BLOCK E OSPE

BY FATIMA HAIDER
KGMC

- **Alkaline tide**

  Alkaline tide refers to a condition, normally encountered after eating a meal, where during the production of hydrochloric acid by the parietal cells in the stomach, the parietal cells secrete bicarbonate ions across their basolateral membranes and into the blood, causing a temporary increase in blood pH

- **Four different types of catheters**

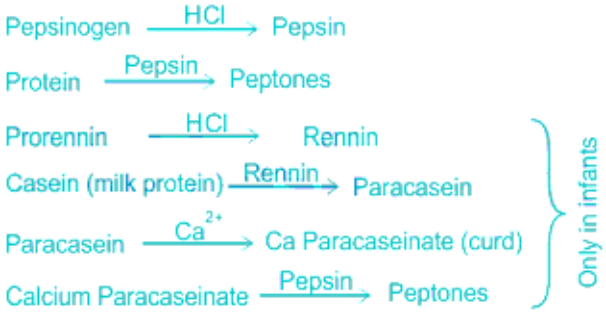
  1. In-dwelling catheter, also known as Foley catheter
     - Stays in place for days or weeks
     - Attached to a drainage bag

  2. Intermittent catheter
     - Often designed for one time use and discarded after use

  3. External catheter
     - Only used for male patients
     - Used for urinary incontinence, not urinary retention

- Pepsinogen effect on milk curdling

  Pepsin break down milk protein (casein). These molecules attract one another to form “curdles” or lumps.



- Buffers...renal n blood

Extracellular fluid	*Major buffer* • Bicarbonate buffer system *Minor buffers* • Intracellular proteins • Phosphate buffer system
Blood	*Major buffers* • Bicarbonate buffer system • Hemoglobin *Minor buffers* • Plasma proteins • Phosphate buffer system
Intracellular fluid	*Major buffers* • Proteins • Phosphate
Urine	*Major buffers* • Ammonia • Phosphate

- **1st 2nd n 3rd line of defense**

NON-SPECIFIC DEFENCES (INNATE IMMUNITY)		SPECIFIC DEFENCES (ADAPTIVE IMMUNITY)
First line of defense	**Second line of defense**	**Third line of defense**
• Skin • Mucous membranes • Secretions of skin and mucous membranes	• Phagocytic leukocytes • Antimicrobial proteins • Inflammatory response • Fever	• Lymphocytes • Antibodies • Memory cells

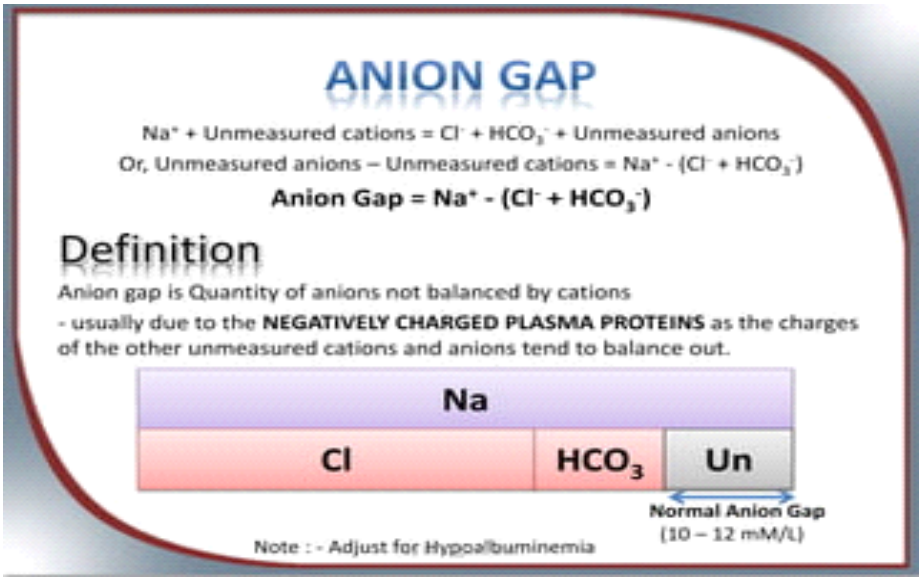
- **Mechanism of action of kidney buffer system**

  The kidneys have two main ways to maintain acid-base balance - **their cells reabsorb bicarbonate HCO_3^- from the urine back to the blood and they secrete hydrogen H^+ ions into the urine**. By adjusting the amounts reabsorbed and secreted, they balance the bloodstream's pH.

- **Most effective buffering system**

  Bicarbonate buffer system

- **Anion gap**

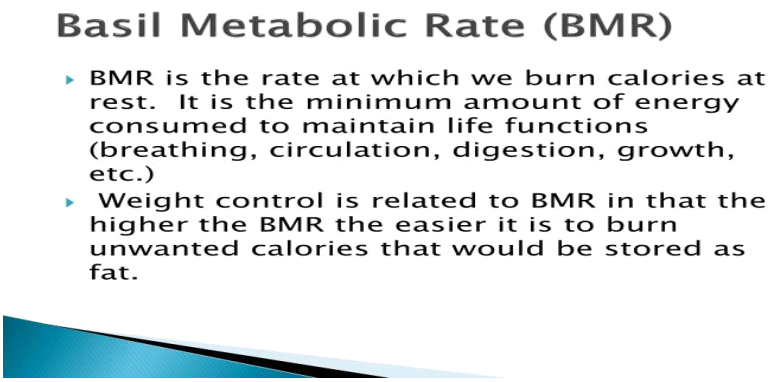


- **Lactic acidosis**

  Lactic acidosis refers to **lactic acid build up in the bloodstream**. Lactic acid is produced when oxygen levels become low in cells within the areas of the body where metabolism takes place

- **BMR**

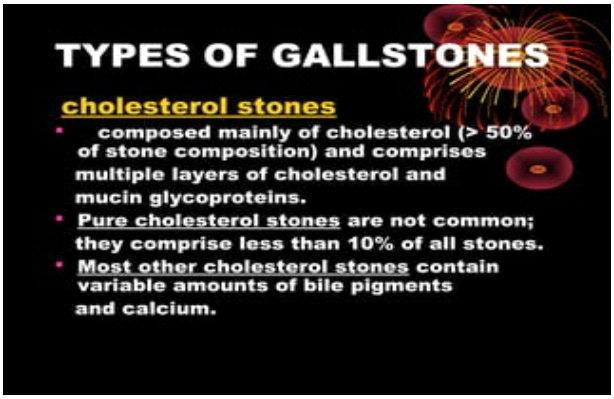
  BMR (Basal Metabolic Rate) is the amount of energy which our body needs to perform basic functions such as breathing, circulation and cell production. It is the minimum number of calories that our body needs to maintain basic physiologic functions while at rest. It is influenced by age, sex, weight and height.



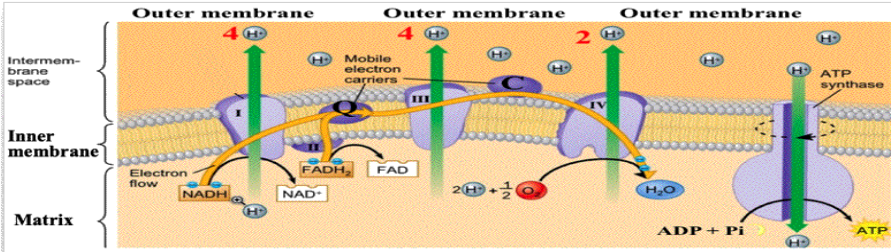
- **Role of cholesterol in stones**

  Gallstones are formed when there is imbalance in chemical composition of bile. Bile contains water, bile acids, cholesterol etc.

  Normally the liver produce bile acids to help digest fat, and the bile acids keep the cholesterol in the bile dissolved. However, if the liver produce too much cholesterol or if the bile contains too little bile acids, the cholesterol can form crystals and eventually harden into stones.



- **Steps of etc**



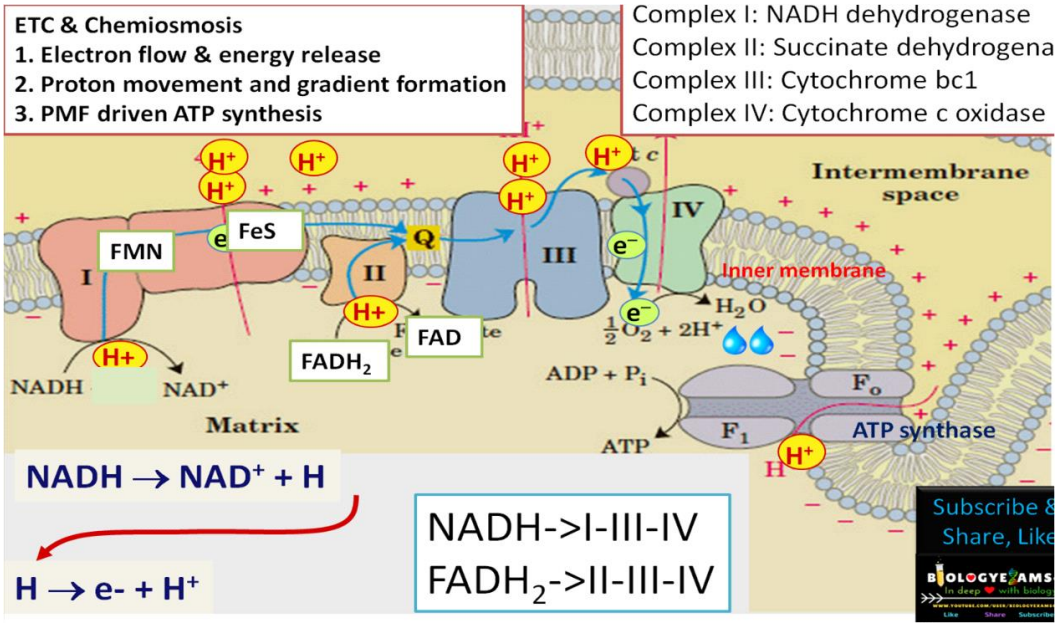
1. Redox of NADH+H+ at Complex I, electrons go to Complex I, four protons pumped from matrix to intermembrane space

2. Redox of $FADH_2$ at Complex II, Coenzyme Q picks up electrons (from Complex I and II) and transports to Complex III

3. Redox of Complex III, four protons pumped from matrix to intermembrane space, carrier C transports electrons to Complex IV

4. Redox of Complex IV, two protons pumped from matrix to intermembrane space, formation of H_20 (20% of water in body)

5. ATP Synthase action, pumps protons from intermembrane space to matrix, produces ATP from ADP + Pi + energy



- **Cheimosmotic phosphorylation**

  Chemiosmosis is the movement of ions (especially protons) across the membrane resulting in electrochemical gradient that drives ATP synthesis.

- **Stomach bed contents**

  1. Left crus of diaphragm
  2. Splenic artery
  3. Suprarenal gland
  4. Left kidney
  5. Body of pancreas
  6. Left colic flexure
  7. Transverse mesocolon

- **Muscles of ant abdominal wall**

  The muscle layers include the **external oblique muscle, internal oblique muscle, transversus abdominis muscle anterolaterally and the rectus abdominis muscle anteriorly**.

