Lecture series
Gastrointestinal tract

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FUNCTIONS OF LARGE INTESTINE
AND ITS APPLIED
STRUCTURE OF LARGE INTESTINE

- Right colic flexure
- Transverse colon
- Left colic flexure
- Ascending colon
- Segment or haustrum
- Descending colon
- Ileocaecal valve
- Caecum
- Appendix
- Sigmoid colon
- Rectum
- Anus
COMPOSITION OF THE LARGE INTESTINE SECRETION

1. Water
2. Mucus
3. Sodium
4. Chloride
5. Bicarbonate
6. Potassium
7. Calcium
CHARACTERISTICS OF LARGE INTESTINE

- **Haustra**- Ring like contractions of the circular muscle divide the colon into pockets called haustra
- **Teniae coli**- Three separate longitudinal ribbons of smooth muscle on outside of ascending, transverse, descending & sigmoid colons. They are visible below the serosa
- **Epiploic appendages**- Small pouches of peritonium filled with fat, situated along the colon
FUNCTIONS OF LARGE INTESTINE

1) **MUCUS SECRETION** - It has no villi, almost no digestive enzymes like small intestine

- It has crypt of lieberkuhn and epithelial lining which contain mucous cells that secrete mucus

- Mucus contain bicarbonate ions
Figure 64-13  A crypt of Lieberkühn, found in all parts of the intestine between the villi, which secretes almost pure extracellular fluid.
RATE OF SECRETION OF MUCUS

- Direct tactile stimuli
- Local nervous reflex
- Stimulation of pelvic nerves from spinal cord which carry parasympathetic innervation

Increased mucus production

Increased bowel movements
Functions of mucus

• Protect intestinal wall against excoriation

• Hold fecal matter together

• Protect from bacterial enzymes & toxicity

• Mucus & alkalinity by HCO$_3^-$ provide barrier to keep acid in feces, from destroying intestinal wall
2. Formation of feces

- Around 1500ml of chyme/day from ileum is moved to caecum, of which maximum amount is absorbed in proximal colon. Only 100ml of fluid & 1-5meq of sodium, chloride is excreted in feces.
- Distal colon acts as storage of feces called as storage colon.
- LI has tight junction between epithelium cells prevents back diffusion of ions back.
  - LI secretes HCO₃⁻, chloride ions. Bicarbonates neutralises acidic products of bacterial action.
  - Absorption of sodium & chloride ions creates an osmotic gradient which in turn causes the absorption of water.
3. FERMENTATION

• Bacteria mainly anaerobic & yeast break down substrates mainly starch, fibers, protein to give energy

  **COMPOSITION OF FECES**
  3/4 water, 1/4 solid

Solid -30% dead bacteria
• -10-20% fat
• -10-20% inorganic matter
• -2-3% Protein
• -30% undigested roughage

• Stercobilin, urobilin to give colour to feces & urine
• Others - indole, skatole, mercaptans, hydrogen sulphide etc
Substrates for fermentation

• Carbohydrate - starch, dietary fiber, pectin, cellulose, hemicellulose, unabsorbed sugars, modified cellulose, polydextrose

• Protein – dietary protein, endogenous protein such as digestive enzymes.

• Others - intestinal glycoprotein, mucopolysaccharides
3. BACTERIAL ACTION IN Large Intestine

- Coliform bacilli is present which causes digestion of small amount of cellulose

- Substances formed by bacterias are vit-k, vit B12, thiamine, riboflavin gases (CO2, H2S, CH4)

- Vit b12 helps in iron absorption

- Vit k is used in blood coagulation
SUBSTRATES

Bacterial + yeast enzymes breakdown

Breakdown products

Acetic acid, propionic acid, butyric acid, carboxylic acid, phenolic acid, amines, ammonia

Fate of substrates

Absorbed/Eliminated in feces/Rectal gases/ Utilized by microflora
SUMMARY OF THE FUNCTIONS OF LARGE INTESTINE

• Reabsorption of water and maintenance of fluid and electrolyte balance
• Helps in formation of stools
• Facilitate fermentation processes
• Absorption of certain product of fermentation such as butyrate, vit. B12, vit k, thiamine, riboflavin
• Storage of fecal matter until eliminated.
CALCIUM ABSORPTION IN INTESTINE

