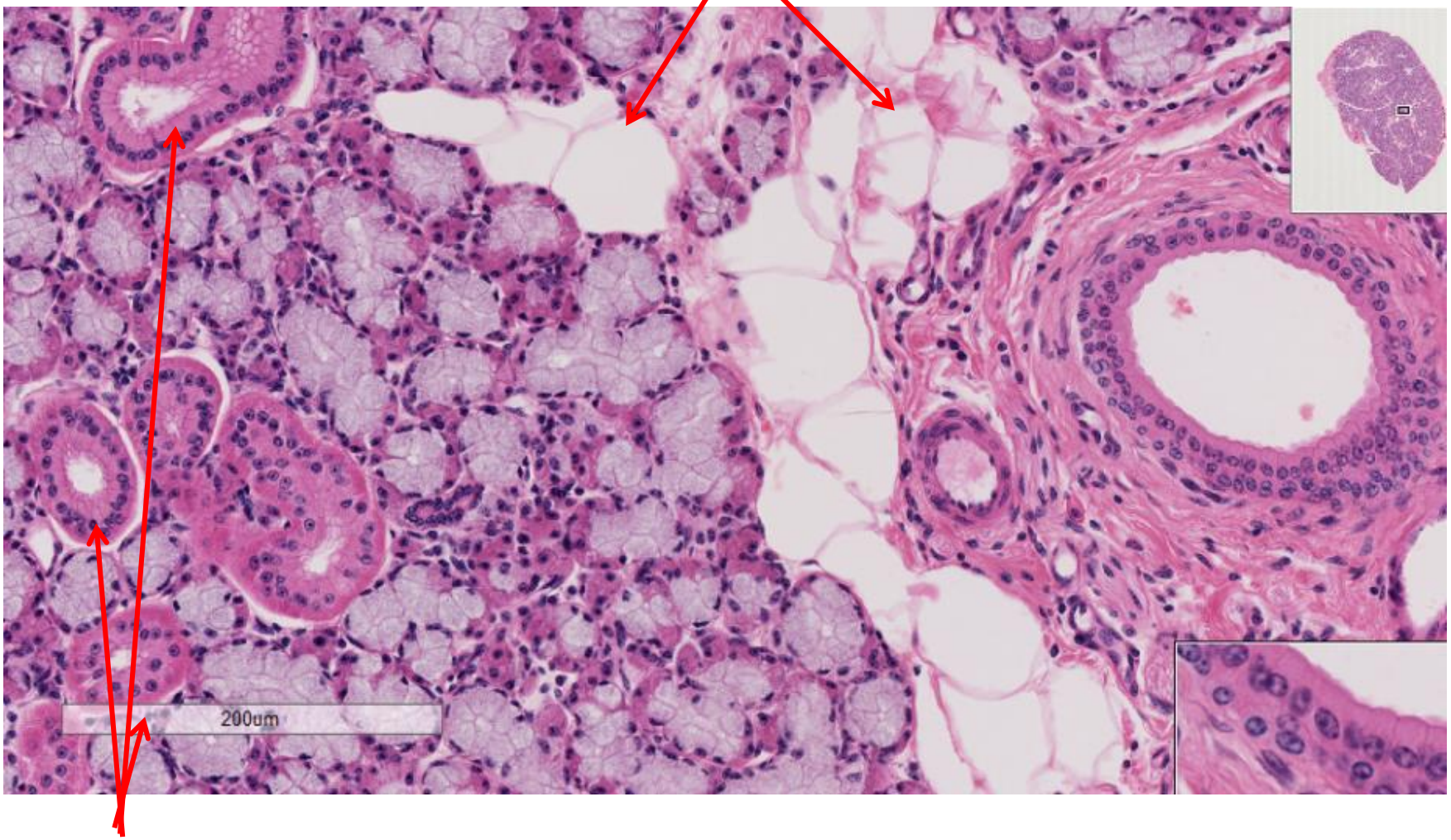
Slide #22 (BV3-113a1) – Tongue, bovine.



Demo Slide #186 (SP-1-108). Parotid salivary gland, sheep



DEMO SLIDE BOX 183 (BV-1-85A)- Mandibular salivary gland, cow.



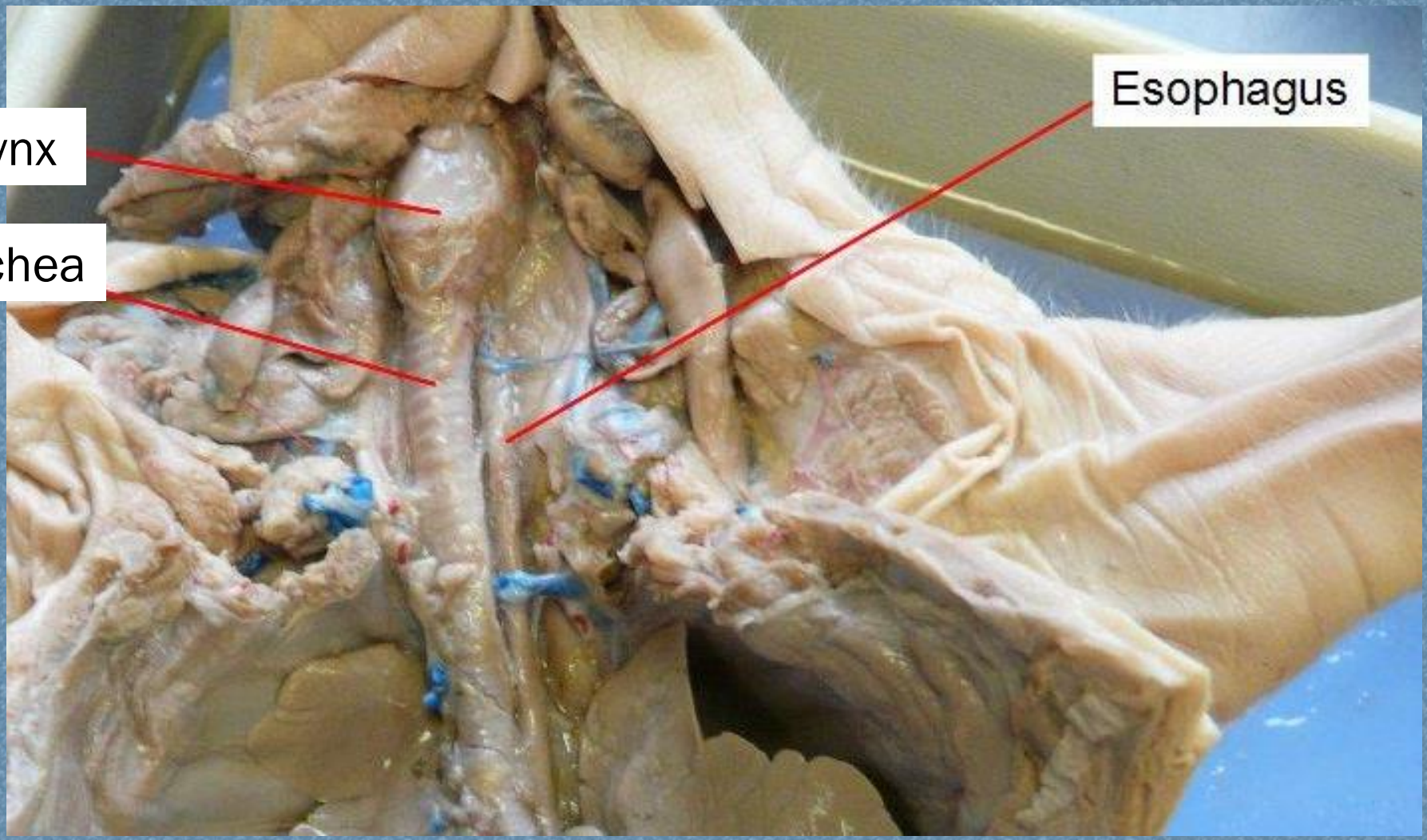
Upper GI

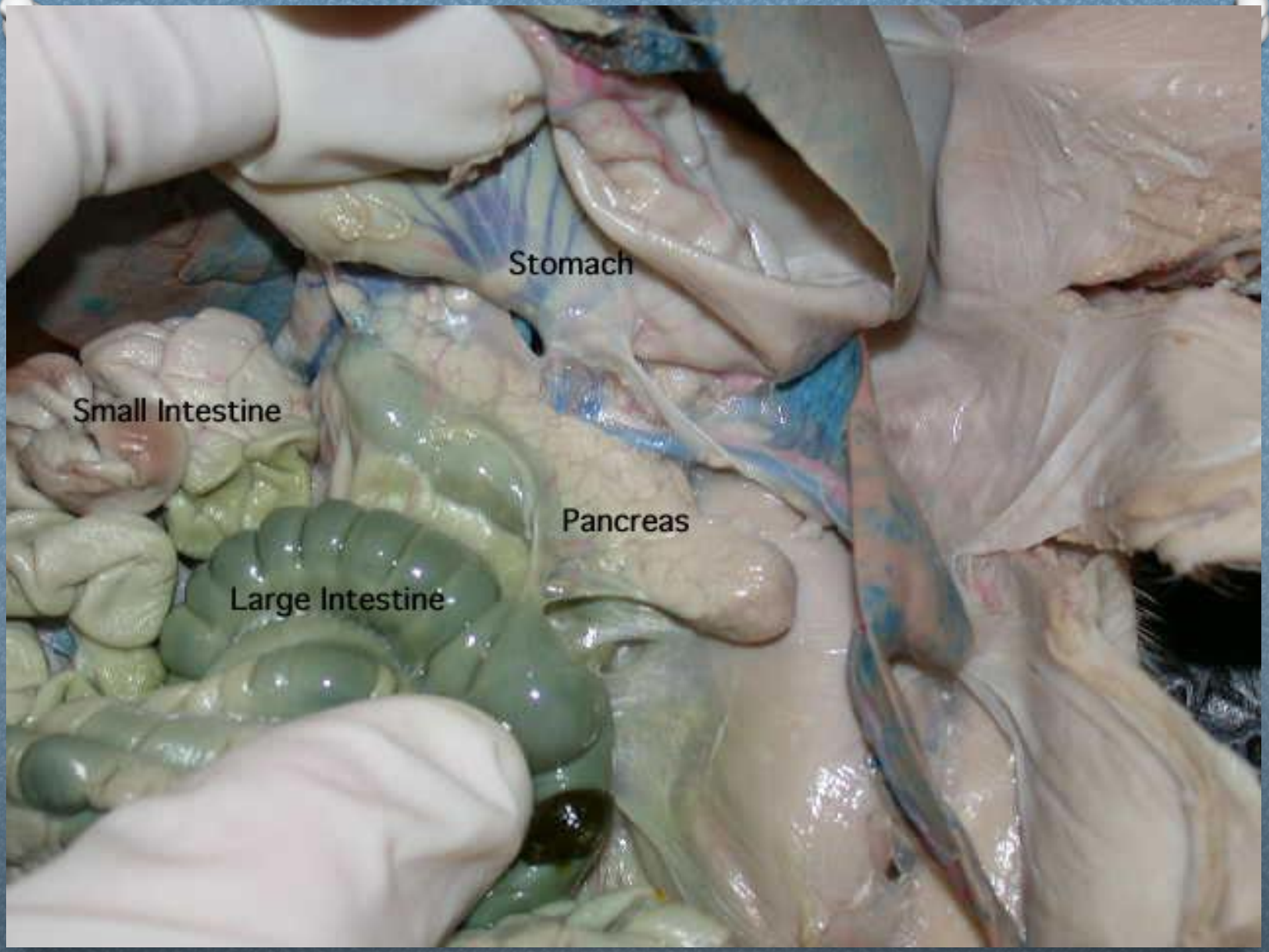
- **Esophagus:** Long thin muscular tube, connects pharynx to the stomach. Moves bolus (wad of food) via peristaltic contractions. Posterior to the trachea
- **Liver:** functions in digestion, metabolism, and storage of nutrients. Bile is produced which helps emulsify fats
- **Stomach:** Food storage and digestion
- **Gallbladder:** Holds bile until needed to digest fatty acids
- **Pancreas:** Excretes enzymes to break down proteins, lipids, and carbohydrates. Also produces insulin
- **Spleen:** Brown, flat, oval organ that filters and stores blood

Lower GI

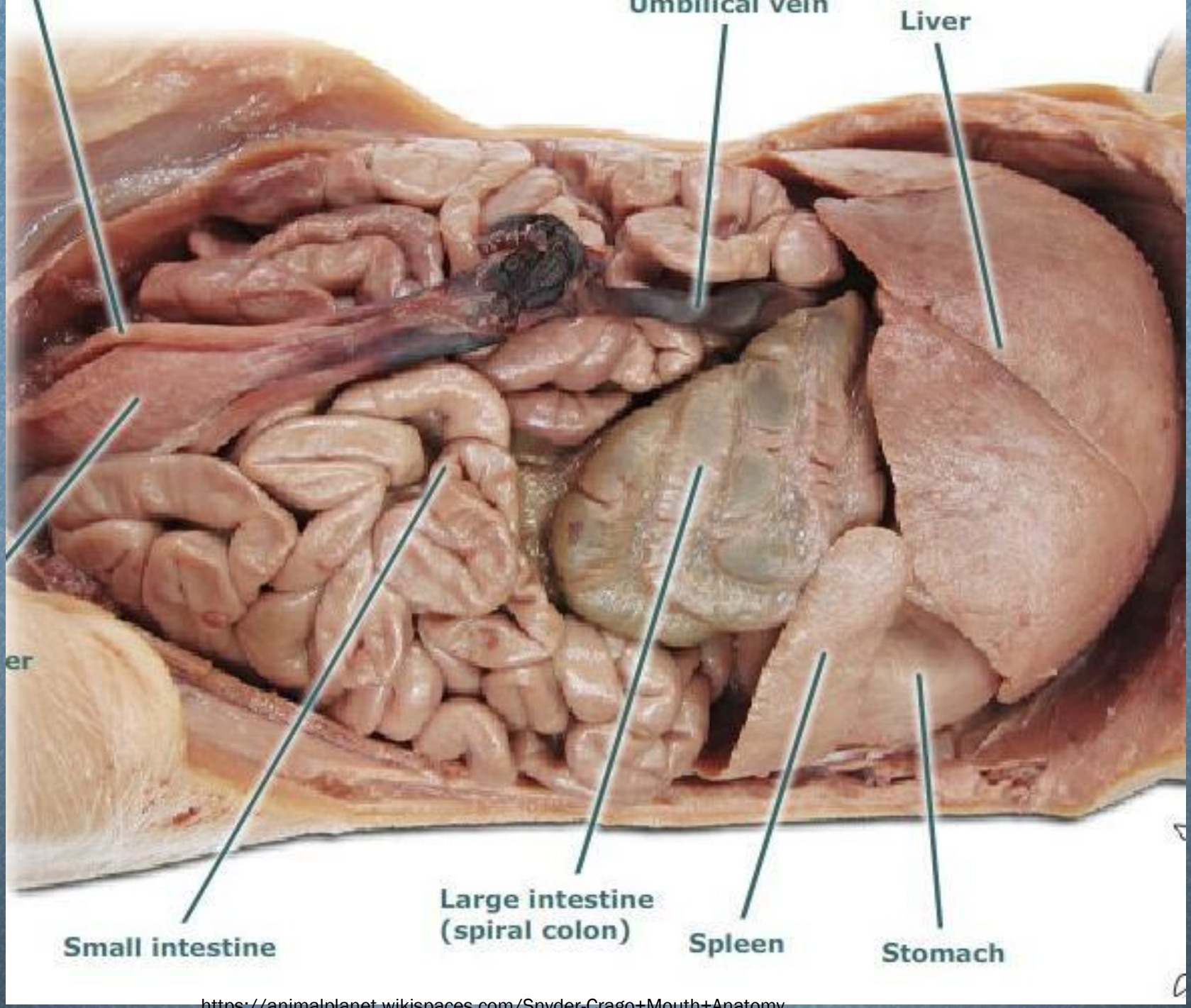
- **Small intestine:** Absorbs 90% of the nutrients from the food we eat. Very long, but SMALL in diameter
  - **Duodenum:** receives chyme (Partially digested food) from stomach. Enzymes form the pancreas, liver, and gallbladder mix here for chemical digestion
  - **Jejunum:** middle section
  - **Ileum:** where remaining nutrients are absorbed
- **Large intestine:** Absorbs water and vitamins while converting digested food into feces. Short but LARGE in diameter
- **Rectum:** Where feces wait to be expelled
- **Anus:** Feces is expelled

