Digestion and absorption of carbohydrate (cc4, unit 2)

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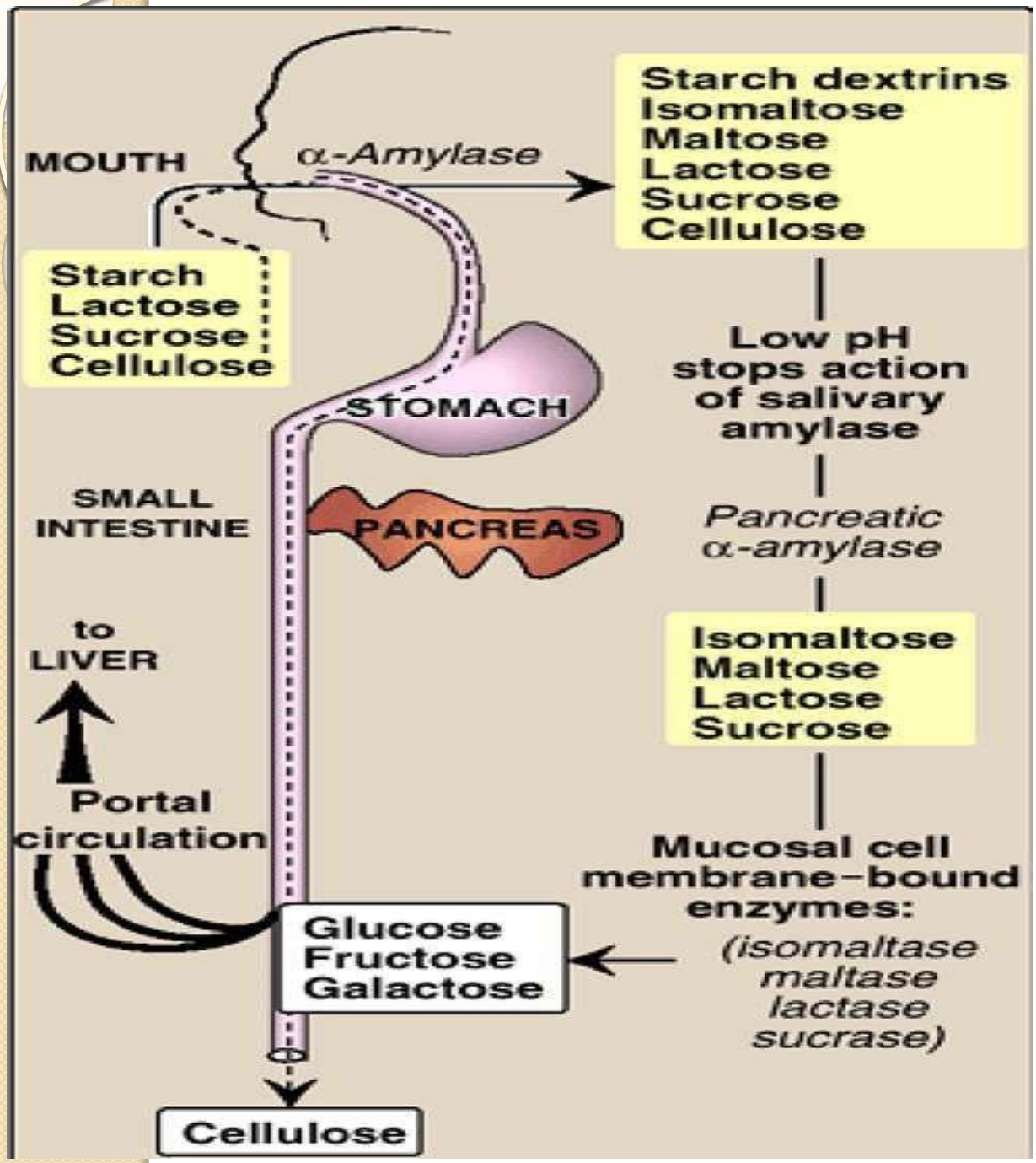
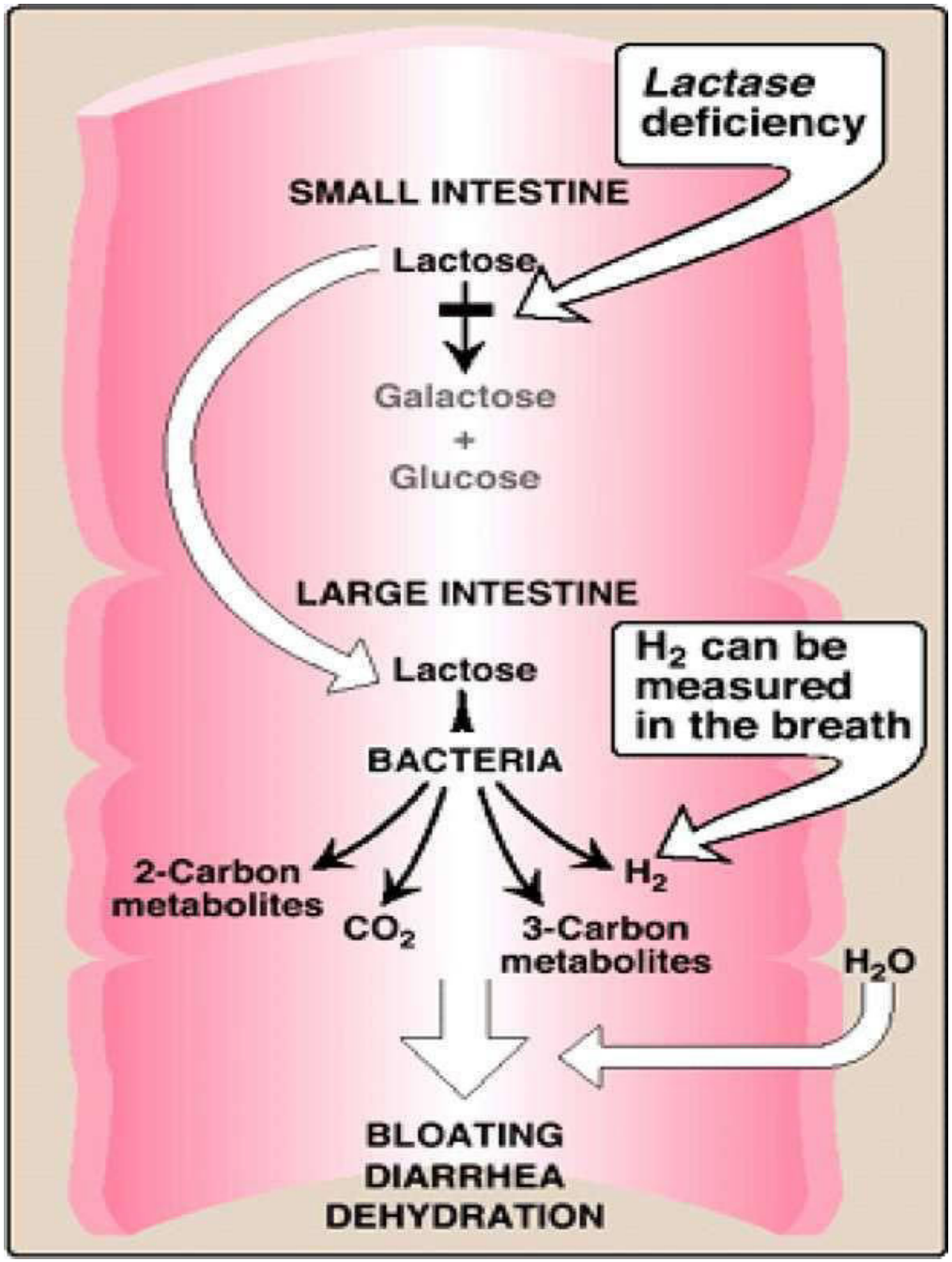


