

Digestive and Excretory Systems

Chapter 38

38-1 Food and Nutrition

- Energy in food can be measured in calories
- Calories (c)
- Kilocalories (kcal)=1000 calories
- Avg teenager needs 2200-2800 kcals/day
- Food provides fuel, minerals and vitamins
- Vitamins and minerals are co-factors that help all your enzymes in your cells work

38-1 Food and Nutrition

- Nutrients (macromolecules)-carb, fats, proteins
- vitamins, minerals and water (at least 1L/day)
- Carbs-energy
- Fats-protect organs, insulate body and store energy, produce myelin on nerves, help to make some hormones
- Proteins-growth and repair, regulatory functions, transport in cells

38-1 Food and Nutrition

- Vitamins-work with enzymes to regulate cell functions
- Minerals-needed in small amounts-Calcium, Iron, Magnesium

38-1 Food and Nutrition

Vitamin A
equivalent to
10 Tomatoes



Vitamin C
equivalent to
50 Slices of Orange



Selenium
equivalent to
35 Cups
of Broccoli



Vitamin E
equivalent to
1.5 Cups of
Whole Almonds



Vitamin K
equivalent to
25 Cups of
Strawberries



Niacin
equivalent to
1.5 Cups
of Peanuts



Vitamin B6
equivalent to 29
Servings of Red and
Green Bell Peppers
(Raw)