GI TRACT



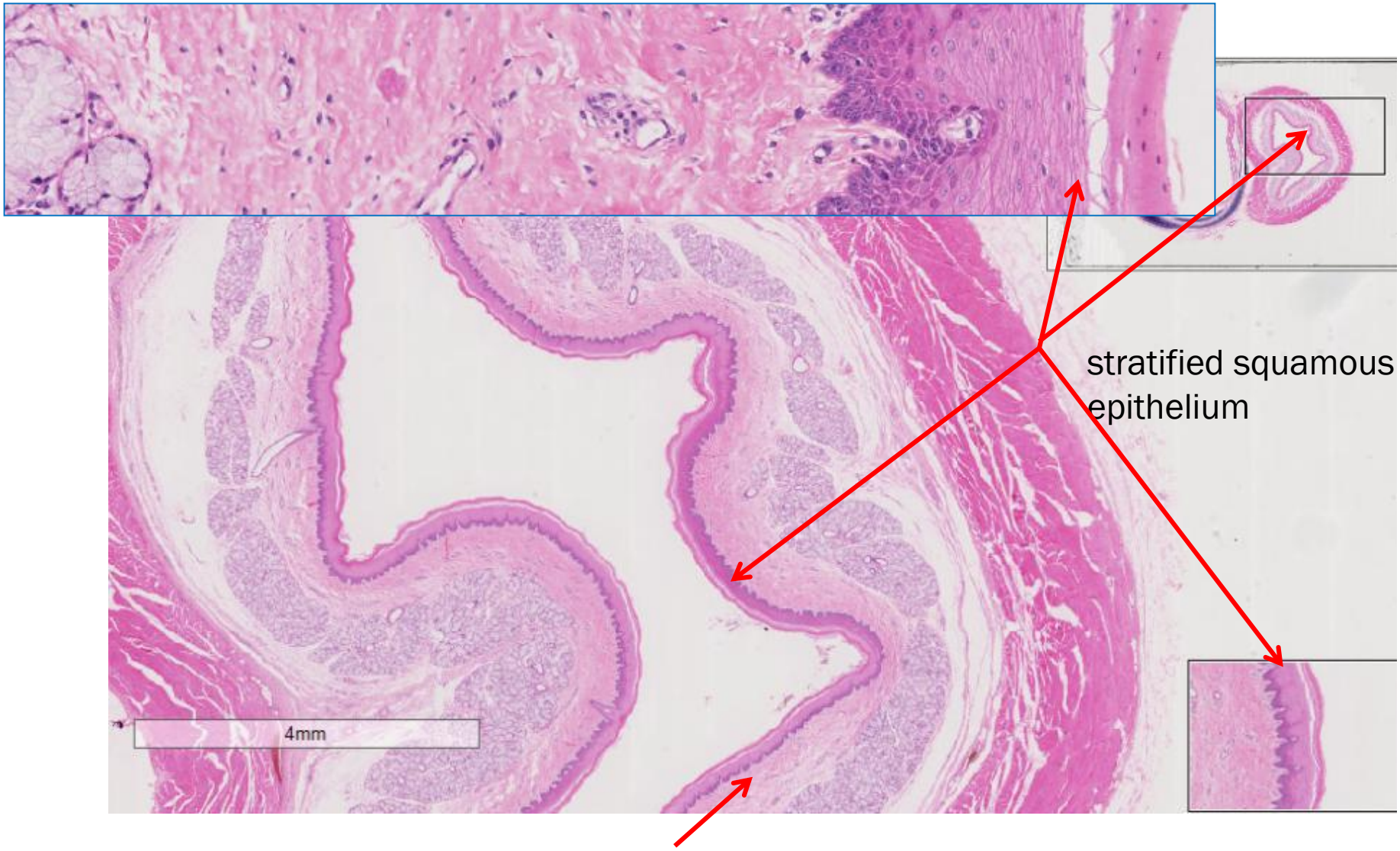


http://www.anselm.edu/homepage/jpitocch/genbios/fetalpig.html

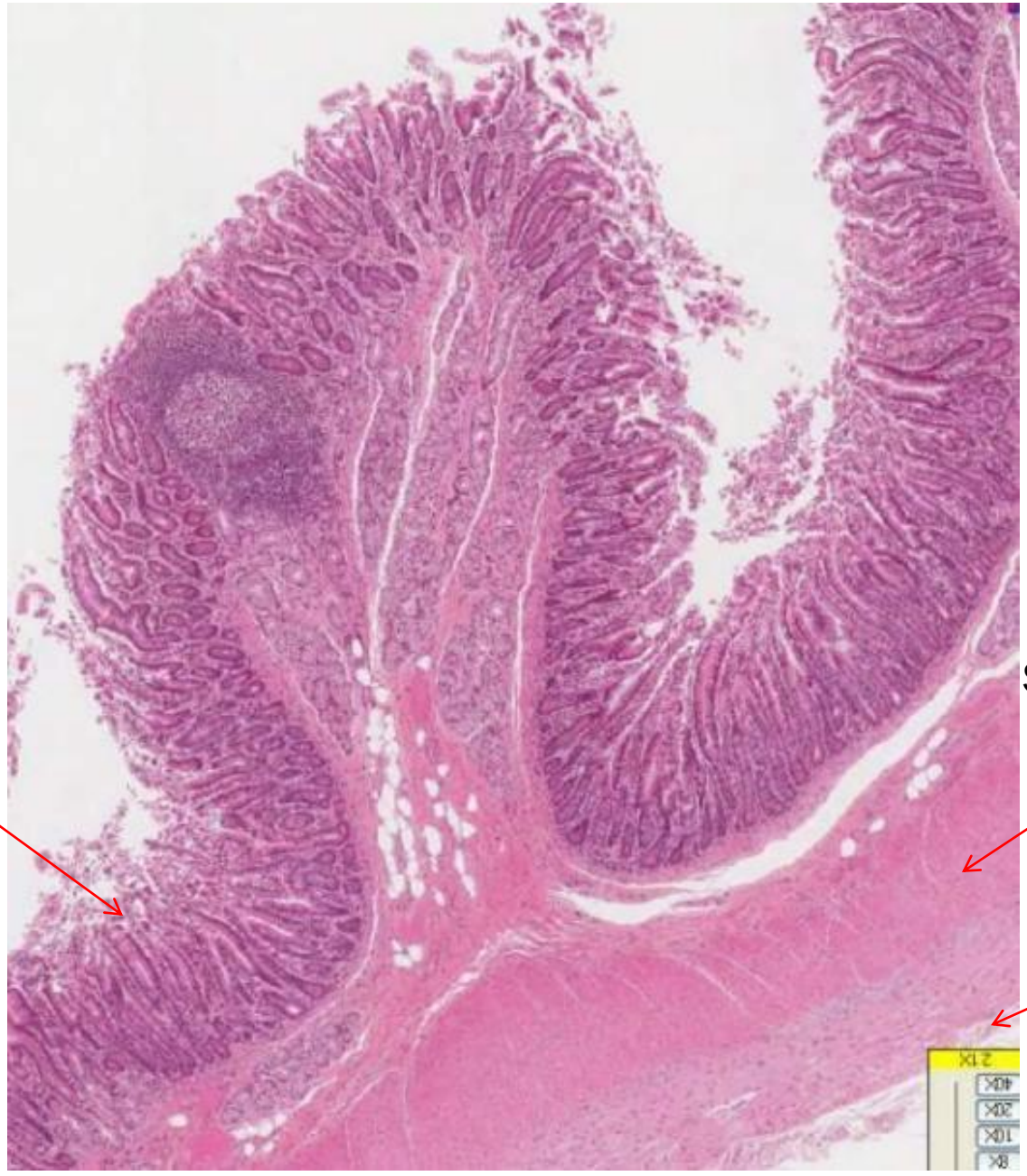


https://animalplanet.wikispaces.com/Snyder-Crago+Mouth+Anatomy

Slide #71 (Pf5-73/205). Esophagus and trachea,

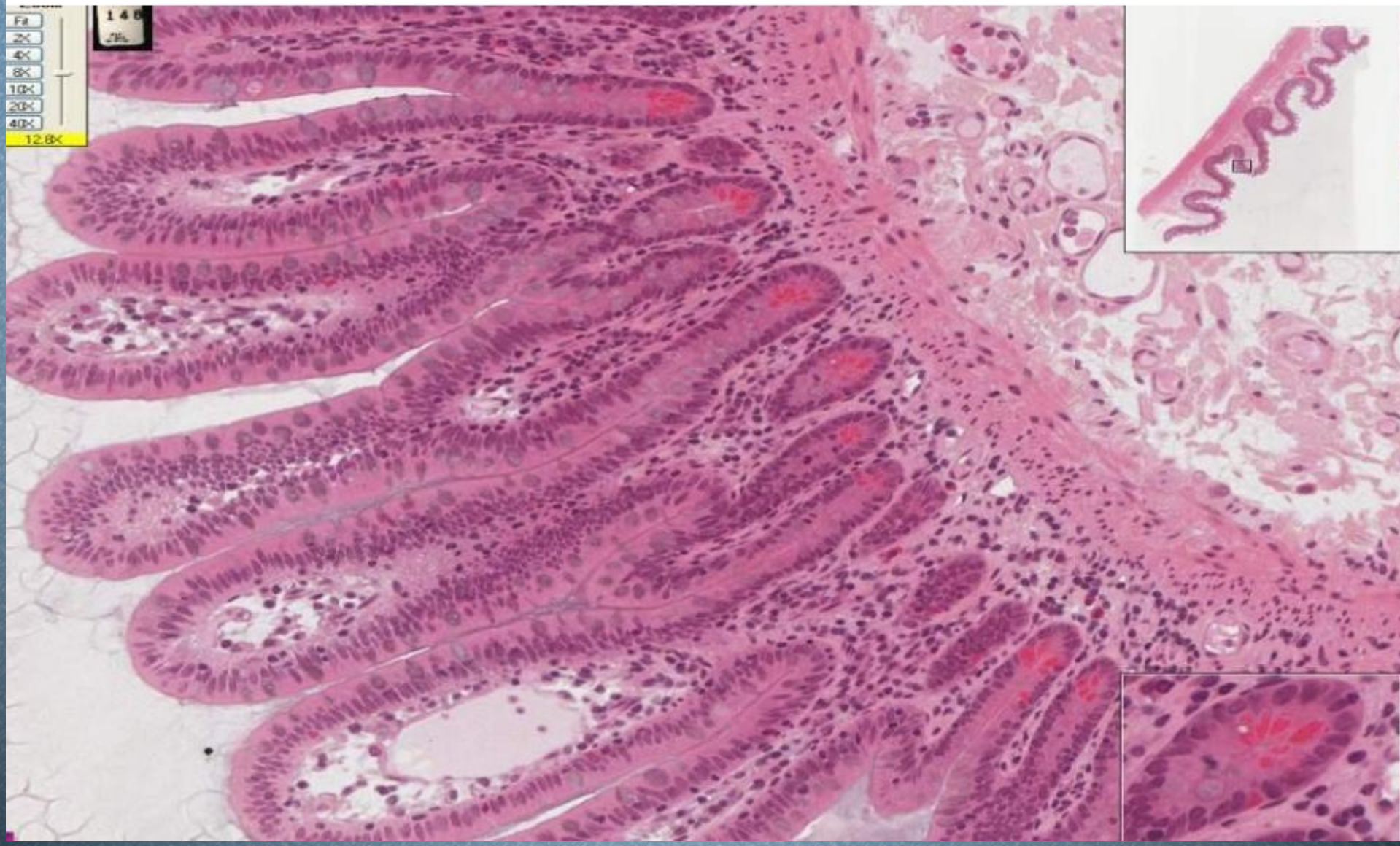


152 Duodenum



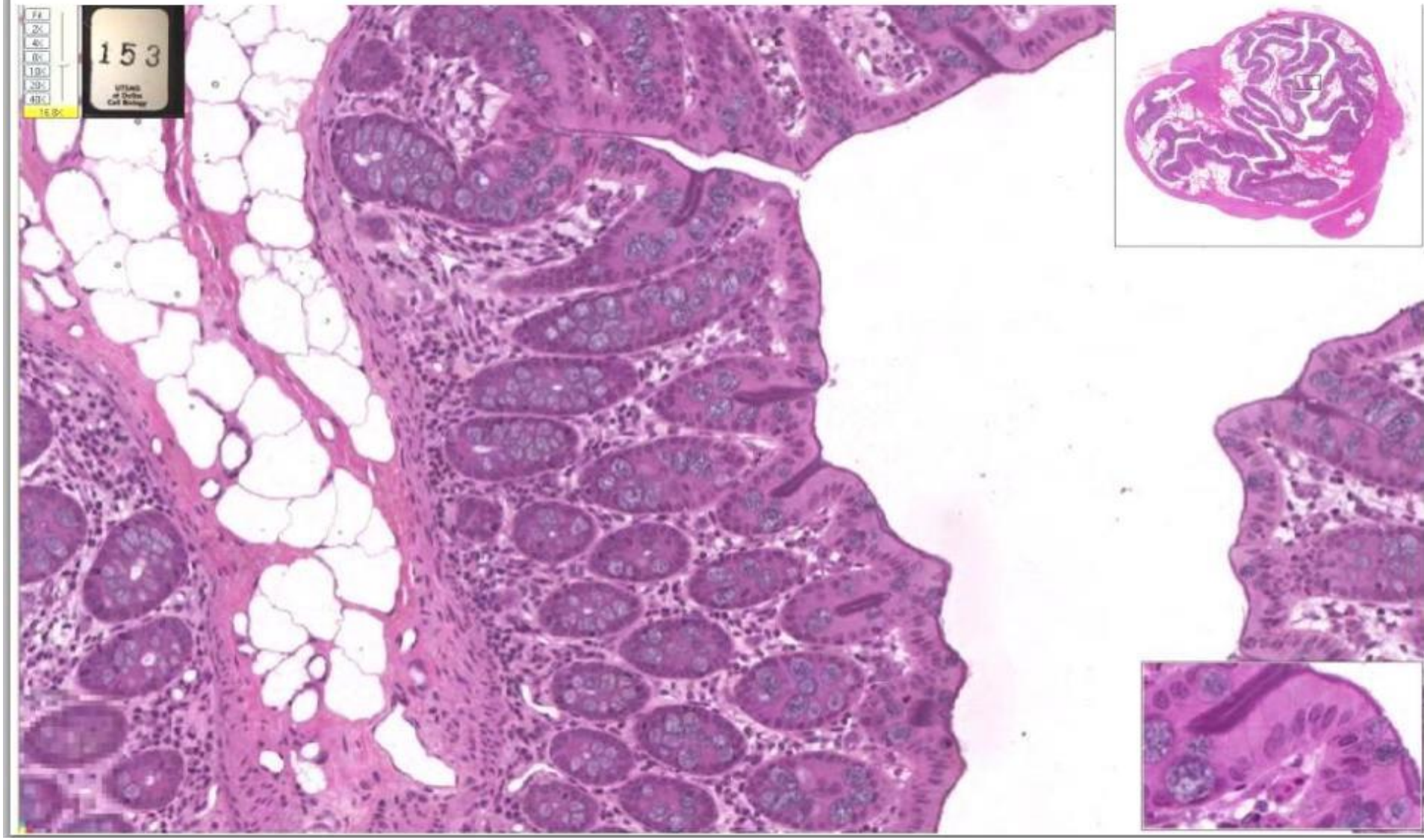
148

Ileum



153

Large intestine or Colon, monkey



Let's take a Closer Look!

- Submandibular gland
- Esophagus
- Spleen
- Liver and Spleen
- Bile Duct and portal vein
- Gallbladder
- Pancreas
- Ileum
- Duodenum
- Liver

Respiratory Tract

Goal: To remove carbon dioxide from the blood and replace it with oxygen

- Works in conjunction with the circulatory system
- Organs:
  - Upper Tract
    - Nose with nares
    - Pharynx
    - Larynx
  - Lower Tract
    - Trachea
    - Lungs which contain the bronchi, bronchioles, and alveoli
    - Diaphragm

Nose

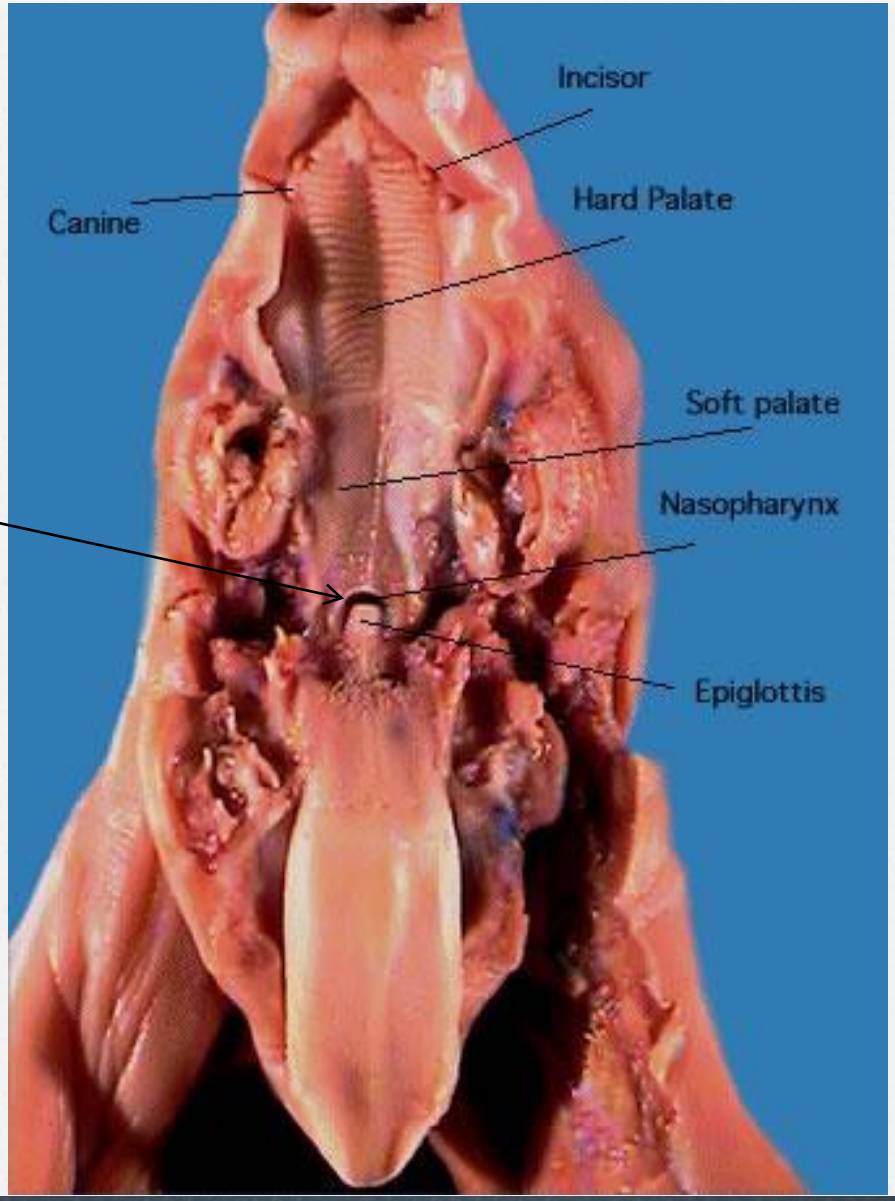
- Air enters the respiratory system through the paired nares or nostrils
- Two nasal passages: separated by bone
- Used for smell
- Hair and mucous membranes clean out particles
- Carbon dioxide is expired through the nares

http://www.whitman.edu/academics/courses-of-study/biology/virtual-pig/respiratory-system

Pharynx and Epiglottis

- Nasopharynx
  - Above the soft palate
  - Leads from the nose to the trachea for breathing
- Laryngopharynx
  - Upper border of the glottis
  - Helps guide food and air
- Epiglottis
  - Small flap of cartilage
  - Lies above the pharynx
  - Allows for air to flow into larynx and trachea
  - Directs food into the esophagus

