Digestion of carbohydrate in small intestine

C Basumata

Digestion of carbohydrate by pancreatic amylase.

- The pancreatic α-amylase secreted by exocrine pancreas is identical in function with that of salivary amylase, but its action is much more powerful.
- Within 15-30 minutes after the acidic chyme from stomach enters the duodenum and mixes with the pancreatic juice, the carbohydrates are almost totally converted into maltose and/or other small glucose polymers.

Regulation of pancreatic secretion: 3 basic stimuli are responsible-

- 1. Acetylcholine, released from the parasympathetic vagus nerve endings and other cholinergic nerves in the ENS.
- 2. Cholesystokinin(CCK), secreted by duodenal and upper jejunal mucosa when food enters small intestine.
- 3.Secretin, also secreted by duodenal and upper jejunal mucosa when highly acidic food enters the duodenum.

Phases of pancreatic secretion: 3 phases-

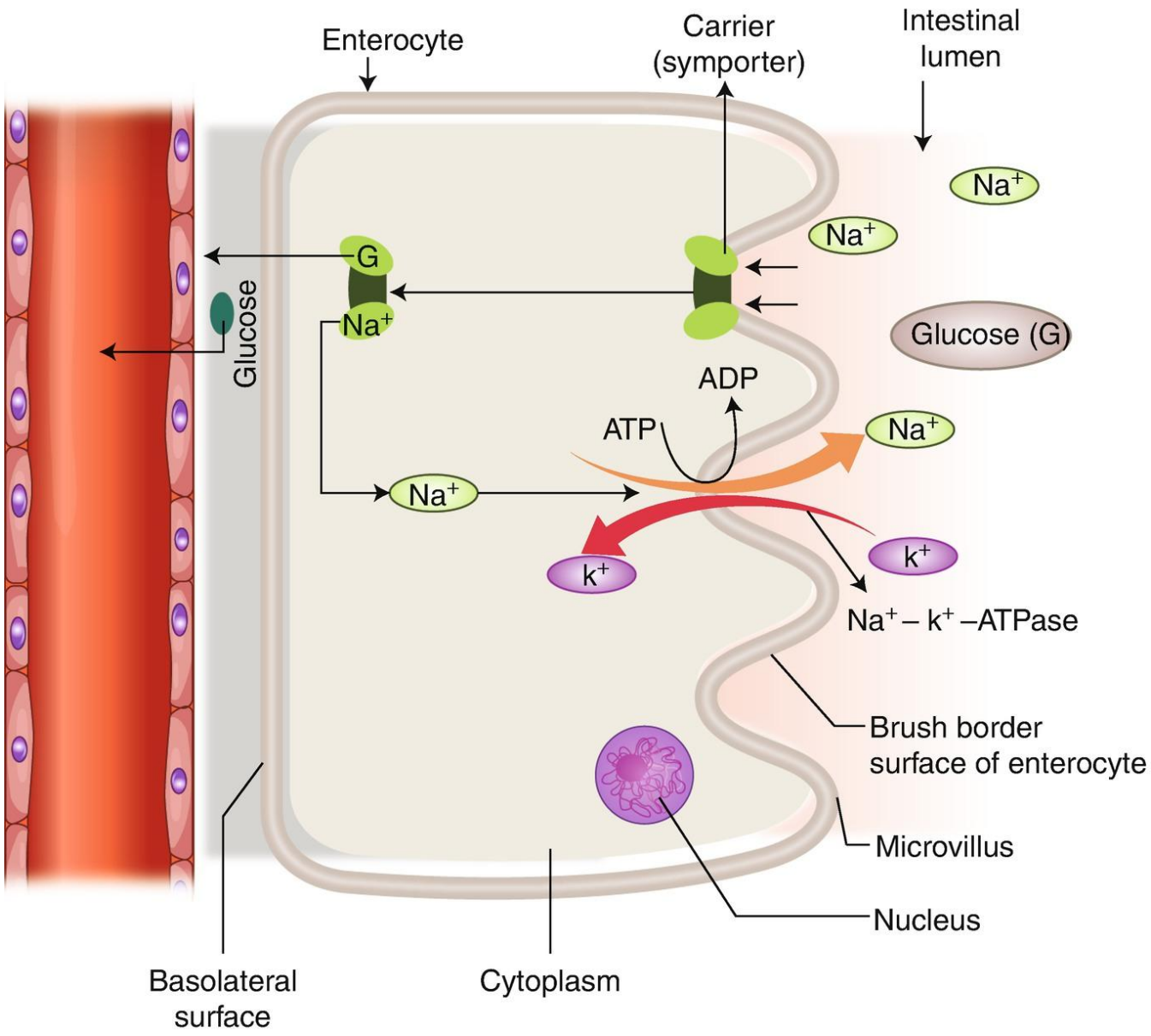
- 1. Cephalic phase: The same nervous signals from brain causing secretion in the stomach also cause acetyl choline secretion from the vagal nerves endings in the pancreas. Only 20% of the secretion(small amount of water, electrolytes & enzymes) takes place in this phase.
- 2. Gastric phase: Only 5-10% of pancreatic enzymes are secreted in this phase by the same nervous stimulation.
- 3. Intestinal phase: The pancreatic secretion becomes maximum only after food enters the duodenum and it is mainly in response to the secretion of secretin hormone.

Digestion of carbohydrates by the enzymes in the small intestine

- The enzymes secreted by the **enterocytes** present in the intestinal villi brush boarder are lactase, sucrase, maltase and α-dextrinase. These enzymes hydrolyze the disaccharides and other small polymers into monosaccharides as follows:
- Lactose *Lactase* Galactose + Glucose
- Sucrose *Sucrase* Fructose + Glucose
- Maltose and other small glucose polymers split into multiple molecules of glucose.

Absorption of carbohydrates

- They are mainly absorbed as monosaccharides, and 80% of it comprise of glucose and 20% of it are galactose and fructose.
- Mechanism of absorption: active transport process.
- Glucose: absorbed by Sodium co-transport mechanism in two steps-
- 1.Active transport of Sodium ions through the baso-lateral membranes of the intestinal epithelial cells into the blood;
- 2. Movement of Sodium ions from the intestinal lumen through the brush-boarder of the epithelial cells into the interior of the cells (Secondary active transport) due to the decrease in Sodium ions caused by the above process.
- In this process, glucose is dragged along with the Sodium inside the cells.
- Once inside the cells, glucose is transported into para-cellular space and finally into the blood by the action of transport proteins (Facilitated diffusion) and enzymes.



Absorption of glucose by symporters (cotransport mechanism)

Absorption of other monosaccharides

- Galactose is absorbed in the same process as glucose, but conversely
- Fructose is absorbed by facilitated diffusion only. However, most of the fructose once inside the cells are phosphorylated and converted into glucose before being absorbed.