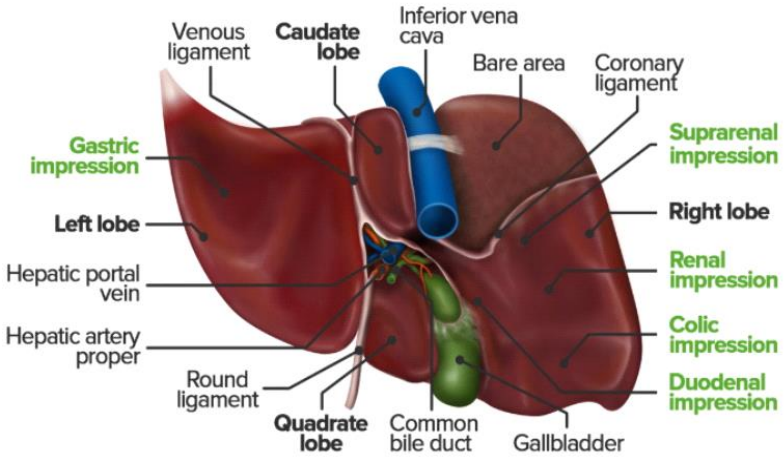
- **Blood supply of stomach**

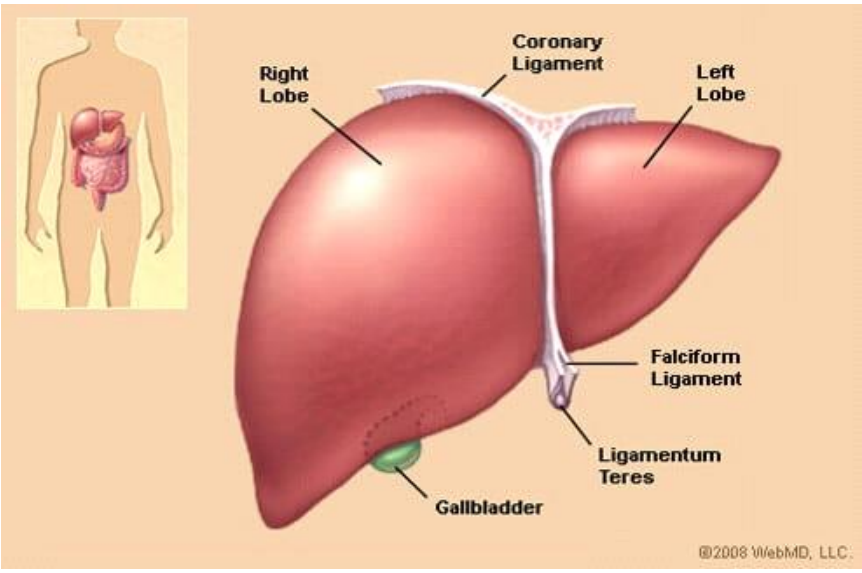
BLOOD SUPPLY

- **Left gastric artery**
  - branch of the celiac artery.
  - Supplies the lower third of the esophagus and the upper right part of the stomach.
- **Right gastric artery**
  - branch of the hepatic artery.
  - Supplies the lower right part of the stomach.
- **Short gastric arteries**
  - arise from the splenic artery at the hilum of the spleen.
  - Supply the fundus.
- **Left gastroepiploic artery**
  - arise from the splenic artery at the hilum of the spleen.
  - Supplies the upper part of the greater curvature.
- **Right gastroepiploic artery**
  - arises from the gastroduodenal branch of the hepatic artery.
  - Supplies the lower part of the greater curvature.

- **Liver lobes**

Liver

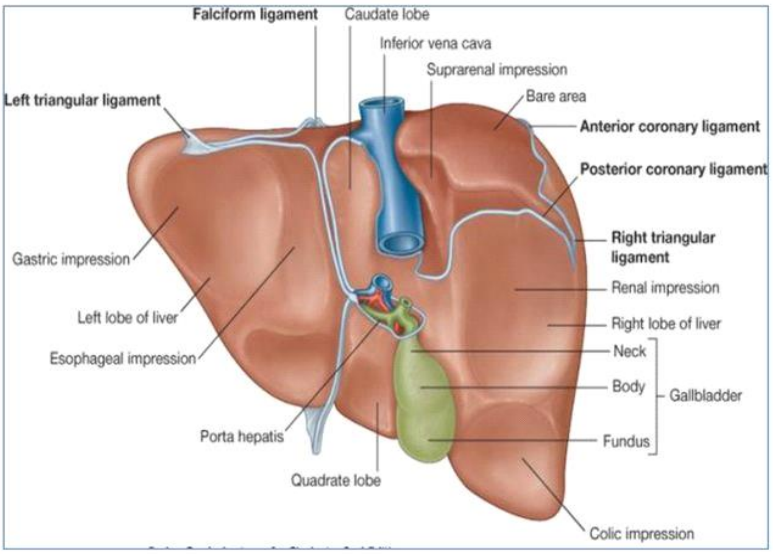




- Anatomical position
- **Impressions of visceras**

- The visceral or the posteroinferior surface, is related to the abdominal viscera.
- It is covered with peritoneum, except 3 areas:
- **Gallbladder fossa,**
- **Porta hepatis.**
- **I.V.C groove.**
- **It bears** multiple fissures and impressions due to contact with other organs.

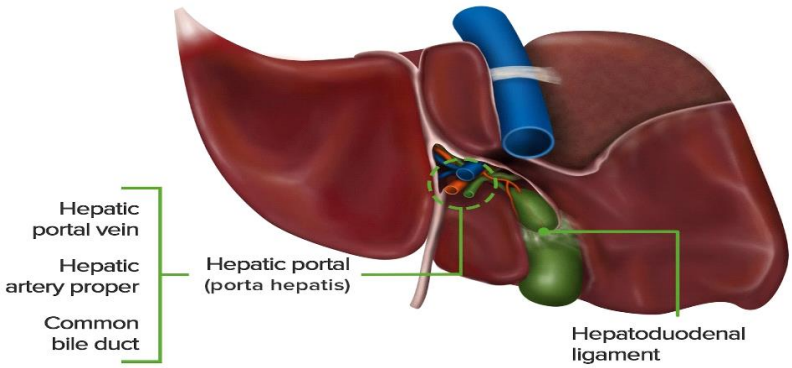
Visceral Surface



- What Ant n post surfaces are called and why
- **Location of liver**

The liver is the largest visceral organ in the body and is primarily in the right hypochondrium and epigastric region, extending into the left hypochondrium

- **Contents entering n leaving liver**

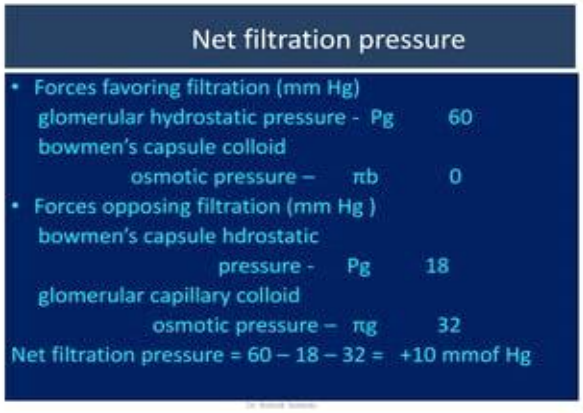


- **GFR formula**

GFR = Kf x Net Filtration Pressure

Net filtration pressure = Glomerular hydrostatic pressure – Bowman's capsule pressure – Glomerular colloid osmotic pressure

- **What factors effect NFP**



- **Value of kf =** 12.5 ml per min per mmHg
- **Value of pressures**

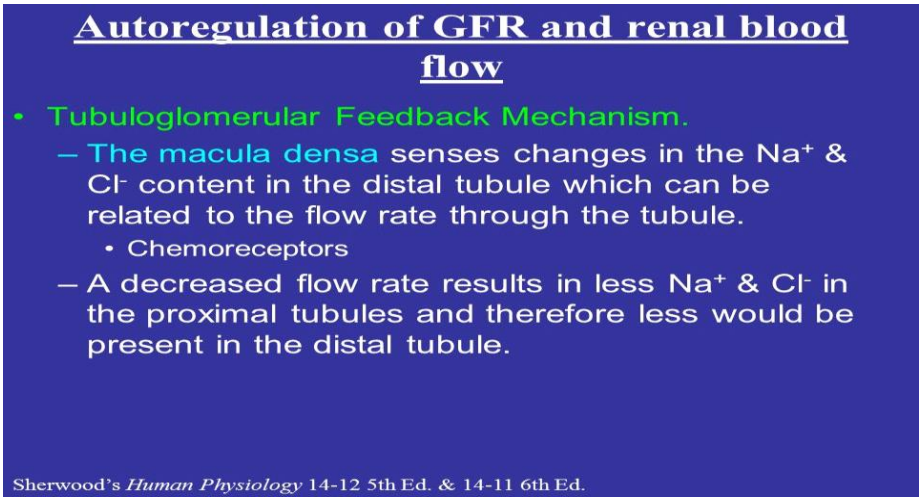
Net filtration pressure = +10 mmHg

Glomerular hydrostatic pressure = +60 mmHg

Bowman's capsule hydrostatic pressure = +18 mmHg

Glomerular colloid osmotic pressure = +32 mmHg

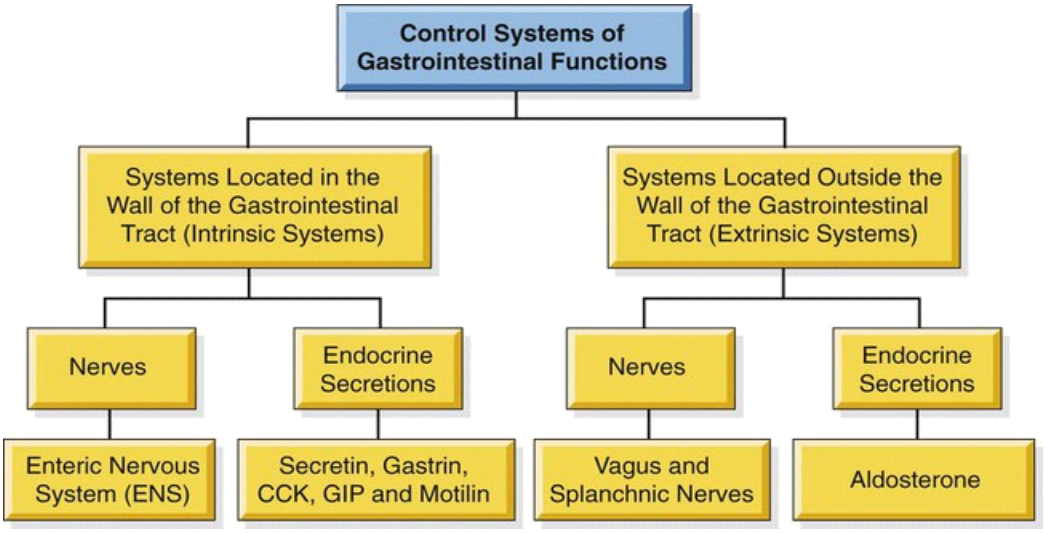
- **Autoregulation of Kidney (when GFR is low)**
  - Myogenic mechanism
  - Tubuloglomerular feedback
  - Renin Angiotensin Aldosterone system



