

Human Anatomy and Physiology-II

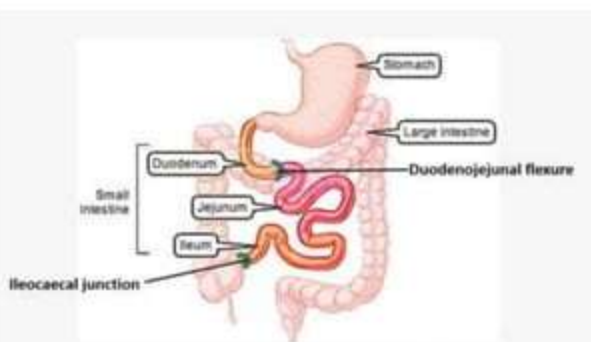
Digestive system (Small intestine) Part-V

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Small intestine

Small intestine -Location

- The small intestine is continuous with the stomach at the pyloric sphincter and leads into the large intestine at the *ileocaecal valve*.
- It lies in the abdominal cavity
- Surrounded by the large intestine.



Small intestine - Length and Size

- It is about 6 meter long.
- It is approximately 2.5–3 cm in diameter.
- As it is too long, it lies coiled and folded in the abdominal cavity



Small intestine parts

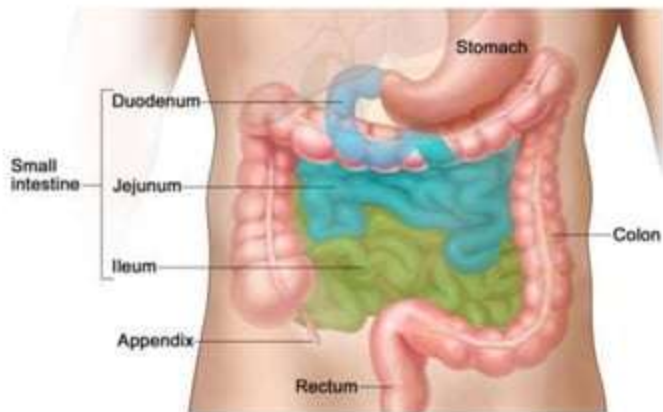
Small intestine - Parts

It is divided in to three Parts

1. Duodenum

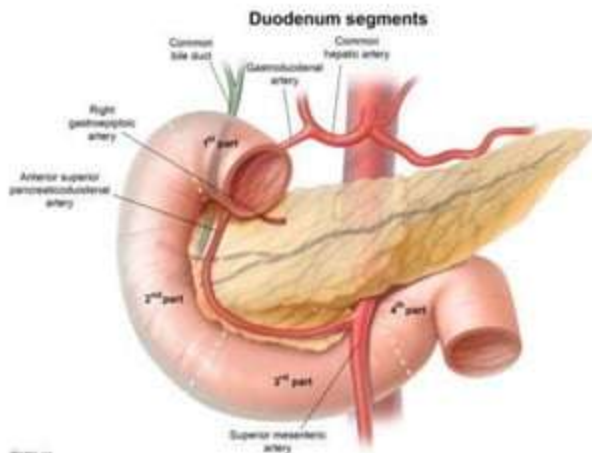
2. Jejunum

3. Ileum



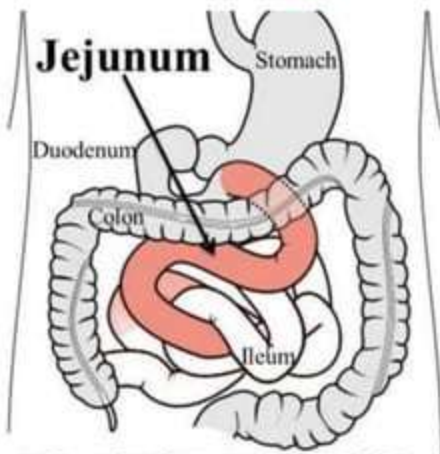
Duodenum

- The duodenum is the first section of the small intestine.
- It is about 25 cm long
- C- Shape
- It surrounds the head of the pancreas
- Thicker layer of tissue