Folate
equivalent to
72 Cups
of Spinach



Vitamin B12
equivalent to
167 Eggs



Thiamin
equivalent to 13
Tablespoons of
Brewer's Yeast



Riboflavin
equivalent to
46 Cups of Yogurt



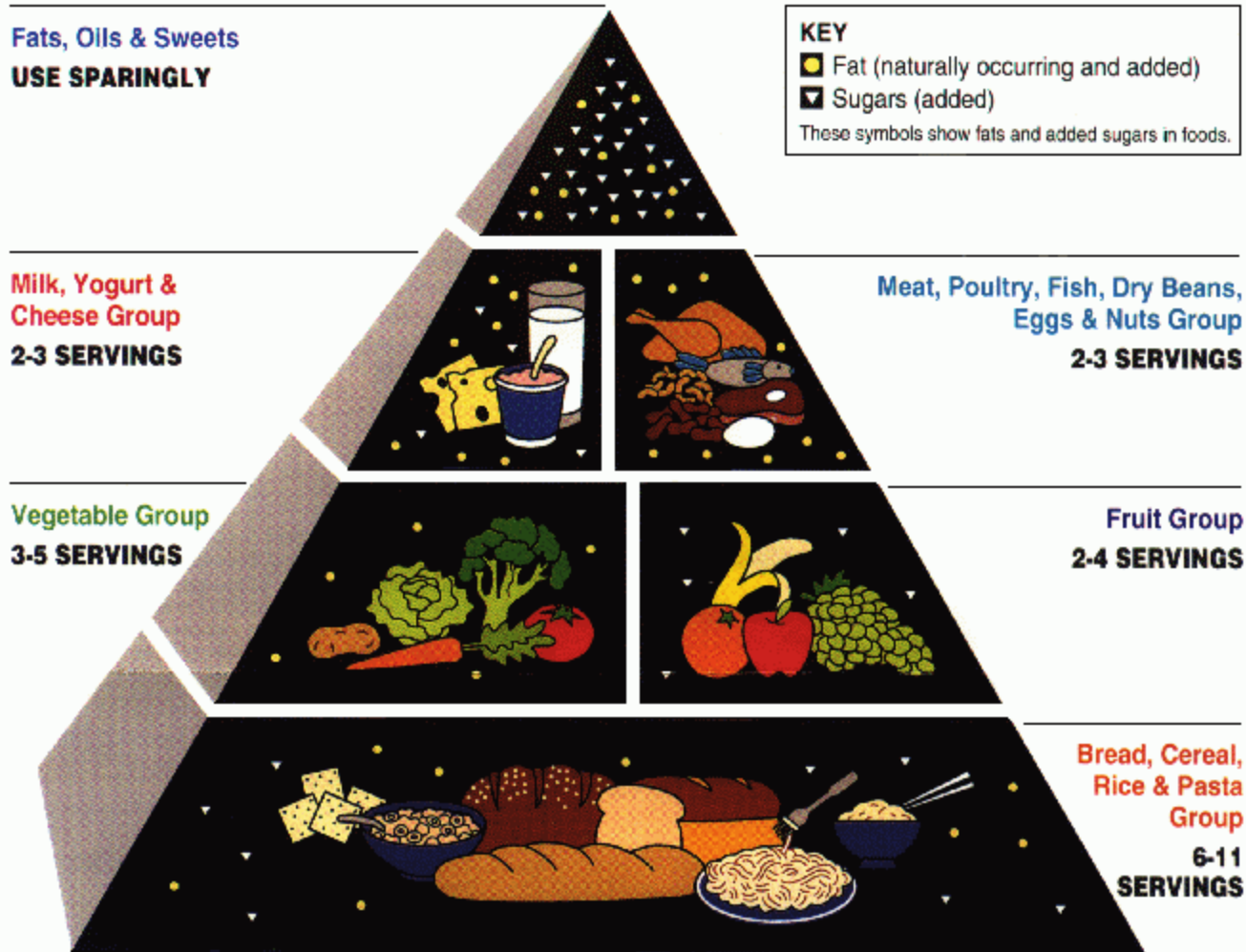
Vitamin D
equivalent to
4 Cups
of Milk



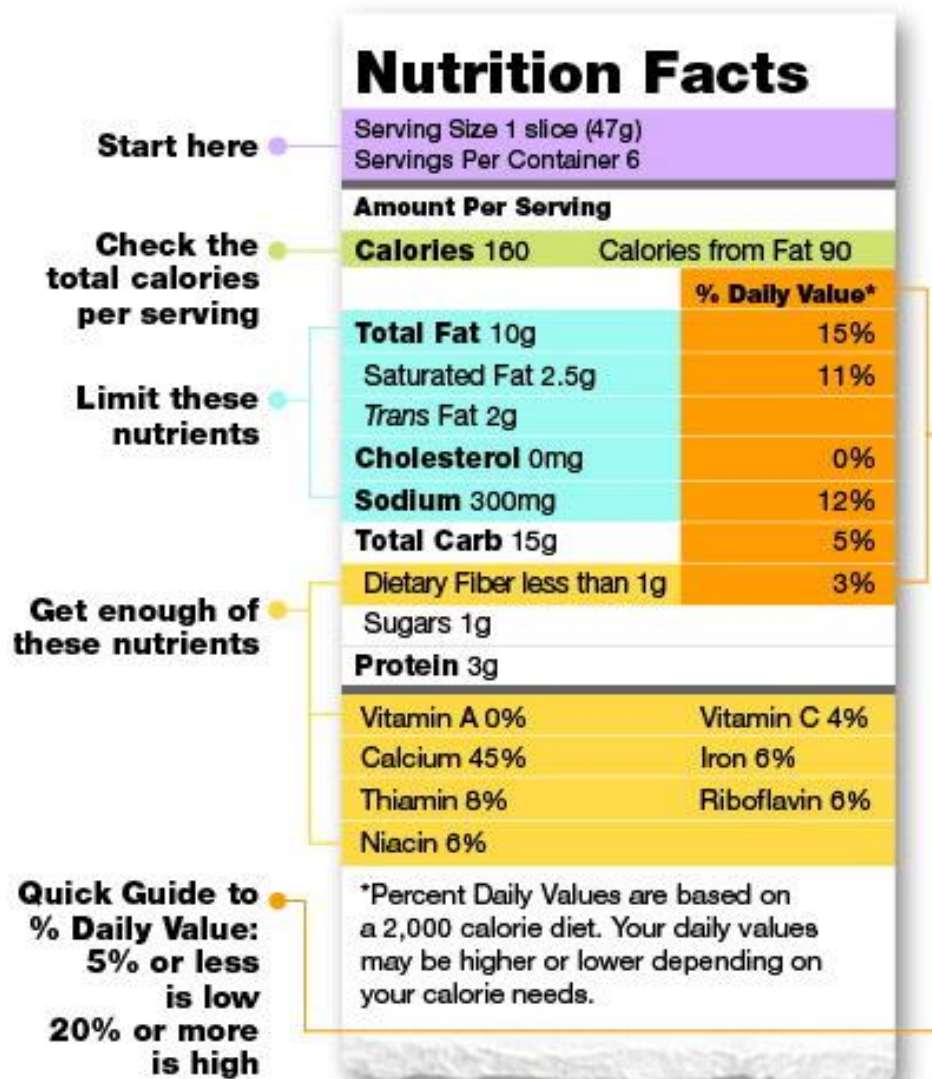
38-1 Food and Nutrition

MINERALS	FUNCTIONS / BENEFITS	FOOD SOURCES
Calcium	Builds bones, teeth, helps blood clot, assists nerves, muscles & heart to function	Milk, cheese, yogurt, buttermilk, tofu
Phosphorous	Builds teeth and bones, helps body get energy from foods	Milk, milk products, meat, fish, poultry, eggs, nuts, dried peas & beans
Iron	Forms part of red blood cells, helps body get energy from foods	Liver, organ meats, egg yolk, meat, poultry, oysters, whole-grain & enriched breads & cereals, dried peas & beans
Sodium	Controls water balance, regulates nerve impulses & muscle contractions	Salt, meat, fish, poultry, milk, and milk products
Potassium	Helps control water balance, regulates nerve impulses, muscle contractions & heart rhythm	Fruits, vegetables, meat, fish, poultry, milk and milk products
Iodine	Regulates energy	Seafood, iodized salt
Magnesium	Part of teeth & bones, helps body use carbohydrates, helps to regulate nerve & muscle contractions	Whole-grain cereal, nuts, dried peas & beans, milk, meat, leafy greens
Copper	Builds body cells, aids digestion & absorption, lubricates joints & organs, regulates body temperature	All liquids- water, coffee, tea, soft drinks, fruit & vegetable juices, milk, ice