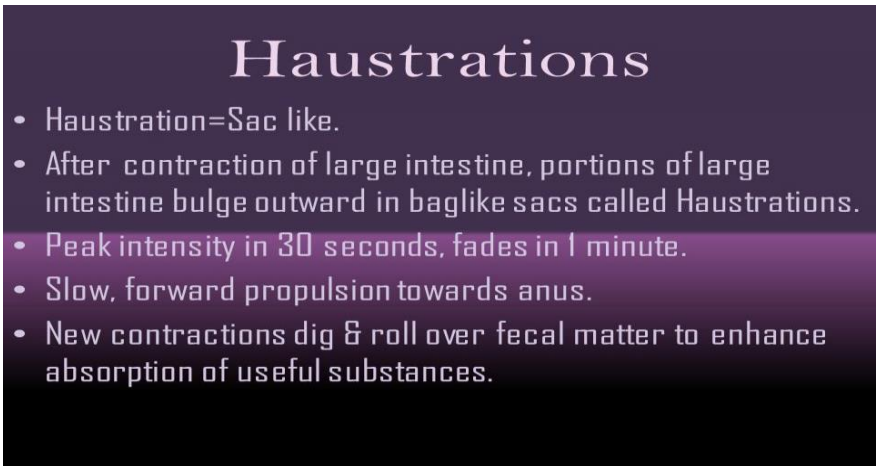
- **Git motility**

  Movements of GIT

  - Propulsive movements – peristalsis
  - Mixing movements – due to peristalsis and local intermittent segmentation contractions
- **Nervous control of git**
  - Myenteric plexus control GIT movements
  - Submucosal plexus control GIT secretion and local blood flow
  - Parasympathetic innervation
  - Sympathetic innervation



- **Haustrations**

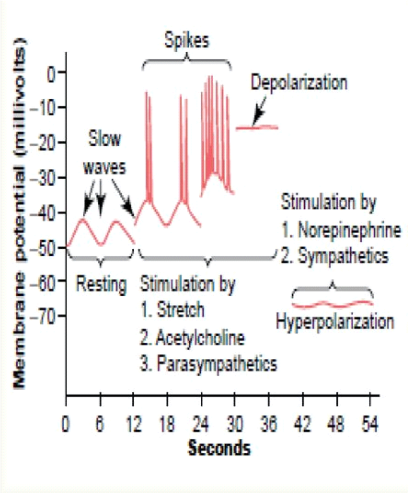


- **Waves types in git (slow n spike)**

GIT smooth muscle

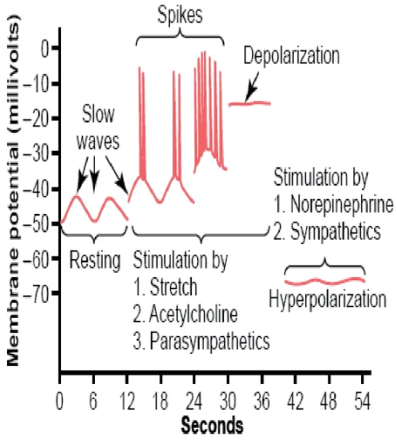
- There are two types of electrical waves.
- ✓ *slow waves* and
- ✓ *Spikes*

- **Slow Waves.**
- **Responsible for rhythmical contractions**
- not action potentials
- slow, undulating changes in the resting membrane potential.
- Their intensity varies between 5 - 15mv
- their frequency: 3 to 12 **per minute**:



Spike Potentials

- The true action potentials.
- Occur automatically when the resting membrane potential of the gastrointestinal smooth muscle becomes more positive than about -40 mV (normal gut potential is from -50 to -60 mV).



- **What is alkaline tide**

Alkaline Tide:
It is the increase in the blood pH produced by the influx of bicarbonate ions from the interstitial fluid to the blood stream, during the formation of HCl acid in the stomach.

Functions of Hydrochloric Acid

1- The acidity of gastric juice kills most of the micro-organisms ingested with food

2- The acidity denatures proteins and inactivates most of the enzymes in food.

3- The acidity helps break down plant cell walls in food and the connective tissue in meat..

4- An acidic environment is essential for the activation and function of pepsin, a protein-digesting enzyme secreted by chief cells.

- **What is titratable acidity of urine**

  Titrable acididty of urine is expressed as the amount of alkali required to titrate or neutralize the acid present in the urine. The titrable acidity, in the normal urine, is mainly due to presence of acid phosphate ions (H_2PO_4) and to a small extent due to organic acids.

Excretion of titratable acid

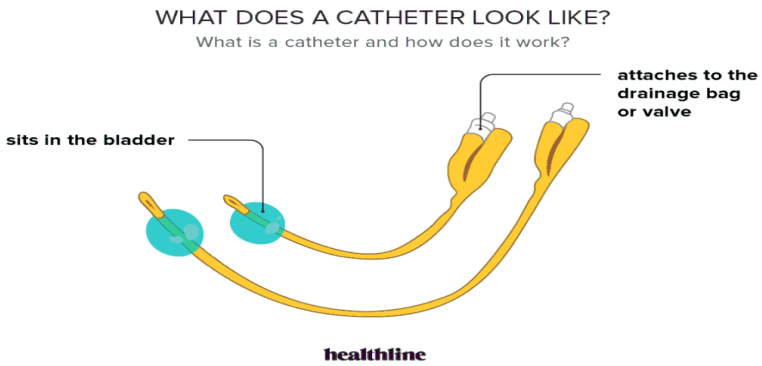
- Titratable acidity is a measure of acid excreted into urine by the kidney.
- It reflects the H^+ ions excreted into urine which resulted in a fall of pH from 7.4.
- The excreted H^+ ions are actually buffered in the urine by phosphate buffer.

- **Conditions in which acidity of urine increases**

pH of urine

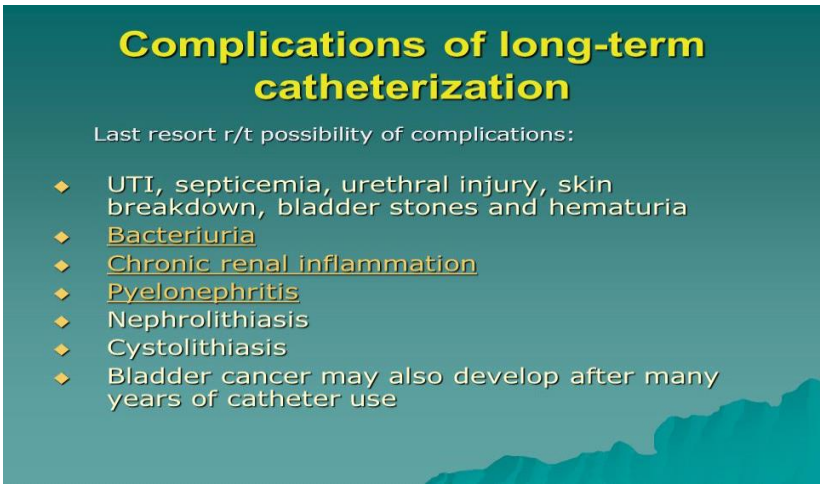
- Usual range: **5,5 – 7,0** (maximal range: **4,5 – 7,5**)
- Aciduria – **pH < 5,4**
  - Cause:
    - diet high in meat products (sulphur and phosphorus are metabolized to sulphates and phosphates)
    - compensation of metabolic / respiratory acidosis
    - along with ketonuria can be predictive of starving/lack of saccharides; if glucosuria is also present, the combination can indicate decompensated DM
- Alkaluria (alkalinuria) – **pH > 6,5**
  - Cause:
    - lacto vegetarian diet
    - urinary tract infection (bacterial urease)
    - compensation of respiratory / metabolic alkalosis at its onset

- **Types of catheter, size of female catheter, complications of catheterization, why balloon is used**



Length of female catheter ranges between 7 – 10 inches

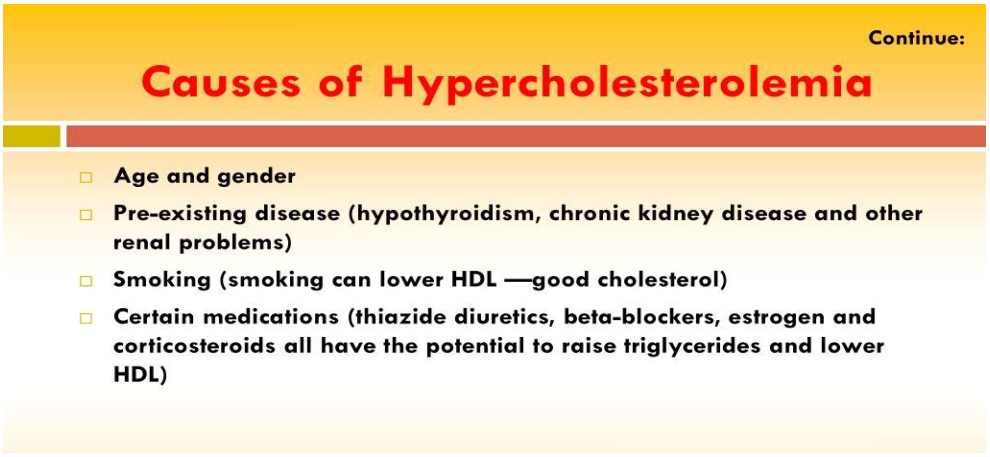
The balloon is inflated after the catheter is properly placed in the bladder **to help keep the catheter seated in the bladder**.

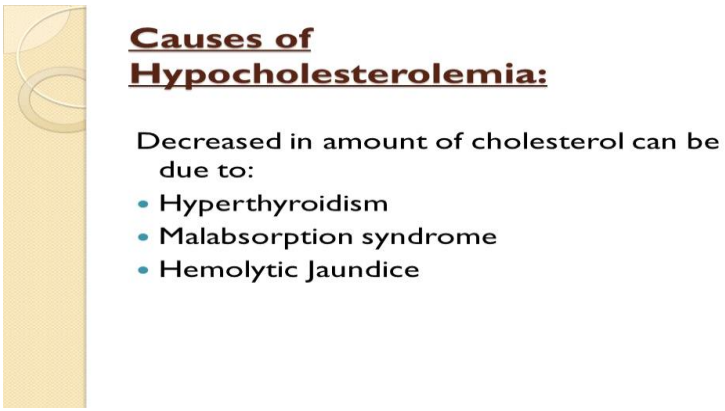


Indications for a Foley Catheter

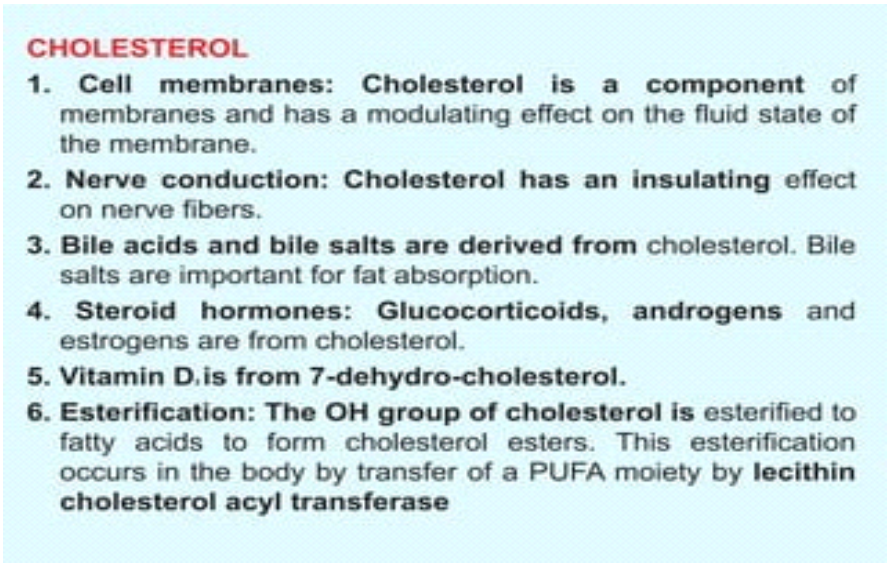
- **Retention** of urine leading to urinary hesitancy, straining to urinate, decrease in size and force of the urinary stream, interruption of urinary stream, and sensation of incomplete emptying
- **Obstruction** of the urethra by an anatomical condition that makes it difficult to urinate: prostate hypertrophy, prostate cancer, or narrowing of the urethra
- **Urine output monitoring** in a critically ill or injured person
- Collection of a sterile urine specimen for **diagnostic purposes**
- Nerve-related bladder dysfunction, such as after spinal trauma, or intractable **incontinence**.
- **Imaging study** of the lower urinary tract
- After surgery to **monitor urine output**