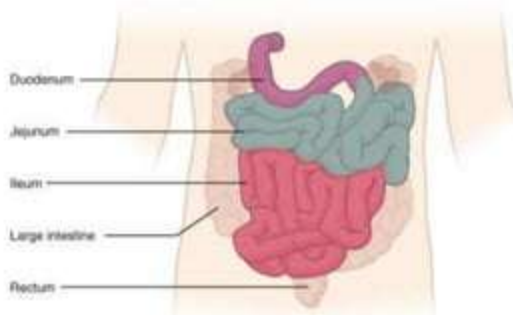
JEJUNUM

- It is middle section of the small intestine
- About 6-7 metres long.
- Its absorb almost all nutrients except water
- It contain small villi for absorption



Ileum

- The final section of the small intestine
- It is about 3 m long, and contains villi similar to the jejunum.
- It absorb water and Vitamin B 12
- The ileum joins to the cecum of the large intestine at the ileocecal junction.



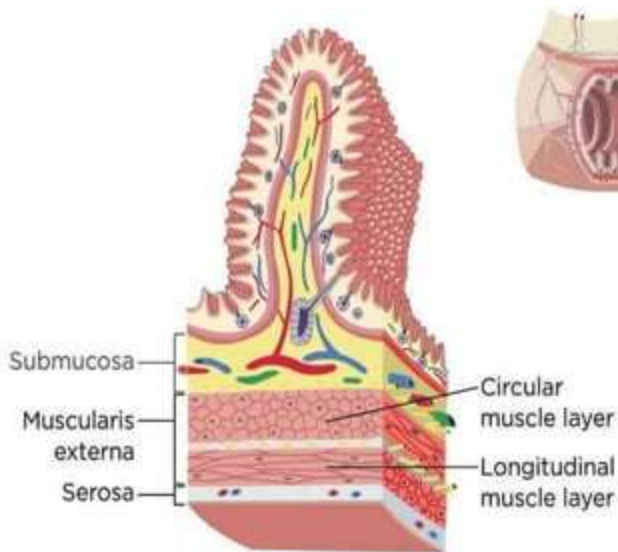


Structure of the small intestine

Structure of the small intestine

It is made up with 4 layers

1. Peritoneum
2. Muscular laye
3. Mucosa
4. Submucosa



villi

The surface area of the small intestine mucosa is greatly increased by permanent circular folds, villi and microvilli

The villi are tiny finger-like projections, 0.5 to 1 mm long

They are large and numerous in the duodenum and jejunum, but are smaller and fewer in the ileum.