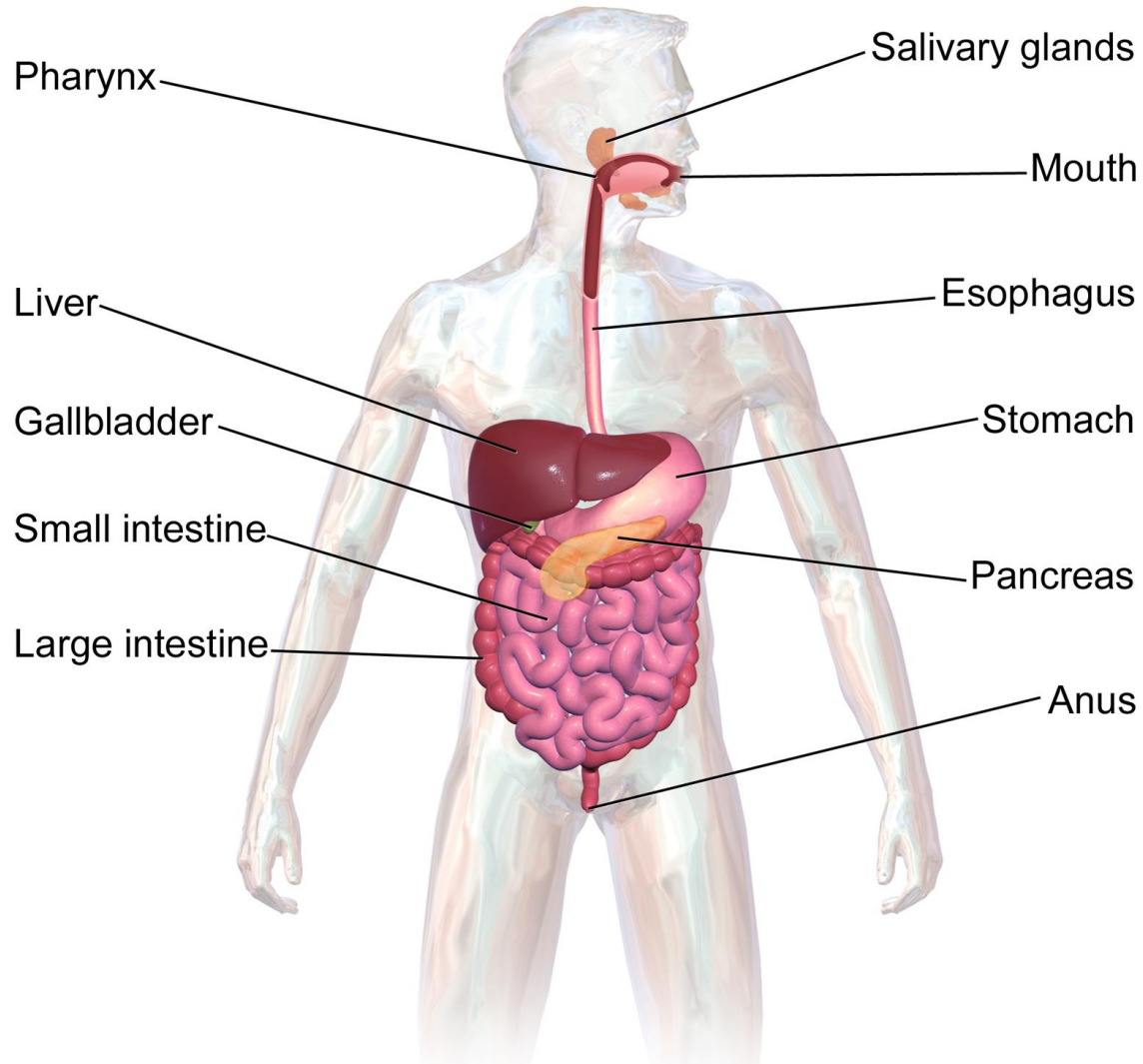
38-1 Food and Nutrition



38-1 Food and Nutrition



38-2 Digestion



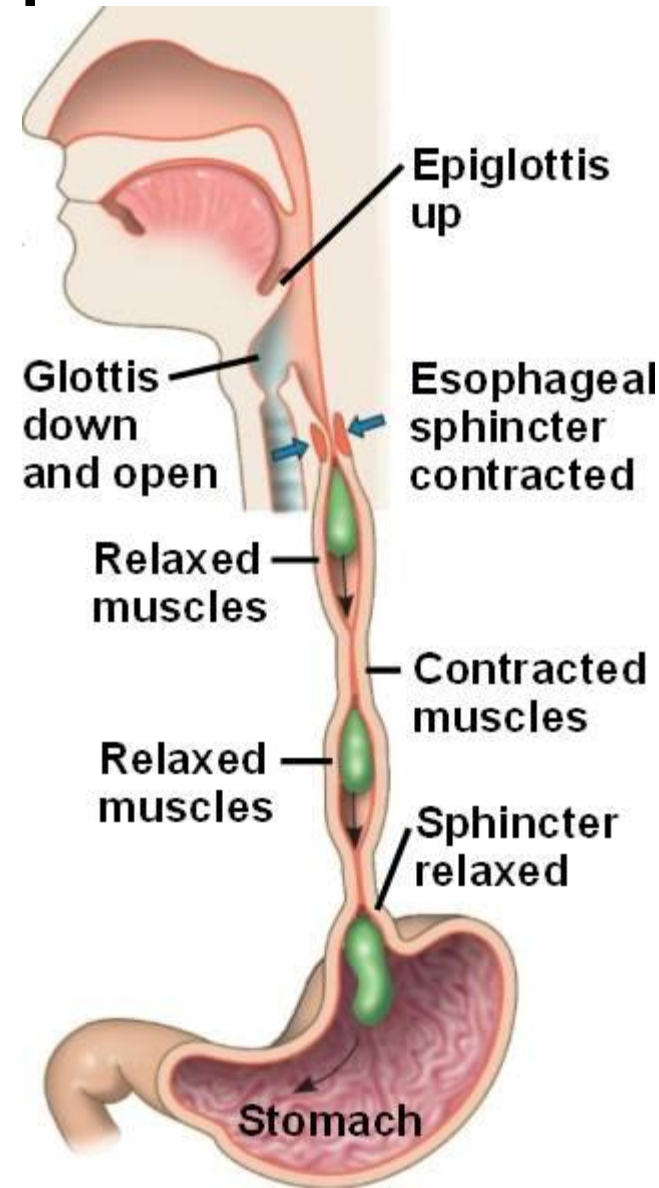
The Components of the Digestive System

38-2 Digestion

- Function is to help convert molecules in food to simpler molecules that can be absorbed and used by cells
- Teeth-mechanical work of digestion-grinding, cutting, tearing
- Saliva-moistens food, contains amylase that breaks down starch
- Together, make a bolus of food

38-2 Digestion

- Esophagus-takes bolus from mouth to stomach
- Swallowing and peristaltic (squeezing) movement of smooth muscles in esophagus push food through



38-2 Digestion

- Stomach-large muscular sac. Can stretch, and contracts to churn food
- Chemical and mechanical digestion
- Chemical digestion-lining of stomach has gastric glands that produce mucous, acid and pepsin
- Acid activates pepsin, which starts to break down proteins