- **Conditions in which cholesterol increases and decreases**





- **Functions of cholestrol**



- **Write procedure to determine serum direct bilirubin**

1. Label three test tubes as U, S, B
2. Transfer 4ml of 1:10 diluted plasma/serum into tubes ‘U’ and ‘B’

3. Transfer 4ml bilirubin standard solution to tube ‘S’
4. Add 1ml Diazo Blank to ‘B’ and mix
5. Add 1ml Diazo reagent to tubes ‘U’ and ‘S’ and mix
6. Record optical density at 545nm after 5 min in photoelectric calorimter

Normal Range of serum direct bilirubin = 0 – 0.35 mg/dl

- **Write procedure to determine free acidity of gastric juice**

1. To 5ml of gastric juice in an Erlenmeyer flask, add 1 -2 drops each of Topfer’s reagent and phenolphthalein. A red color will appear at once, if free HCl is present
2. Titrate it with 0.1N NaOH in the burette at zero mark, till the appearance of yellowish-orange color. Note the first reading of burette.
3. Titrate further, the contents of the flask with 0.1N NaOH till the appearance of a permanent faint pink color. Note the final reading of burette.
4. Now calculate the free acidity in gastric juice

   Volume of 0.1N NaOH used = ‘F’ ml

   5ml gastric juice required = ‘F’ ml 0.1N NaOH

   1ml gastric juice will require =

   100 ml gastric juice will require = = A

- **Embryo diagram labelling....**
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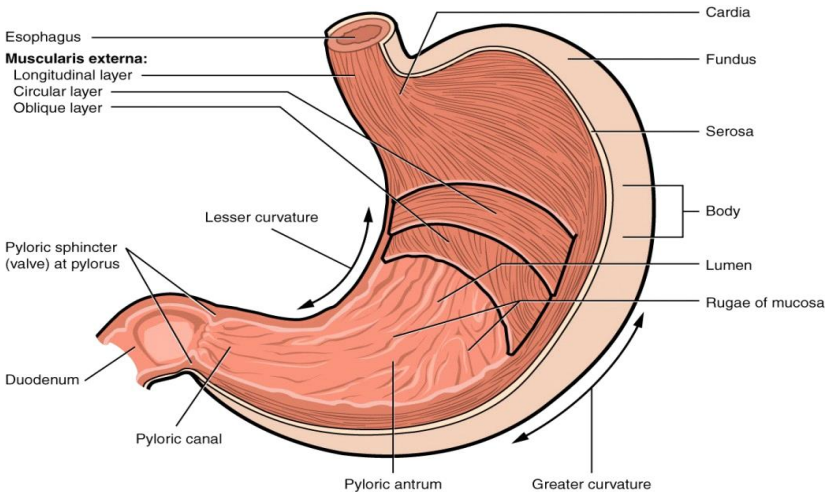
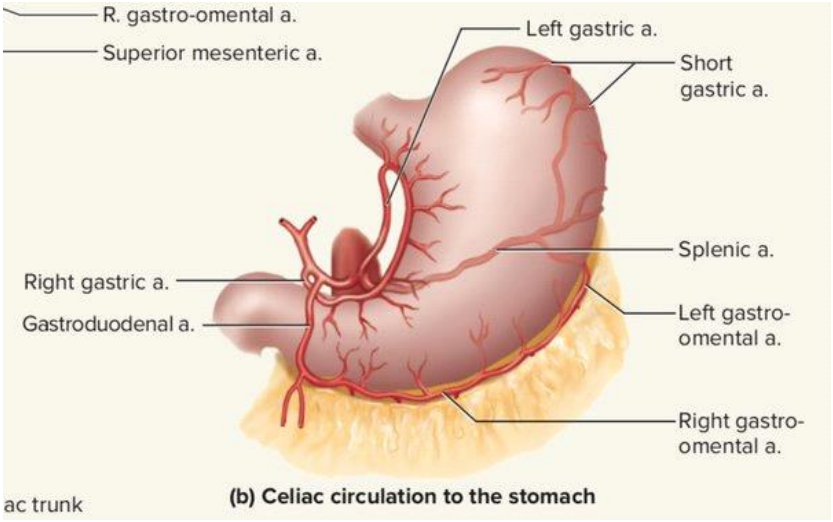
- **Diagram of stomach...identify rugae... Write down the blood supply along the greater curvature of the stomach**





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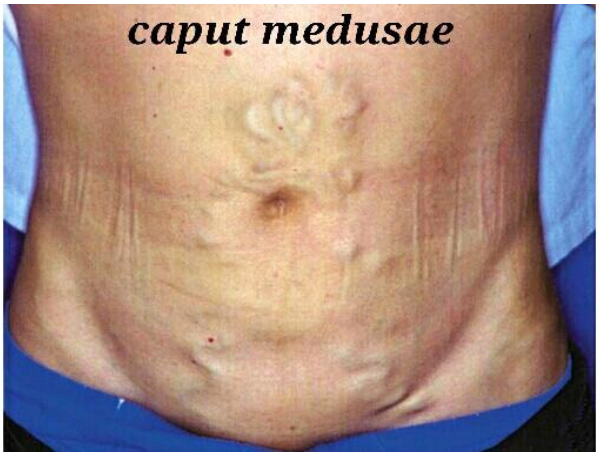
- **Figure.... Identify caput madusae.... What is its cause**

  The root cause of caput medusae is **portal hypertension**, which is an increase in pressure in the portal vein.



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- Liver model.... Viva...

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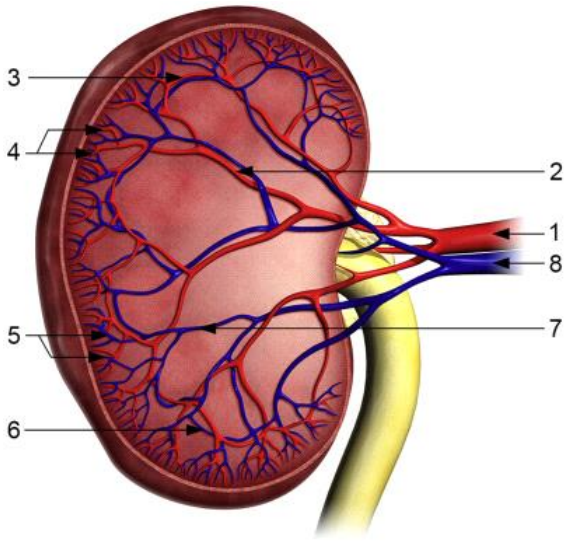
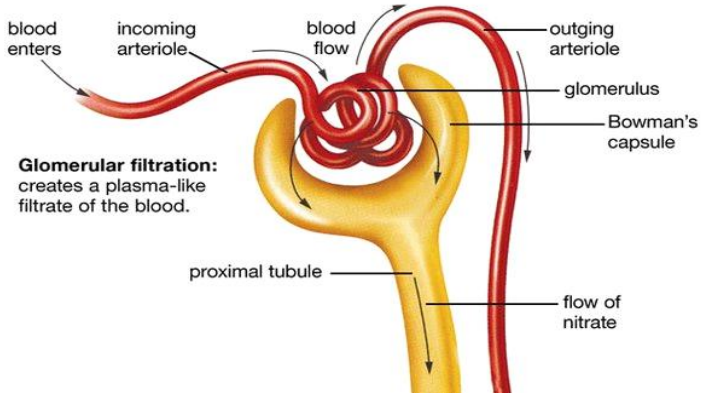
- **Blood supply of kidney...**



1. Renal artery
2. Interlobar arteries
3. Arcuate arteries
4. Interlobular arteries
5. Interlobular veins
6. Arcuate veins
7. Interlobar veins
8. Renal vein

-

- **Diagram of Bowman's capsule.... Labelling**



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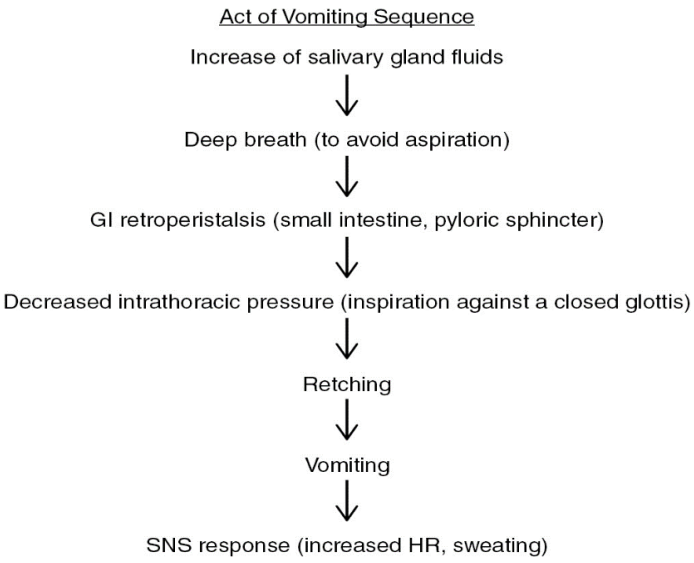
- Nephron..labelling.... Epithelium...
- RENIN ANGIOTENSIN II mechanism...
- **Law of gut**

  A stimulus within the intestine (i.e. the presence of food) initiates a band of constriction on the proximal side and relaxation (receptive relaxation) on the distal side and results in a peristaltic wave