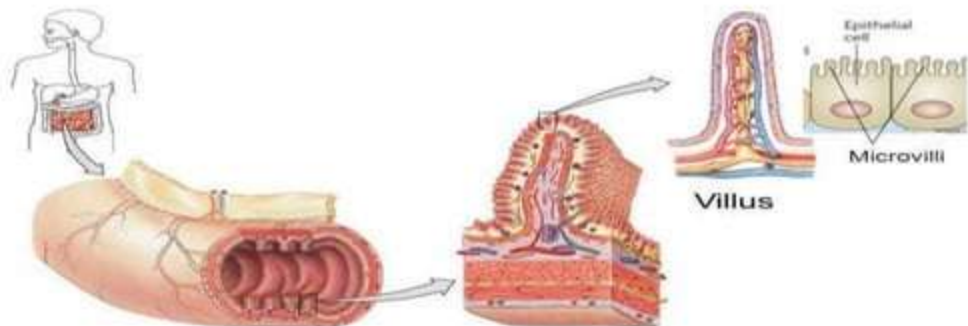


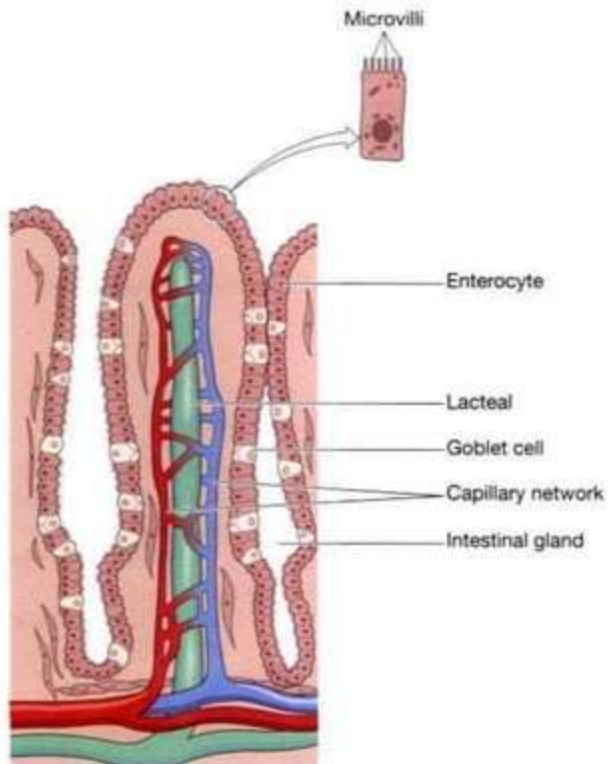
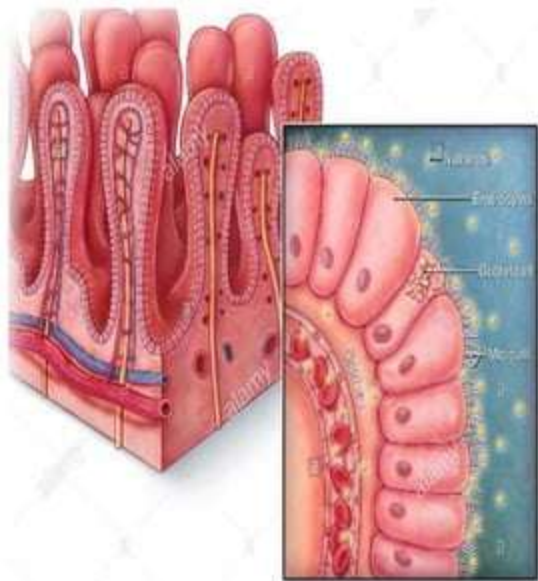
It consists of columnar epithelial cells, or enterocytes, with tiny microvilli (1 μm long) on their free border.

Goblet cells that secrete mucus

These epithelial cells enclose a network of blood and lymph capillaries.

The lymph capillaries are called lacteals because absorbed fat gives the lymph a milky appearance.

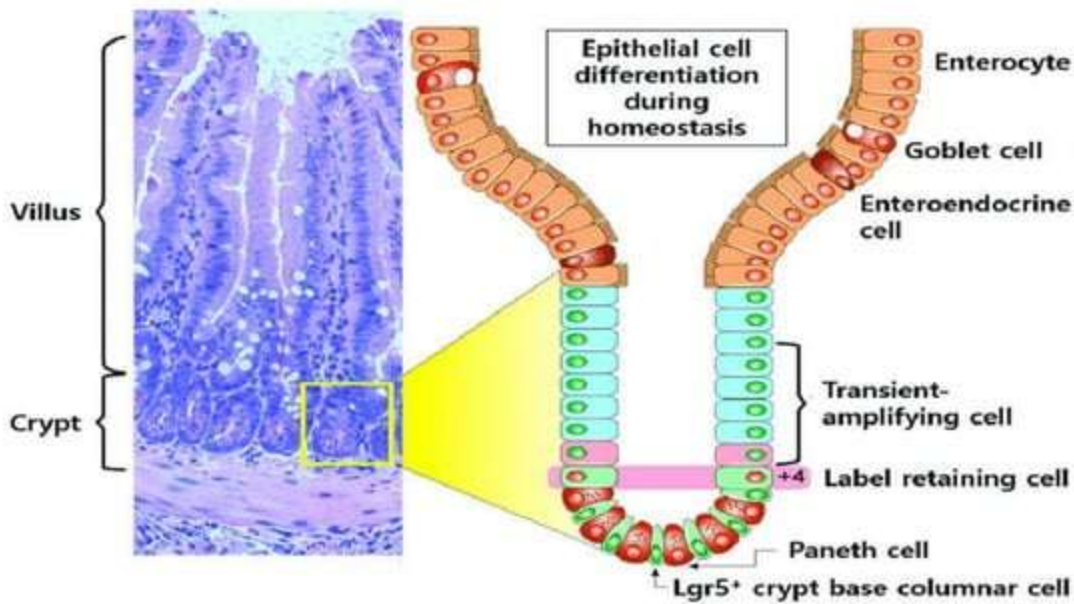




Intestinal glands

Intestinal glands or Crypts of Lieberkühn

- Situated below the surface between the villi
- The glands and intestinal villi are covered by epithelium which contains multiple types of cells.
 1. Enterocytes-Absorbing water, electrolytes.
 2. Goblet cell -secreting mucus
 3. Enteroendocrine cell- secreting hormones
 4. Paneth cells-secreting anti-microbial peptides