• Calcium entering in GIT is about 1 gm/day of which 40% is absorbed

• Absorbed mainly in duodenum and jejunum
  Absorption takes place by 3 steps:
  a) Passive diffusion at enterocyte through ca channel
  b) Inside the cell binds with ca-binding protein calbindin D(CaBP) & sequestered in ER, Golgi apparatus
  c) At basolateral membrane ca transported to blood via ca-ATPase pump
  d) Active form of vit D stimulates uptake, increase CaBP & Ca-ATPase pump
IRON ABSORPTION IN INTESTINE

- About 12-15mg/day of iron is absorbed in GIT
- Two form of dietary iron: heme & non heme
- Enterocytes absorb heme iron
- Iron is mainly absorbed in duodenum & jejunum
- Iron is absorbed in ferrous form
- Heme in cytoplasm oxidised by heme oxygenase into iron
- Iron is stored as ferritin by help of protein apoferritin
- Iron goes to blood with the help of b-globulin synthesis by liver known as transferrin
IRON ABSORPTION IN INTESTINE

- Heme iron
- Nonheme iron
- Duodenal cytochrome B
- DMT1
- Mucosal ferritin
- Ferroportin 1
- Hepcidin
- Hephaestin
- Plasma transferrin
- Erythroid marrow

Lost by shedding of epithelial cells
APPLIED OF LARGE INTESTINE
CONSTIPATION

• It is the slow movement of feces through the large intestine
• Associated with dry hard feces in the colon due to excess absorption of fluid or insufficient fluid intake.
• Causes
  • Obstruction
  • Tumor
  • Adhesion
  • Constriction
  • Ulcer
DIETARY FIBERS

• Also known as ROUGHAGE
• It consist of non-starch polysaccharide such as cellulose, waxes and pectin.
• Advantage
  --it increases bulk, soften stools, shortens transient time in intestinal tract.
  --reduces colon carcinoma
  --lower blood cholesterol, by binding with bile acid formed from cholesterol

Examples-fruits & vegetables
Steatorrhea

It means excess, bulky, pale, oily appearance, fowl smelling stool.

CAUSES

• Cystic fibrosis
• Celiac disease
• Crohn’s disease
• GB Stone/cancer
• Hypoparathyroidism
• Pancreatic/renal/hepatic disease

DIAGNOSIS

• Examination of stool for presence of fat by Sudan III staining
CELIAC DISEASE

• Celiac disease is an autoimmune disorder.

• Characterized by the damage of mucosa and atrophy of villi in small intestine, resulting in impaired digestion and absorption.

• It is also known as gluten sensitive enteropathy
HIRSCHSPRUNG/MEGACOLON DISEASE

It is due to lack or deficiency of ganglion cell in the myenteric plexus in a segment of the sigmoid colon causing dilatation of colon proximal to it.
IRRITABLE BOWEL SYNDROME

Common disorder that affects the large intestine

**SIGN & SYMPTOMS**

- Cramping
- Abdominal pain
- Bloating
- Diarrhea/Constipation
- Mucus in stool
CAUSES

• Prolonged & strong muscle contraction of intestine
• Nervous system
• Inflammation in the intestine
• Severe infection
• Change in microflora of gut
• Food allergy/stress/hormones
**RISK FACTORS**

- Young female
- Family history of IBS
- Mentaly unstable person

**COMPLICATIONS**

- Poor quality of life
- Mood disorders
INFLAMMATORY BOWEL DISEASE

• Crohn’s disease—it effect any segment of gut from mouth to anus
• Symptom —abdominal pain, diarrhea, fever, weight loss, anemia, skin rash, arthritis, bowel cancer.
• Onset—20-30 years
• Diagnosis—biopsy
• Medication —Corticosteroid
  -Methotrexate
ULCERATIVE COLITIS- it is a disease in which extensive area of the wall of the large intestine become inflammed and ulcerated

Symptoms- stool with mucus and blood
- Tenesmus
- fever
- weight loss
- Fatigue

Medication- cortocosteroid
- ileostomy
References

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