

# CHAPTER 16

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## The Respiratory System

# What do you already know about the Respiratory System?

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- What's the pathway of air into our lungs?
- How is oxygen and carbon dioxide exchanged?
- Why do we need oxygen?
- What diseases or environmental factors affect breathing and who is at risk?

# 16.1 Respiration Video

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Click on the heading above to watch an instructional video

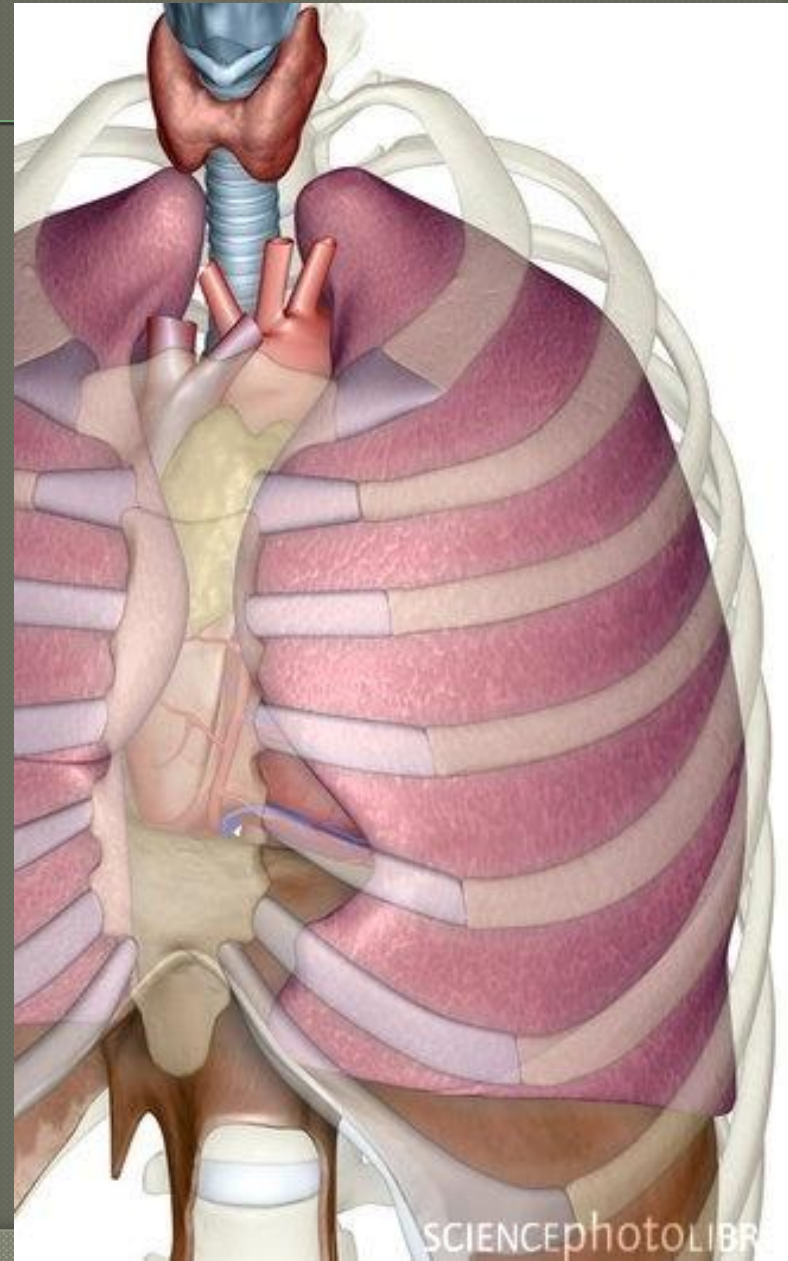


# Respiratory System Functions

## ○ Taking in Oxygen

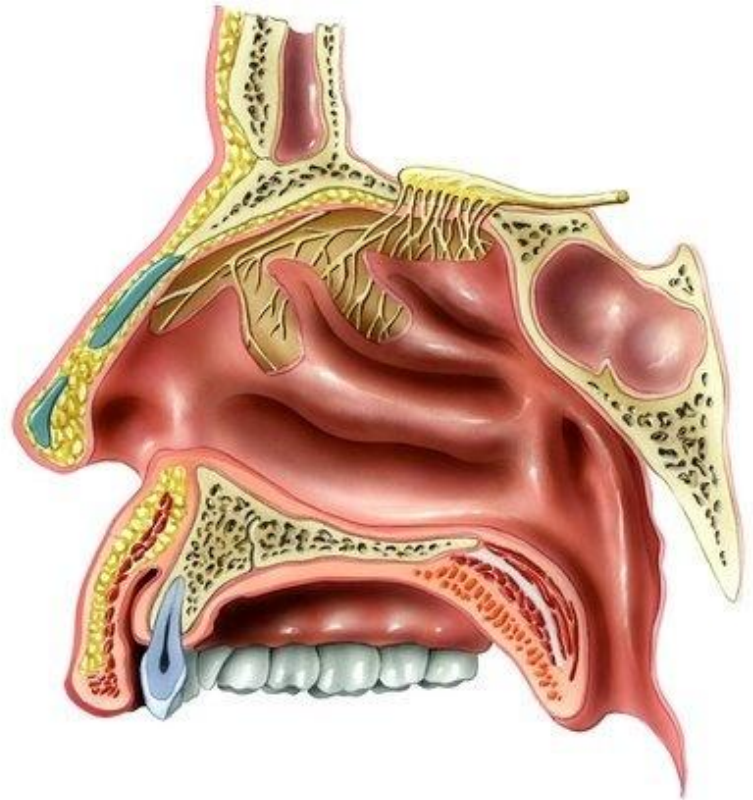
- Breathing = moving air in and out of lungs
- Respiration = exchange of  $O_2$  and  $CO_2$
- Cellular Respiration = adding oxygen to glucose to get energy.