Functions of small intestine

Functions of the small intestine

1. Secretion of intestinal juice
2. Completion of chemical digestion of carbohydrates, protein and fats in the enterocytes of the villi.
3. Absorption of nutrients.
4. Protection against infection by microbes.
5. Secretion of the hormones cholecystokinin (CCK) and secretin.

succus entericus

Small intestine- succus entericus

- Secretion from small intestine is called succus entericus
- Volume : 1800 mL/day
- The principal constituents of intestinal secretions are:
 - water
 - mucus
 - mineral salts
 - enzyme: enterokinase (enteropeptidase).
- The enzymes involved in completing the chemical digestion of food in the enterocytes of the villi are:
 - peptidases
 - lipase
 - sucrase, maltase and lactase

Digestive functions of Succus entericus enzymes

Enzyme	Substrate	End products
Peptidases	Peptides	Amino acids
Sucrase	Sucrose	Fructose and glucose
Maltase	Maltose and maltotriose	Glucose
Lactase	Lactose	Galactose and glucose
Dextrinase	Dextrin, maltose and maltotriose	Glucose
Trehalase	Trehalose	Glucose
Intestinal lipase	Triglycerides	Fatty acids



Absorption in small intestine

Absorption in small intestine

Villi and microvilli in small intestinal mucosa increases the surface area of mucosa. This facilitate the absorptive function of intestine.

Digested products of following mostly absorbed in small intestine.

Proteins

Carbohydrates

Fats

Vitamins,

Minerals

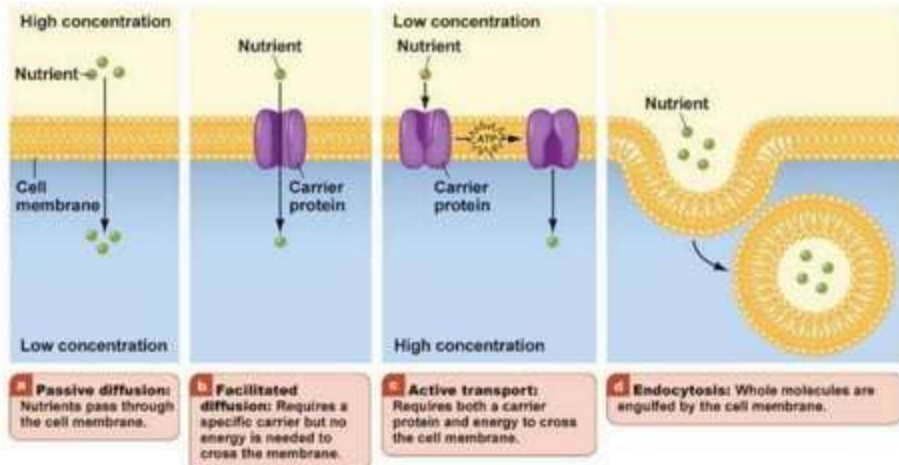
Water

Absorption -Place

1. **Absorption** of the majority of nutrients takes place in the jejunum.
2. Iron is **absorbed** in the duodenum.
3. Vitamin B12 and bile salts are **absorbed** in the terminal ileum.

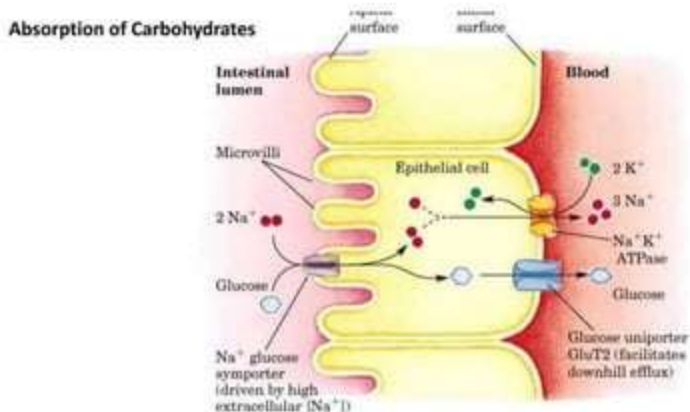
Absorption Process

1. **Diffusion.** Monosaccharides, amino acids, fatty acids and glycerol slowly.
2. **Active transport-** Disaccharides, dipeptides and tripeptides.