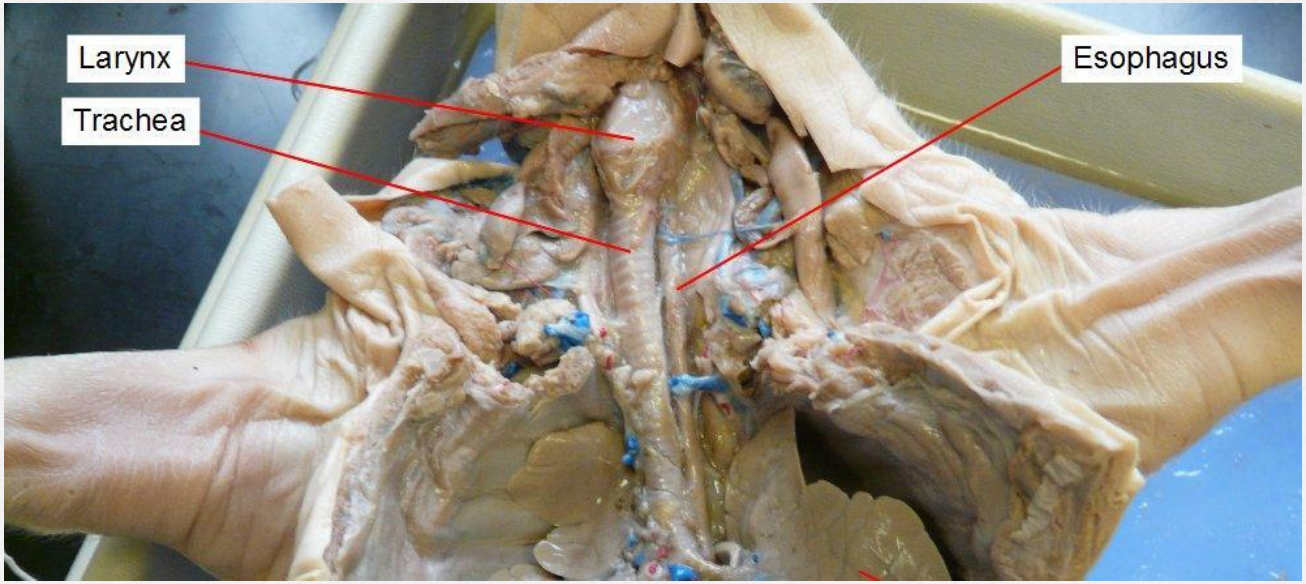
laryngopharynx



http://www.anselm.edu/homepage/jpitocch/genbios/fetalpig.html

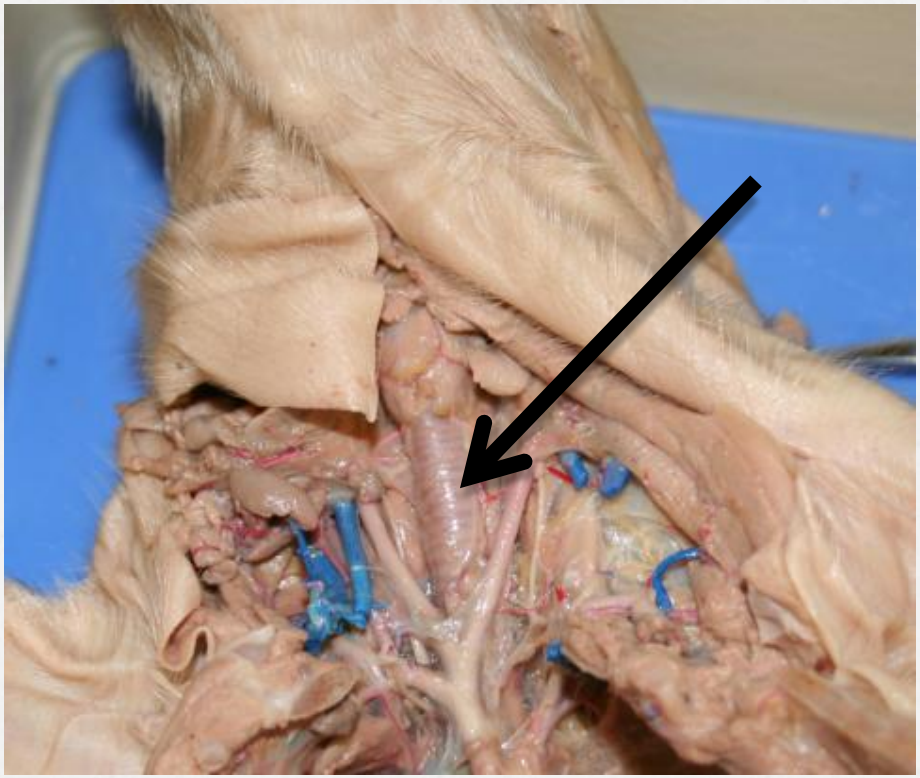
Larynx

- Large hard structure attached to the trachea
- Contains the vocal cords
- As air passes through the vocal cords vibrate and produce sound



http://faculty.clintoncc.suny.edu/faculty/michael.gregory/files/bio%20102/bio%20102%20laboratory/fetal%20pig/Mouth_and_neck_region_4.jpg

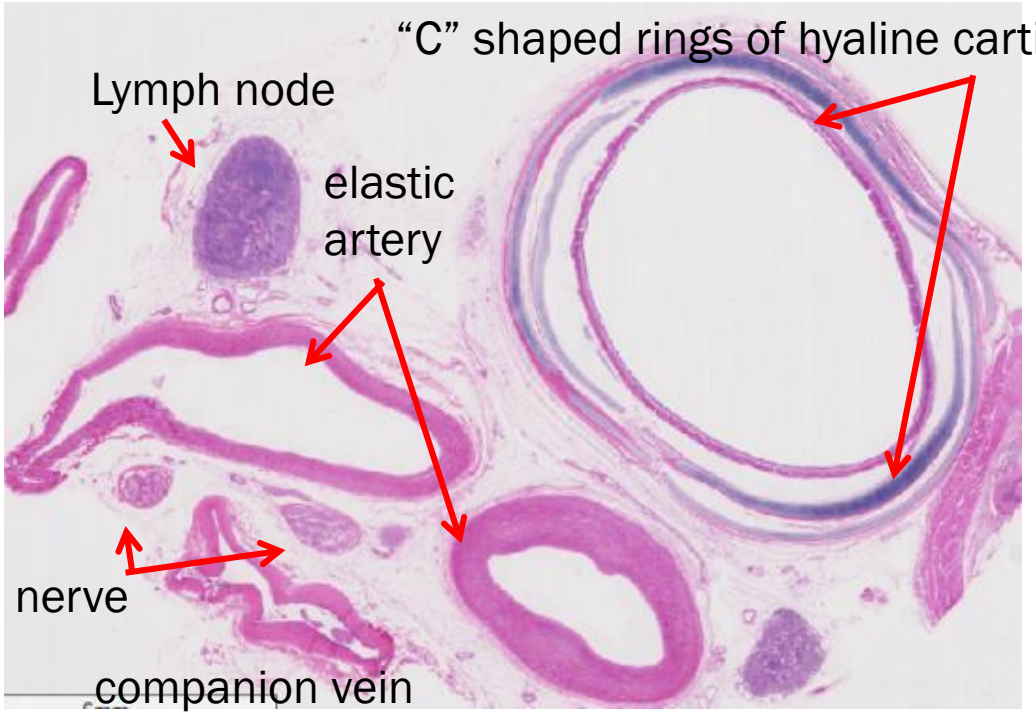
Trachea

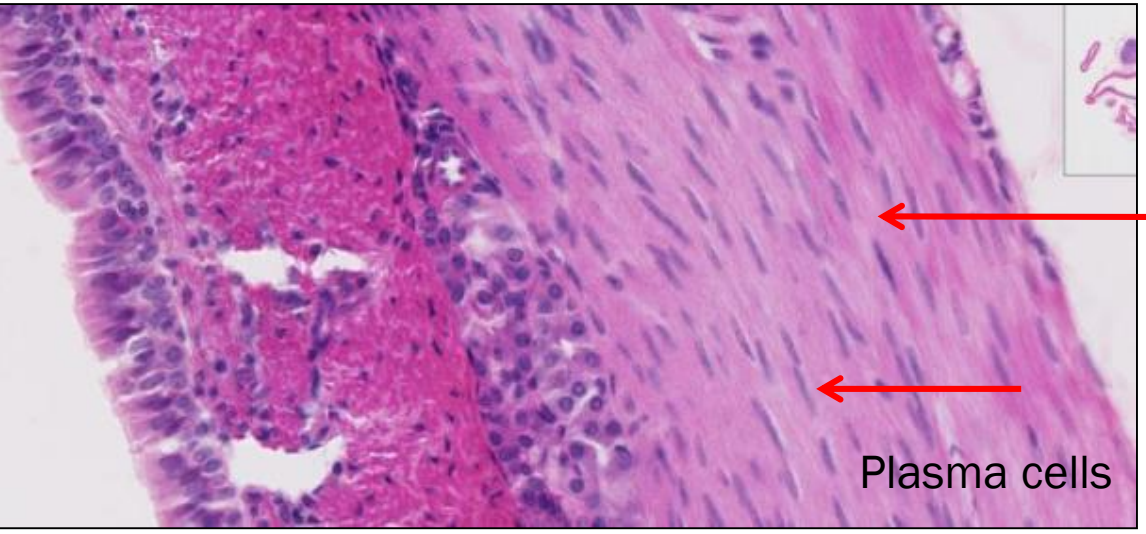


- Windpipe
- Connects larynx to lungs
- Contains cartilage rings that prevent trachea from collapsing
- Extends into the thoracic cavity
- Branches into bronchi
- Allows air into the lungs
- Anterior to the esophagus

https://www.google.com/search?q=trachea+fetal+pig&espv=2&biw=972&bih=854&source=lnms&tbm=isch&sa=X&ei=qAQ4VKTyO4_o8AHI4oC4Ag&ved=0CAYQ_AUoAQ#facrc=_&imgdii=ZJMqXEEmRUJLqM%3A%3BLYjzE16FarDrrM%3BZJMqXEEmRUJLqM%3A&imgrc=ZJMqXEEmRUJLqM%253A%3BREGnqwdLFxjyuM%3Bhttp%253A%252F%252Fclassconnection.s3.amazonaws.com%252F244%252Fflashcards%252F2198244%252Fjpg%252Fpulmonary_trunk1352727288605.jpg%3Bhttp%253A%252F%252Fwww.studyblue.com%252Fnotes%252Fnote%252Fn%252Fpig-functions%252Fdeck%252F4427531%3B1058%3B794

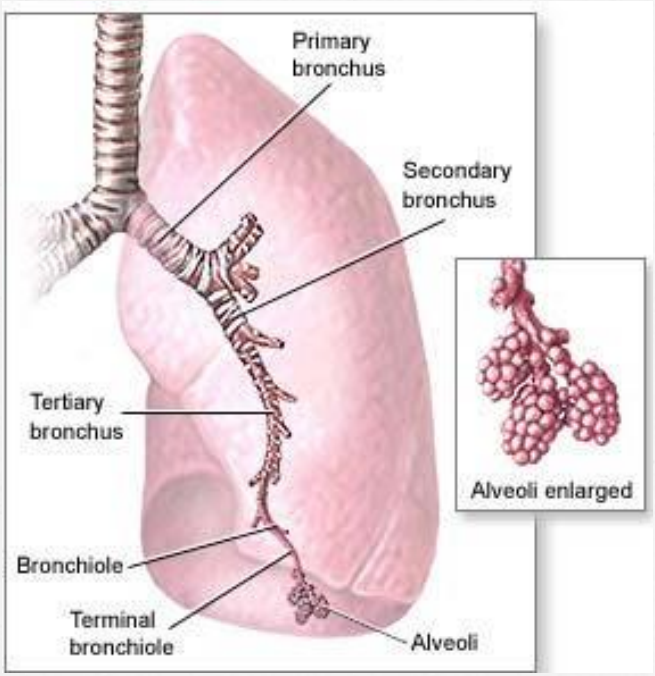
DEMO SLIDE BOX 81 – Trachea and elastic artery, pig.





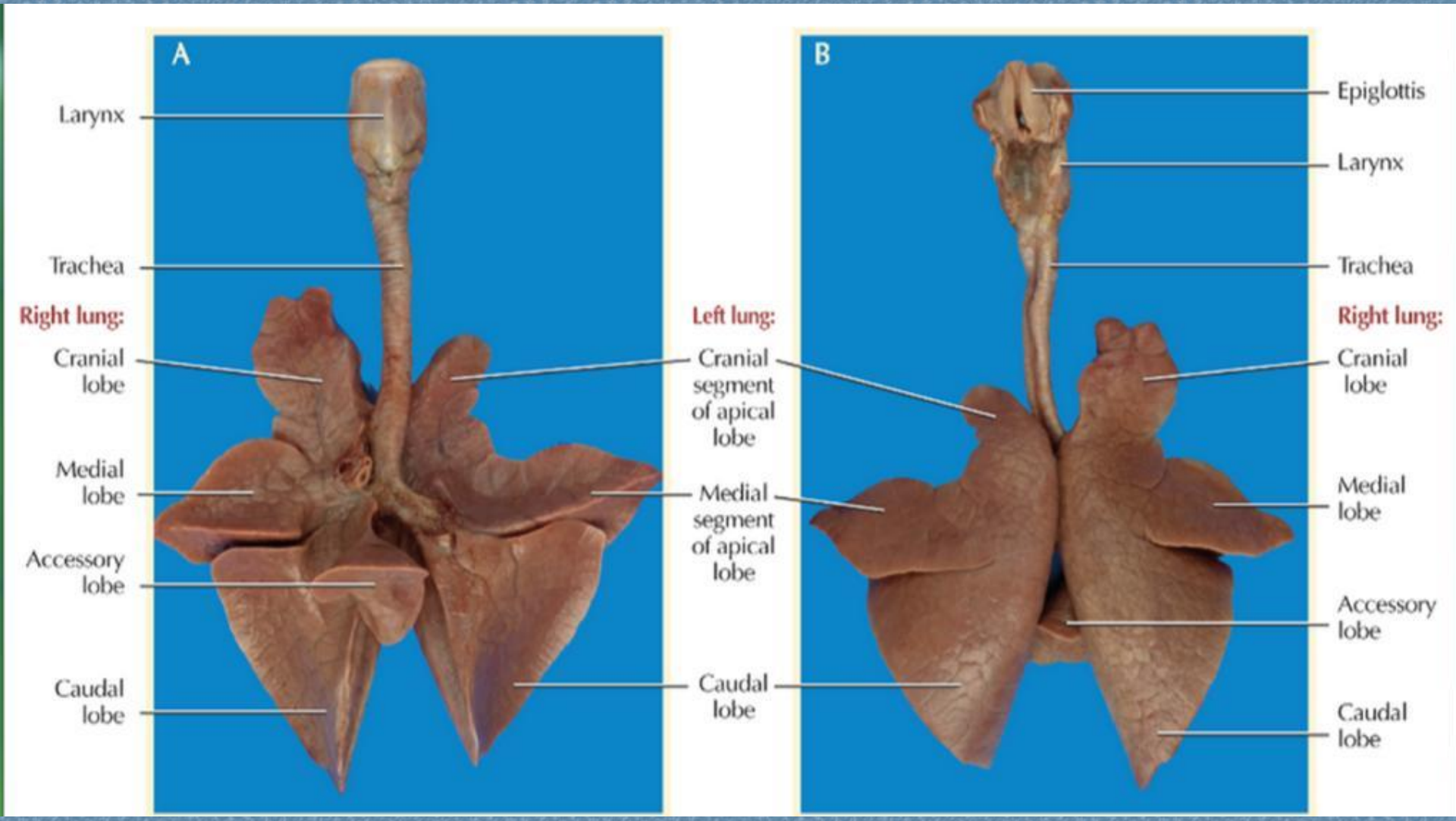
Lungs

- Branching of the trachea to bronchi to lungs
- Located on either side of the heart
- The bronchi divide into bronchioles
- Bronchioles branch into alveolar sacs
- Alveolar sacs are bunches of alveoli
- Alveoli hold air and tightly bound in blood vessels; allows for gas exchange



Lungs continued

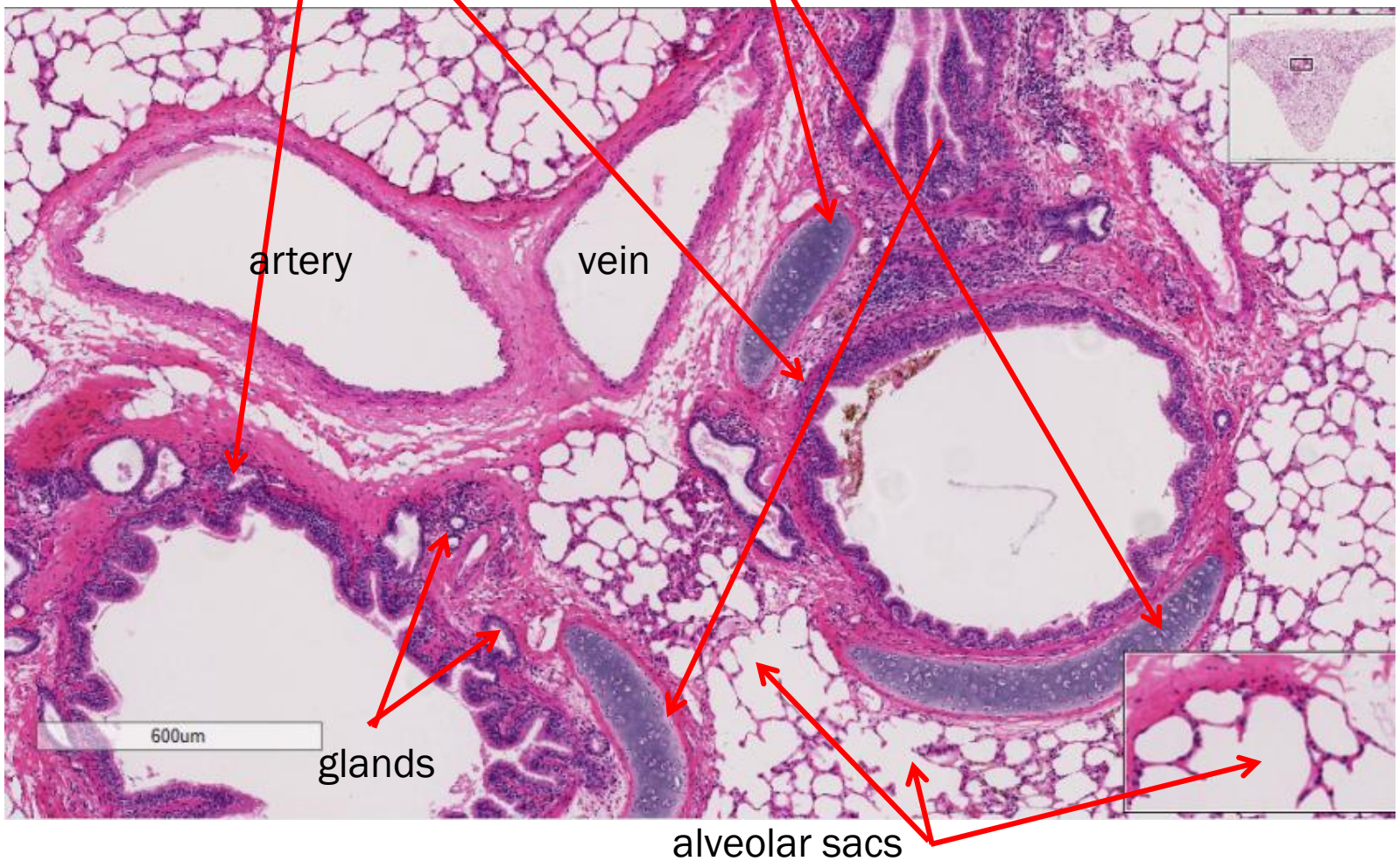
- Sectioned into lobes
- Right lung is larger (4 lobes)
  - cranial, medial, caudal, and accessory lobes
- Left lung is smaller because of space taken up by the heart (2 lobes)
  - apical and caudal lobe