## ○ Removing $CO_2$ + Water produced by cells



# Organs of Respiration

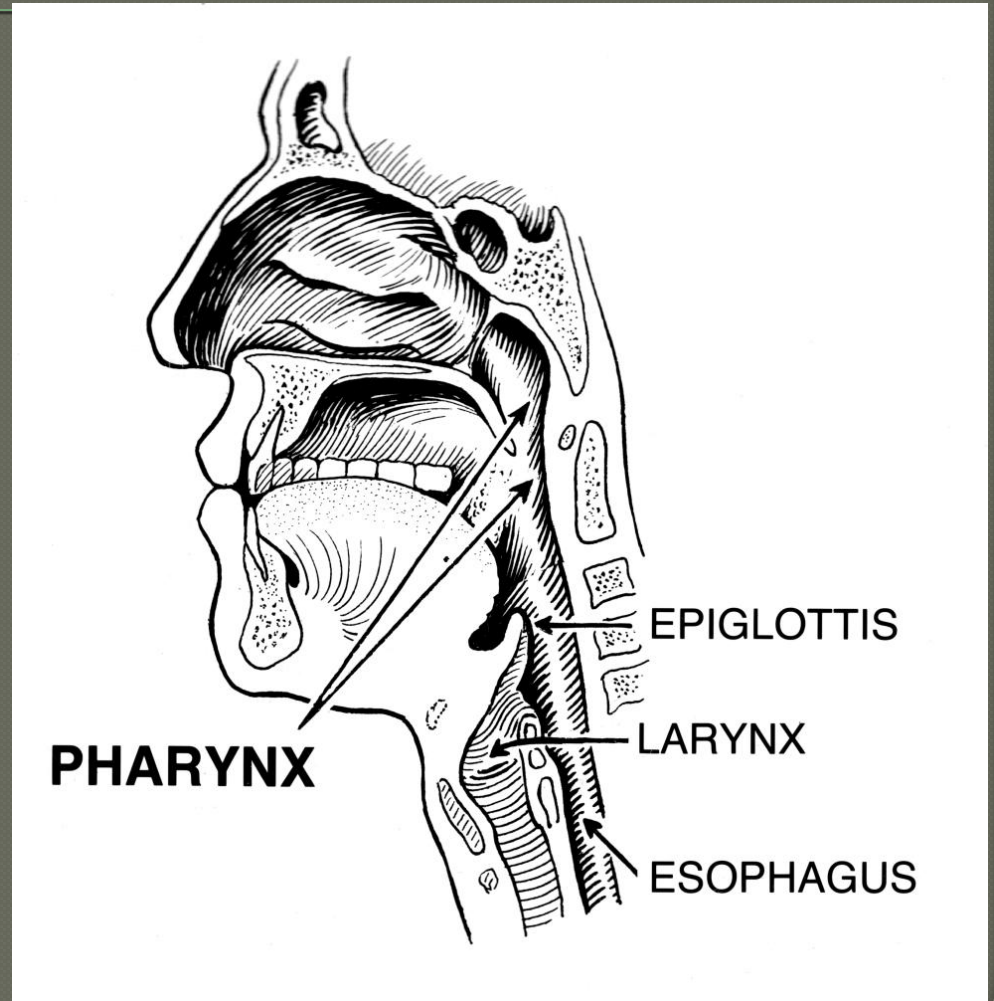
- Nose
  - nostrils = openings
  - coarse hairs trap dirt
- Nasal Passages
  - capillaries – warm air
  - mucus - moistens, traps junk
  - cilia (tiny hairs)- move mucus to back of throat for swallowing (germs killed by stomach acid)



Profile internal view of nasal cavity

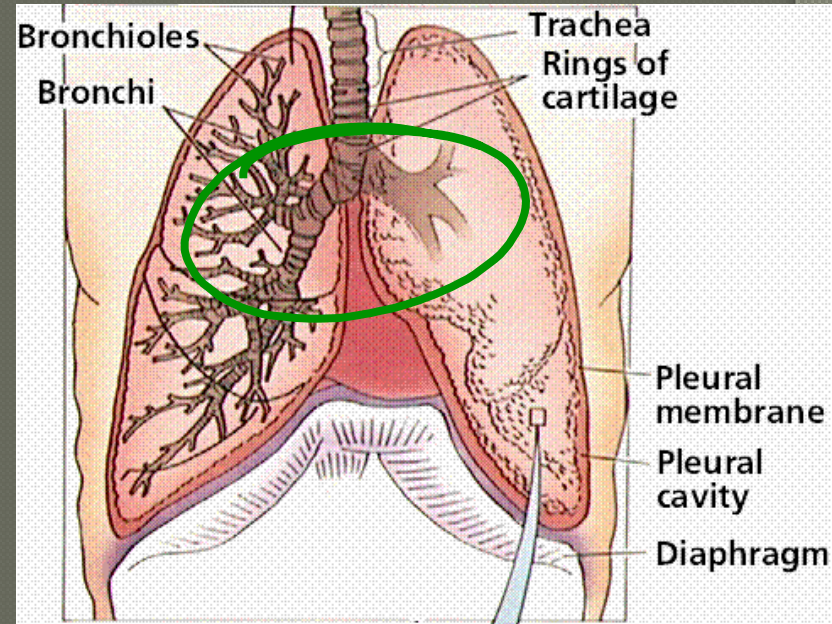
# Organs of Respiration (cont.)

- Pharynx
  - where trachea and esophagus meet
  - Epiglottis area
- Larynx
  - voice box
  - air vibrates vocal cords to make sounds