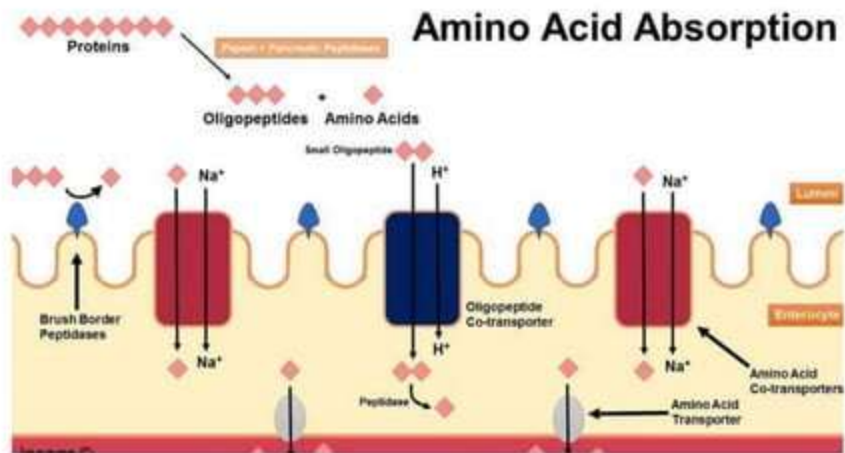
ABSORPTION OF CARBOHYDRATES

Monosaccharides- glucose, galactose and fructose into the capillaries in the villi and reach to blood vessels(portal vein) by facilitated diffusion.



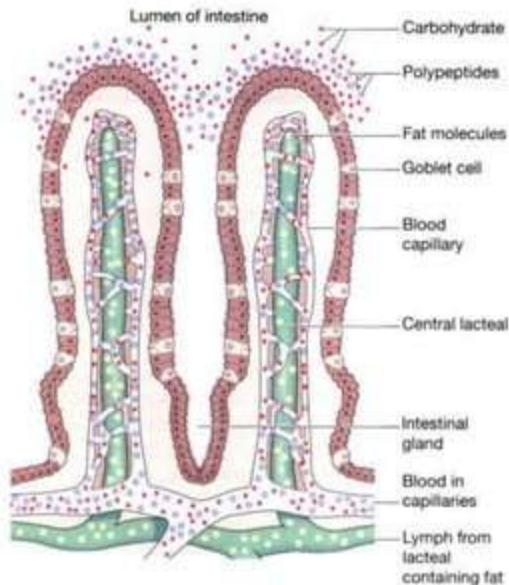
Absorption of Protein

Proteins are absorbed in the form of amino acids from small intestine by sodium cotransport, facilitated diffusion.



Absorption of Fat

The lymph capillaries in villi called lacteals because absorbed fat from the intestine gives the lymph a milky appearance.



Large intestine

Large intestine

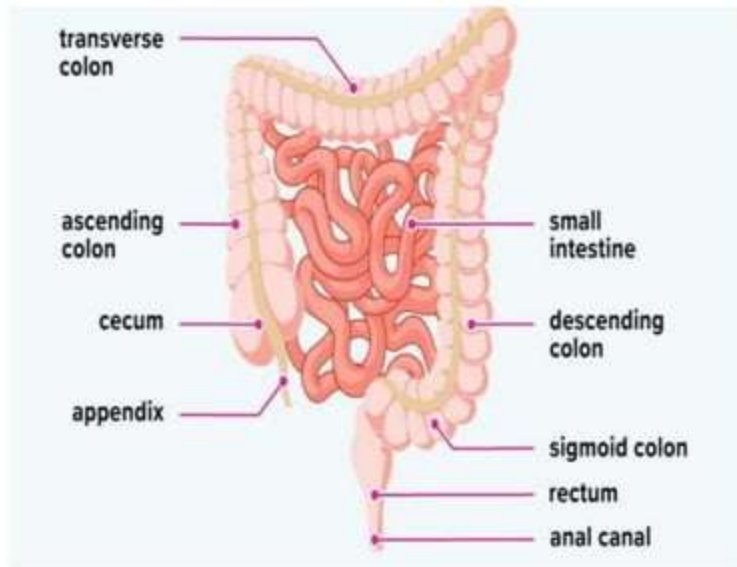
- This is about 1.5 metres long
- Beginning at the caecum and terminating at the rectum and anal canal deep in the pelvis.
- It forms an arch round the coiled-up small intestine



