Blood supply

- Splanchnic circulation includes:
  - Arteries that branch off aorta to serve digestive organs
  - Hepatic, splenic, and left gastric arteries
  - Inferior and superior mesenteric arteries

GI wall composition

- Digestive organs: Be familiar with the basic processes carried out by the GI system & know the general laminar structure of the wall of the GI tract and the tissues
  - Structures of the GI tract
  - Mouth, pharynx, and esophagus:
    - Mouth
Kidneys: form urine
- Gross Anatomy
  - Paired, bean shaped
  - Retroperitoneal
- Microscopic anatomy
  - Nephron = functional unit
- Blood supply
  - Renal arteries enter kidney at hilus
  - Renal veins exit at hilus
- Function is to filter blood

Physiology of Kidneys
- Three processes are involved in urine formation and adjustment of blood composition:
  - Glomerular filtration: produces cell- and protein-free filtrate
  - Outward pressures
    - Forces that promote filtrate formation
    - Hydrostatic pressure in glomerular capillaries (HPgc) is essentially glomerular blood pressure
Regulation of Glomerular Filtration

- Intrinsic controls: Renal autoregulation
  - Myogenic regulation
  - Increased mean arterial pressure increases GFR myogenic regulation
    - Response to stretch in afferent arteriole
    - Muscle contracts in response to stretch
    - Increased resistance lowers glomerular capillary pressure
    - Counteracts effects of increased MAP
  - Tubuloglomerular feedback
    - Response to rate of blood flow past macula densa
    - Afferent arteriole contracts
    - Increased resistance lowers glomerular capillary pressure
    - Counteracts effects of increased MAP

- Extrinsic controls: Neural and hormonal mechanisms
  - Sympathetic nervous system
    - When BP is low
    - Norepinephrine (Sympathetic NS) and Epinephrine (adrenal medulla) cause
      - Systemic vasoconstriction, which increases blood pressure
      - Constriction of afferent arterioles, which decreases GFR
      - Blood volume and pressure increases
  - Renin-angiotensin-aldosterone mechanism
    - Main mechanism for increasing blood pressure

- Tubular reabsorption: selectively returns 99% of substances from filtrate to blood in renal tubules and collecting ducts
  - Tubular reabsorption quickly reclaims most of tubular contents and returns them to blood
  - Water and solutes move from renal tubules into peritubular capillaries (returned to blood)
    - Renal tubules to interstitial fluid
  - Most occurs in proximal tubule
    - Selective transport
    - Mostly not regulated
• Transcellular route
  • Solute enters apical membrane of tubule cells
  • Travels through cytosol of tubule cells
  • Exits basolateral membrane of tubule cells
  • Enters blood through endothelium of peritubular capillaries
• Paracellular route
  • Between tubule cells
  • Limited by tight junctions, but leaky in proximal nephron
    • Water, Ca2+, Mg2+, K+, and some Na+ in the PCT move via this route
• Primary active transport of Sodium
  • Na-K ATPase pumps
• Secondary active transport
  • Electro chemical gradient creates ‘push’ for other solutes