- **Vomiting act**



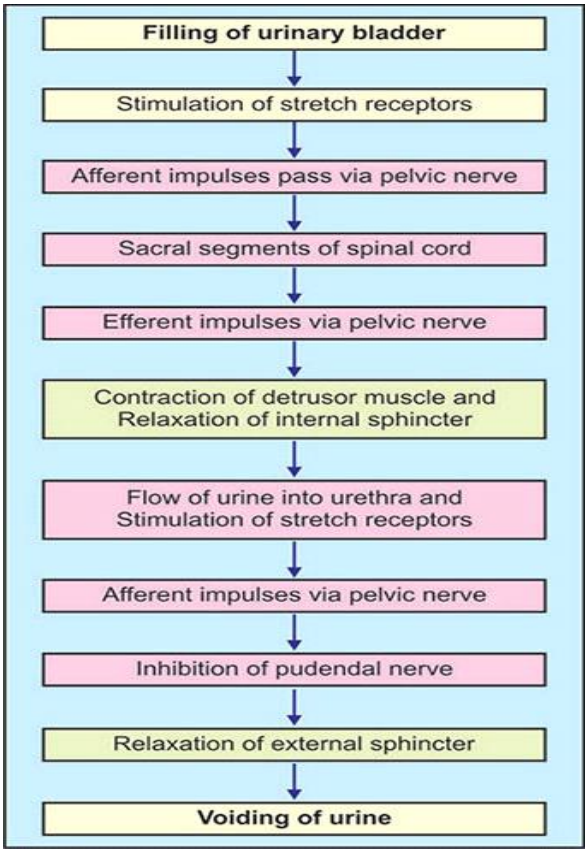
- **Pharyngeal stage of swallowing**

Oral preparatory phase	Food enters oral cavity Mastication and bolus formation
Oral propulsive phase	Tongue elevates and propels bolus to pharynx
Pharyngeal phase	Soft palate elevates to seal nasopharynx Larynx and hyoid bone move anteriorly and upwards True vocal folds adduct False vocal cord adduct Epiglottis moves posteriorly and downwards Respiration stops Pharyngeal wave Upper oesophageal sphincter relaxes Upper oesophageal sphincter opens
Oesophageal phase	Bolus passes to oesophagus Oesophagus contracts sequentially Lower oesophageal sphincter relaxes Bolus reaches stomach

- **Types of electric waves**

1. Slow waves
2. Spike waves

- **Micturition reflex**



- **defecation reflex** – travel from colon and rectum to spinal cord and back again to produce the powerful colonic, rectal and abdominal contractions required for defecation.
- **Function of juxtaglomerular apparatus**
    1. Secretion of renin
    2. Secretion of prostaglandins
    3. Regulation of GFR

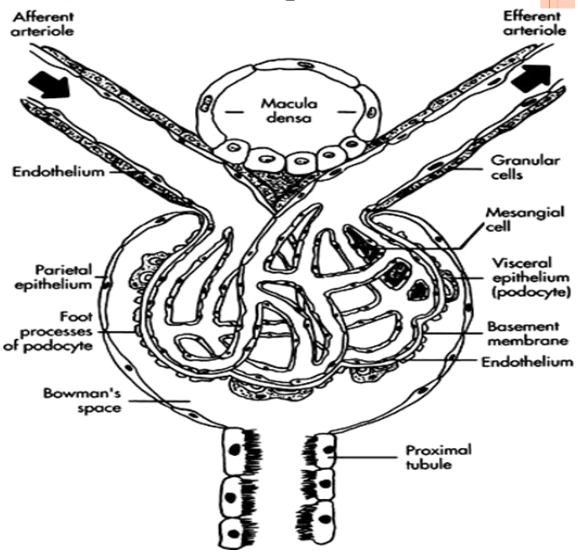
JUXTAGLOMERULAR APPARATUS

- organ situated near glomerulus of each nephrone
- **3 structures:**

1 macula densa
2 extraglomerular mesangial cell
3 juxtaglomerular cells

- Function :

Primary function is secretion of hormonal sub
1- secretion of renin
2- secretion of other substances (PGs)
3- regulation of GBF and GFR

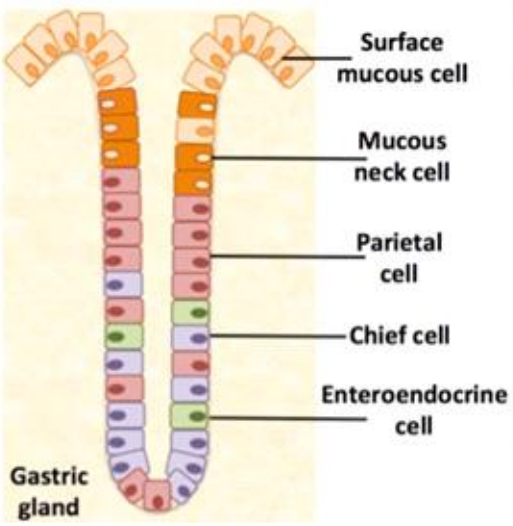


- **Concentration and dilution of urine**
  1. ADH
  2. Renal medullary osmolarity
- **Role of bile**

Functions of Bile Salts

- **Important for cholesterol excretion:**
  1. **As metabolic products of cholesterol**
  2. **Solubilizer of cholesterol in bile**
- **Emulsifying factors for dietary lipids, a prerequisite step for efficient lipid digestion**
- **Cofactor for pancreatic lipase and PLA2**
- **Facilitate intestinal lipid absorption by formation of mixed micelle**

- **Role of CCK**
  1. Strongly contracts the gallbladder, thereby expelling bile into small intestine
  2. Inhibits appetite to prevent overeating
- **Cells in gastric gland**



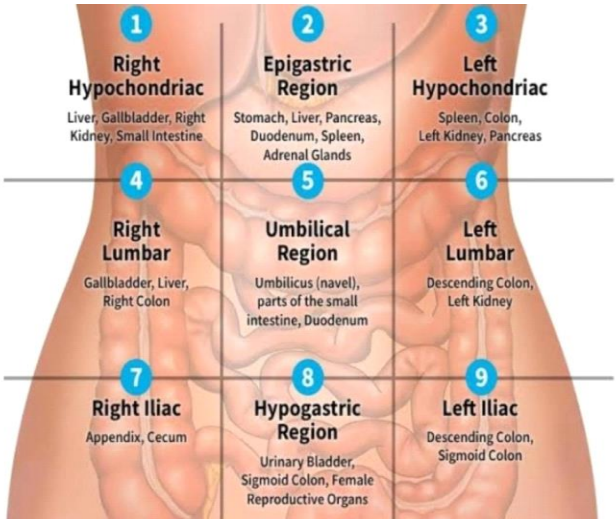
Cells of the gastric glands	Secretory products
Surface mucous cells	Mucin in an alkaline fluid
Mucous neck cells	Mucin in an acidic fluid
Parietal cells	HCl & intrinsic factor
Chief cells	Pepsinogen & lipase
G cells/enteroendocrine cells	Gastrin

- **Direct and indirect inguinal hernia**

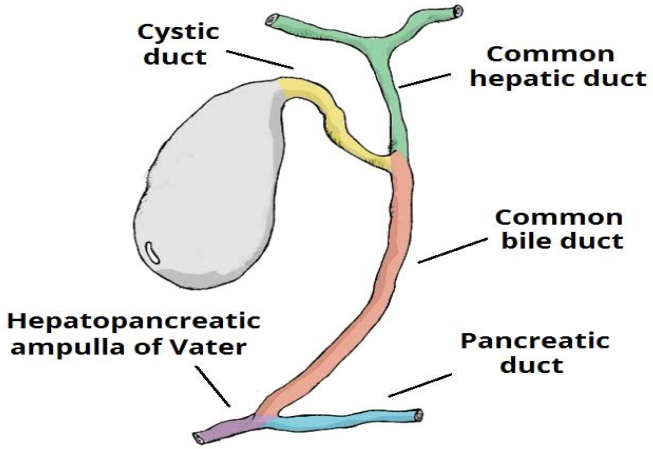
Indirect Versus Direct inguinal hernias

Indirect Inguinal Hernia	Direct Inguinal Hernia
Pass through inguinal canal.	Bulge from the posterior wall of the inguinal canal
Can descend into the scrotum.	Cannot descent into the scrotum.
Lateral to inferior epigastric vessels.	Medial to inferior epigastric vessels.
Reduced: upward, then laterally and backward.	Reduced: upward, then straight backward.
Controlled: after reduction by pressure over the internal (deep) inguinal ring.	Not controlled: after reduction by pressure over the internal (deep) inguinal ring.
The defect is not palpable (it is behind the fibers of the external oblique muscle).	The defect may be felt in the abdominal wall above the pubic tubercle.
After reduction: the bulge appears in the middle of inguinal region and then flows medially before turning down to the scrotum.	After reduction: the bulge reappears exactly where it was before.
Common in children and young adults.	Common in old age.

- **Quadrants of abdomen**



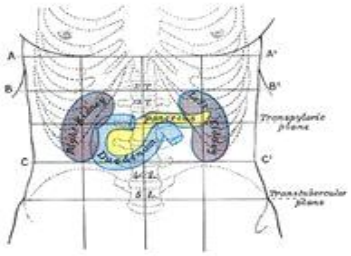
- **Biliary tree**



- **Layers of anterior abdominal wall**
  1. Skin
  2. Superficial fascia
     - Fatty layer: Camper's fascia
     - Membranous layer: Scarpa's fascia
  3. Muscles
     - External oblique
     - Internal oblique
     - Transversus abdominus
  4. Transversalis fascia

5. Extraperitoneal fat
6. Parietal layer of peritoneum

- Anterior and posterior abdominal wall
- **Transpyloric plane**



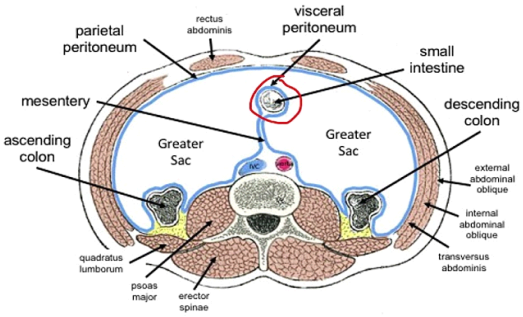
Structures Crossed By Transpyloric Plane :

L1 vertebra
Pylorus
Pancreatic neck
Duodenojejunal flexure
Fundus of gall bladder
9th costal cartilage
Hila of kidneys
Origin of portal vein
Transverse mesocolon
2nd part of duodenum
Superior mesenteric artery origin
Hilum of spleen
Termination of spinal cord

- **Intraperitoneal organs**

Intraperitoneal organs

- Almost completely covered with visceral peritoneum
- Suspended within the abdominal cavity but not inside the peritoneal cavity
- Examples:
  - Stomach
  - Liver
  - Most of small intestine
  - Cecum/Appendix
  - Transverse & sigmoid colon
  - Gallbladder
  - Spleen



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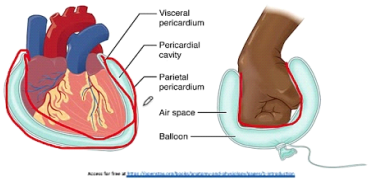


- **retroperitoneal organs**

1. Duodenum (2nd , 3rd, 4th part)
2. Pancreas

3. Ascending and descending colon
4. Kidney
5. Ureter
6. Suprarenal gland
7. Abdominal aorta
8. Inferior vena cava

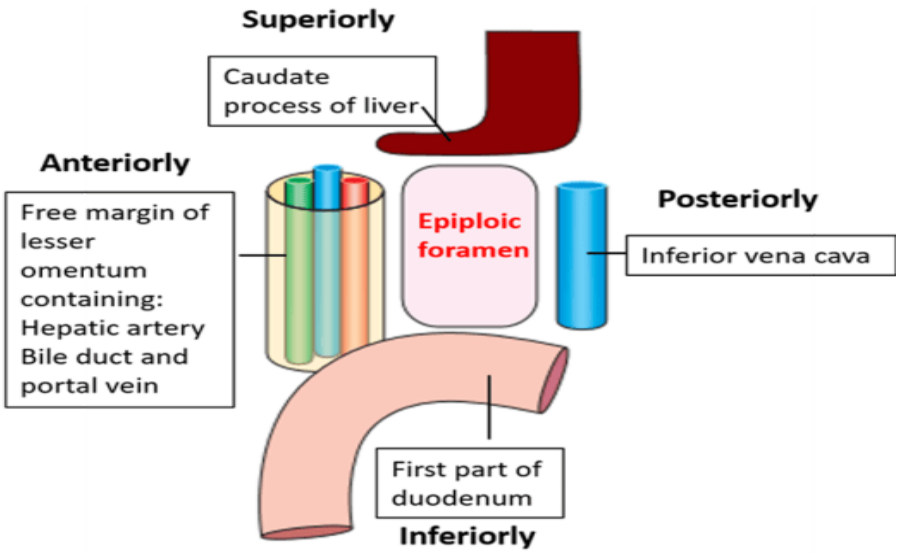
- **Blood supply of liver**

  The liver receives a blood supply from two sources. The first is the hepatic artery which delivers oxygenated blood from the general circulation. The second is the hepatic portal vein delivering deoxygenated blood from the small intestine containing nutrients.