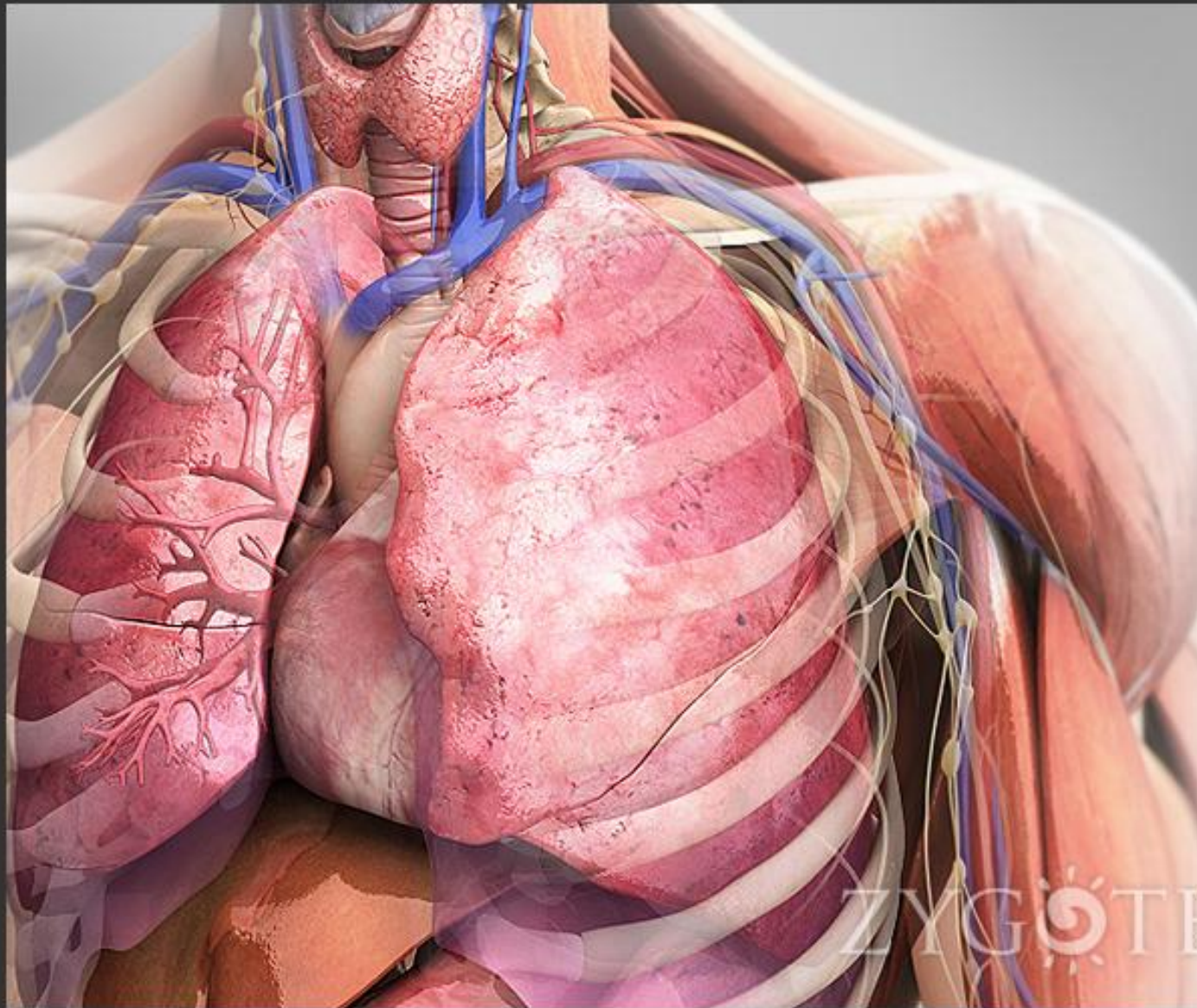


# Organs of Respiration (cont.)

- Trachea
  - tube to lungs
  - rings of cartilage - protect; keep open
  - lined with mucus membranes
  - cilia move junk up to throat
- Bronchi
  - 2 branches into lungs
- Bronchioles
  - repeating branches inside lungs



Where are the Bronchi? Bronchioles? The trachea?



ZYGÖTE





trachea

This anatomical illustration shows the human respiratory system. The trachea is the large windpipe at the top, which branches into the bronchi. The bronchi further divide into smaller bronchioles. The lungs are shown in a reddish-pink color, and the surrounding structures like the ribcage and muscles are also visible. Blue arrows point from the text labels to the corresponding anatomical parts.

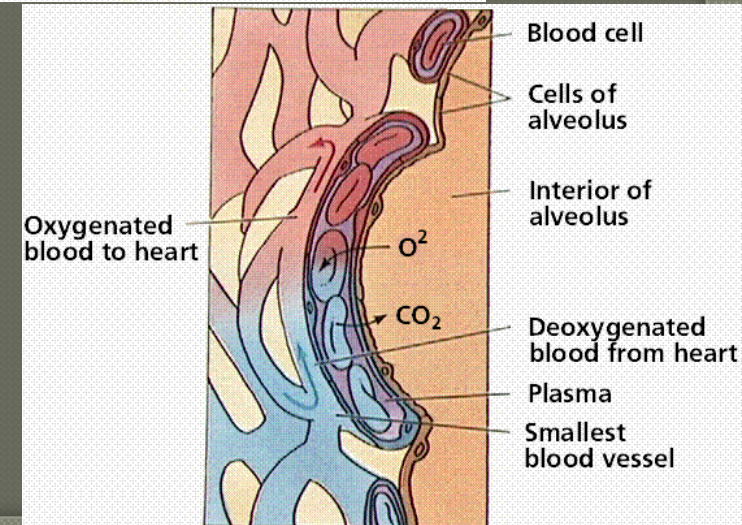
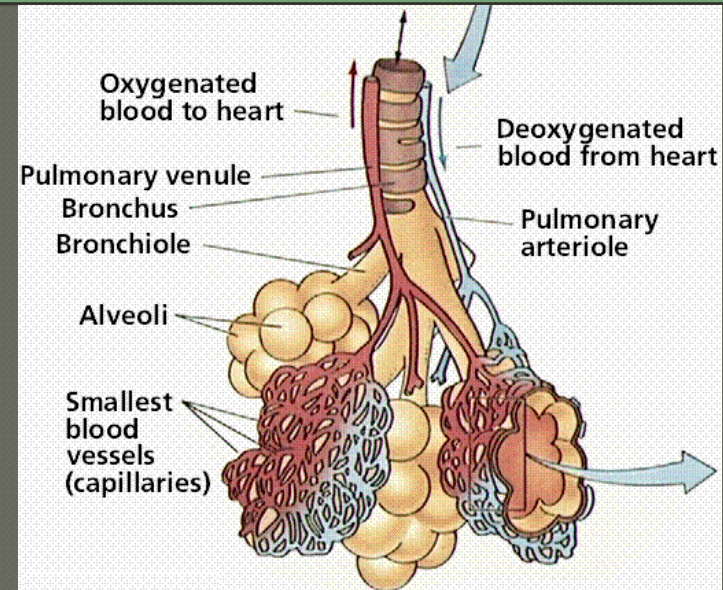
bronchi