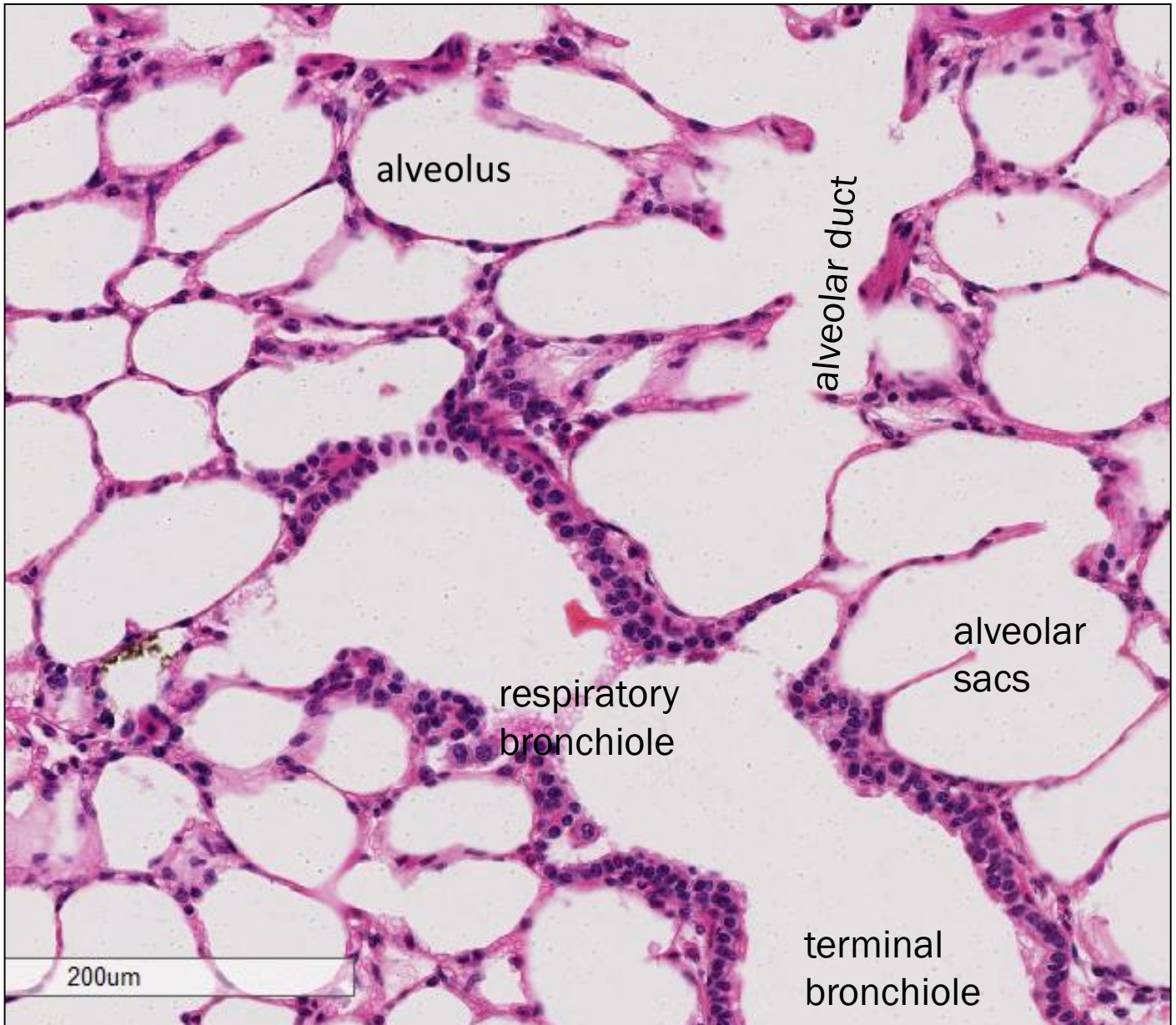
https://www.inkling.com/read/dissection-guide-atlas-fetal-pig-smith-schenk-3rd/chapter-6/the-thoracic-cavity

Slide #72(SP-1-81). Lung, sheep.

smaller intrapulmonary bronchi.

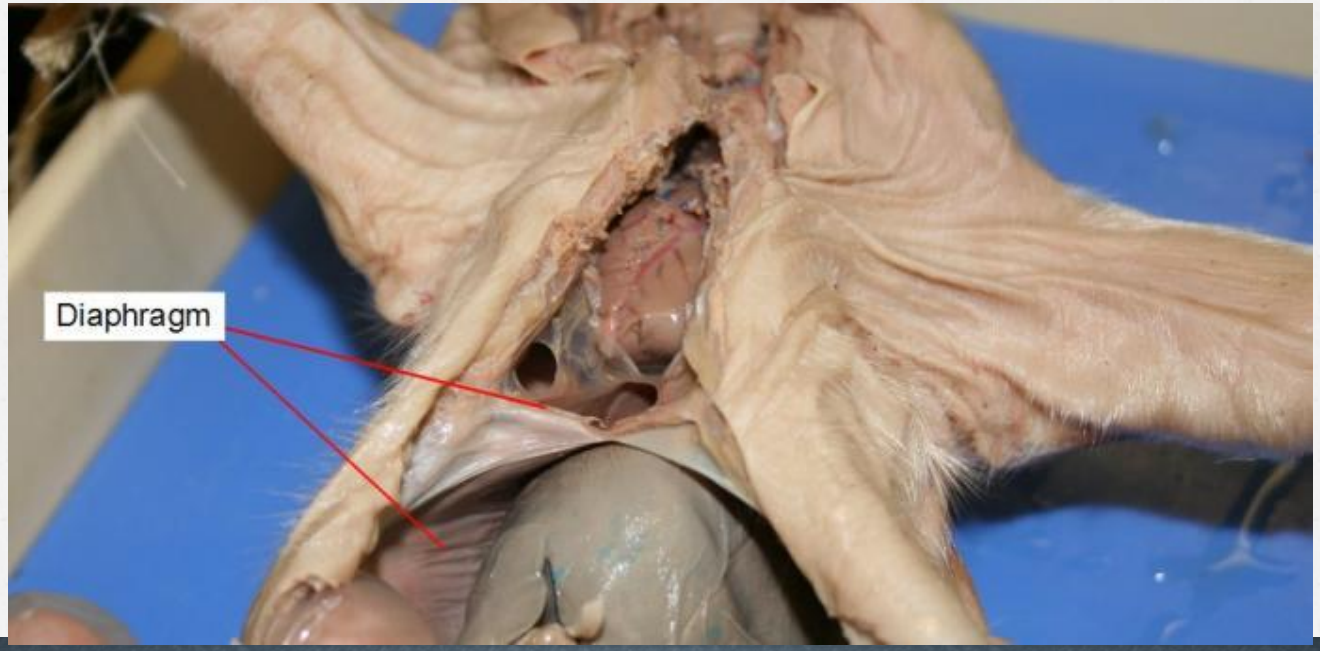


Slide #72(SP-1-81). Lung, sheep.

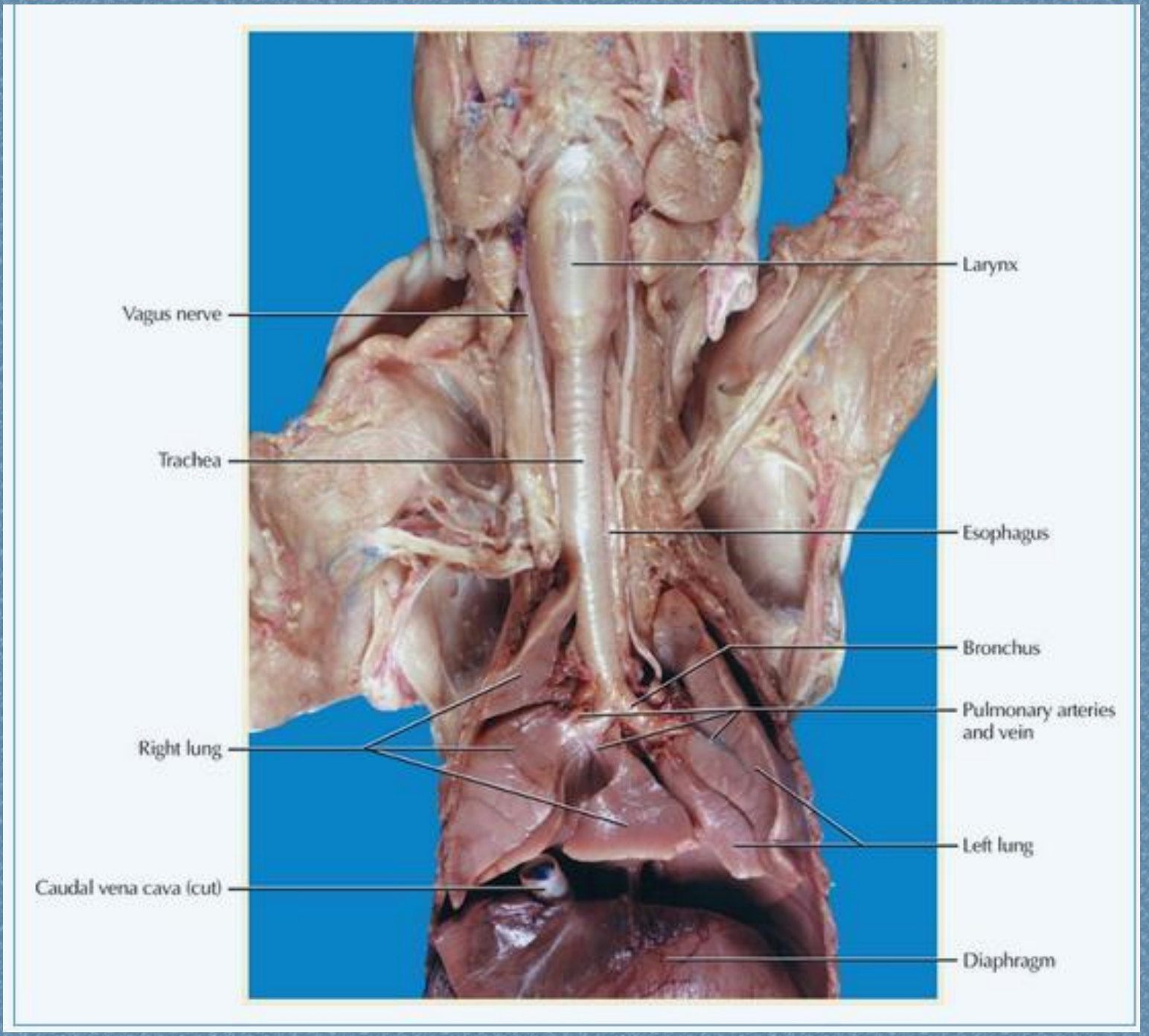


Diaphragm

- Below the lungs
- Thin muscular sheet of tissue
- Only in mammals
- Expands to allow air in (diaphragm contracts)
- Compresses to expel air (diaphragm relaxes)
- Separates the chest and abdominal cavities



http://faculty.clintoncc.suny.edu/faculty/michael.gregory/files/bio%20102/bio%20102%20laboratory/fetal%20pig/Respiratory_system_5.jpg



https://www.inkling.com/read/dissection-guide-atlas-fetal-pig-smith-schenk-3rd/chapter-6/the-thoracic-cavity

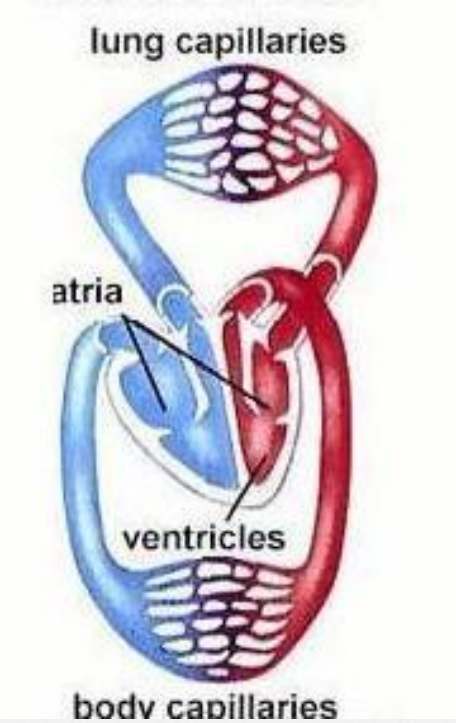
Let's take a Closer Look!

- Cross section of the Trachea
- Nasal Tract
- Lungs
- Esophagus and Trachea
- Larynx
- Lung
- Larynx, Esophagus, and Glands

Circulatory System

Allows blood, nutrients, oxygen and other gases, and hormones to flow throughout the body

- Mammals (including humans)
  - Double loop system
  - 4 chambered heart
- Organs
  - Heart
  - Lungs
  - Arteries
  - Veins



http://www.ideacenter.org/contentmgr/showdetails.php/id/1113

Think of it like a highway

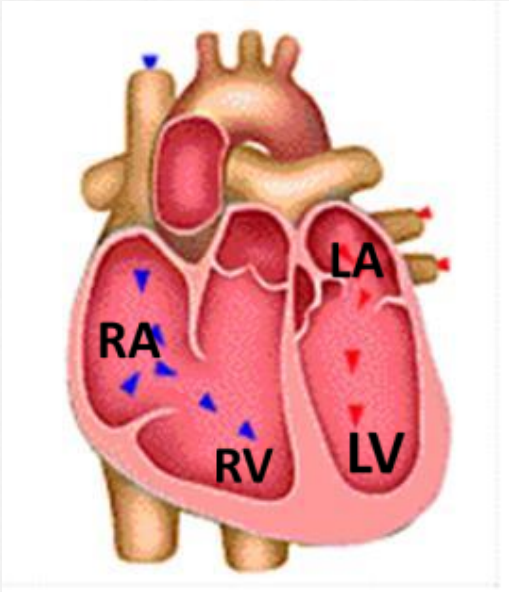
- **Blood**: Transports cells just like a bus transports people

- **Heart**: Controls the flow of blood like a traffic control light

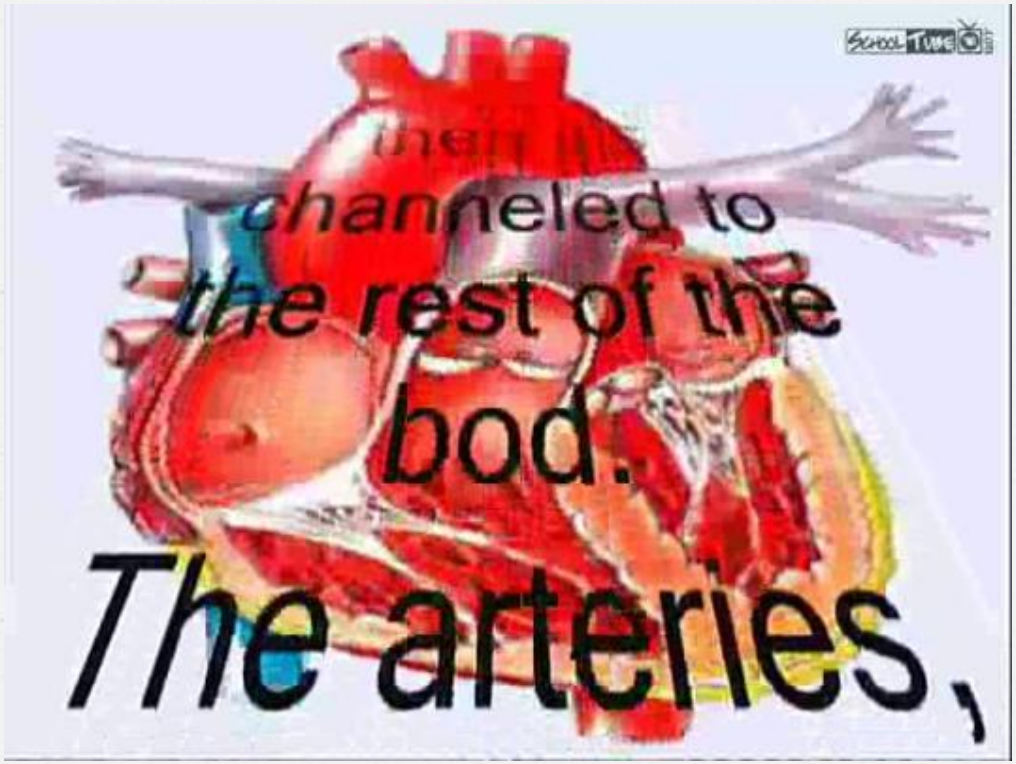
- **Blood Vessels**: lead the flow of blood through the body like roads

Heart

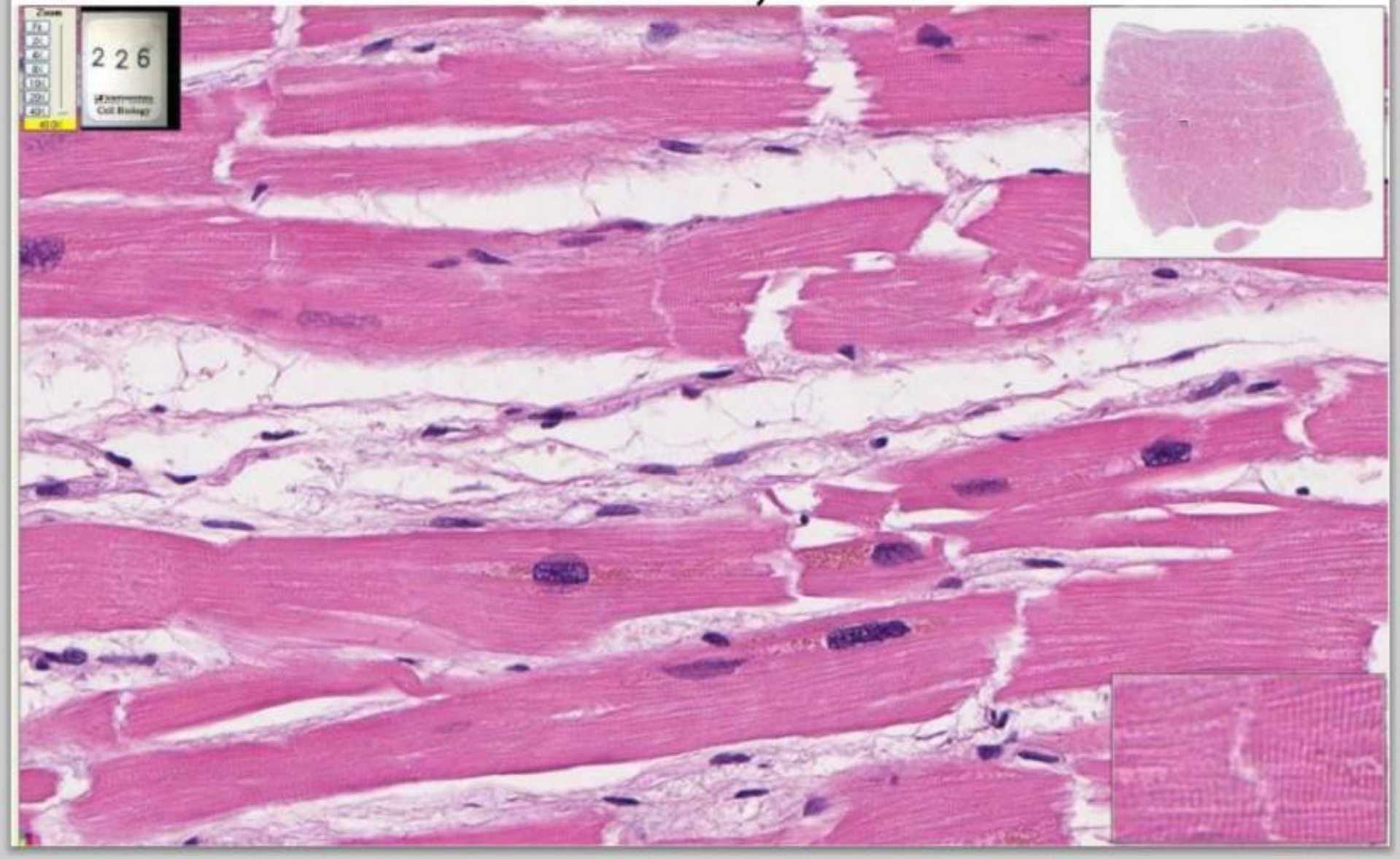
- Muscle used to pump blood
- 4 chambers in mammals
  - *Right Atria*
  - *Right Ventricle*
  - *Left Atria*
  - *Left Ventricle*
- Atria pump blood to ventricles
- Ventricles pump blood out of heart and into circulatory system
- Valves prevent backflow of blood