- **Gut supply**

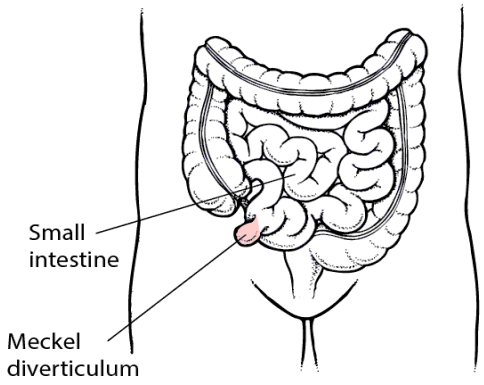
  1. Celiac artery
  2. Superior mesenteric artery
  3. Inferior mesenteric artery

- **Boundaries of epiploic foramen**

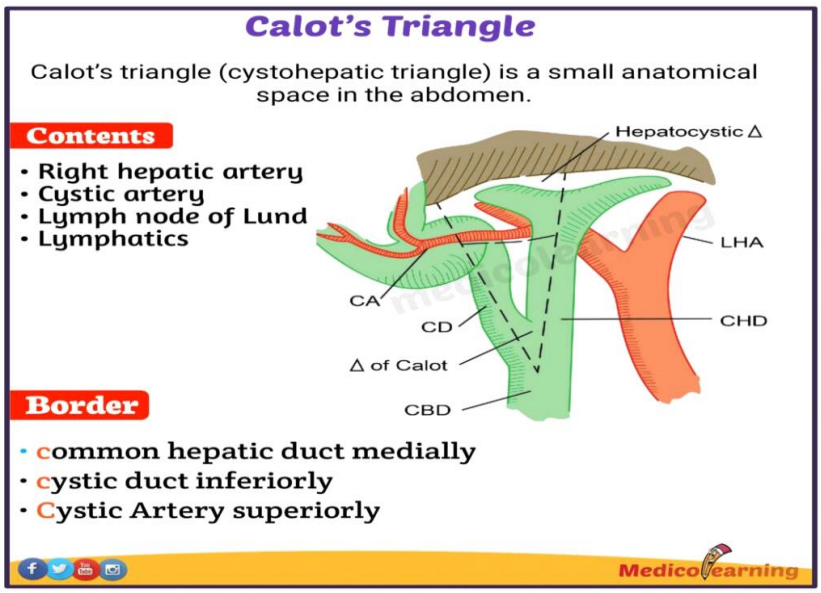


- **Meckel diverticulum**

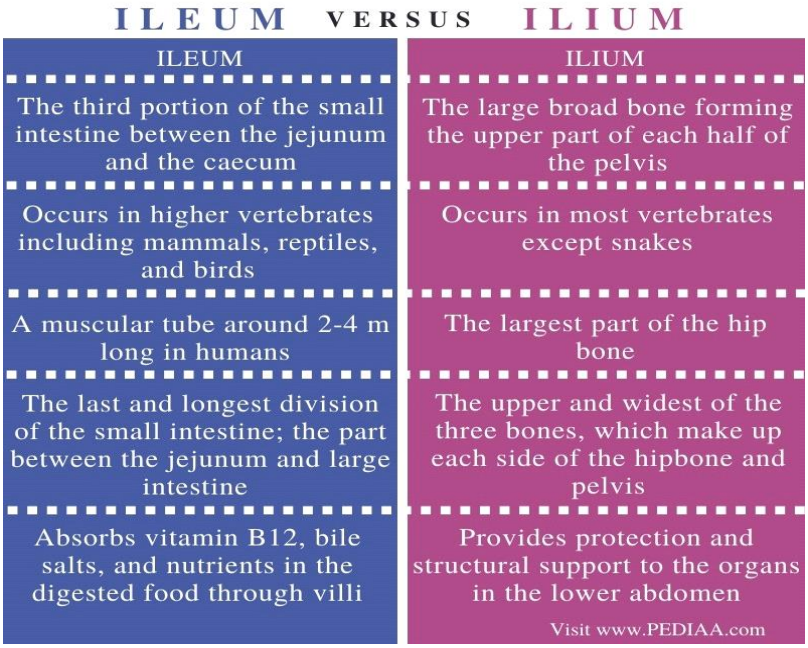
  Meckel's diverticulum is **the most common congenital anomaly of the gastrointestinal tract**. It results from incomplete obliteration of the vitelline duct leading to the formation of a true diverticulum of the small intestine



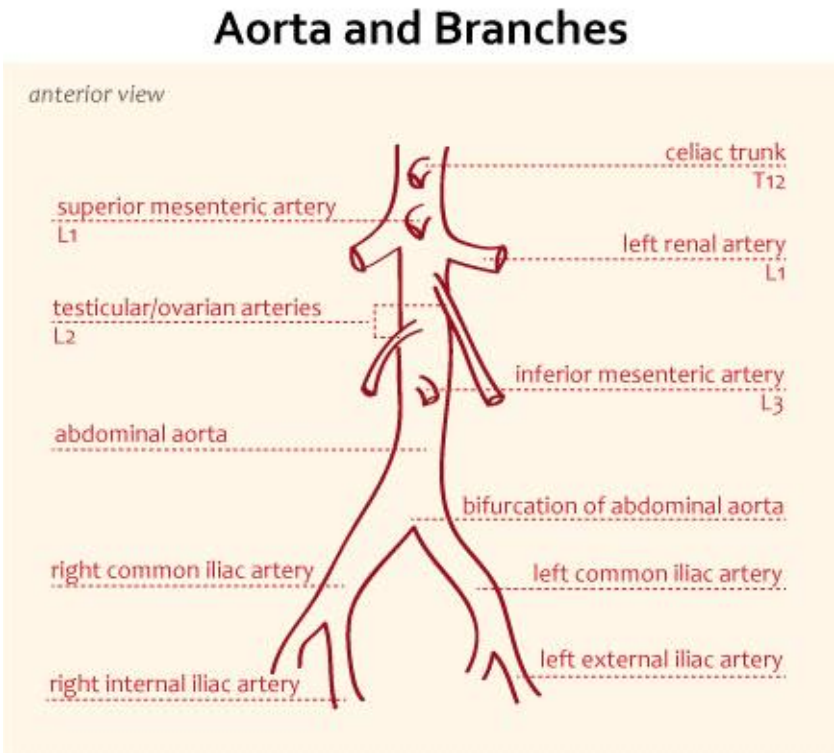
- **Calot triangle**



- **Jejunum vs ileum**



- **Branches of abdominal aorta, levels**



- **Tributaries of IVC**

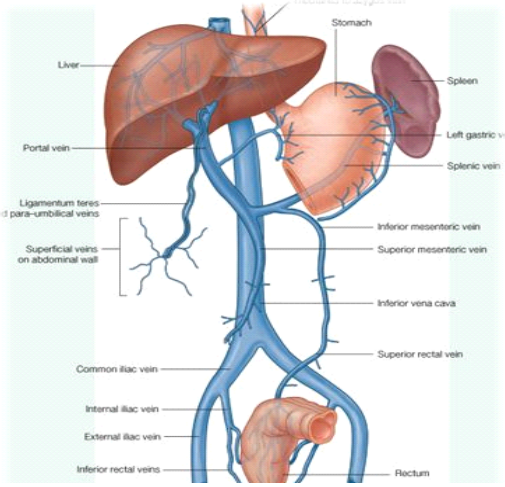
1. Hepatic veins
2. Right suprarenal vein
3. Renal veins

4. Right testicular or ovarian vein
5. Inferior phrenic vein
6. Four lumbar veins
7. Two common iliac veins
8. Median sacral vein

- **Portosystemic anastomosis**

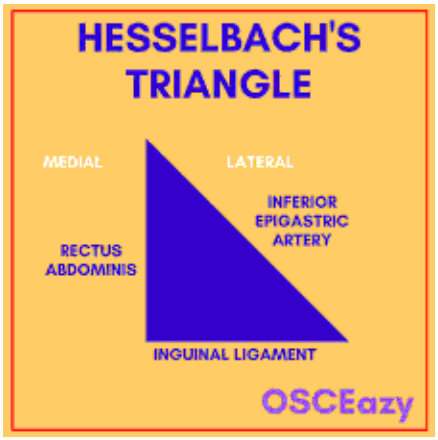
Sites of Portocaval Anastomosis

- Lower end of esophagus: left gastric vein & azygos vein
- Lower part of rectum: (Hemorrhoids) superior and middle rectal veins & inferior rectal vein
- Para umbilical region: (Caput Medusae) Para umbilical veins & superficial epigastric vein
- Retroperitoneal: Veins draining colon & veins of the posterior abdominal wall
- Patent ductus venosus:
- Left branch of portal vein & inferior vena cava.



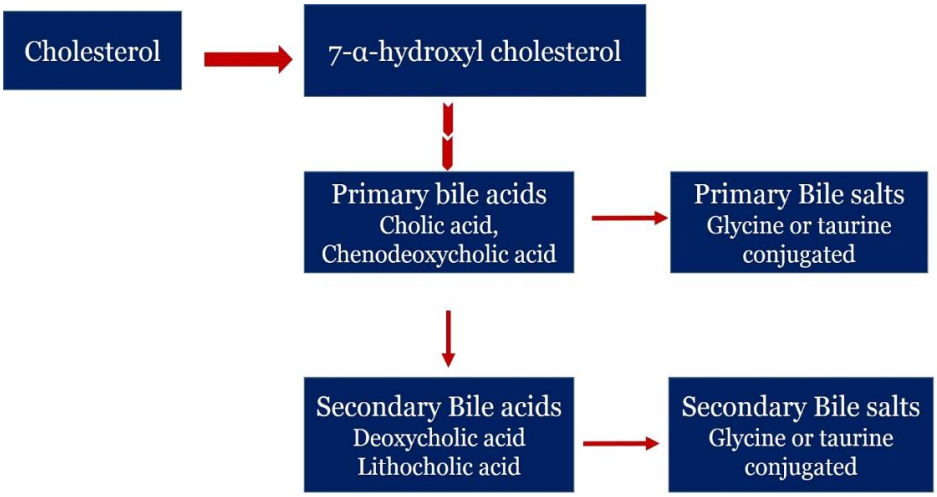
- **Hesselbach triangle**

The inguinal triangle (**Hesselbach's triangle**) is a region in the anterior abdominal wall.