bronchioles

# Organs of Respiration (cont.)

## Alveoli

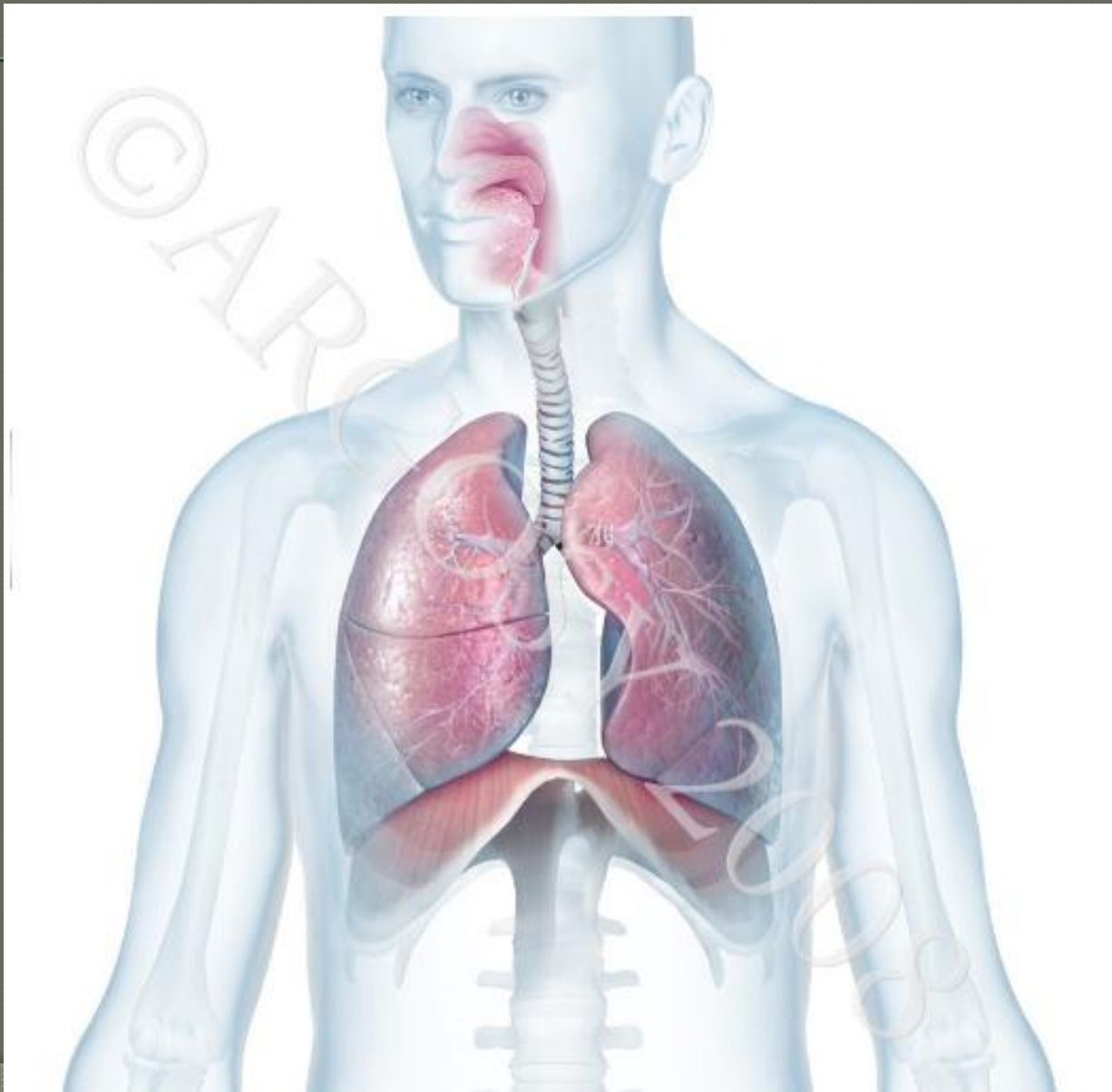
- one-cell thick sacs at ends of bronchioles
- surrounded by capillaries
- Provide surface area for exchange  $O_2$  and  $CO_2$



# Scanning Electron Microscope image of Alveolus (air sac) and capillaries



Can you describe the pathway of air (the structures it would pass when we take in a breath)?



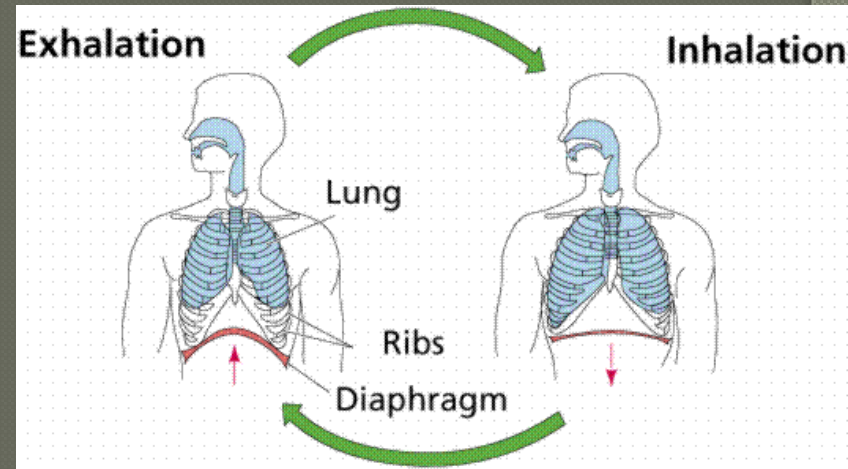
# Mechanics of Breathing

## ○ Inhalation

- diaphragm pulls down; rib muscles pull up & out
- chest expands; internal pressure decreases
- air moves into lungs

## ○ Exhalation

- diaphragm & rib muscles relax
- chest cavity contracts so pressure increases
- air forced out of lungs



# Lung cancer: SEM image of tumor in alveolus



# SECTION 2

## Smoking and Your Health



# Chemicals in Tobacco Smoke

## ■ Tar

- Sticky substance that causes cilia to clump

## ■ Carbon Monoxide

- Colorless, odorless gas
- Binds to hemoglobin instead of needed oxygen
- Results in increased breathing and faster heartbeat

