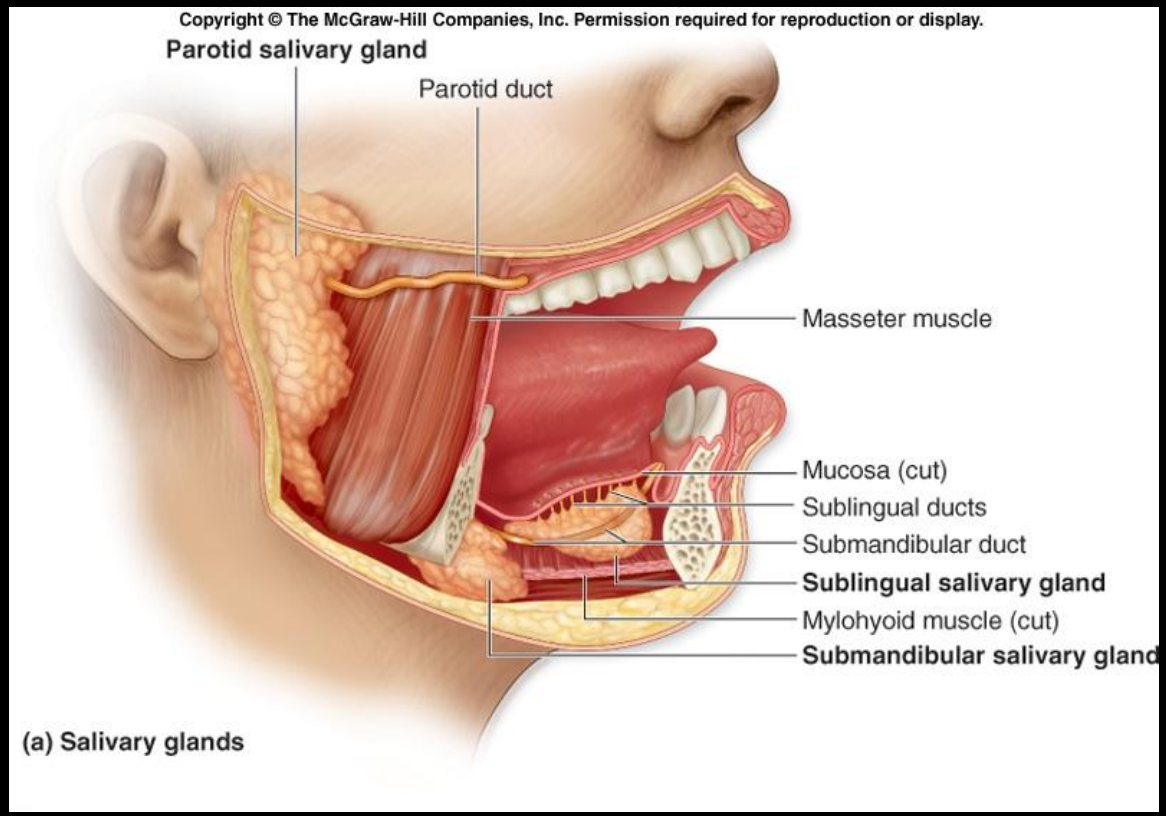
CARBOHYDRATE DIGESTION

MMHS SCIENCE DEPT.

MOUTH

- Ptyalin breaks down starches to disaccharides and some trisaccharide units.