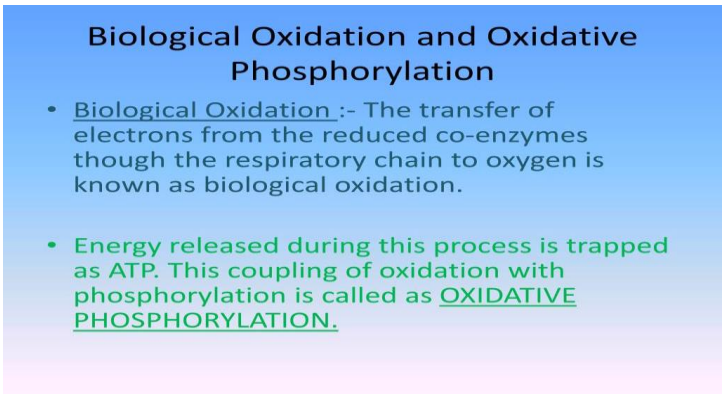


Direct hernias occur within the hasselbalch triangle whereas, indirect inguinal hernias occur lateral to the triangle

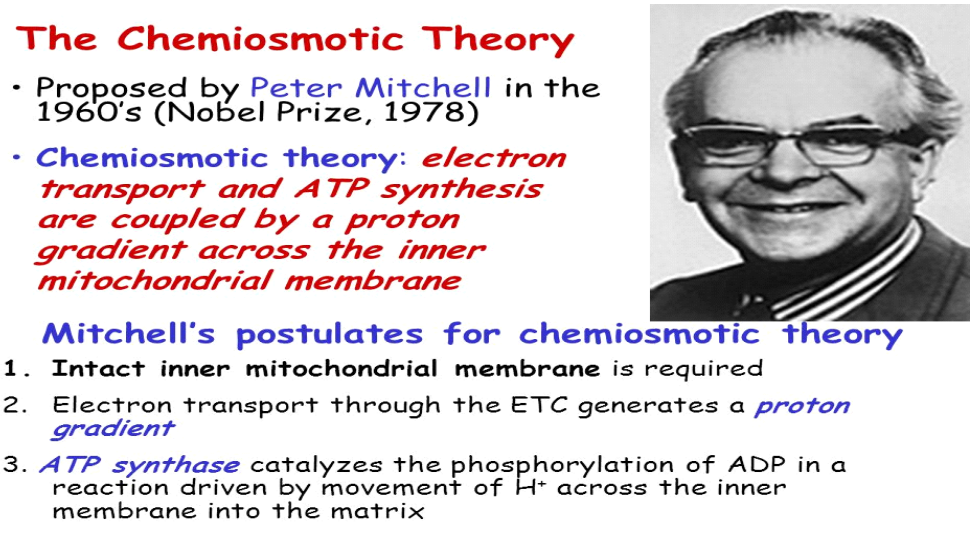
- **Prevention of stones by bile**



- **Biological oxidation vs oxidative phosphorylation**



- **Chemiosmotic theory**

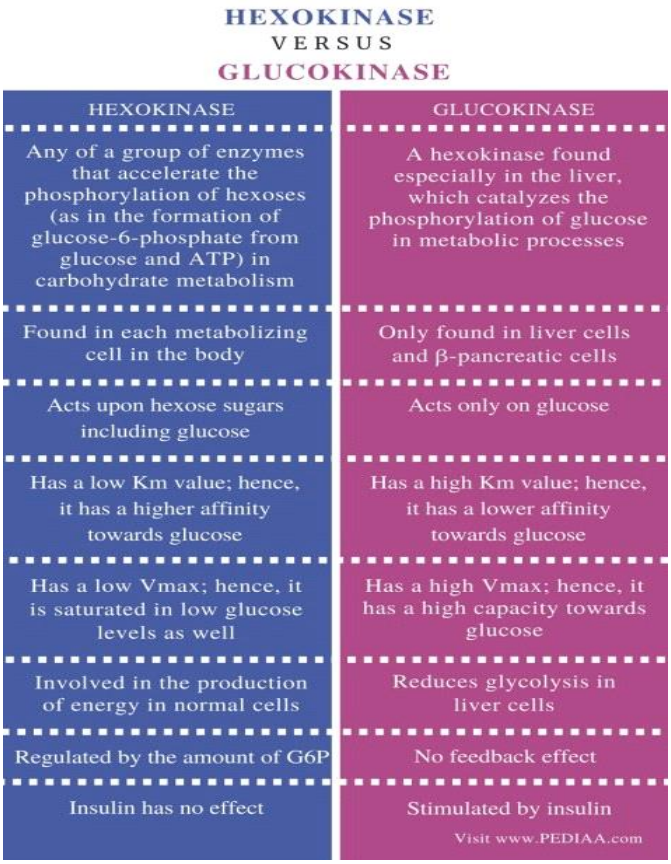


- Complexes of ETC
- **Inhibitors of ETC...**

Inhibitors of Oxidative Phosphorylation

- Complex I: Rotenone
- Complex II: Carboxin
- Complex III: Antimycin A
- Complex IV: Cyanide, Azide, Carbon monoxide
- ATP synthase: Oligomycin
- ATP-ADP translocase: Atractyloside (a plant glycoside)

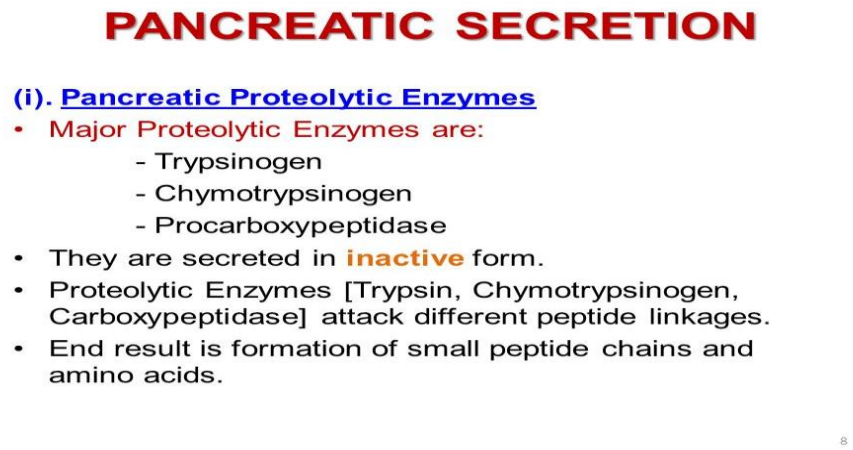
- **Hexokinase vs glucokinase**



- Rate limiting steps of glycolysis
- **buffering capacity of haemoglobin is due to?**

  Histidine
- Acidosis and alkalosis
- Mechanism of kidney buffer action
- Factors involved in glucose absorption

- **Pancreatic enzymes and regulation**



- Trypsin inhibitors
- **Sources of NADH and FADH**

FADH2 and NADH are created from FAD and NAD+ through reduction-oxidation reactions in the Krebs cycle during respiration

- **Gastric acid pH** = 2
- **Components of gastric juice**

Gastric juice comprises water, mucus, hydrochloric acid, pepsin, and intrinsic factor. Of these five components, pepsin is the principal enzyme involved in protein digestion

- **Functions of HCl**

Functions of hydrochloric acid in our stomach:

It creates the acidic conditions necessary for the action of the enzyme pepsin.
It activates pepsin to act on proteins.
It also destroys the structure of proteins so that the enzymes can digest them easily.
It gets mixed with food and kills the bacteria present in food.

- PHYSIO VIVA

- Function of juxtaglomerular apparatus.... Tubulo-glomerular feedback
- Deglutition... Processes involved
- Forces involved in glomerular filtration
- Mechanism involved in generation of electric waves in GIT
- **EPITHELIUM OF MINOR CALYCES** = transitional epithelium
- **What is normal level of creatinine in urine** = 1.0 to 1.8 gm/day
- **Name the method used for creatinine determination**

  Folin's Method
- **Conditions in which creatinine increases and decreases**

  INCREASED CREATININE

  1. Muscular dystrophy (early stage)
  2. Due to increased tissue catabolism as in fever

  DECREASED CRETININE

  - Muscular dystrophy (late stages)
  - Muscular atrophy
  - Muscular weakness
  - Heavy meat diets
  - Paralysis
- **Comparison between PCT and DCT... Brush border, nuclei, basement membrane,.....**

PCT	DCT
simple cuboidal epithelium	
PCTs have nuclei spaced some what farther apart than those of DCTs	DCTs have nuclei less spaced than those of PCTs
more intensely eosinophilic than those comprising distal tubules	less intensely eosinophilic than those comprising proximal tubules
brush border of microvilli (apical ends less distinct than those of DCT).	not have a brush border, although there may be scattered microvilli (apical ends more distinct than those of PCT).
may be occluded lumen	clearer lumen
Cells are extensively interdigitated → boundaries between adjacent cells are inconspicuous (i.e., in section the epithelium looks like a continuous band of cytoplasm with nuclei appearing at irregular intervals).	
Because the proximal convoluted tubule is considerably longer than the distal convoluted tubule, a typical section of the renal cortex includes many more profiles of proximal tubules than of distal tubules	

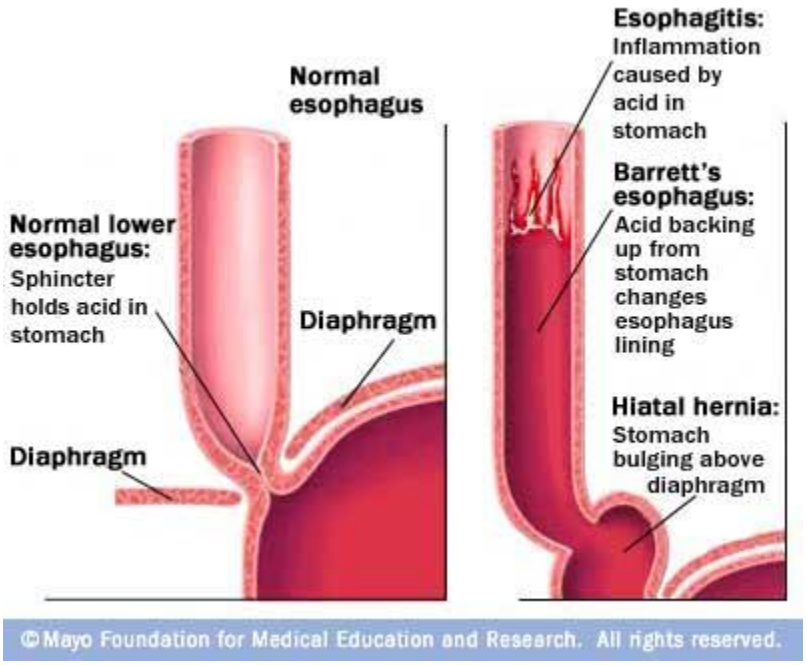
- **Main function of gastrin, secretin, VIP, ADH, erythropoeitin**

1. Gastrin (from the stomach): stimulates gastric motility and secretion.
2. CCK (from small intestines) stimulates pancreatic enzyme secretion, and gall bladder contraction. Inhibits gastric emptying.
3. Secretin (from small intestines): stimulates pancreatic and biliary bicarbonate secretion.

