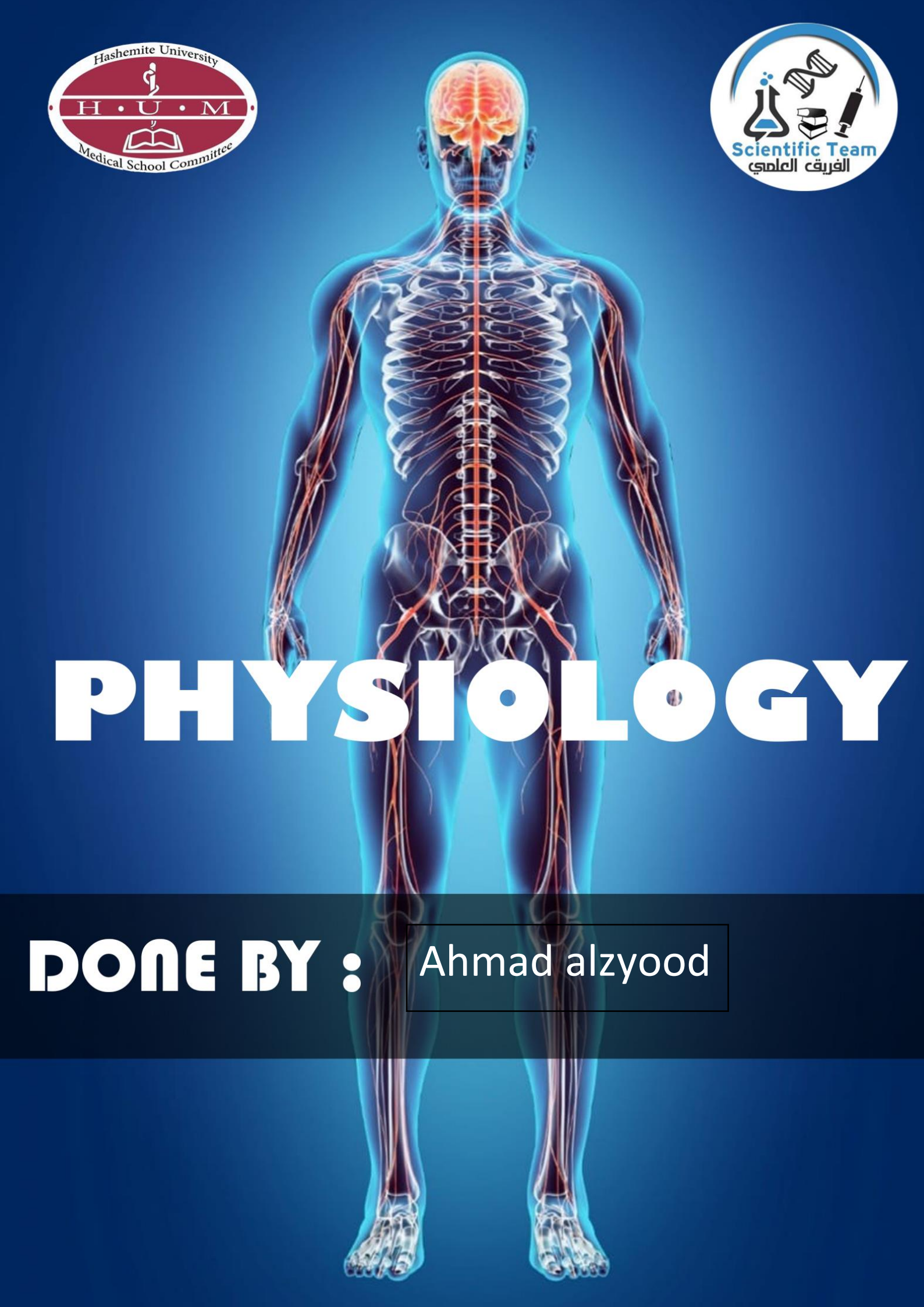
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الفريق العلمي
PHYSIOLOGY
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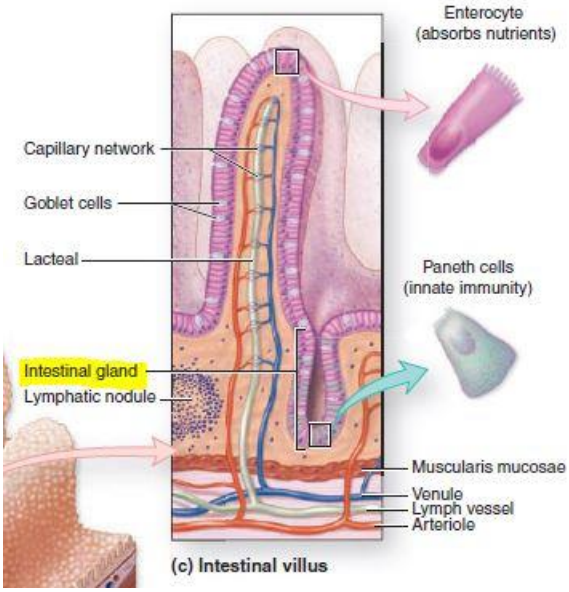
# Lecture 5 : Small and Large intestine secretions