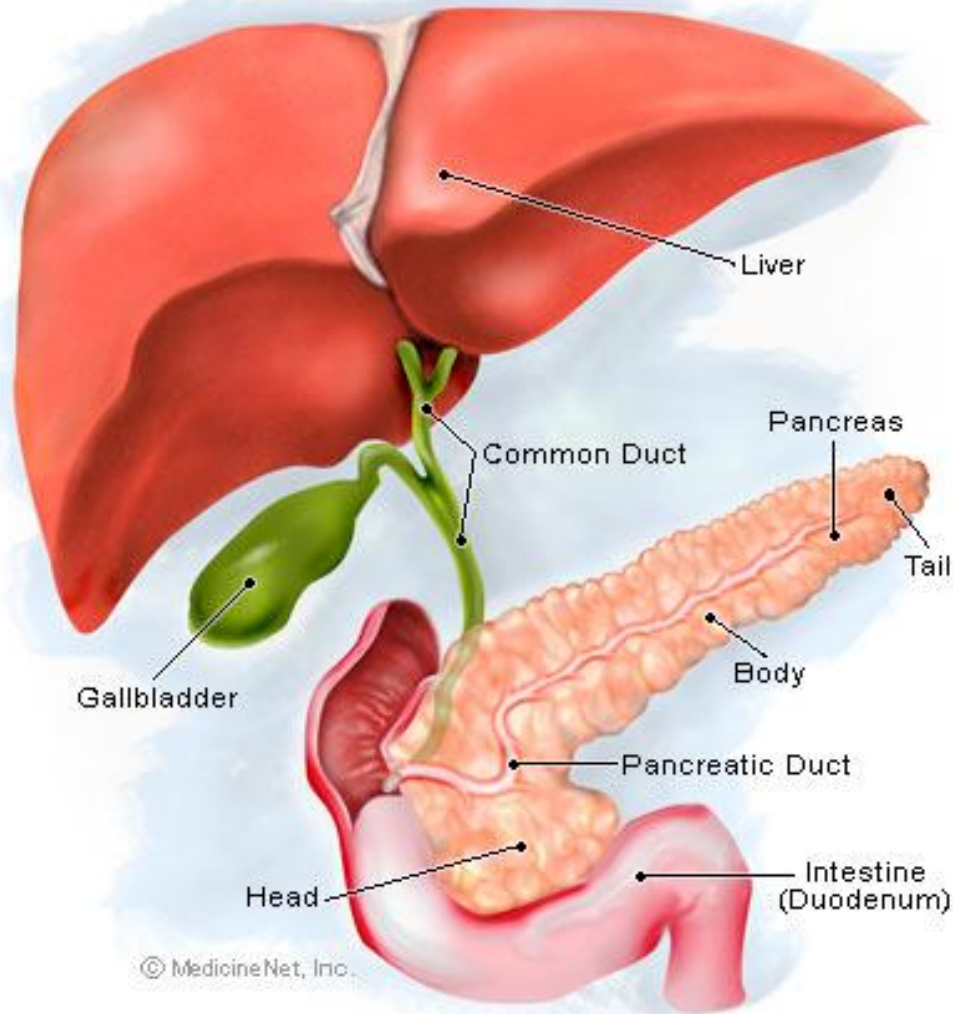
38-2 Digestion

- Mechanical digestion-churning of muscles in stomach mixes the food, mucous, acid and pepsin, makes chyme
- Chyme moves from stomach through pyloric valve to small intestine

38-2 Digestion

- Pancreas and Liver
- Chyme moves through pyloric valve into small intestine where most chemical digestion takes place
- Duodenum is the first part of the small intestine
- In the duodenum chyme mixes with enzymes and digestive fluids from the liver and pancreas

38-2 Digestion



38-2 Digestion

Summary of digestive enzymes

Where	What	Result
Salivary glands	Amylase	Polysacchs.
Stomach	Pepsin	Proteins
Pancreas	Lipase	Lipids
	Trypsin	Proteins
	Chymotrypsin	Proteins
	Nucleotidase	DNA/RNA
Brush-border	Peptidases	Protein
	Nucleases	Dinucleotides
	Lactase	Lactose
	Maltase	Maltose
	Sucrase	Sucrose

38-2 Digestion

- Pancreas
- Just below the stomach
- Produces hormones that regulate sugar level
- Produces enzymes that break down carbs, lipids, proteins and nucleic acids
- Produces sodium bicarbonate that neutralizes stomach acid as it reaches the small intestine so the digestive enzyme can function