- Folley's catheter. 2 advantages and 2 complications
-
- Slides.... Duodenum and kidney
-
- Embryo figure of Langmann....labelling of somite, Intra-embryonic cavity, endoderm, nephrotome, dorsal aorta, nephric tubule

-
- **Barrett's esophagus... Change of epithelium, 2 causes..**

Barrett's esophagus results from long-term exposure to stomach acid. When you have gastroesophageal reflux disease (GERD), stomach acid backs up into your esophagus. This frequent acid exposure causes inflammation and damage to the cells in your esophagus.



- Biochem pactical... Free acidity of gastric juice
-
- BIOCHEM VIVA
- **What is glycogenesis**

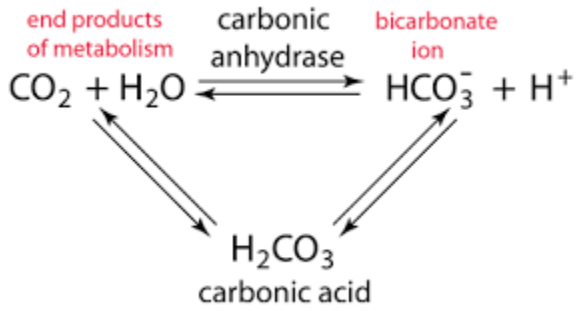
Glycogenesis is the process of glycogen synthesis, in which glucose molecules are added to chains of glycogen for storage. This process is activated during rest periods following the Cori cycle, in the liver, and also activated by insulin in response to high glucose levels.

- **What are buffers**

A buffer is a solution that can resist pH change upon the addition of an acidic or basic components.

- **Function of carbonic anhydrase**

Carbonic anhydrases (CAs) catalyze a reaction fundamental for life: the bidirectional conversion of carbon dioxide (CO2) and water (H2O) into bicarbonate (HCO3-) and protons (H+).



- LIVER MODEL....VIVA
- Anatomical position, location
- Surfaces
- Impressions
- Ligamentum teres, cystic duct, common bile duct
- Liver blood supply
- Hepatic vein, IVC
-
- Stomach arterial supply
- **Function of portal vein**

The portal vein (PV) is the main vessel of the portal venous system (PVS), which drains the blood from the gastrointestinal tract, gallbladder, pancreas, and spleen to the liver.

- **Embryological origin of inguinal canal**

Formation of the inguinal canal in males occurs concurrently with testicular descent prior to birth. The testes originate in the posterior abdominal cavity and, through certain signals, descend and ultimately reside in the scrotal cavity.

- Autoregulation of Kidney when GFR is low:
  1. Myogenic mechanism
  2. Tubuloglomerular feedback
  3. Renin Angiotensin Aldosterone system
- Aldosterone Escape: The excape from sodium – retaining effects of excess aldosterone of primary aldosteronism, which is a manifestation of volume and pressure natriuresis. Mechanism: Excess Aldosterone → Excess sodium and water retention → Aldosterone escape after 1 or 3 days → Pressure Natriuresis/ Volume Natriuresis → Excretion of sodium

- Normal blood pH = 7.4
- GIT ARTERIAL SUPPLY
    1. Celiac artery
    2. Superior mesenteric artery
    3. Inferior mesenteric artery
- Celiac Artery Branches:
    1. Left gastric artery
    2. Splenic artery
    3. Hepatic artery
- Superior mesenteric artery branches:
    1. Inferior pancreaticoduodenal artery
    2. Middle colic artery
    3. Right colic artery
    4. Ileocolic artery
    5. Jejunal and ileal branches
- Branches of Inferior mesenteric artery
    1. Left colic artery
    2. Sigmoid arteries
    3. Superior rectal artery
- Branches of splenic artery
    1. Pancreatic branches
    2. Left gastroepiploic artery
    3. Short gastric arteries
- Branches of Hepatic artery
    1. Right gastric artery
    2. Gastroduodenal artery
        - Right gastroepiploic artery
        - Superior pancreaticoduodenal artery
    3. Right Hepatic artery
        - Gives off cystic artery
    4. Left Hepatic artery
- Superior mesenteric vein joins the splenic vein to form the portal vein
- Three areas of constriction of ureter:
    1. Where ureter leaves the renal pelvis
    2. Where ureter is kinked as it crosses the pelvic brim
    3. Where ureter pierce the bladder wall
- Aortic hiatus of diaphragm → at level of T_{12}
- Aorta divides into two common iliac arteries at level of L4
- Branches of abdominal aorta
    1. Celiac artery
    2. Superior mesenteric artery
    3. Inferior mesenteric artery
    4. Suprarenal artery
    5. Renal artery

6. Testicular or ovarian artery
7. Inferior phrenic artery
8. Four lumbar arteries
9. Two common iliac arteries
10. Median sacral artery

- Abdominal hernia (asked in proff external viva) - A ventral (abdominal) hernia refers to any protrusion of intestine or other tissue through a weakness or gap in the abdominal wall. Umbilical and incisional hernias are specific types of ventral hernias.
- An inguinal hernia occurs above the inguinal ligament, whereas femoral hernia occurs below inguinal ligament
- Arterial Supply of stomach
    - Lesser Curvature → Right and left gastric arteries
    - Greater Curvature → Right and left gastroepiploic arteries
    - Fundus → Short gastric arteries derived from splenic artery
- Venous Drainage of Stomach
    - Right and left gastric veins drain into portal vein
    - Short gastric and left gastroepiploic veins drain into splenic vein
    - Right gastroepiploic vein drains into superior mesenteric vein
- Contents of porta hepatis
    - Right and left hepatic ducts
    - Right and left branches of hepatic artery
    - Portal vein
    - Nerves
    - Lymph vessels
- Liver divided into right and left lobe by falciform ligament
- Ligamentum teres is fibrous remains of umbilical vein
- Ligamentum venosum is fibrous remains of ductus venosus
- Tributaries of portal vein
    1. Splenic vein
    2. Superior mesenteric vein
    3. Inferior mesenteric vein
    4. Left gastric vein
    5. Right gastric vein
    6. Cystic vein
- Titrable acidity is dependent on diet
- Creatinine excretion is independent of diet and exercise
- For determination of titrable acidity of urine = Folin's method
  For determination of creatine in urine = Folin's method
  For determination of plasma proteins = Biuret method
  For determination of serum cholesterol = Ferric chloride method
- Biuret Reagent
    - Copper sulphate
    - Sodium citrate
    - Sodium carbonate

- Test for chloride (From first year notebook, came in our proff)
    - 2 ml urine
    - 2 drops conc. HNO_3
    - 1 ml 2% silver nitrate
    - Formation of white precipitate
- Normal Values
    - Titrable acidity of urine = 200 – 500 ml/day
    - Urinary creatinine = 1.0 – 1.8 g/day
    - Free acidity = 20 – 30%
    - Total acidity = 40 – 60%
    - Serum total proteins = 6.3 – 7.8 g/dl
    - Serum cholesterol = 150 – 250 mg/dl
    - Serum direct bilirubin = 0 – 0.35 mg/dl
    - Serum total bilirubin = 0.2 – 1.2 mg/dl
- Contents in which acidity of urine increases:
    1. Dehydration
    2. Kidney disease
    3. High protein diet
    4. Certain medications like aspirin and diuretics
    5. Urinary tract infection
    6. Diabetes
- Causes of Hypercholestrolemia
    1. Pregnancy
    2. Diabetes mellitis
    3. After a high lipid diet
    4. Hypothyroidism
    5. Biliary obstruction due to calculi etc.
    6. Nephrosis
    7. Lipaemia
- Causes of Hypocholestrolemia
    1. A low cholesterol diet
    2. Pernicious anemia
    3. Hyperthyroidism
    4. Certain liver diseases
    5. Malabsorption syndrome
- Blood supply of kidney
    1. Renal artery
    2. Segmental artery
    3. Interlobar artery
    4. Arcuate artery
    5. Interlobular artery
- Rate limiting steps of glycolysis
    1. Hexokinase-catalyzed phosphorylation of Glucose
    2. Phosphofructokinase catalyzed phosphorylation of Fructose-6-phosphate

3. Pyruvate kinase catalyzed conversion of phosphoenolpyruvate to pyruvate

- Glycolysis is the conversion of glucose to pyruvate or lactate, with the production of ATP
- Krebs cycle of citric acid cycle is a series of reactions that occur in cells to produce energy. Citric acid cycle essentially involves oxidation of acetyl CoA to CO_2 and H_2O
- Gluconeogenesis: Synthesis of glucose from non-carbohydrate compounds
- Cori cycle: Gluconeogenesis from lactate in liver
- Glycogenesis: Synthesis of glycogen from glucose. Glycogenesis takes place in cytosol and requires ATP and UTP, besides glucose
- Glycogenolysis: Degradation of stored glycogen in liver and muscle
- Lactic Acidosis → due to deficiency of enzyme pyruvate dehydrogenase (PDH)
    - Excess lactic acid in blood
    - May be due to:
        1. Excess exercise
        2. Alcohol abuse
        3. Certain medications such as metformin
        4. Chronic kidney or liver disease
- The metabolic defects concerned with glycogen synthesis and degradation are collectively referred to as glycogen storage diseases
- Phenylketonuria (PKU)
    - Deficiency of enzyme phenylalanine hydroxylase
    - Accumulation of phenylalanine
- Alkaptonuria
    - Deficiency of enzyme homogentisic acid oxidase, which is responsible for breaking down amino acids tyrosine and phenylalanine
    - Homogentisic acid accumulates in body
    - Symptoms: dark urine, joint pain, ochronosis
- Urea cycle is series of chemical reactions that occur in liver and is responsible for sysnthesis and excretion of urea, a nitrogen-containing compound.
- Maple syrup urine disease
    - Deficiency of branches α-keto acid dehydrogenase
    - Affects body's ability to breakdown leucine, isoleucine and valine
    - Rare autosomal recessive disorder
    - Characterized by feeding problems, vomiting, ketoacidosis, changes in muscle tone, and a characteristic maple syrup like odour in urine because of rise in isoleucine
    - Treatment involves strict low-protein diet
- Albinism
    - Defects in tyrosine metabolism
    - Deficiency in production of melanin
- Functions of proline
    - Important for proper folding of proteins
    - Involves in synthesis of collagen
    - Antioxidant proteins
- How alcohol leads to thiamine deficiency?
    1. Alcohol interferes with absorption of thiamine from intestine

2. Alcohol can increase breakdown of thiamine in body

- Pyruvate Dehyrogenase complex (PDH) components:
  E1 – Pyruvate dehydrogenase
  E2 – Dihydrolipoamide acetyl transferase
  E3 – Dihydrolipoamide dehydrogenase