Digestion of carbohydrate

- In the diet, carbohydrates are present as complex polysaccharides (starch, glycogen), and to a minor extent, as disaccharides (sucrose and lactose).
- They are hydrolyzed to monosaccharide units in the gastrointestinal tract.
- The process of digestion starts in mouth by the **salivary alpha-amylase.**
- **However, the time available** for digestion in the mouth is limited, because the gastric hydrochloric acid will inhibit the action of salivary amylase.

- In the **pancreatic juice another alpha-amylase** is available, which will hydrolyze the alpha-1,4 glycosidic linkages randomly, so as to produce smaller subunits like maltose, isomaltose, dextrins and branched or unbranched oligosaccharides.
- The cells of brush border of intestine contain the enzymes, **sucrase, maltase, isomaltase and lactase.**
- They hydrolyze the corresponding disaccharides into component monosaccharides, which are then absorbed.

Lactose intolerance



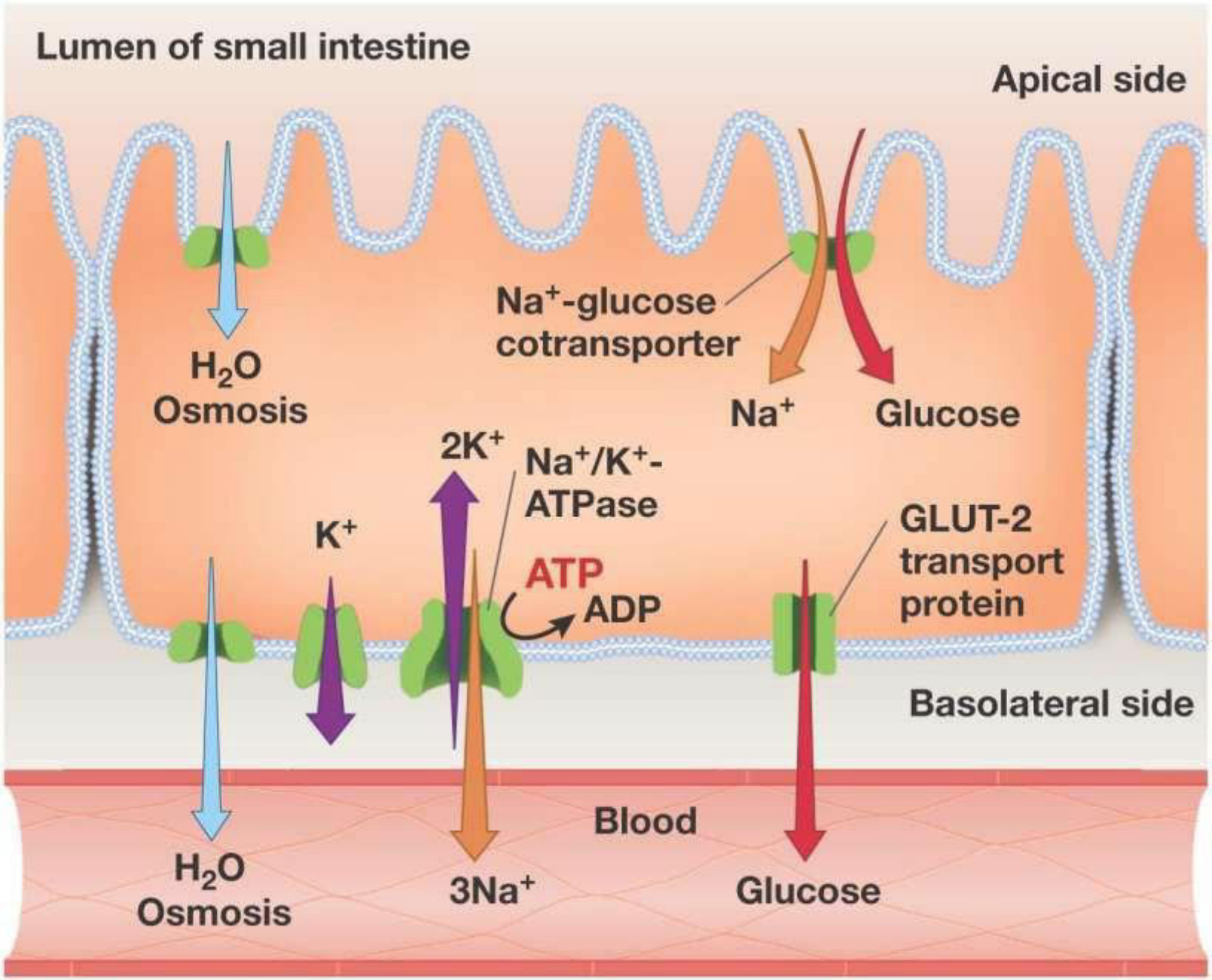
ABSORPTION

Only monosaccharides are absorbed by the intestine

Absorption of glucose

TABLE 9.1: Glucose transporters

Transporter	*Present in*	*Properties*
GluT1	RBC, brain, kidney, colon, retina, placenta	Glucose uptake in most of cells
GluT2	Serosal surface of intestinal cells, liver, beta cells of pancreas	Low affinity; glucose uptake in liver; glucose sensor in beta cells
GluT3	Neurons, brain	High affinity; glucose into brain cells
GluT4	Skeletal, heart muscle, adipose tissue	Insulin-mediated glucose uptake
GluT5	Small intestine, testis, sperms, kidney	Fructose transporter; poor ability to transport glucose
GluT7	Liver endoplasmic reticulum	Glucose from ER to cytoplasm
SGluT	Intestine, kidney	Cotransport; from lumen into cell



Co-transport from Lumen to Intestinal Cell

- This process is mediated by Sodium Dependent Glucose Transporter-1 (SGluT1). Absorption from intestinal lumen into intestinal cell is by co transport mechanism (secondary active transport).
- A membrane bound carrier protein is involved, which carries glucose, along with sodium. This sodium is later expelled by the sodium pump with utilization of energy. So energy is needed indirectly.