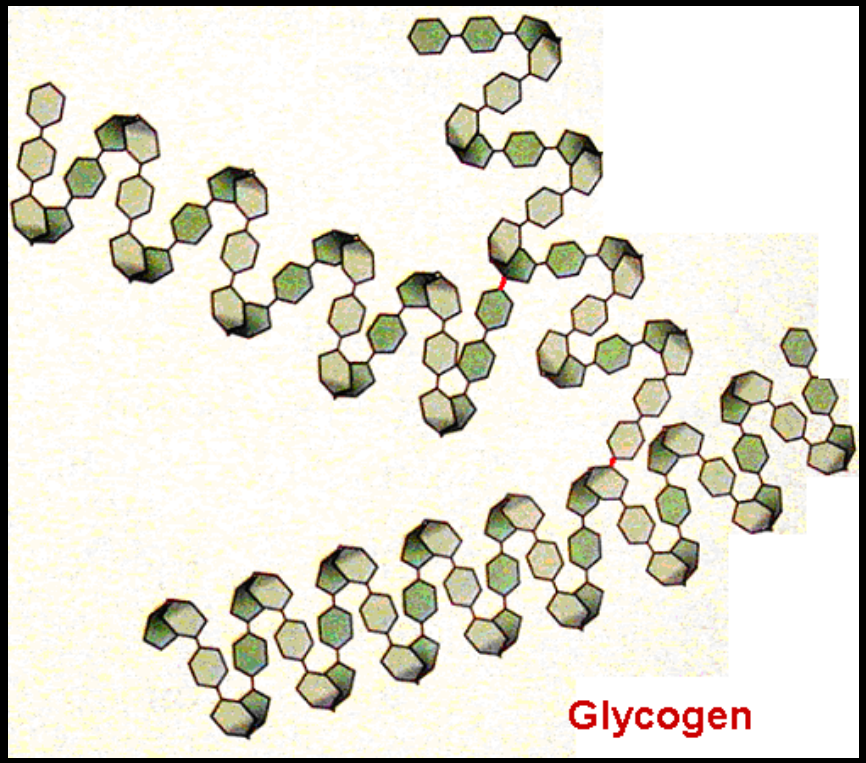
SMALL INTESTINE

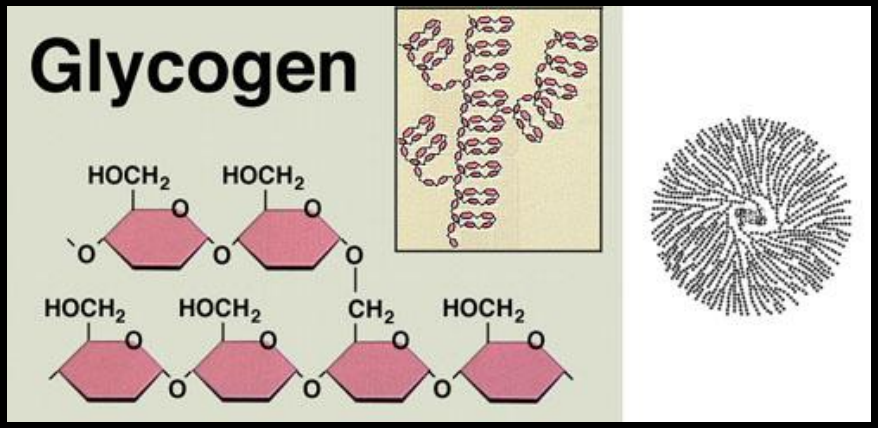
- Pancreatic amylase produced in the pancreas breaks down the remaining starches into the disaccharide maltose.
- Sucrose (table sugar) and Lactose (milk sugar) are ingested and not touched until the intestinal enzymes act.
  1. **Maltase**- breaks down maltose into 2 glucose molecules via Hydrolysis (add water to break bonds).
  2. **Sucrase** – breaks down sucrose into a glucose and fructose molecule via hydrolysis.
  3. **Lactase** – breaks down lactose into a glucose and galactose molecule via hydrolysis.

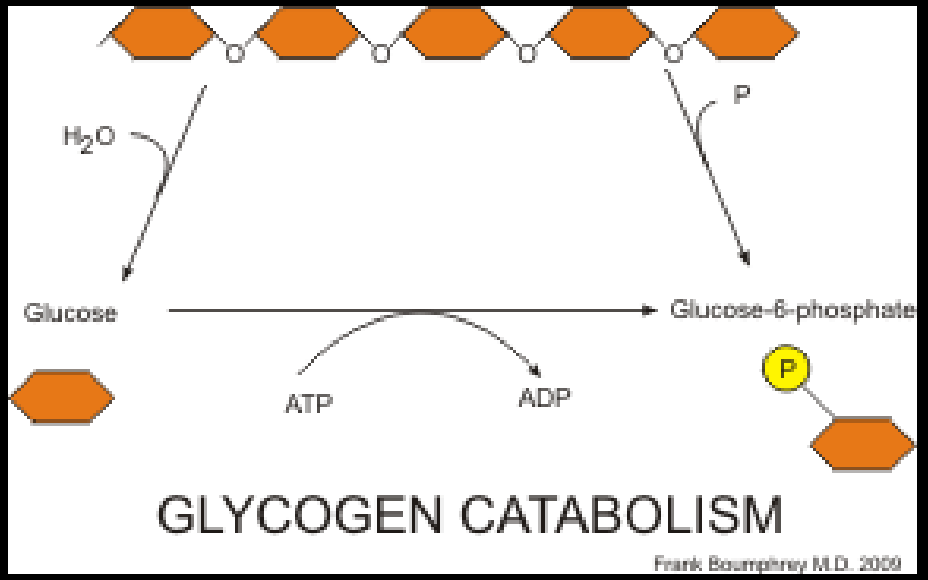
ABSORPTION OF CARBOHYDRATES

1. Carbs (Monosachs) absorbed into epithelial cells of the villi and microvilli by facilitated diffusion.
2. Moves from simple columnar cells into capillaries by diffusion.
3. Moves to the liver by the hepatic portal blood system.
4. The liver filters impurities and stores the excess reducing sugars (monosachs) as glycogen.