PARTS OF LARGE INTESTINE

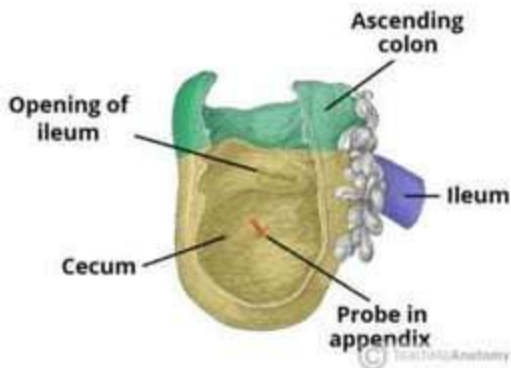
For descriptive purposes
the colon is divided into the

1. Caecum
2. Ascending colon
3. Transverse colon
4. Descending colon
5. Sigmoid colon
6. Rectum
7. Anal canal.



Caecum.

- This is the first part of the colon
- It is usually about 13 cm long and has the same structure as the walls of the colon but contains more lymphoid tissue.



Parts of Colon

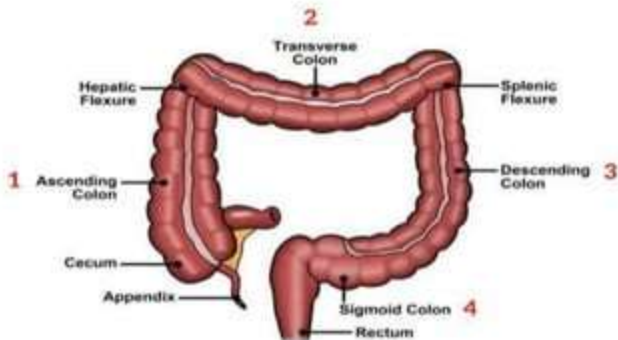
1. The ascending colon

This passes upwards from the caecum, it curves to become the transverse colon.

2. The transverse colon

This is a loop of colon which extends across the abdominal cavity in front of the duodenum and the stomach.

The colon is divided into four sections

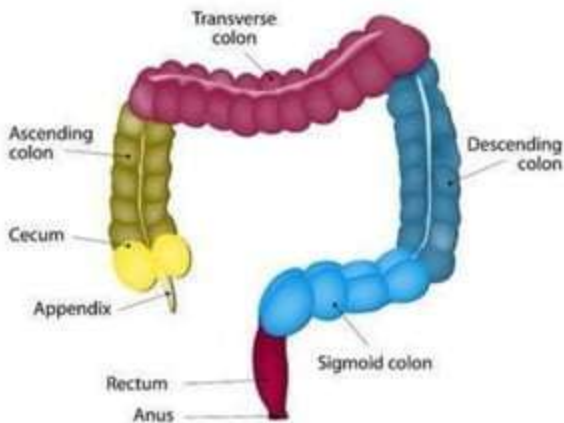


3. The descending colon

This passes down the left side of the abdominal cavity .

4. The sigmoid colon.

This part describes an S-shaped curve in the pelvis then continues downwards to become the rectum.



Functions of the large intestine

- 1. Absorption-** It Absorb of water, Mineral salts, Glucose ,Alcohol and some drugs.
- 2. Formation of feces-** After the absorption of nutrients, water ,unwanted substances in the large intestine form feces. This is excreted out.
- 3. Excretory function-** Heavy metals like mercury, lead, bismuth and arsenic through feces
- 4. Secretory Function-** It secretes mucin and inorganic substances like chlorides and bicarbonates.
- 5. Synthetic Function or Microbial activity-**
It have certain types of bacteria like *Escherichia coli*, *Enterobacter aerogenes*, *Streptococcus faecalis* which synthesise vitamin K and folic acid.

Thanking you

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