## Histology of Small intestine

The epithelium of small intestine is consist of simple columnar cells (enterocytes) with goblet cells that lining the surface covering the villi and crypts. The villi are projections toward the lumen and crypts are invagination. عكس الvilli



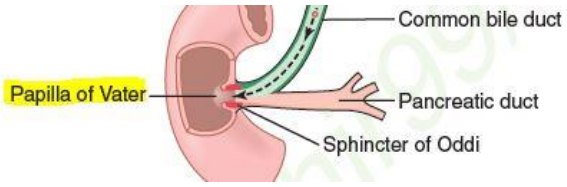

The intestinal gland in the picture = crypt of Lieberkühn

## Now lets start physiology:

## Secretions of Small intestine

Firstly, the small intestine is a site for digestion of nutrients. The nutrients come from the stomach with its acidic secretions (HCl). So the first thing that the small intestine secrets is **Mucus** (protective and lubricating molecule ). The mucus is secreted By 1- Brunner's glands and 2- goblet cells

- Brunner's glands, is located in the wall of the first few centimeters of the duodenum, mainly between the *pylorus* of the stomach *and* *the papilla of Vater*, where pancreatic secretion and bile empty into the duodenum.




These glands secrete large alkaline mucus in response to

1- Tactile or irritating stimuli
2- Vagal stimulation
3- GI hormones → **secretin**

The function of the mucus secreted by Brunner's glands is to protect the duodenal wall from digestion by the highly acidic gastric juice emptying from the stomach. In addition, the mucus contains a large excess of bicarbonate ions, which add to the bicarbonate ions from pancreatic secretion and liver bile in neutralizing the hydrochloric acid entering the duodenum from the stomach.
Brunner's glands are inhibited by sympathetic stimulation; therefore, such stimulation in very excitable persons is likely to leave the duodenal bulb unprotected and is perhaps one of the factors that cause this area of the gastrointestinal tract to be the site of peptic ulcers in about 50 percent of persons with ulcers.

- The enterocyte that is on the crypt → secrets water + electrolytes. The goal of water secretion is to digest nutrients mainly fat, proteins and carb. Details in lecture 6

Mechanism of water secretion → *active* secretion of Chloride and Bicarbonate into the crypts→ electrical drag → the sodium ions is transported with them → the water is moved by osmosis.

- The enterocyte that is on the villi region → reabsorb water + electrolytes + end products of digestion. This one **contains digestive enzymes**.

The intestinal secretions are formed by the enterocytes of the crypts at a rate of about 1800 ml/day. These secretions are almost pure extracellular fluid and have a slightly alkaline pH in the range of 7.5 to 8.0. The secretions are also rapidly reabsorbed by the villi. This flow of fluid from the crypts into the villi supplies a watery vehicle for absorption of substances from chyme when it comes in contact with the villi. Thus, the primary function of the small intestine is to absorb nutrients and their digestive products into the blood.

- Digestive enzymes of enterocytes that covers the villi :
  1- Peptidases → for splitting small peptides into AA.
  2- Four enzymes for carbohydrates digestion:
     a- Sucrase
     b- Lactase
     c- Maltase
     d- Isomaltase
  3- Intestinal lipase for Fat digestion.
- Repair of intestinal epithelium especially that covers the villi
  1- Mitosis of epithelial cells that located deeply in the crypts.
  2- Migration of new epithelial cells along the basement membrane to the tips of villi or another site replacing the old cells that shed into the lumen.
- Regulation of Small intestine secretions :
  - Mostly by local enteric nervous reflexes

## Secretion of Mucus by the large intestine

- The large intestine has crypt of Lieberkühn but it hasn't villi and doesn't secrete digestive enzymes, only mucus.
  1- This mucus contains moderate amounts of bicarbonate ions secreted by a few non–mucus-secreting epithelial cells.
  2- Its secretion is in response to
     a- direct, tactile stimulation of the epithelial cells lining the large intestine.
     b- local nervous reflexes to the mucous cells in the crypts of Lieberkühn.
     c- Pelvic nerve that contains parasympathetic innervation → when stimulated → increase mucus secretion. Also motility is increased
- Mucus functions
  1- Protective against excoriation and bacterial activity
  2- Adherent medium for holding fecal matter together
  3- Due to its alkaline → protect the mucus from acids in the feces
- Diarrhea : is a wash for the mucus in a result of its irritation
  ➔ High secretions of water and electrolytes + normal alkaline viscid mucus → dilutes the irritating factors → lead to rapid movement of feces + the irritating factors toward the anus→ earlier recovery.

Good luck