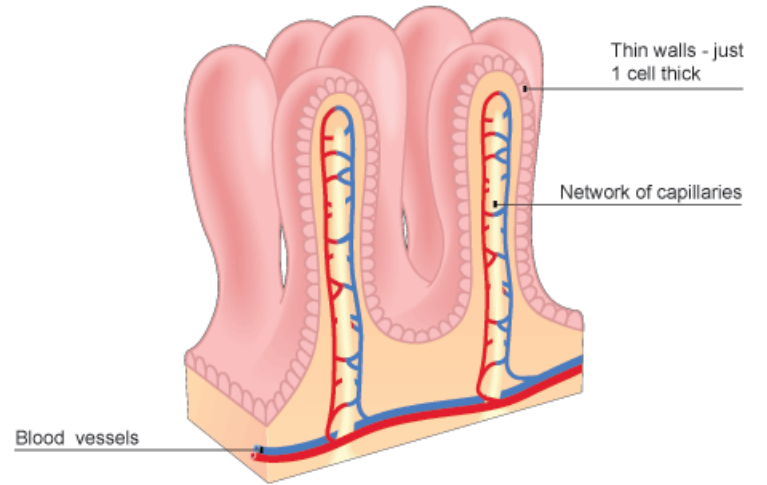
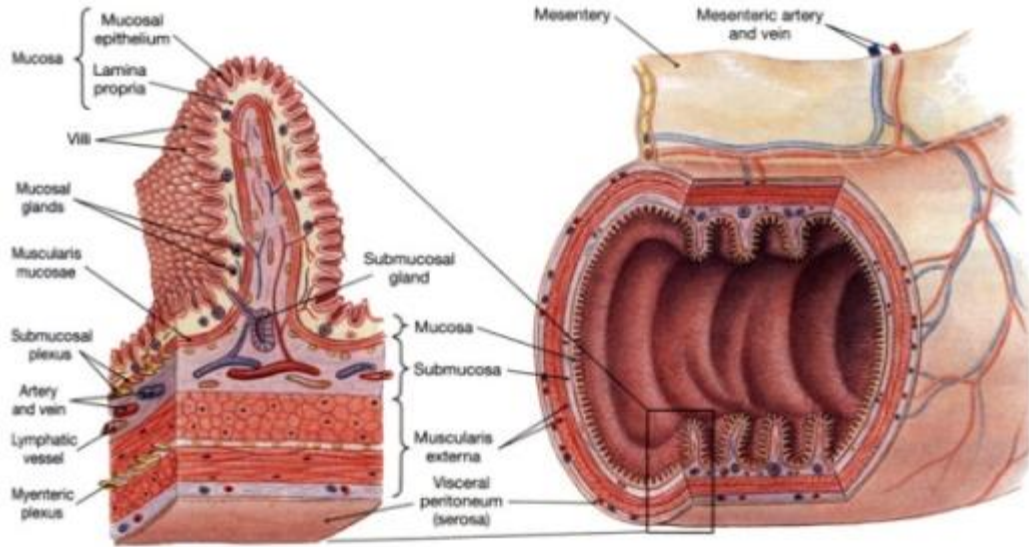
38-2 Digestion

- Liver
- Above the stomach, assists the pancreas
- Produces bile (loaded with lipids and salt) which acts like a detergent dissolving and dispersing fats in food so then lipases can break down the fat droplets
- Bile is stored in gall bladder

38-2 Digestion

- Small intestine
- Duodenum is shortest part
- Jejunum and ileum are 2 other parts, 3 meters long
- Most nutrient absorption occurs here-carbs and protein into capillaries, fats into the lymph vessels (lacteals)
- Villi create lots of surface area for diffusion and active transport
- Slow wave-like motion of the smooth muscles keeps everything moving

38-2 Digestion



38-2 Digestion

- Large Intestine-most food here is nutrient free
- Water, cellulose and undigested material is left
- Primary job is to remove water from undigested material
- Just below the entry to the LI is the appendix-in some animals contains microbes that digest cellulose
- Bacteria in LI produce enzymes that produce useful compounds like vitamin K
- When things go wrong here-diarrhea