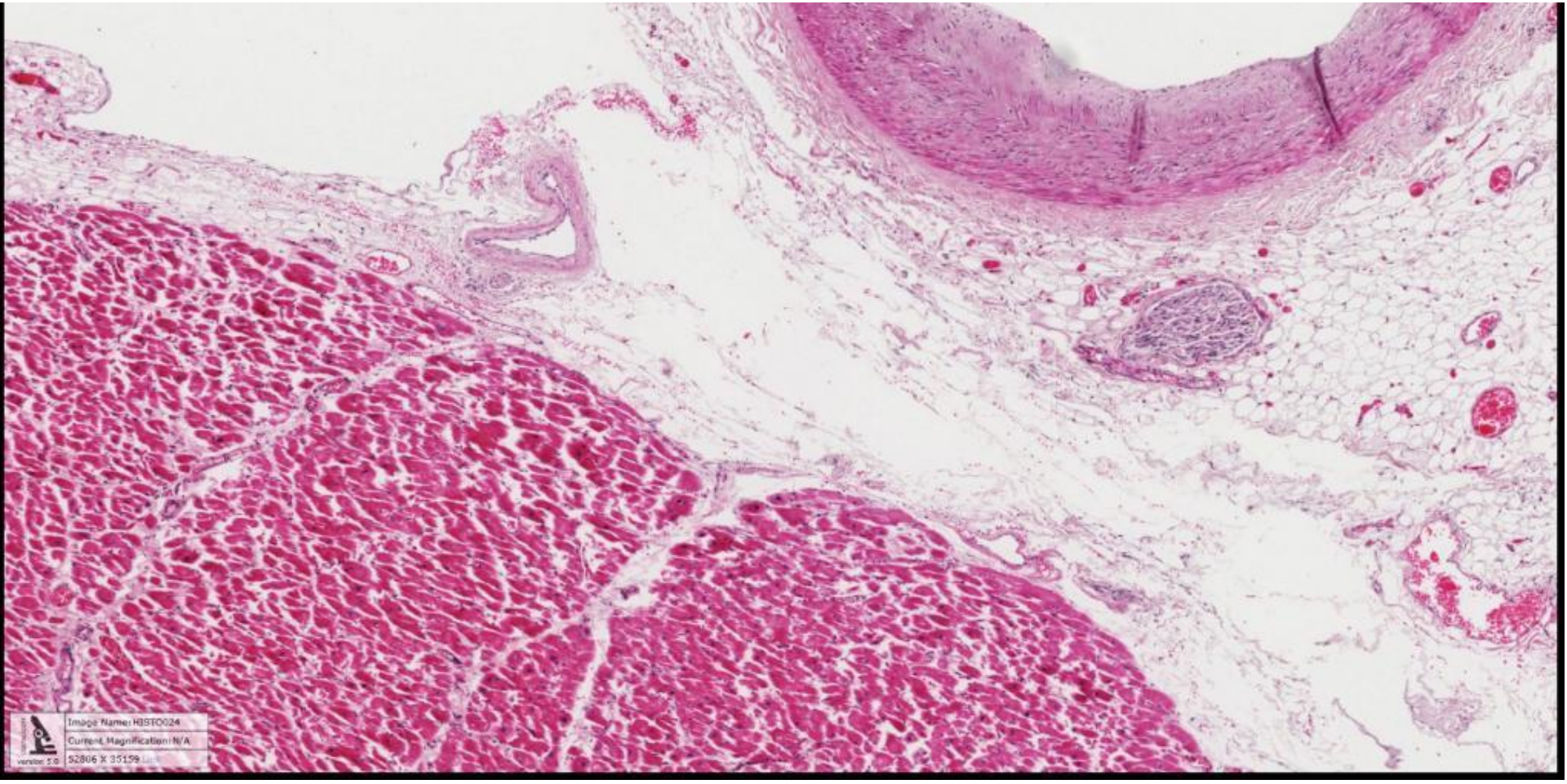
It's more fun to sing

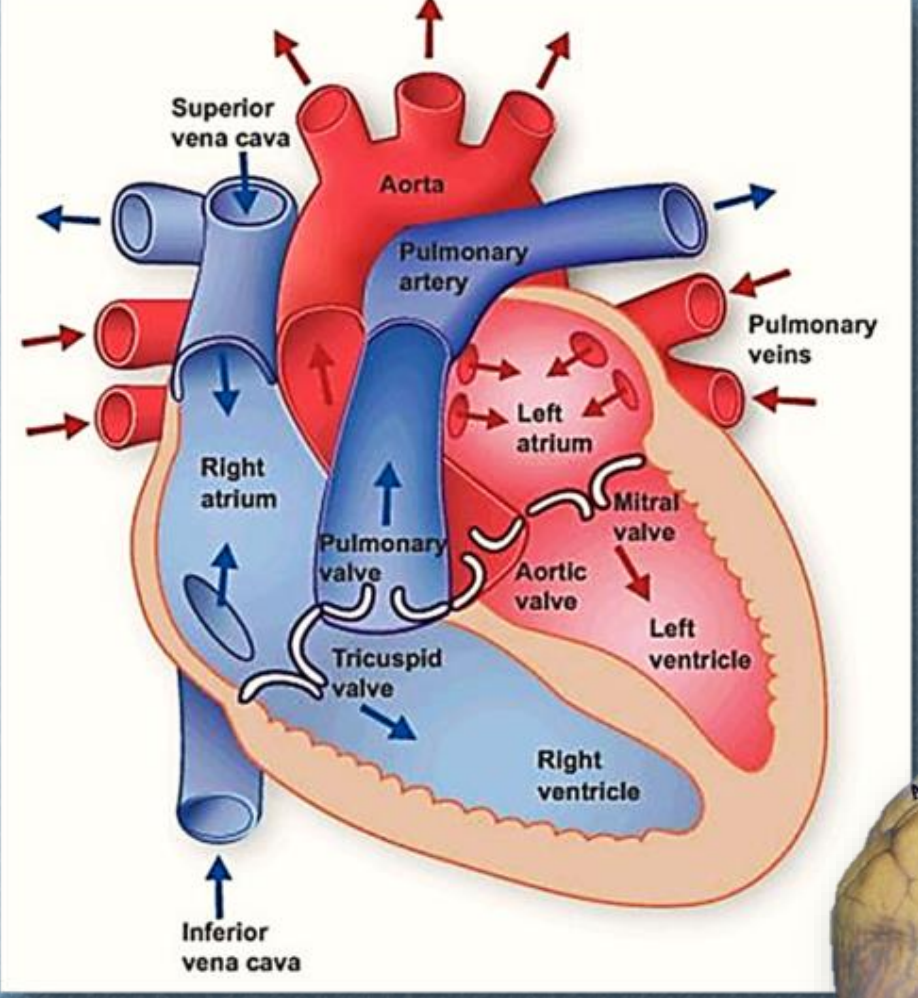


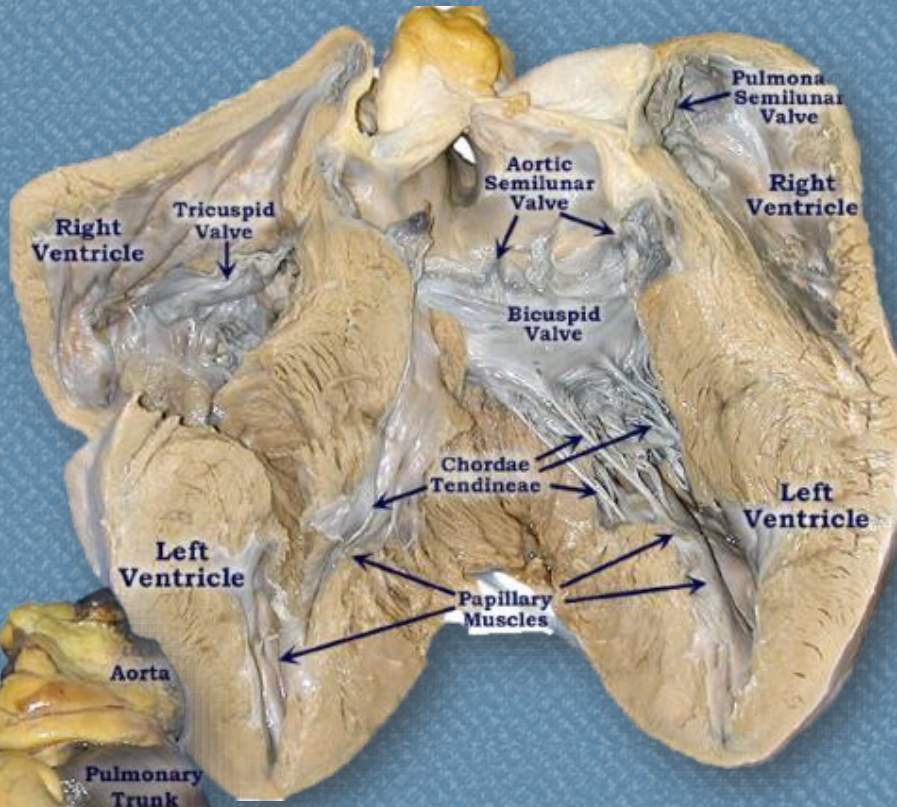
226 Opened Interclated disc in cardiac cells of Heart, endocardium

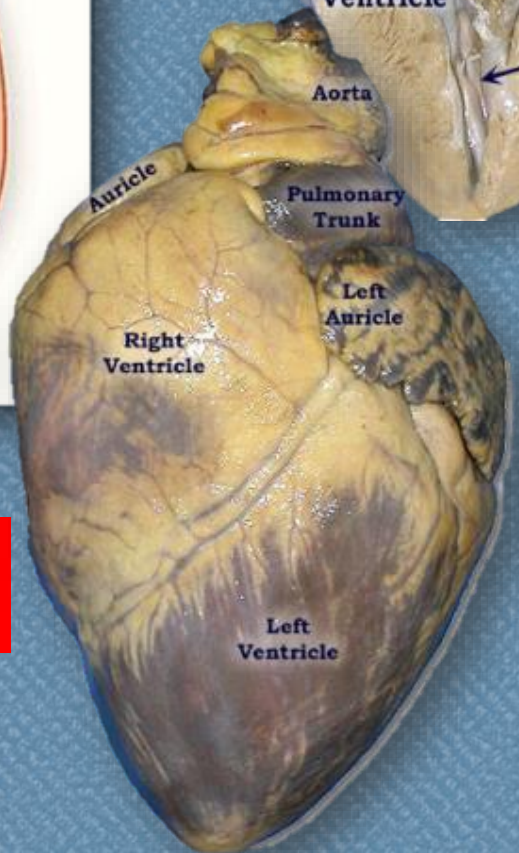


Heart with Valve









REMEMBER IT IS ALWAYS THE LEFT AND RIGHT OF THE PIG

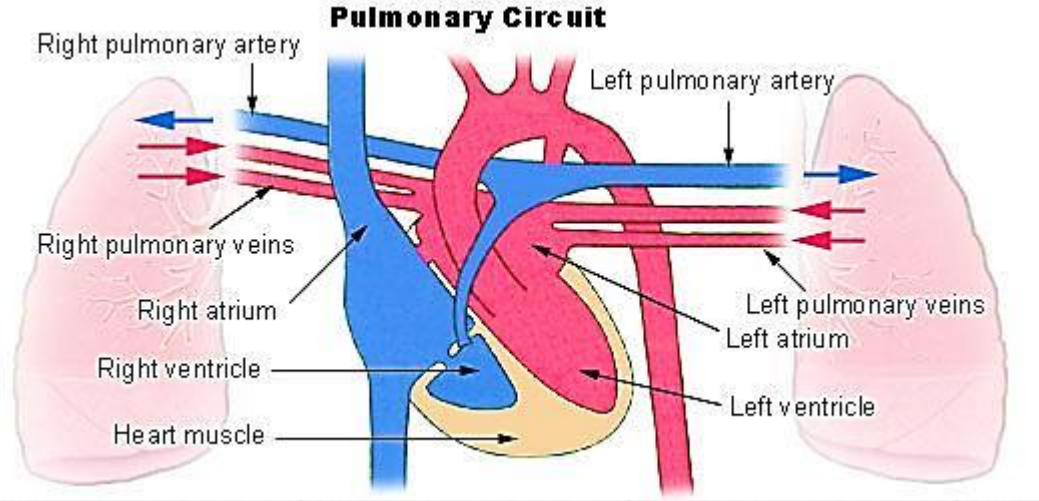
https://district.bluegrass.kctcs.edu/shirley.whitescarver/BIO139Lab/BIO139/139Lab2/Lab2PigHeartLables.html

Path of the Blood

- Oxygenated blood from the lungs enters from the pulmonary veins into the left atria, pumped through the mitral valve, and into the left ventricle.
- Then it is pumped through the aortic valve where it leaves through the Aorta to the be taken to the rest of the body
- Once circulated around the body the deoxygenated blood enters through the Superior Vena Cava from the top of body and Inferior Vena Cava from the bottom of body all into the right atria.
- It is then pumped through the tricuspid valve into the right ventricle
- Pumped through the pulmonary valve into the pulmonary artery to the lungs to be oxygenated.
- Once oxygenated it will return through the pulmonary artery.

Lungs

- Provide oxygen to the blood and remove carbon dioxide from the blood
- Exchange of gases takes place in the alveolar sacs



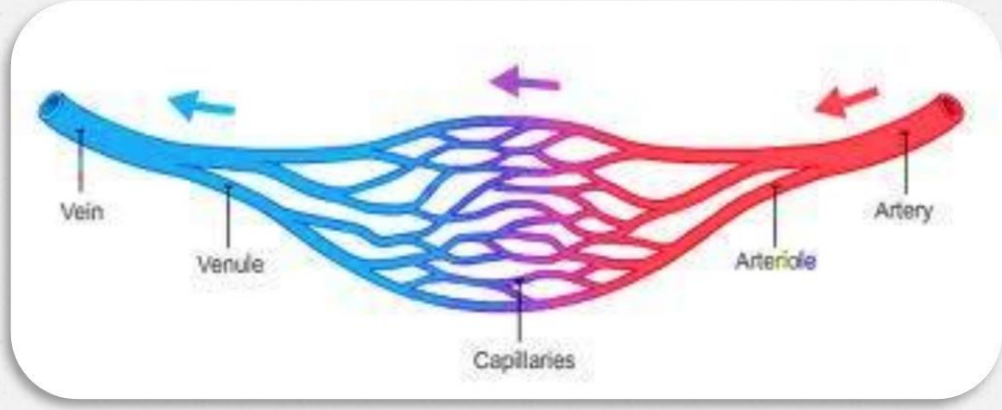
http://en.wikipedia.org/wiki/Pulmonary_circulation

Blood

- Liquid that circulates in the blood vessels, transporting oxygen, carbon dioxide, waste, and hormones around the body.
- Blood contains
  - White Blood Cells (leukocytes)- fight against infections
  - Red blood cells (erythrocytes) – transport oxygen
  - Platelets (thrombocytes)- assist in clotting
  - Plasma- liquid that suspends proteins and the solid components of blood