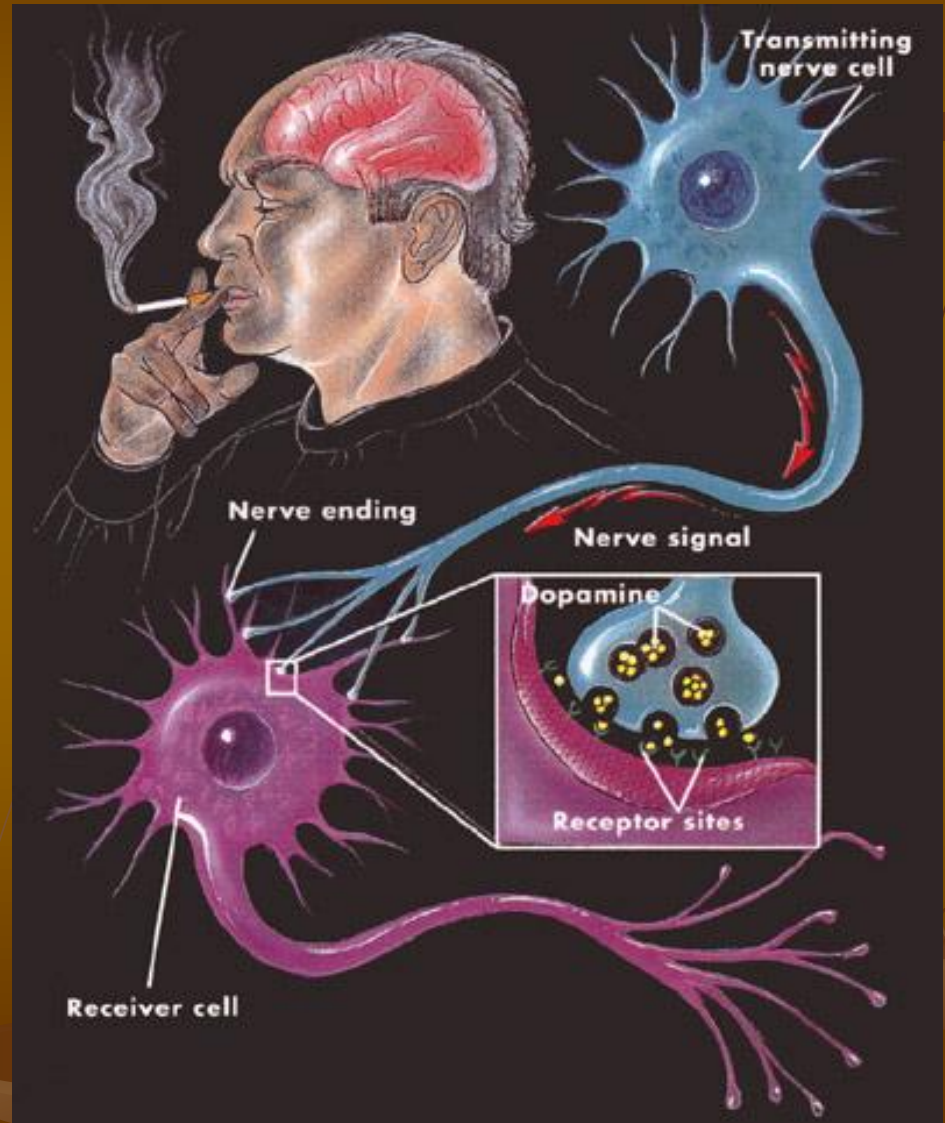


Example	Common Use
Carbon Monoxide	Gas in car exhausts
Copper	Electric wiring
Tar	Road surfaces
Nicotine	Pesticide
Acetone	Paint stripper
Ammonia	Cleaning agent
Arsenic	Rat poison
Benzene	Petrol fumes
Butane	Lighter fuel
Formaldehyde	Embalming fluid
Hydrogen cyanide	Poison in gas chamber
Methanol	Rocket fuel
Methane	Swamp gas
Toluene	Industrial solvent
DDT	Banned insecticide
Radon	Radioactive gas
Polonium	Radioactive fallout



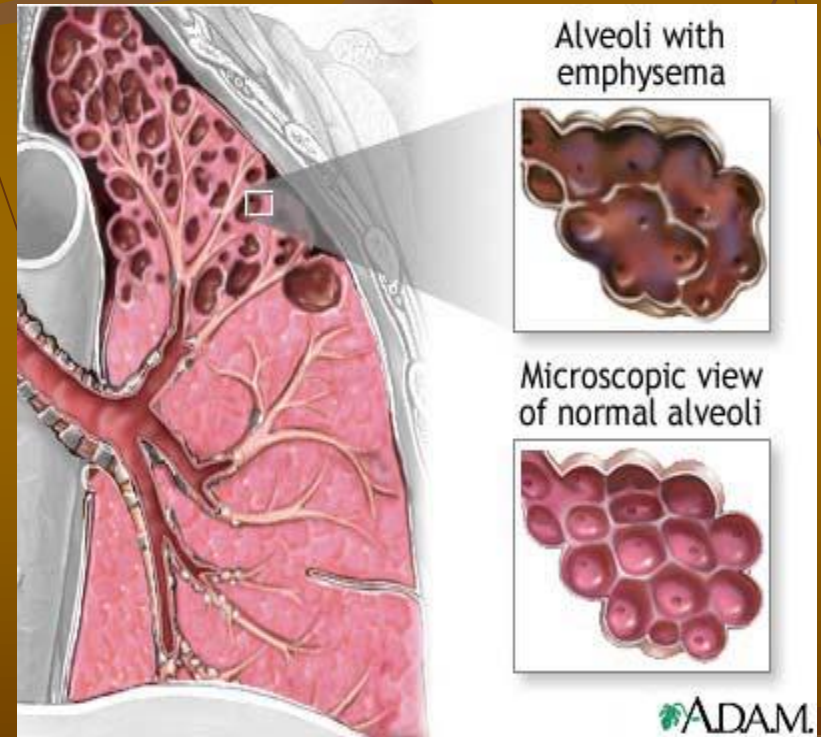
# Chemicals (cont.)

- Nicotine
  - Stimulant drug
    - increases heart rate and blood pressure
  - Causes addiction
    - Physical dependence-craving



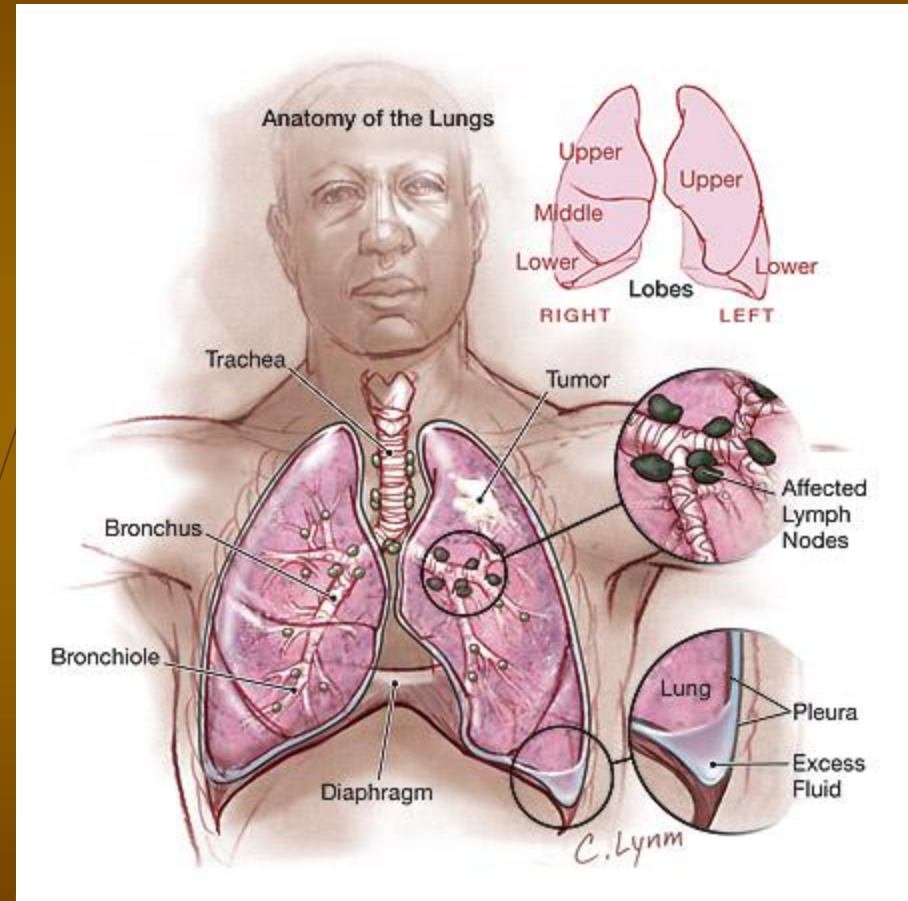
# HEALTH PROBLEMS

- Chronic Bronchitis
  - Long term disease (permanent damage)
  - infection of bronchi &/or bronchioles
- Emphysema
  - alveoli lose ability to expand and contract
  - caused by tar in cigarettes



# Health Problems (cont.)

- Lung cancer
  - Causes growths and tumors that take up space in lungs
- Asthma
  - bronchial tubes contract and block air flow
- Atherosclerosis
  - Build up on artery walls