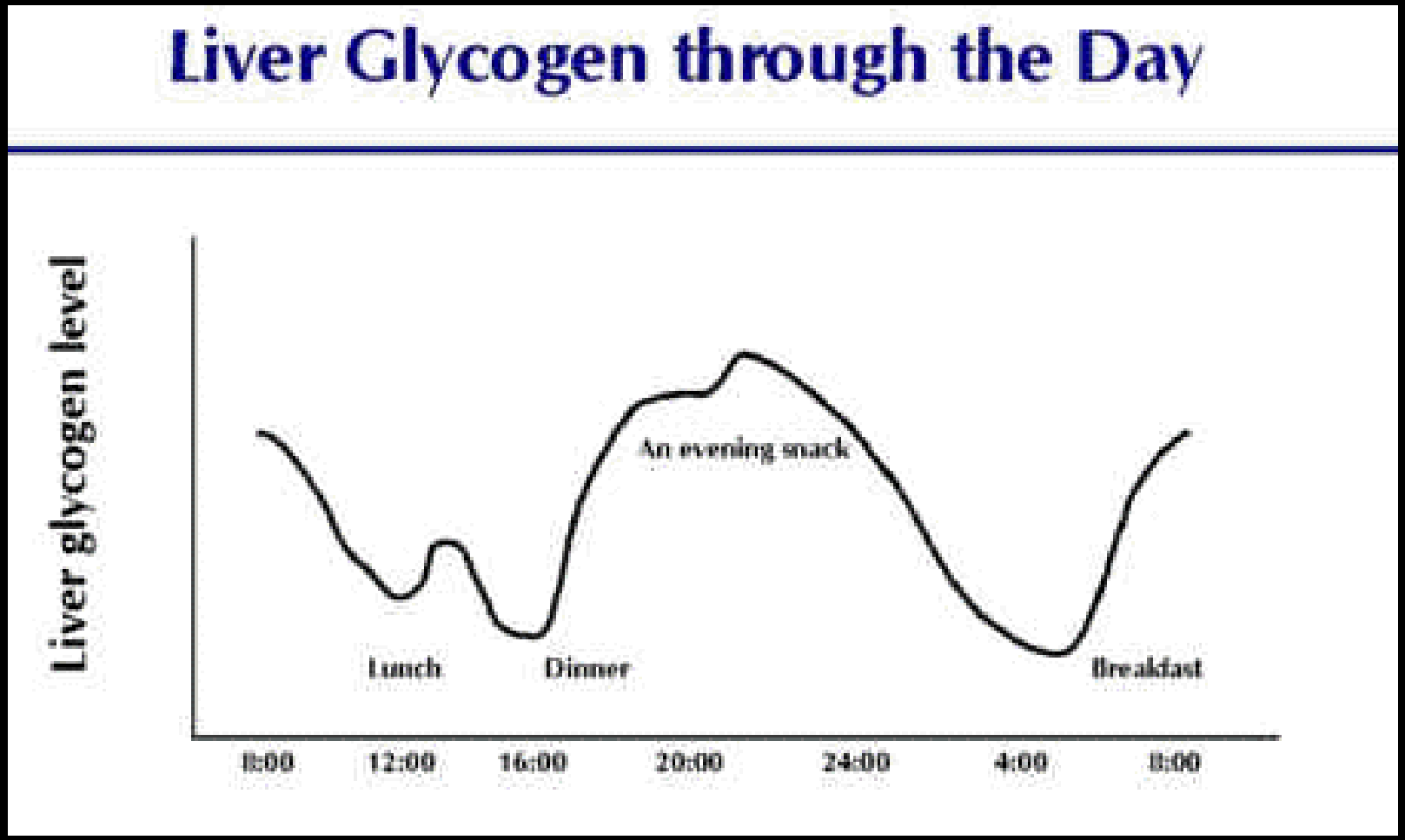
glycogen


Glycogen

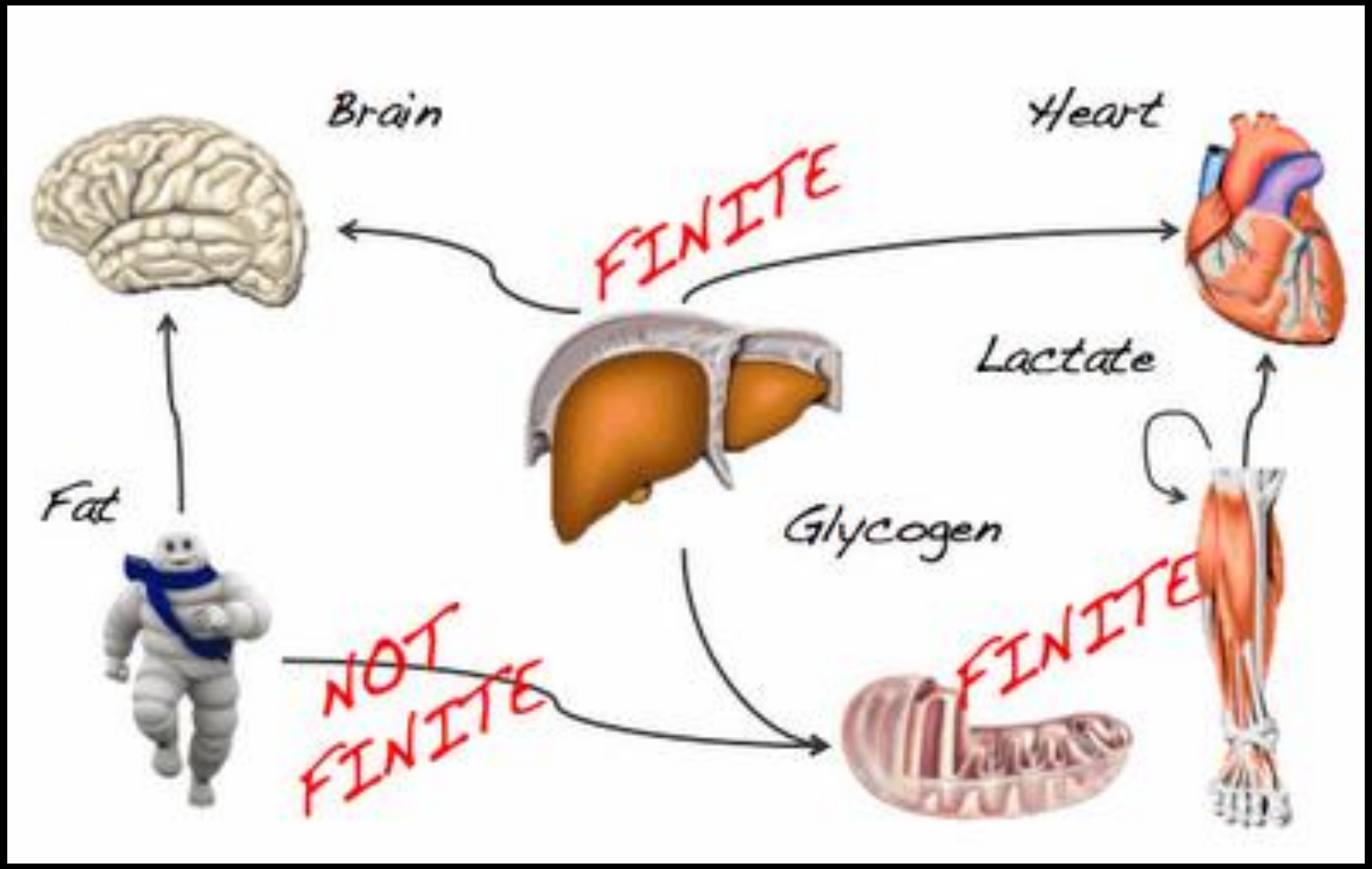

Glycogen
HOCH2
HOCH2
HOCH2
HOCH2
CH2
HOCH2


H2O
P
Glucose
Glucose-6-phosphate
ATP
ADP
P
GLYCOGEN CATABOLISM
Frank Boumphrey M.D. 2009

Fluctuating Glycogen Levels



Fluctuating Glycogen Levels



Fluctuating Glycogen Levels

Energy Stores in Man				
Tissue Fuel	Provides fuel for			
	Reserve, grams	Starvation	Walking	Marathon
Fat	9000-15000	34 days	11 days	3 days
Muscle Glycogen	350	14 hours	5 hours	70 minutes
Liver Glycogen	80	3.5 hours	70 minutes	18 minutes
Blood/Extracellular Glucose	20	40 minutes	15 minutes	4 minutes
Body Protein	6000	15 days	5 days	1.3 days

Indigestible Carbohydrates

A. Provides food for methane-producing, colonic bacteria.
   1. Meals high in carbs like cellulose (plant matter) and complex fiber provide ample food for bacteria.
   2. Bacteria fermentation will produce H_2O, CO_2, and CH_4 (methane gas).
   3. The bacteria byproducts make flatus (gas).

Lactose Intolerance

- Often, the small intestine stops producing the enzyme lactase in adolescents.
- This leaves excess sugar for the colonic bacteria.
- As bacteria metabolize more food, they produce more gas resulting in symptoms like constipation, cramping, and diarrhea.

Why We Need Carbs!

- Carbs are essential for cell activity.
- Mitochondria take glucose and convert it to ATP through **cell respiration** (Glycolysis, Kreb's, ETC).
- ATP is then utilized throughout the body for a multitude of uses.
- Uses include movement, cell building, thought, digestion, blood pumping, protein formation, etc.