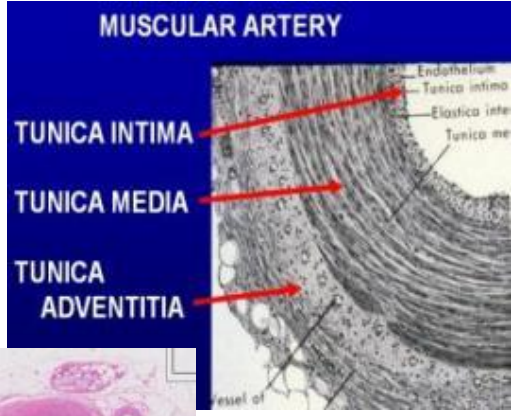
Blood Vessels

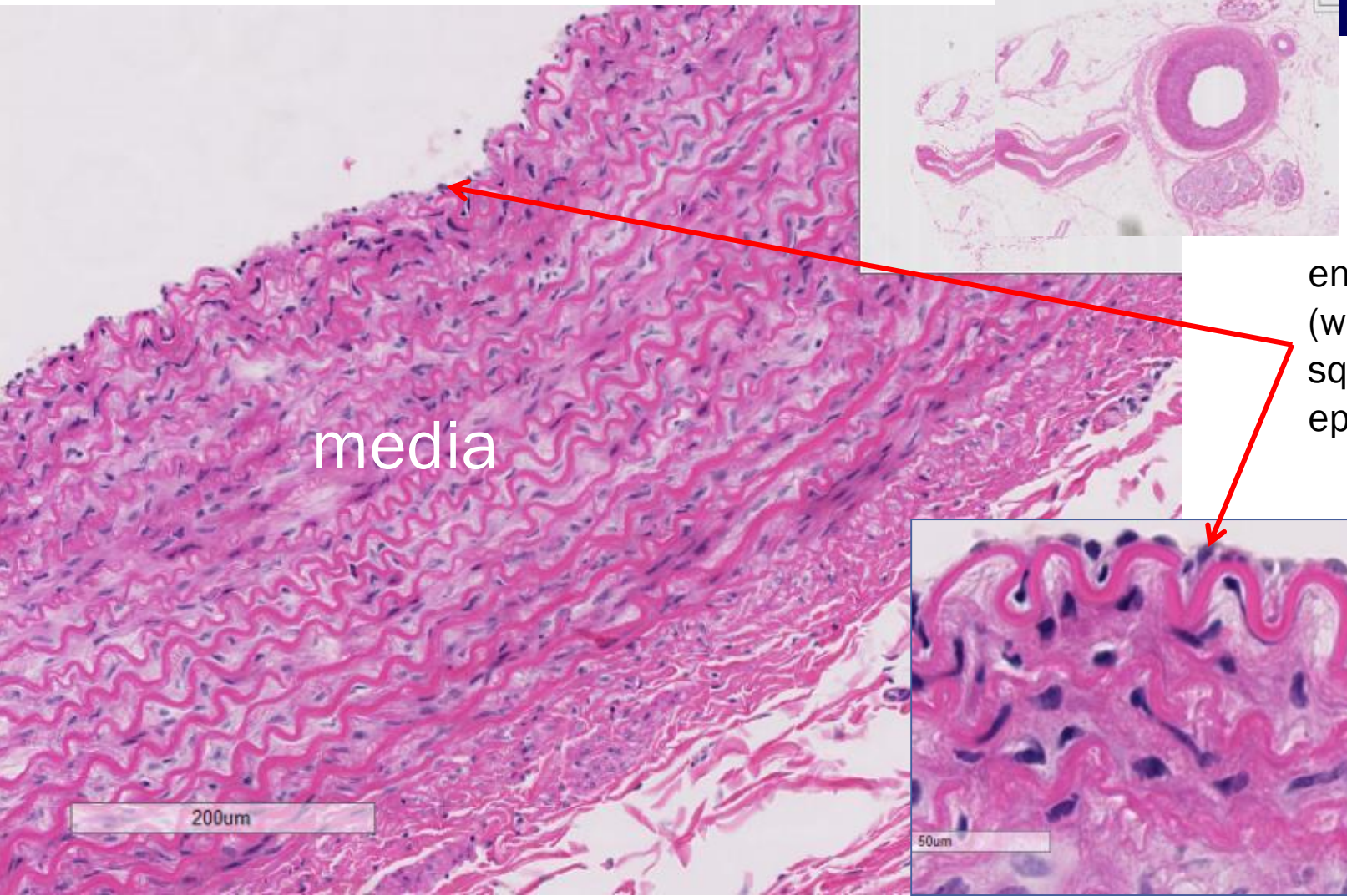
- **Veins-** carry blood to the heart
- **Arteries-** carry blood away from the heart
- **Capillaries** – small pathway that connects arteries to veins
  - Only one blood cell wide



https://www.studyblue.com/notes/note/n/emt-basic/deck/5473108

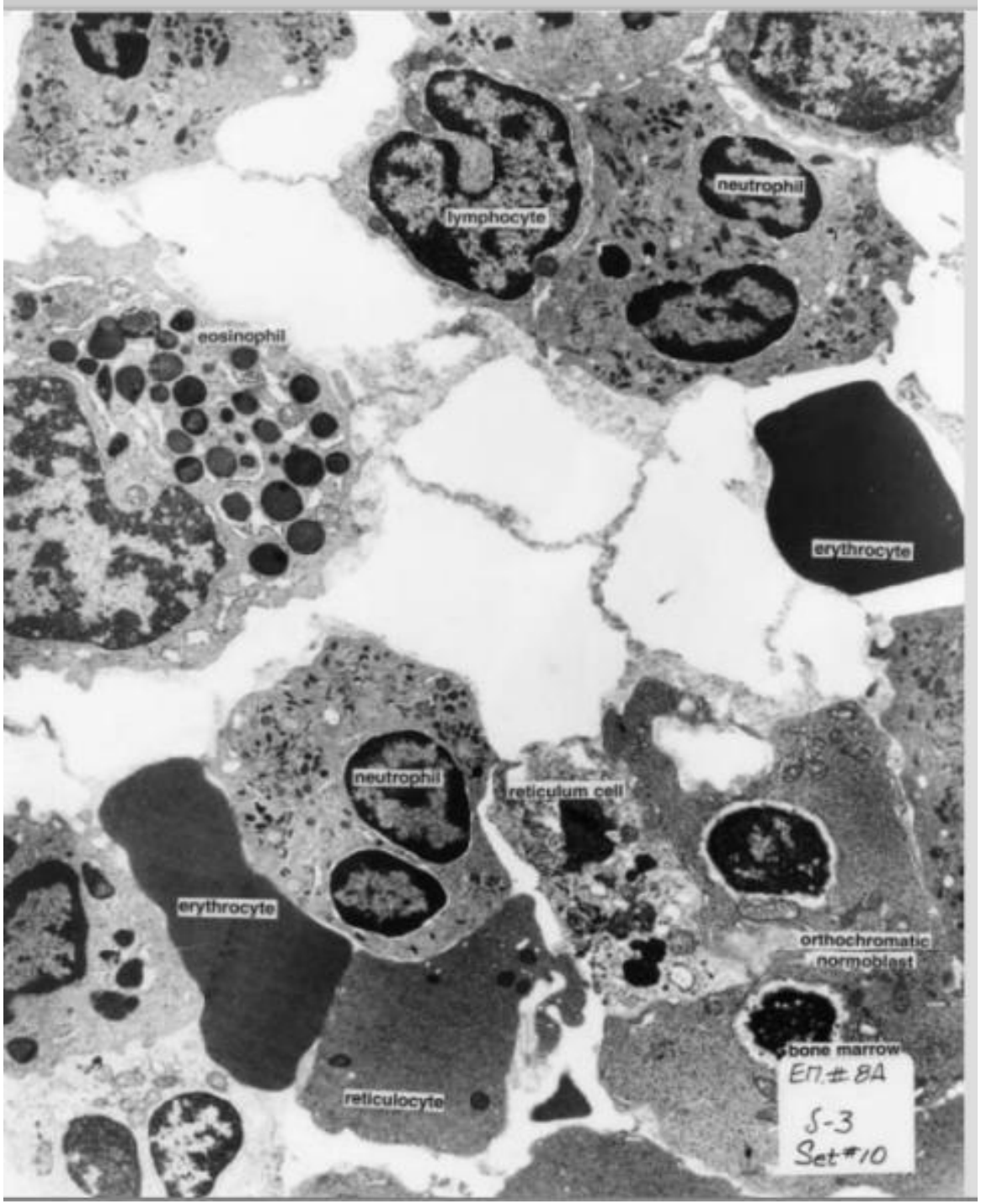
Slide #16 (Pmi 7A). Blood vessels, pig





endothelium (which is simple squamous epithelium

Blood Cells Labeled



Let's Take a Closer Look

- Peripheral Blood Smear
- Red Bone Marrow Smear
- Heart, Epicardium
- Heart, Endocardium
- Blood 1
- Blood 2
- Blood 3
- Bone Marrow
- Heart with Valve
- Heart Muscle
- Heart

http://www.microscope-microscope.org/basic/microscope-images/138-microscopes-lg.jpg

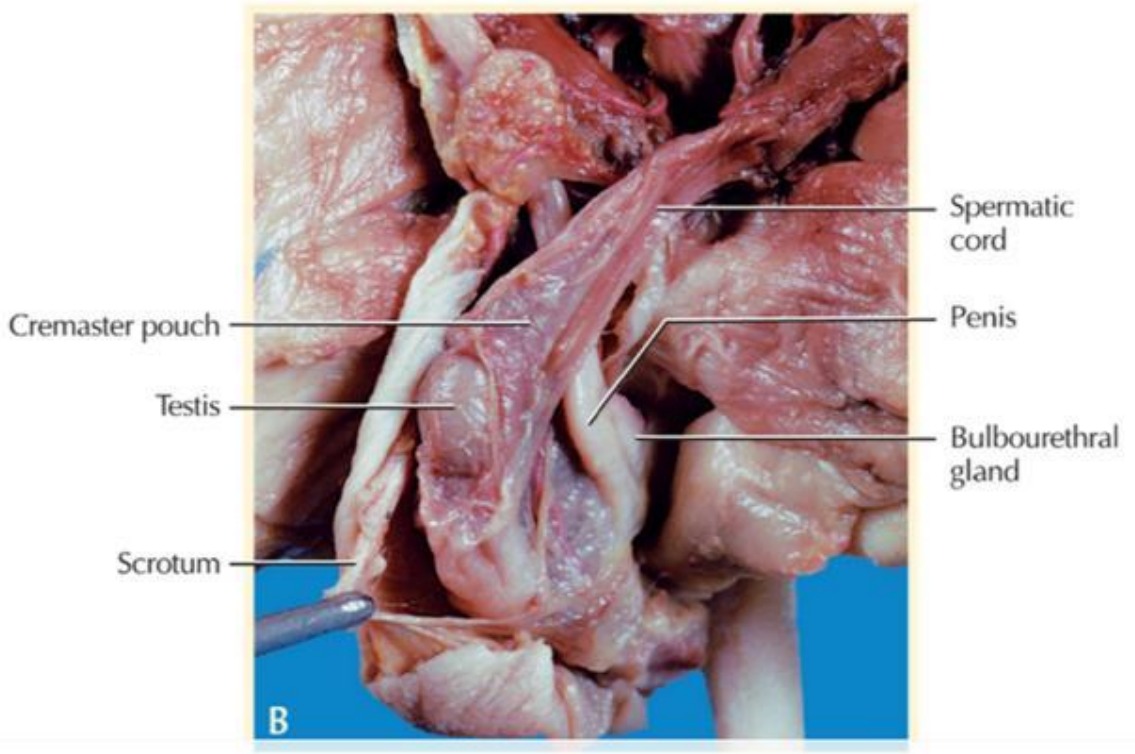
Reproductive System

Expands the population of a certain species

- Male and female reproductive tracts are different
- Males-produce testosterone and sperm
- Females- produce oocytes

Male Repro Tract

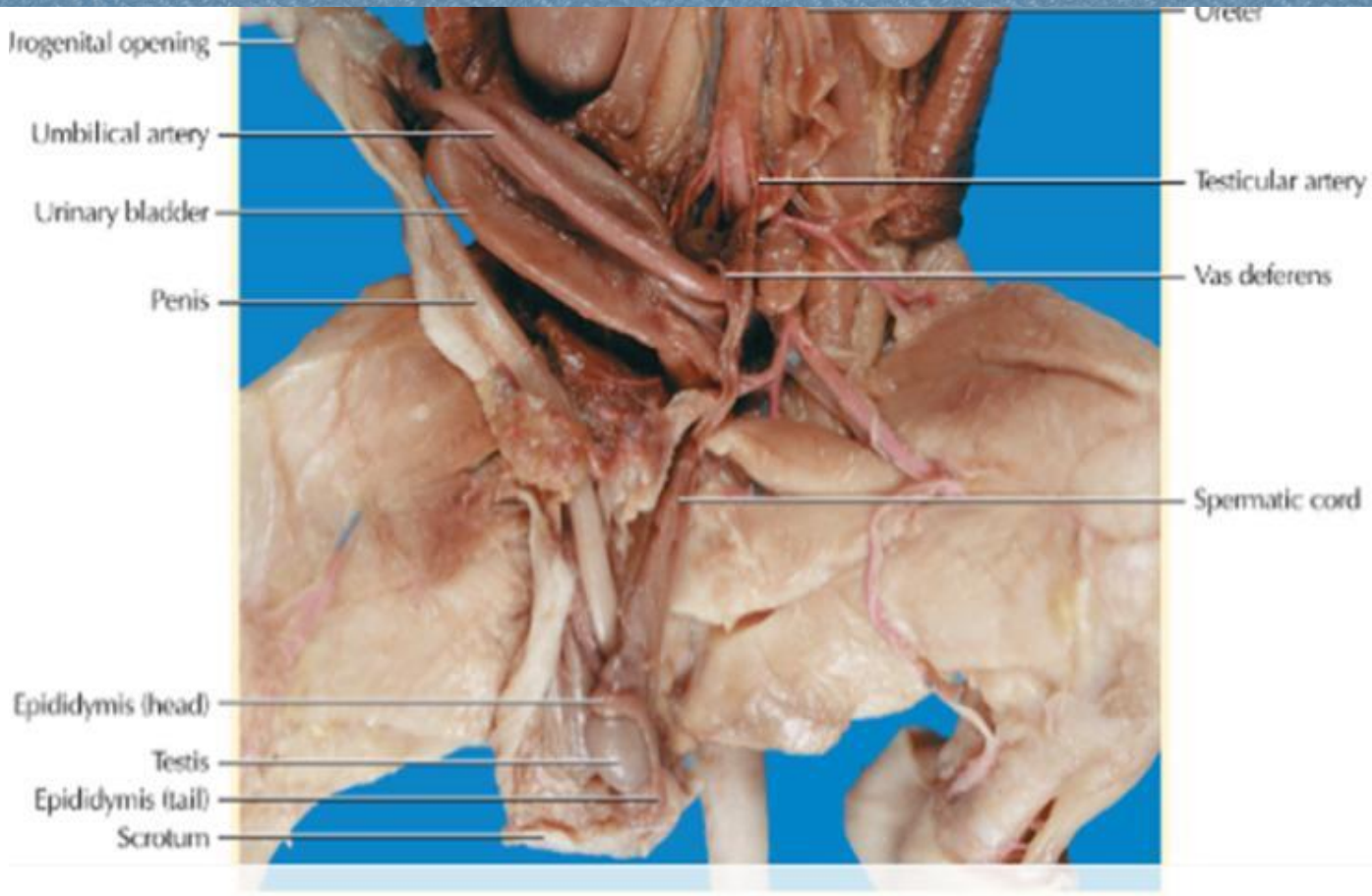
- Testes – produce sperm
- Penis - deposits semen into female reproductive tract. Expels urine from the body.
- Cremaster muscle –pulls the testes closer to the body to keep warm
- Scrotum - houses the testes
- Bulbourethral Gland - gives off seminal fluid to urethra



B Inset depicting testis in scrotal sac; digestive tract removed for clarity.

https://www.inkling.com/read/dissection-guide-atlas-fetal-pig-smith-schenk-3rd/chapter-7/reproduc system

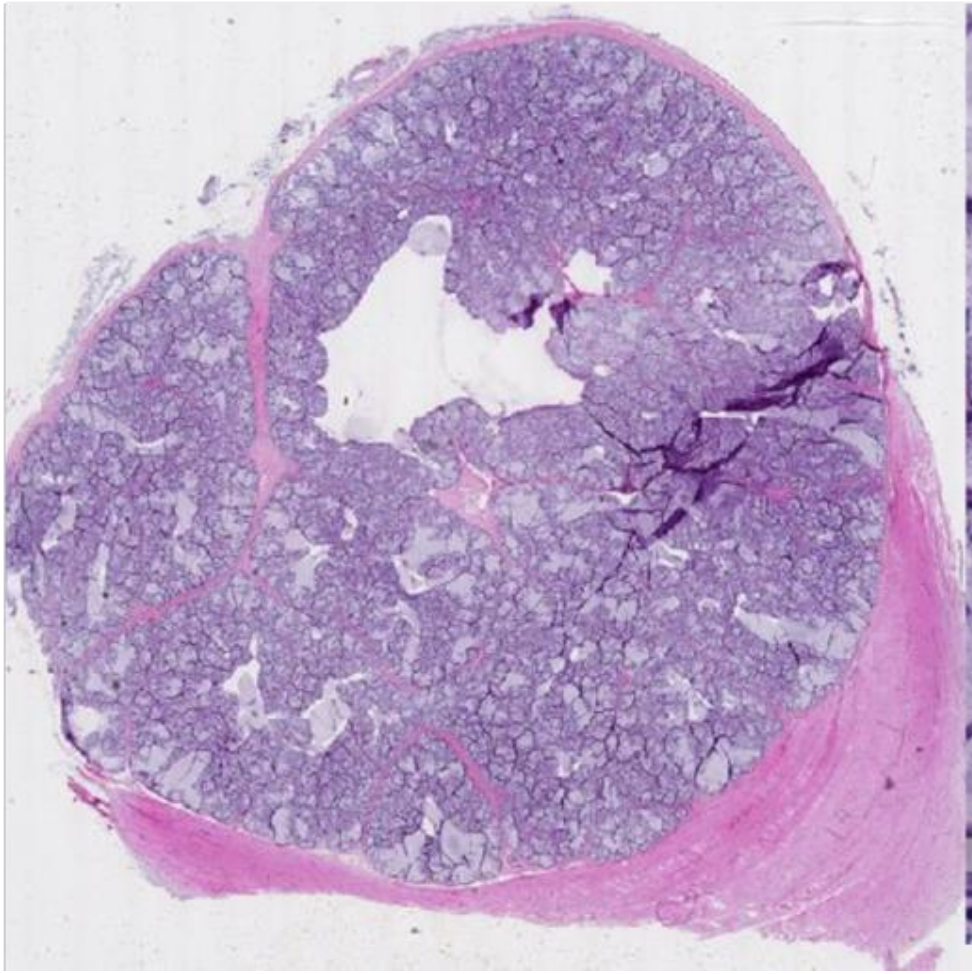
- Spermatic cord - contains Vas deferens, spermatic artery and vein, lymphatic vessels, and leads to the epididymis
- Epididymis- stores sperm
- Seminiferous tubules – sperm produced
- Vas deferens- transports sperm to urethra

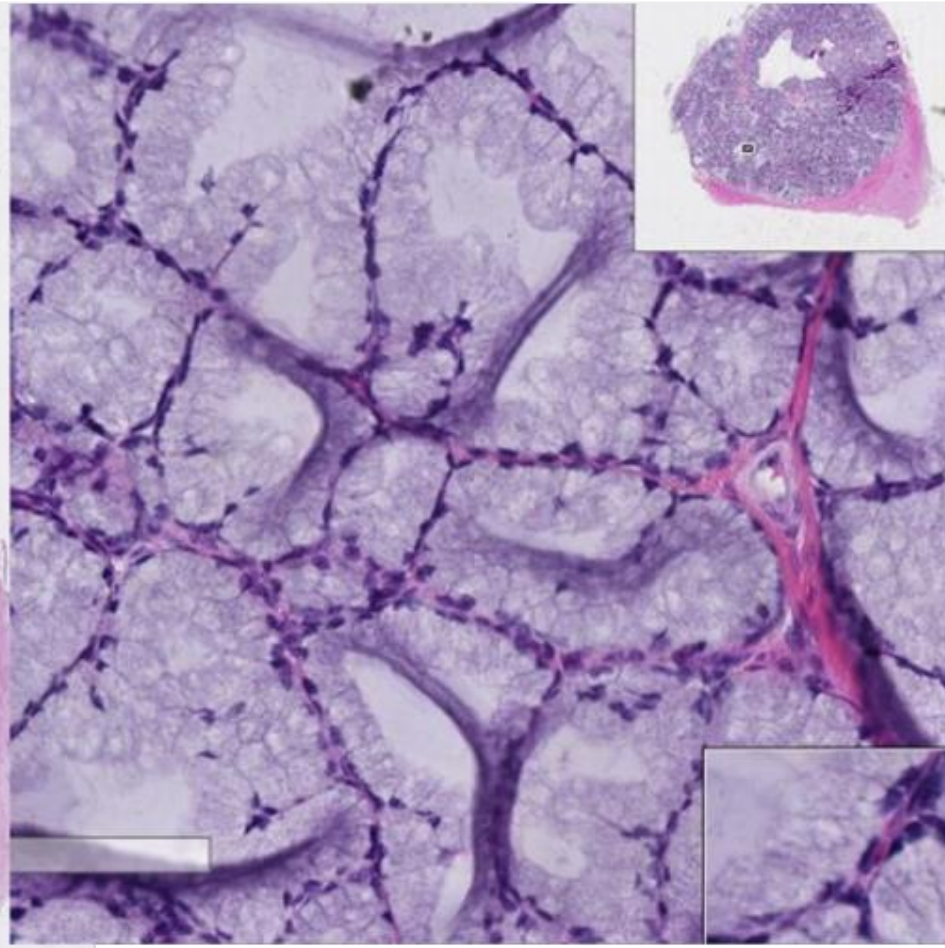


A Reproductive structures in the male with cremasteric pouch removed.