# Section 3

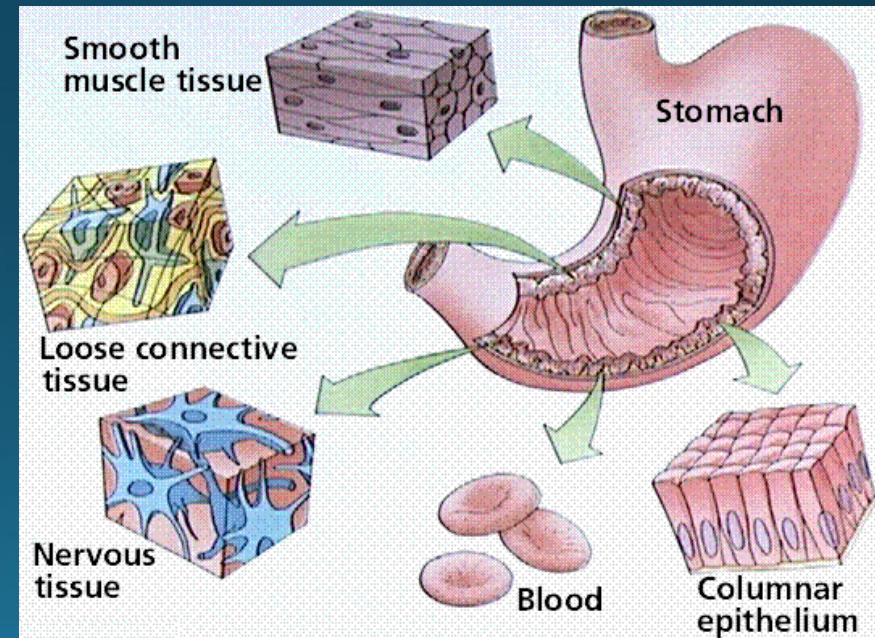
- The Excretory System

# What do you know about the excretory system (urinary system)?

- What is the main function of the excretory system?
- Which body systems rid the body of waste?
- Can you describe the process or pathway to rid waste via the urinary system?
- Who is susceptible to infection or illness?
- What's the difference between the ureters and the urethra?

# Excretion

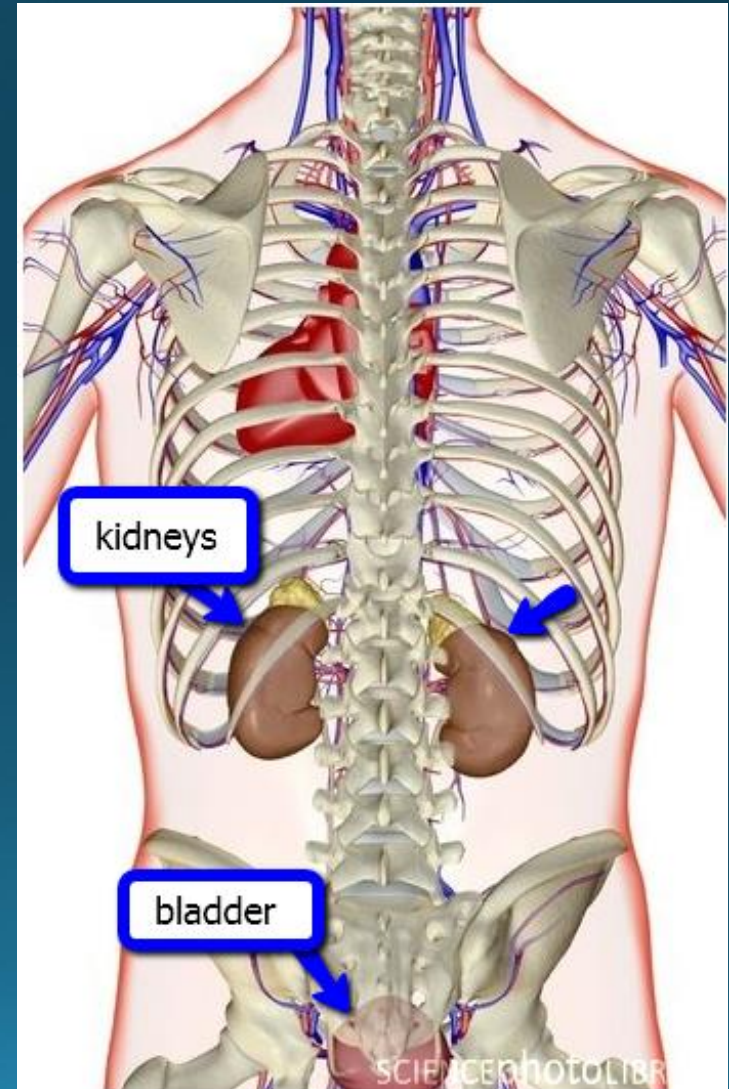
- Collecting wastes produced by cells and removing them from the body
- Wastes:
  - Urea – chemical resulting from breakdown of protein
  - Water
  - Heat
  - Salt



