CARBOHYDRATE DIGESTION
MOUTH

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

Liver Glycogen through the Day

Liver glycogen level

Lunch  Dinner  An evening snack  Breakfast

8:00  12:00  16:00  20:00  24:00  4:00  8:00
Fluctuating Glycogen Levels
## Fluctuating Glycogen Levels

### Energy Stores in Man

<table>
<thead>
<tr>
<th>Tissue Fuel</th>
<th>Provides fuel for</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reserve, grams</td>
</tr>
<tr>
<td>Fat</td>
<td>9000-15000</td>
</tr>
<tr>
<td>Muscle Glycogen</td>
<td>350</td>
</tr>
<tr>
<td>Liver Glycogen</td>
<td>80</td>
</tr>
<tr>
<td>Blood/Extracellular Glucose</td>
<td>20</td>
</tr>
<tr>
<td>Body Protein</td>
<td>6000</td>
</tr>
</tbody>
</table>

*Note: The table compares the energy stores in various tissues and their fuel availability for different activities.*
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 H2O, CO2, and CH4 (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.