- Urethra – receives seminal secretions form the testes. Drains excretory products from the bladder
- Prostate- secretes fluid that carries sperm

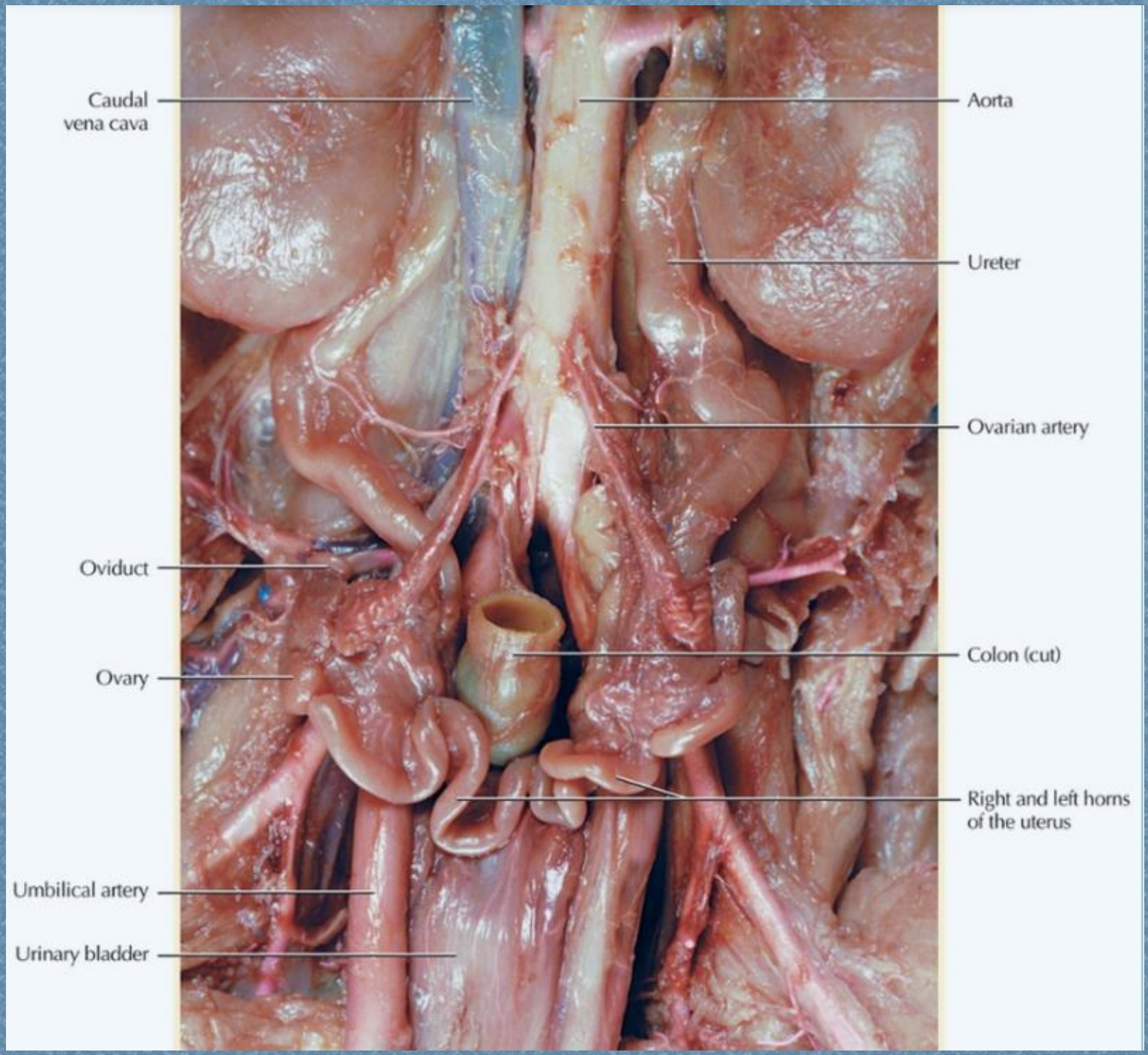
Slide #131 (946) -- Bulbourethral gland, boar.



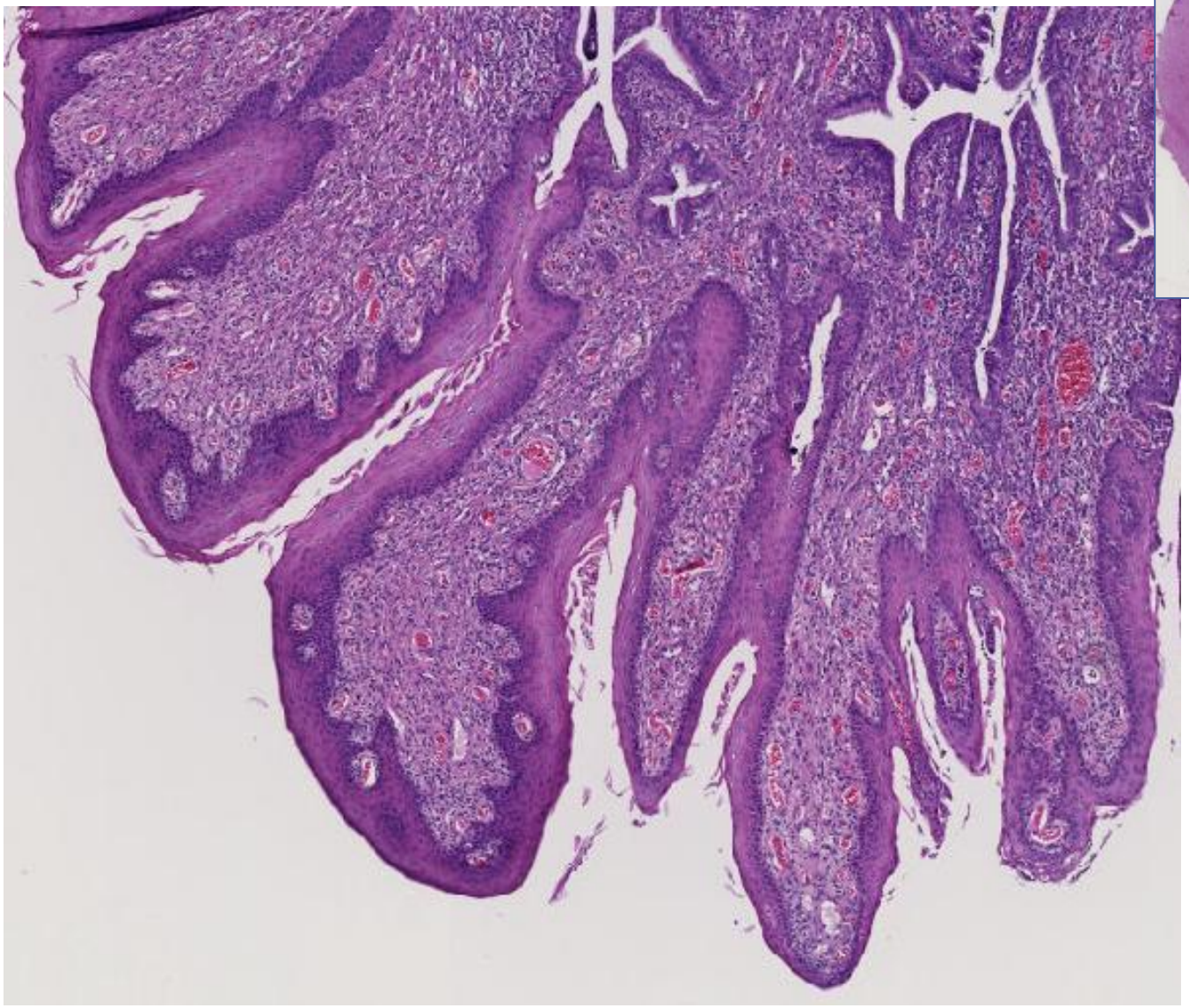


Female Repro Tract

- Ovaries- Produces oocytes (eggs)
- Oviduct- receives mature oocytes at ovulation; site of fertilization
- Uterine Horns- Site of implantation and embryonic development
- Vagina- receives penis during copulation; serves as part of birth canal
- Urogenital Sinus- chamber in which the vagina and urethra meet

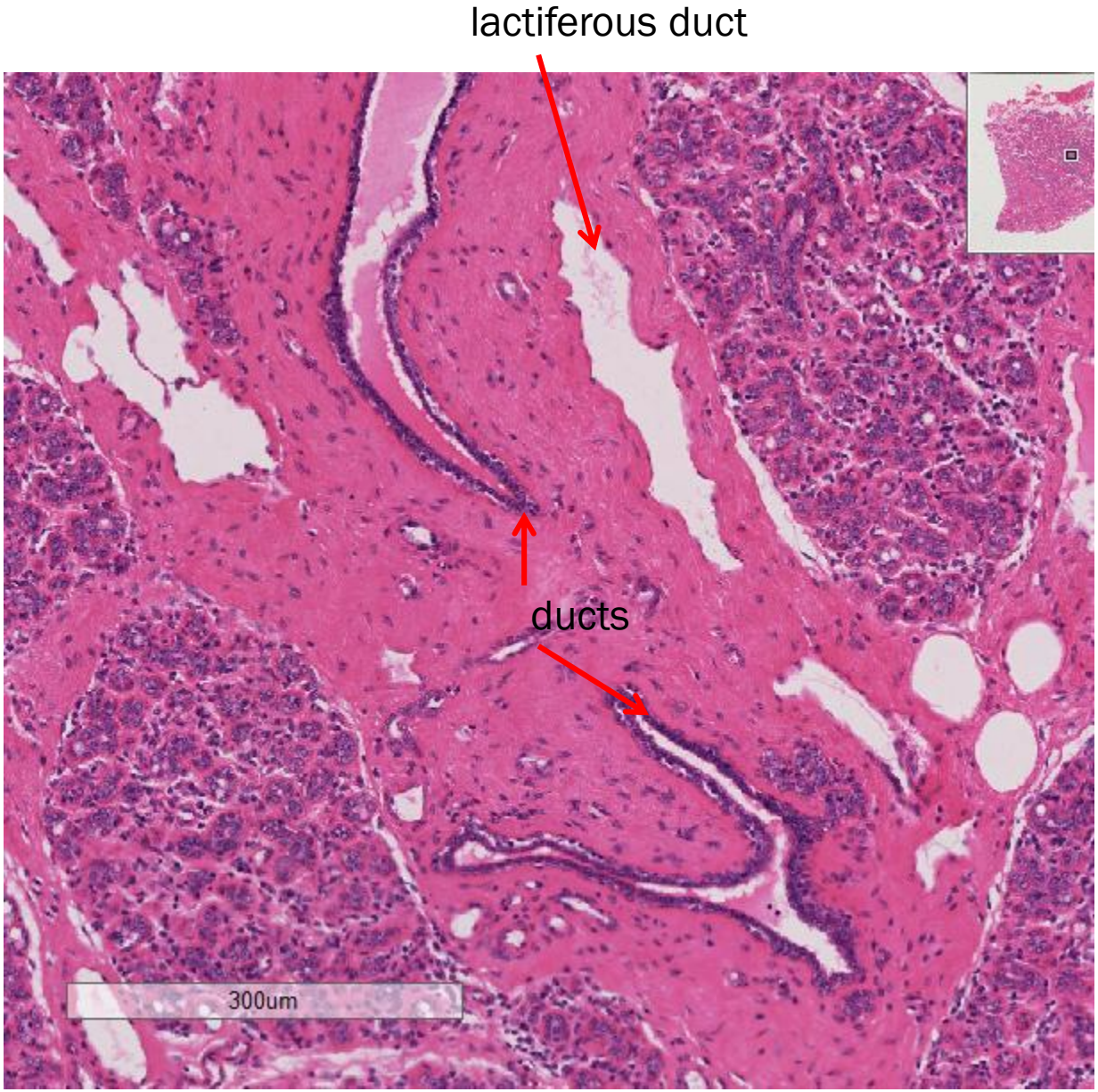

Caudal vena cava
Aorta
Ureter
Ovarian artery
Oviduct
Colon (cut)
Ovary
Right and left horns of the uterus
Umbilical artery
Urinary bladder

DEMO SLIDE BOX #208 – Cervix, sow.



complex folds of the luminal surface of the cervix.

Slide #183 (PG-1-84). Mammary gland, sow.



Let's Take a Closer Look

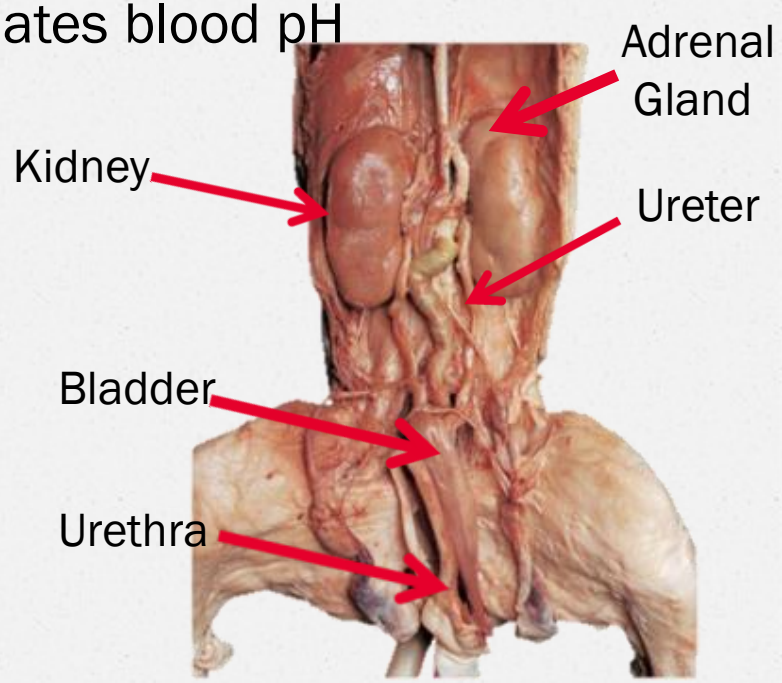
- Ovary 1
- Ovary 2
- Ovary 3
- Uterus
- Vagina
- Testis
- Seminal Vesicle
- Prostate
- Testis 2

http://nerdbranding.com/product/microscope/

Urinary System

Eliminates wastes from the body, regulates blood volume and pressure, controls levels of electrolytes and metabolites, and regulates blood pH

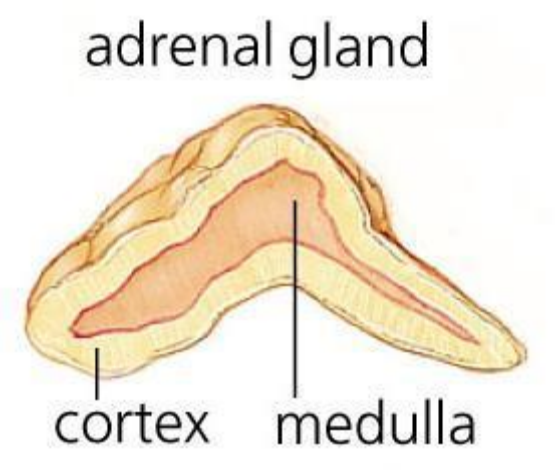
- Organs
  - Adrenal Glands
  - Kidneys
  - Ureter
  - Bladder
  - Urethra



http://memorize.com/urinary-system-pig-2/h4nsyh4ns

Adrenal Glands

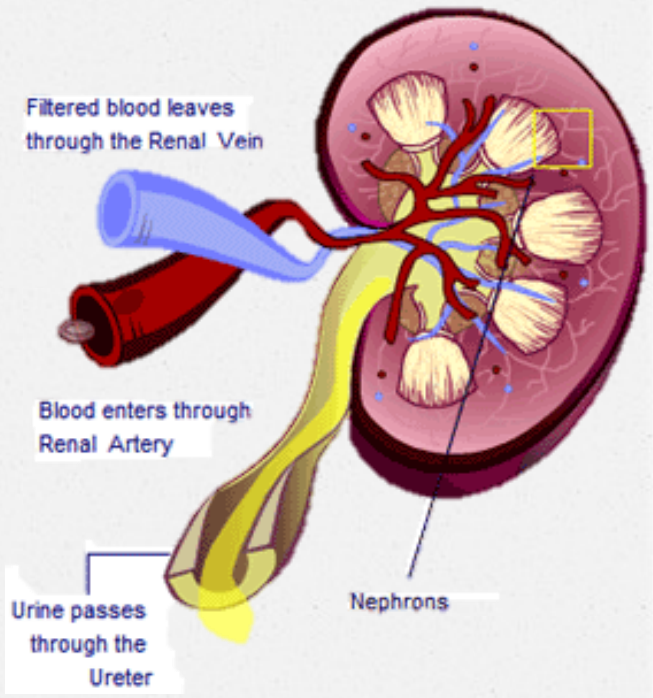
- Sit on top of the kidneys
- 2 total
- 2 Parts
  - Adrenal Cortex- outer part that produces hormones vital to life, such as cortisol (metabolism) and aldosterone (blood pressure)
  - Adrenal Medulla- inner part that produces nonessential hormones, such as adrenaline (stress)