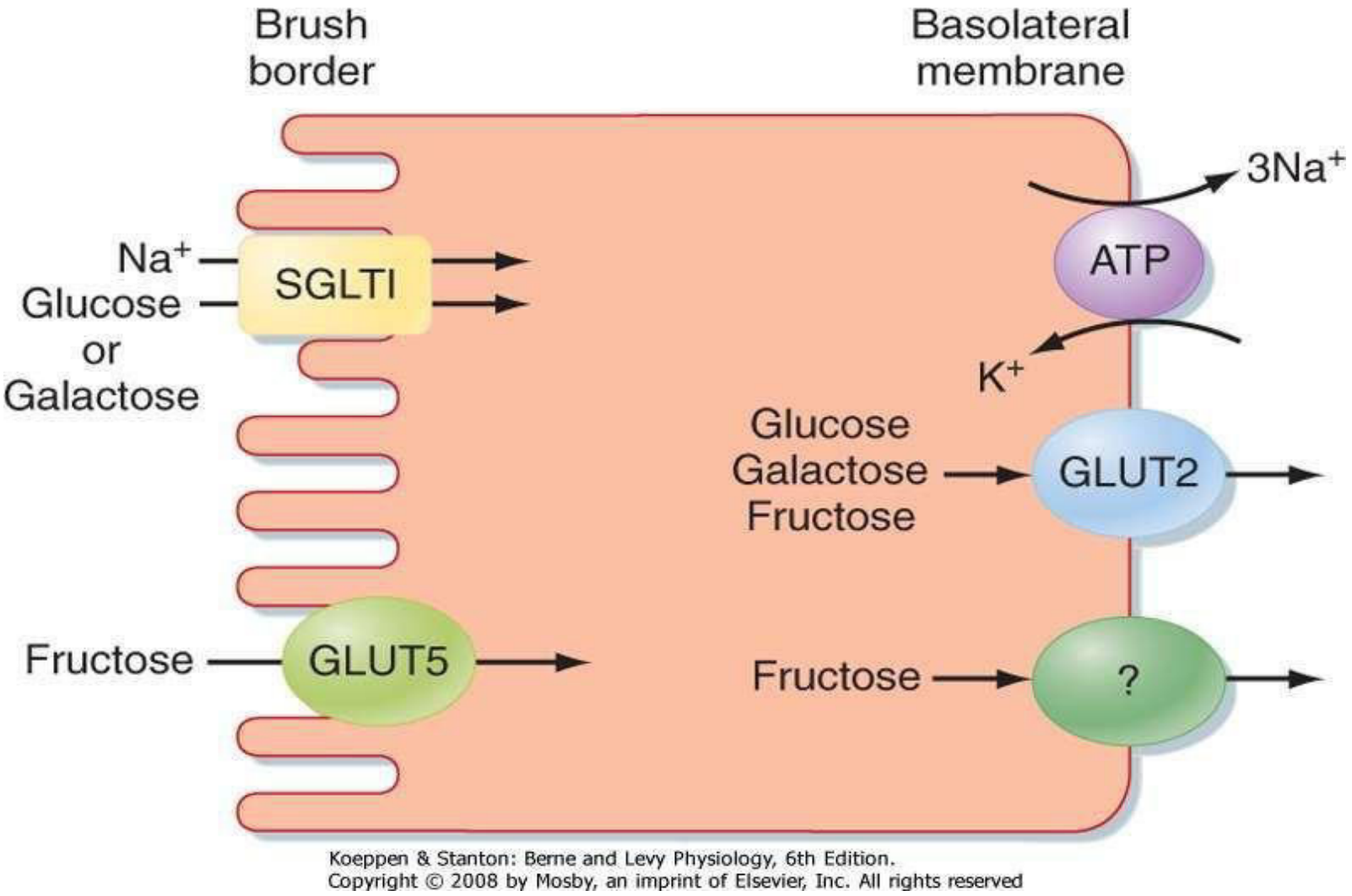
Another Uniport System Releases Glucose into Blood

- Intestinal cells release glucose into blood stream by the carrier mechanism called Glucose Transporter Type 2 (GluT2).
- This transporter is not dependent on sodium. It is a uniport, facilitated diffusion system.
- GluT2 is present in intestinal epithelial cells, liver cells, beta cells of pancreas and kidney.

Oral rehydration solution(ORS)

- Given in treatment of diarrhea.
- Contains sodium and glucose.
- Sodium drags glucose and water with it and provide rehydration and energy to cells.

Absorption of galactose and fructose



Any questions?

Thank you