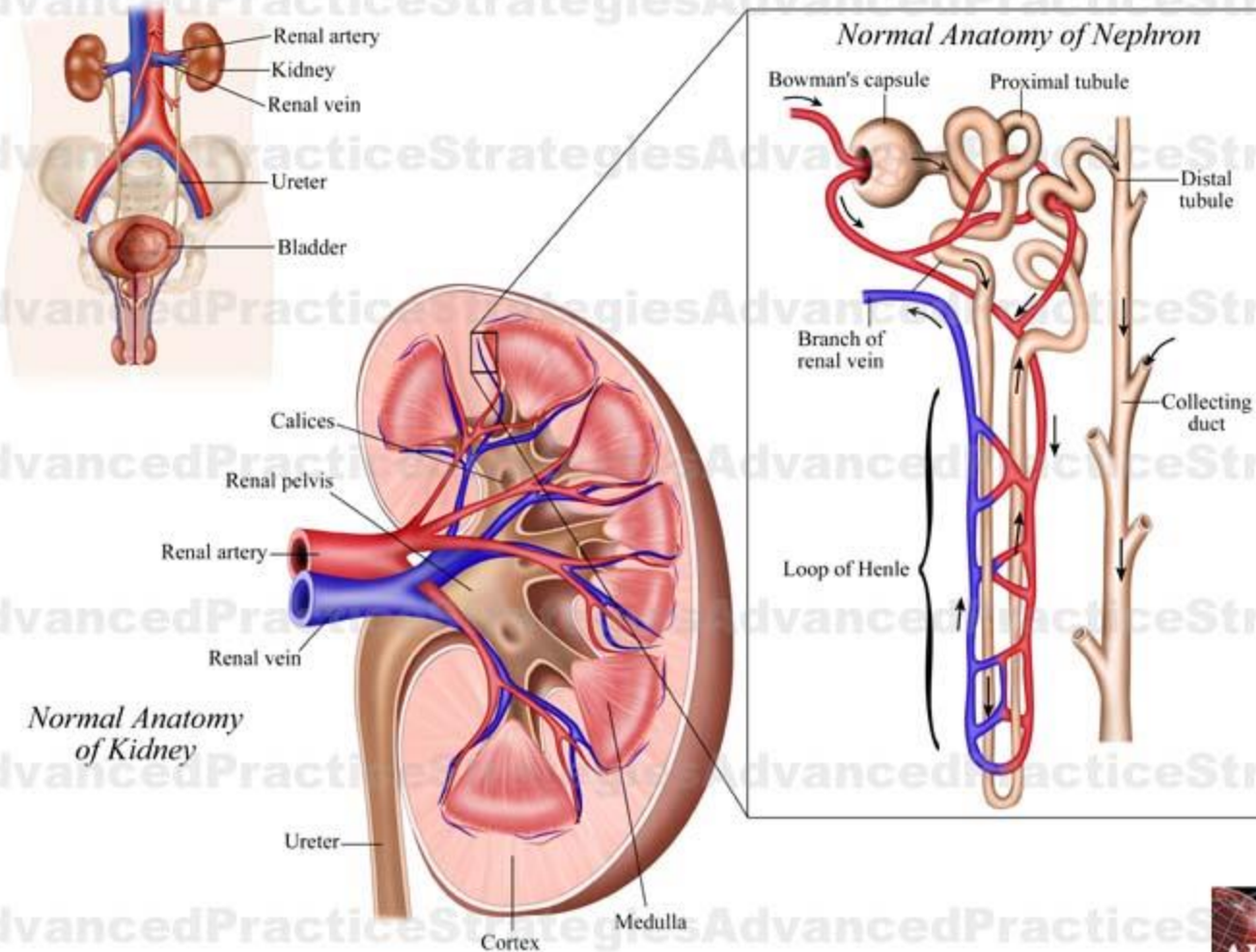
38-3 Excretory System

- Helps maintain homeostasis
- Eliminates excess salts, carbon dioxide, urea
- Skin, lungs and kidneys

38-3 Excretory System

- Kidneys
- 2, size of clenched fists
- Ureter exits kidney and goes to bladder
- Bladder stores urine
- Waste rich blood enters kidney through renal artery
- Excess water, urea and salt is collected and made into urine
- Clean filtered blood exits through renal vein