# Excretory System Organs

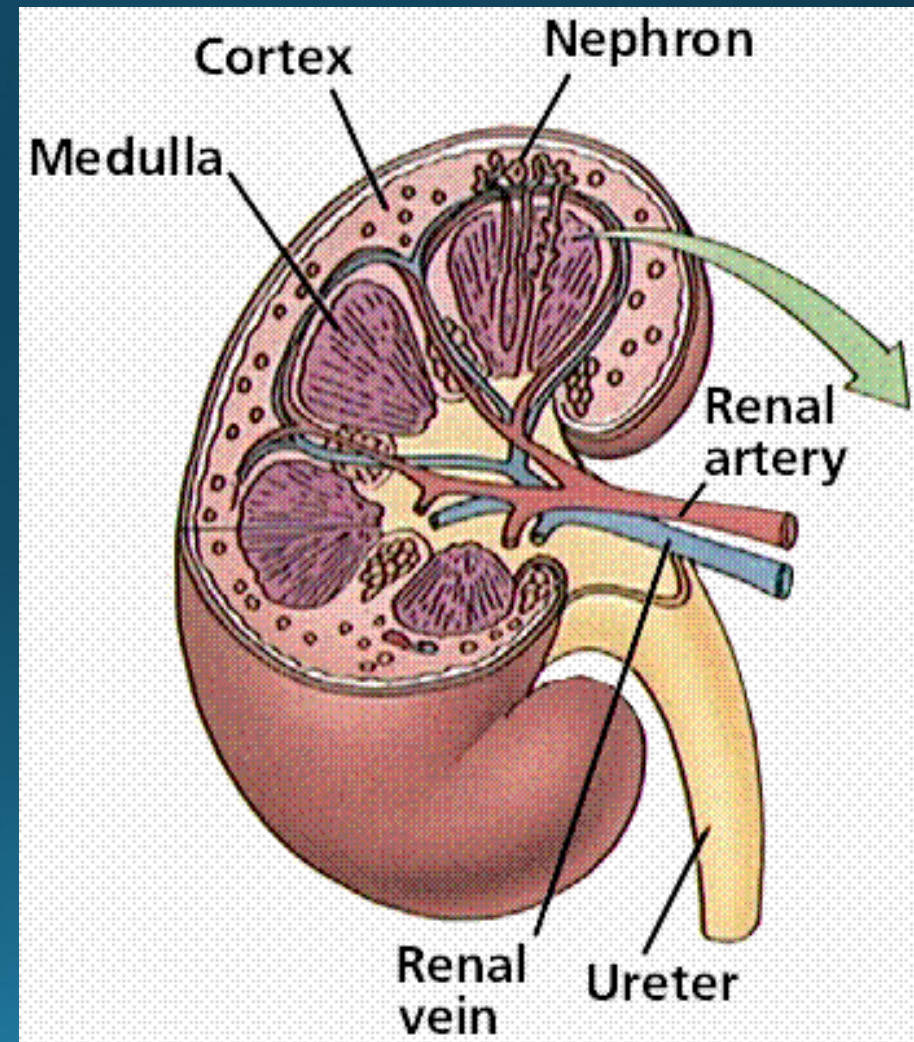
- Kidneys

- Filter Blood
- Contain Nephrons



# •Kidneys

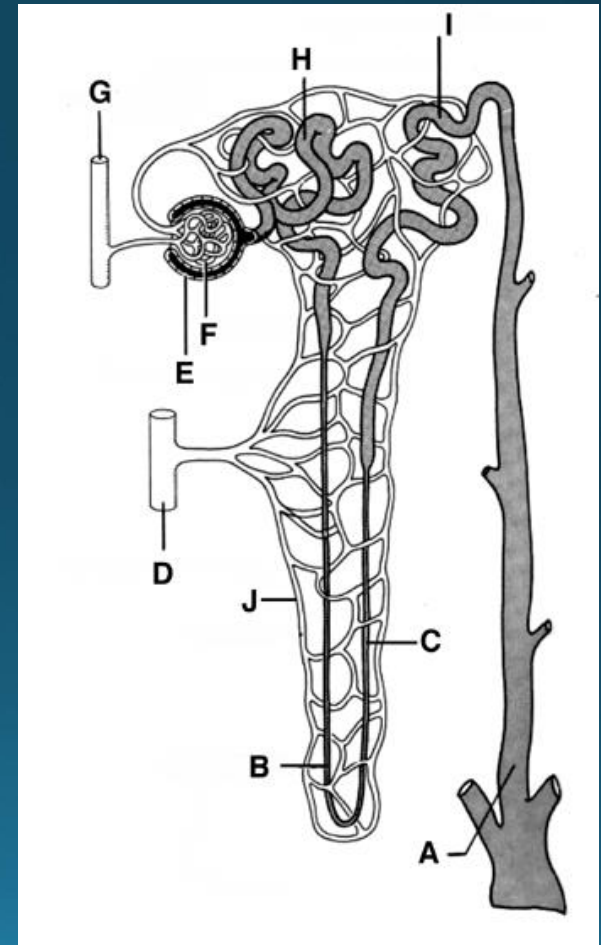
- Cortex- outer region
  - Protected by Renal Capsule
  - Location of blood filtration
- Medulla- inner region
  - Controls salt and water levels in urine
- Pelvis- base of kidney
  - Location for urine collection
  - Kidney stone formation





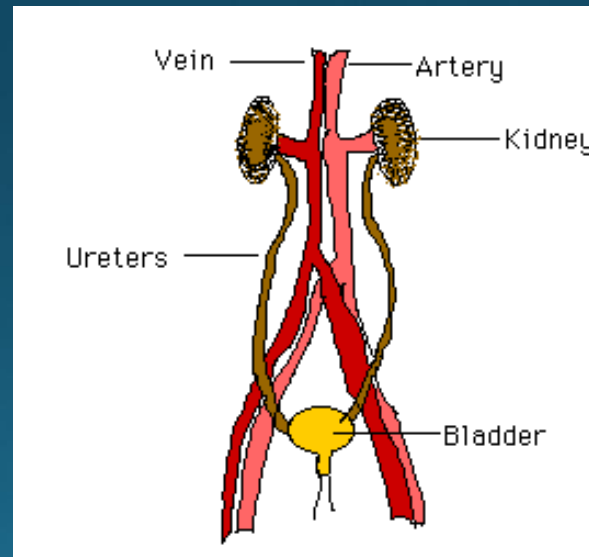
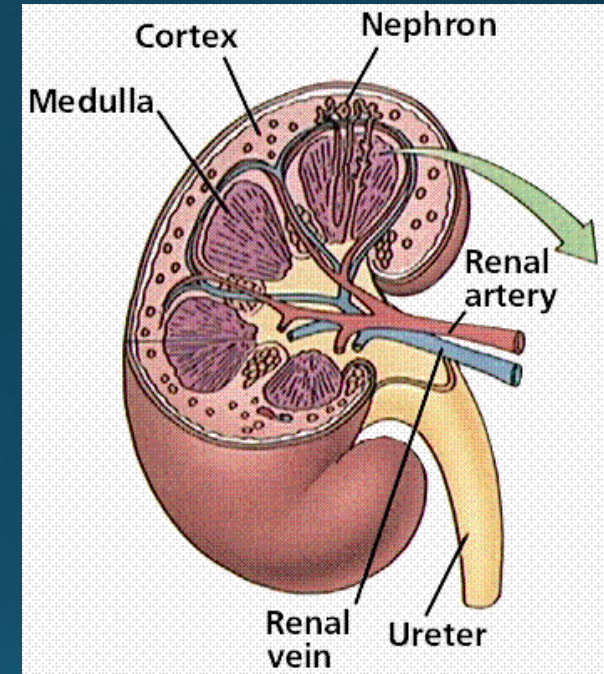
# Nephrons

- About 1 million in each kidney
- Steps for urine formation:
  - Blood from arteries to nephrons
  - Good material is filtered into capsule
  - Water and glucose is reabsorbed into blood
  - Waste (urine) remains in tubule