http://http://blog.lib.umn.edu/clar0841/psychblog/4/

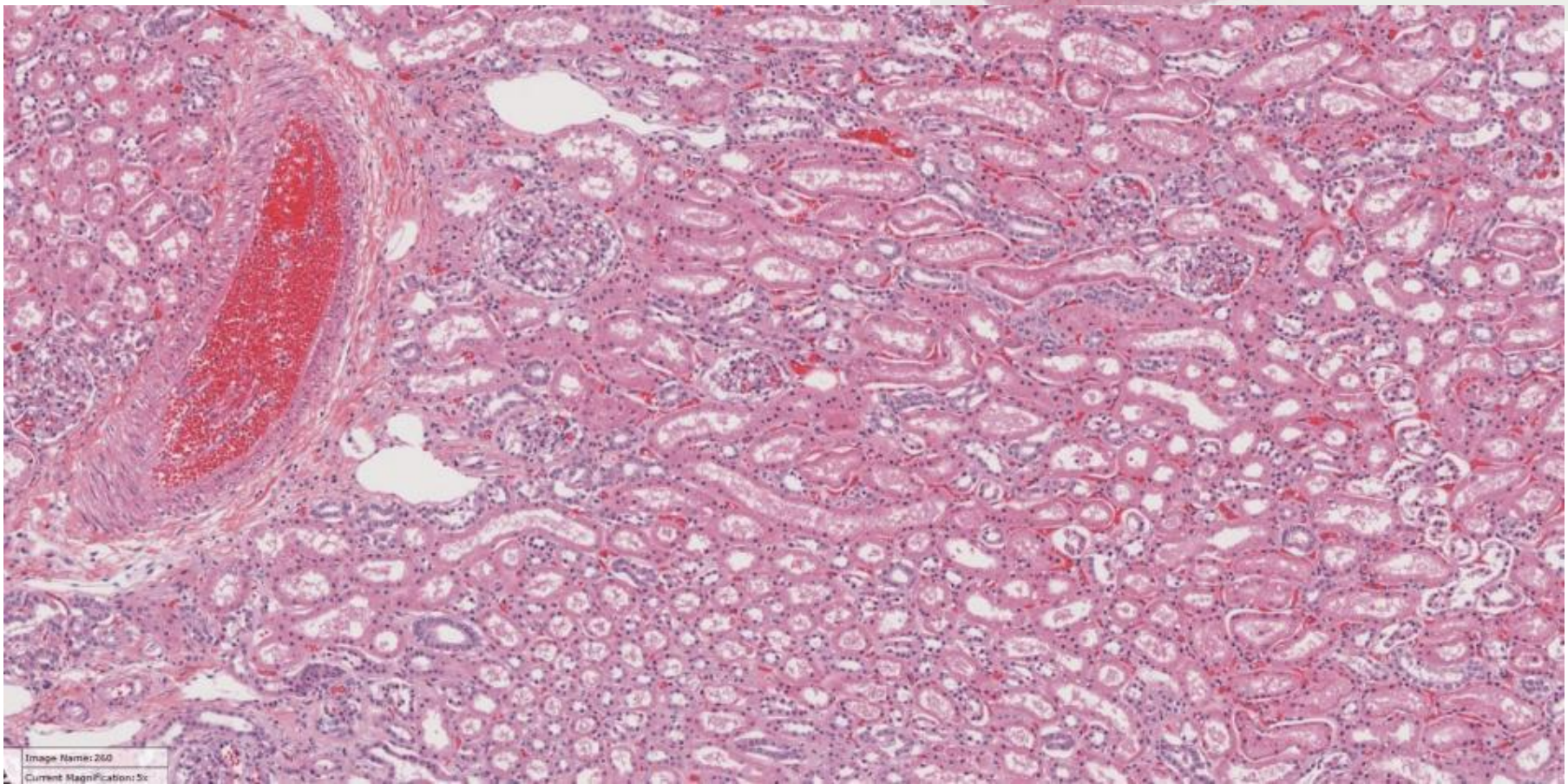
Kidneys

- Two kidneys
- Remove waste and excess water from the blood
- Keep proper balance of salts and acids
- Nephrons are functional unit
  - Filter the blood
  - Water and waste removed
- Blood, waste and water enter kidney through the Renal Artery
- Blood cleaned of waste and excess water leave kidney through Renal Vein.



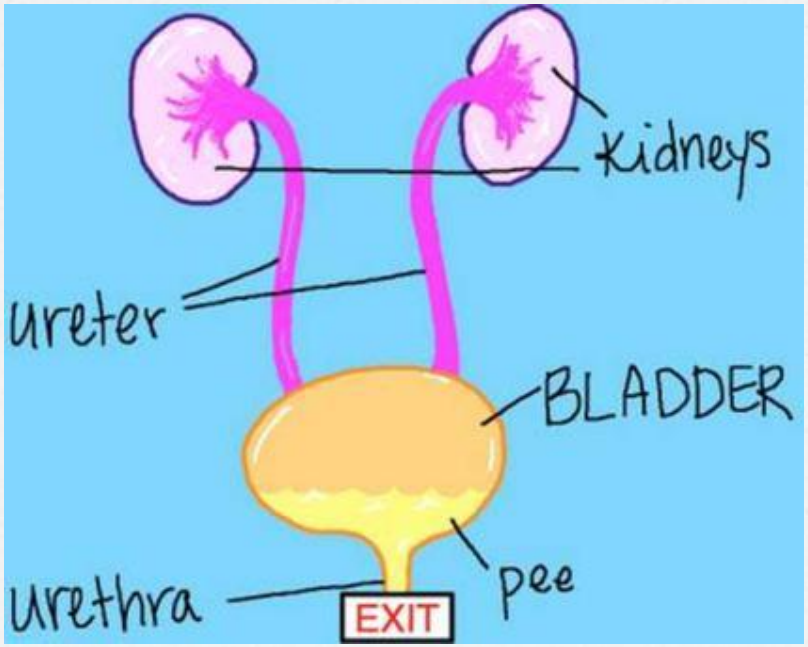
http://www.kidney.org.au/KidneyDisease/Howourkidneyswork/tabid/590/Default.aspx

Kidney

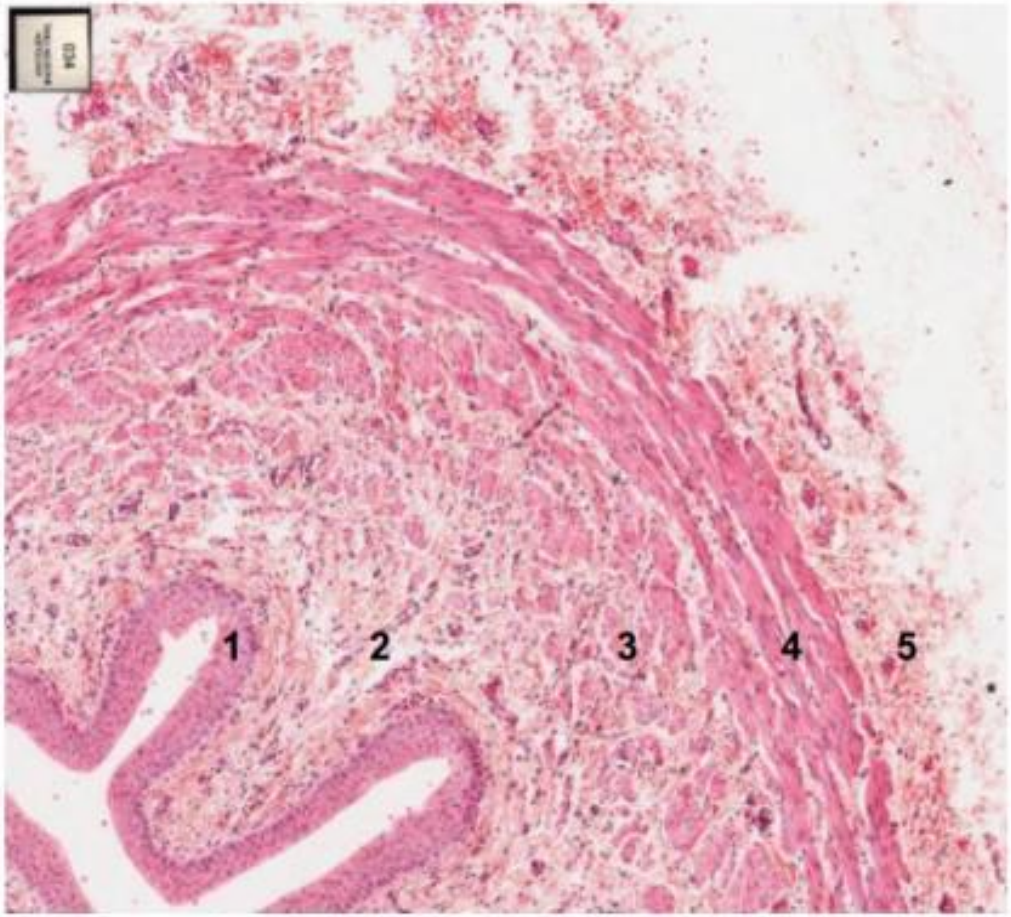


Ureter, Bladder, and Urethra

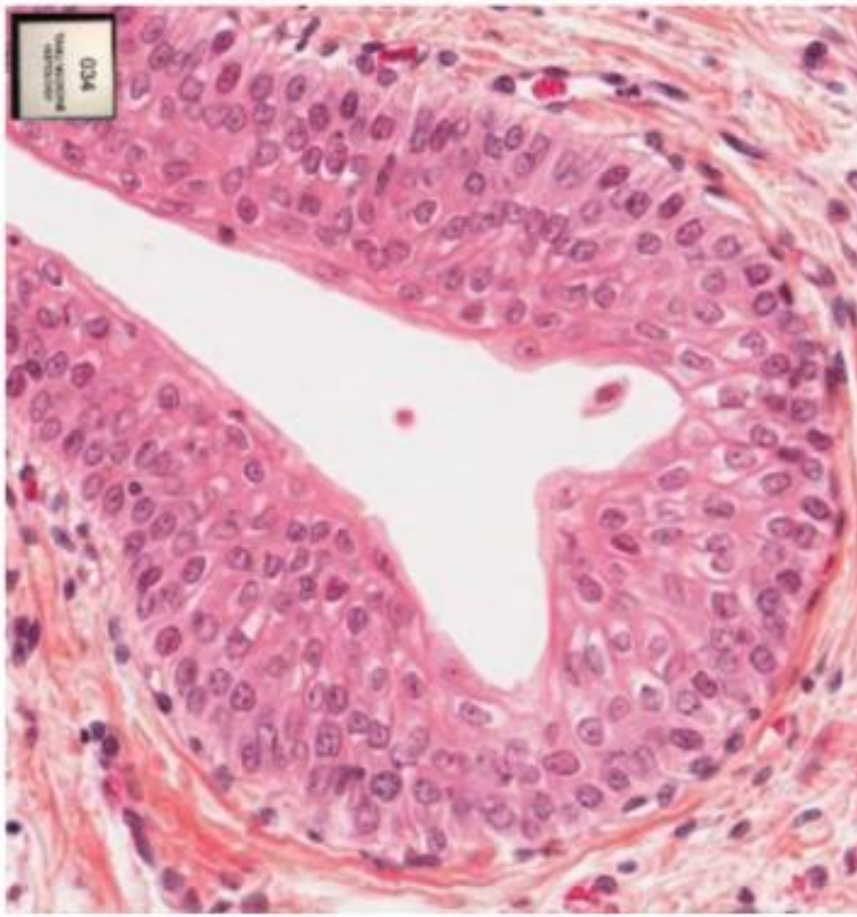
- Ureter
  - One from each kidney
  - Carries urine from kidney to bladder
  - Strong muscular tube
- Bladder
  - Hollow organ
  - Expands as it is filled
- Urethra
  - Takes urine from the bladder to be eliminated



Slide 34: Ureter (upper 1/3)

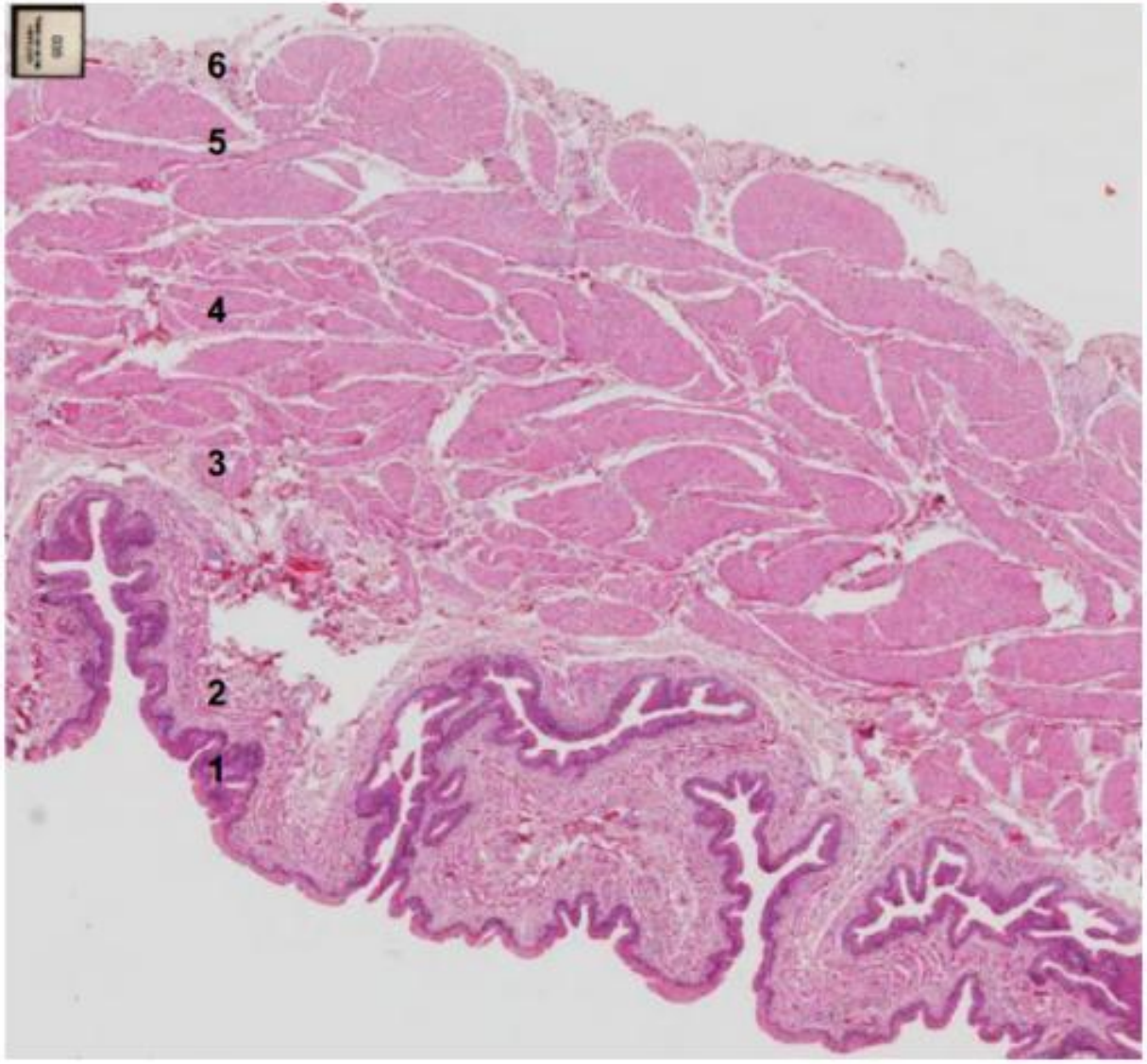


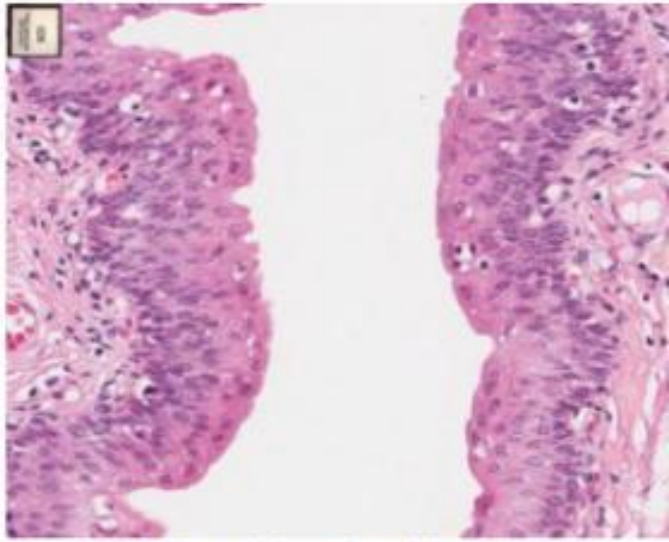
1. Transitional epithelium
2. Lamina propria
3. Longitudinal smooth muscle
4. Circular smooth muscle
5. Adventia



Transitional epithelium

Slide 35: Urinary Bladder



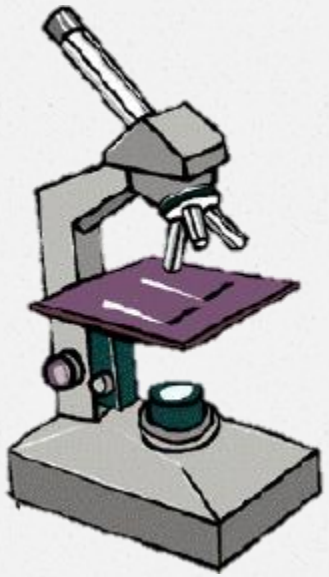


Transitional epithelium

6. Serosa
5. Outer longitudinal smooth muscle
4. Middle circular smooth muscle
3. Inner longitudinal smooth muscle
2. Lamina propria
1. Transitional epithelium

Let's Take a Closer Look

- Kidney 1
- Kidney 2
- Ureter
- Bladder
- Ureter 2
- Adrenal gland
- Kidney 3



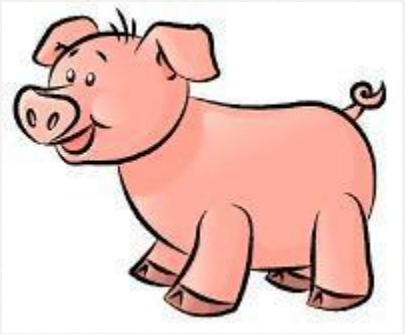
http://www.biologyjunction.com/microscope_lab1.htm

Who would have thought a pig would be so closely related to a human??!!

https://www.google.com/search?q=pig+and+farmer+friend+cartoon&espv=2&biw=1197&bih=753&source=lnms&tbm=isch&sa=X&ei=5khRVOqeA4upgwS7n4HQBw&ved=0CAYQ_AUoAQ#tbm=isch&q=human+in+mud+cartoon&imgdii=_

References

- http://peer.tamu.edu/
- http://www.whitman.edu/academics/courses-of-study/biology/virtual-pig/respiratory-system
- http://www.thepigsite.com/pighealth/article/9/respiratory-system
- http://www.anselm.edu/homepage/jpitocch/genbios/fetalpig.html
- http://www.upt.pitt.edu/ntress/Bio1_Lab_Manual_New/fetal_pig_respiratory_intro.htm
- https://www.inkling.com/read/dissection-guide-atlas-fetal-pig-smith-schenk-3rd/chapter-6/the-thoracic-cavity
- http://faculty.clintoncc.suny.edu/faculty/michael.gregory/files/bio%20102/bio%20102%20laboratory/fetal%20pig/Respiratory_system_5.jpg
- http://bioserv.fiu.edu/~walterm/human_online/labs/fetal_pig/fetal_pig_anatomy.htm
- http://www.shsu.edu/~agr_www/documents/FetalPigDissectionLab_000.pdf
- https://www.inkling.com/read/dissection-guide-atlas-fetal-pig-smith-schenk-3rd/chapter-7/reproductive-system



The End