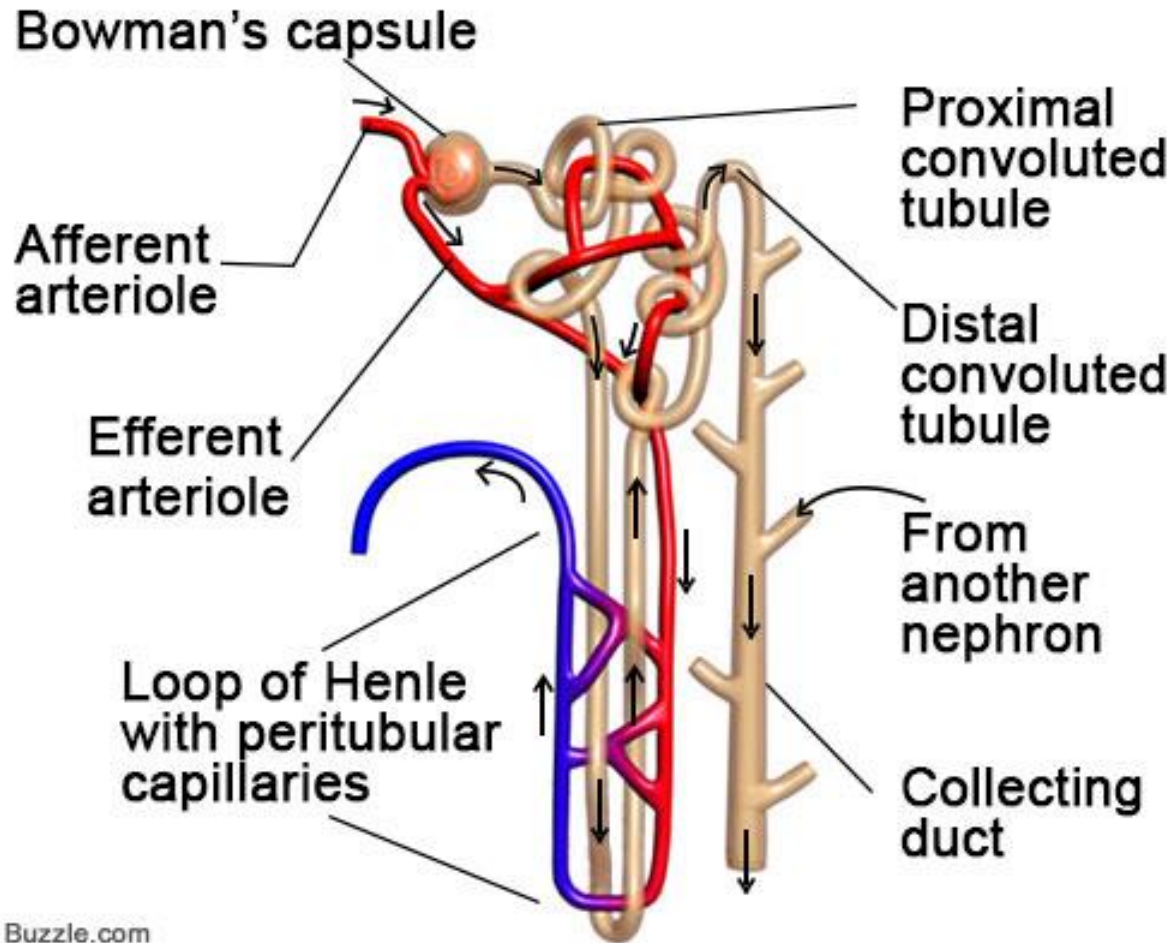
38-3 Excretory System



38-3 Excretory System

- Kidney structure
- Inner part-medulla
- Outer part-cortex
- Functional units are nephrons
- 1 million nephrons/kidney
- Nephrons are in cortex except for loops of Henle, in medulla
- Each nephron has its own arteriole

38-3 Excretory System



38-3 Excretory System

- Blood passes from arteriole to capillaries, gets filtered
- Diffusion of waste occurs into collecting duct which leads to ureter, then to bladder
- Blood exits nephron through venule
- Substances get filtered, reabsorbed or secreted

38-3 Excretory System

- Filtration-Blood gets filtered in a network of capillaries called glomerulus nested in a Bowman's capsule, inside the nephron
- Blood is under pressure, and capillaries are permeable
- Filtrate contains water, urea, glucose, salt, amino acids and some vitamins

38-3 Excretory System

- Reabsorption and secretion-Kidneys filter all the blood every 45 minutes
- Not all filtrate is excreted, most of it is reabsorbed
- Nutrients, amino acids and glucose
- Hydrogen ions (H^+ , makes solutions acidic) are secreted into the filtrate through capillaries
- After reabsorption, called urine
- Urine is concentrated in the loops of Henle to conserve water
- Urine stored in bladder until released into urethra

38-3 Excretory System

- Kidney function is controlled by composition of the blood
- More water =more reabsorption
- More salt=less reabsorption
- Wants to keep a constant salt concentration and pH
- Works by diffusion and osmosis

38-3 Homeostasis by Machine