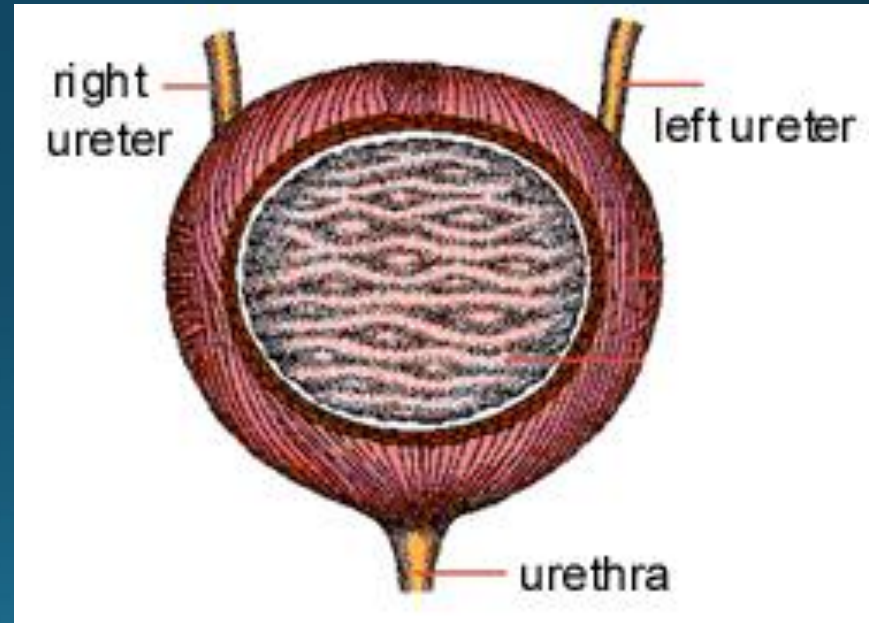
# Ureters

- Carry urine from Kidney to the bladder
- Through 2 narrow tubes to the bladder



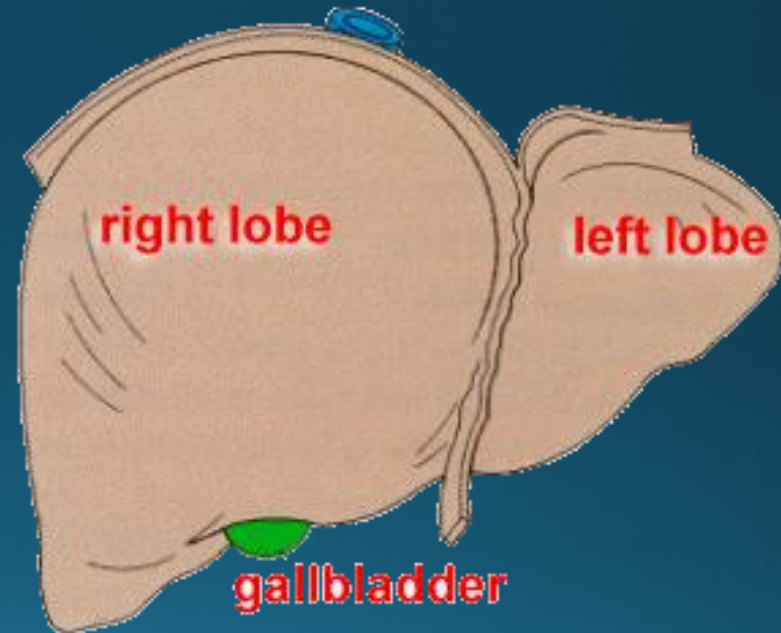
# Urine Removal (cont.)

- Urinary Bladder
  - Storage area
  - Sac-like and muscular
- Urethra
  - Small tube beneath bladder
  - Urine exit



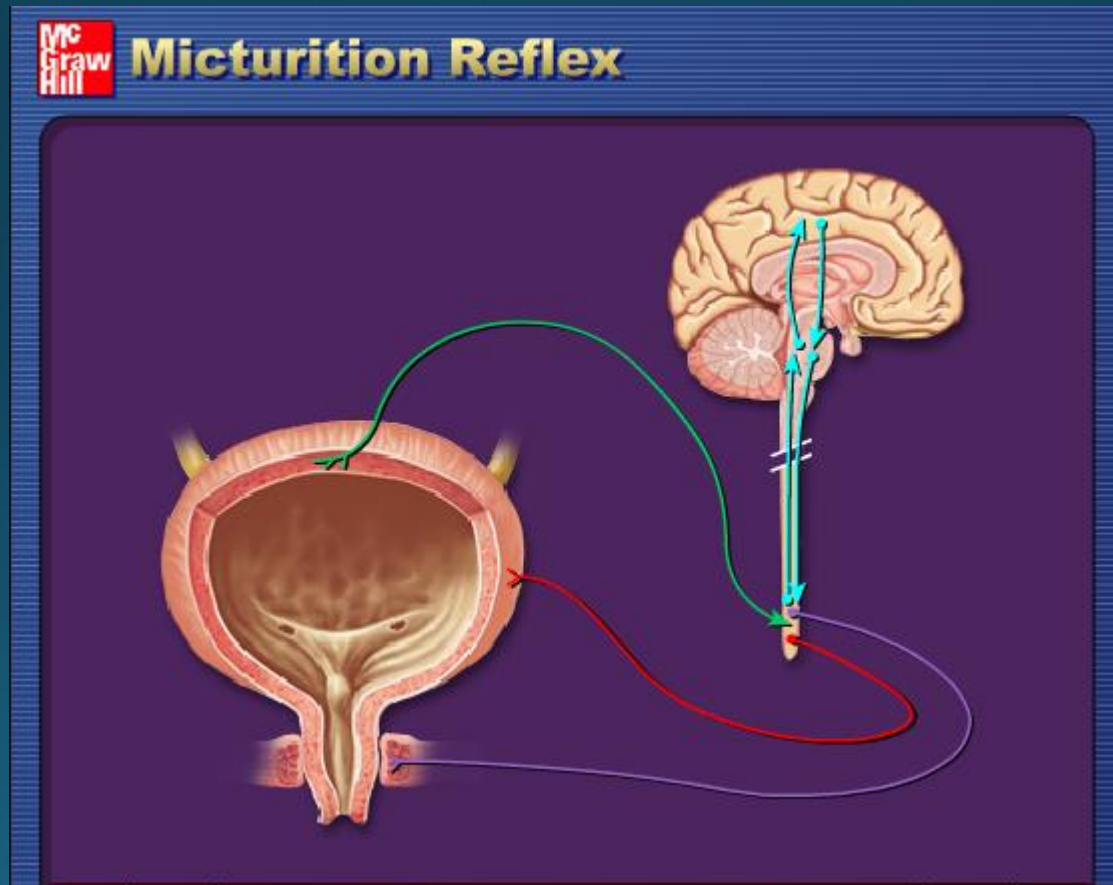
# Accessory Organs of Excretion

- **LIVER**
  - detoxifies poisonous substances
  - Breaks down RBC
- **LUNGS**
  - water, CO<sub>2</sub>, heat
- **SKIN**
  - water, salt, urea, heat



# Micturition Reflex

- To pee or not to pee? That is the question!



# Urinary Problems

- Kidney failure
  - transplant or dialysis
- Kidney stones
  - clog up tubules
  - Laser treatment to break stones
- Urinary tract infections
  - common, can be caused by e. coli
- Urinalysis
  - Detects some medical problems
- Diabetes
  - Glucose present in urine
- Kidney Failure
  - Protein present in urine



- [http://highered.mcgraw-hill.com/sites/0072495855/student\\_view0/chapter27/labeling\\_exercises.html#](http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter27/labeling_exercises.html#)