“Why We Eat”

- nutrients – chemical substances supplied from environment
- macronutrients – carbohydrates, proteins, & fats
- micronutrients – vitamins & minerals (needed daily in small amounts)
- nutrition – (nutrients) foods needed for health that cannot be synthesized by body cells
- metabolism – ways nutrients are used to support life processes
- essential nutrients – cannot be synthesized by cells & needed by body (amino acids)
- water – essential & must be added to diet

Various factors acting on cells of the hypothalamus control body weight.

Carbohydrates - Organic compounds that include sugars & starches. The energy in chemical bonds is the power that drives cellular processes.

Carbohydrate Sources
- complex carbs – polysaccharides, starch from grains, vegetables, & glycogen from meat
- simple carbs – disaccharides from milk sugar, cane sugar, beet sugar, molasses, & monosaccharides from honey & fruits

Digestion breaks complex carbs down to monosaccharides which are small enough to be absorbed. (glucose)

Cellulose – complex carb human enzymes cannot digest; it provides bulk or roughage against which the muscular wall of the intestines can push

Carbohydrate Utilization
* Carbohydrates are absorbed as monosaccharides.
* The liver converts fructose & galactose to glucose.
* Oxidation releases energy from glucose.
* Excess glucose is stored as glycogen or converted to fat.

Carbohydrate Requirements
* Carbs are primary source of energy for the body.
* Some cells need a constant supply of glucose.
* Amino acids will be converted to glucose if glucose is scarce.
* 125-175 grams of carbs daily is necessary to spare protein breakdown & excess fat utilization.
* 200-300 grams of carbs in average daily diet.

<table>
<thead>
<tr>
<th>18.1</th>
<th>Types of Vegetarian Diets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Food Restrictions</td>
</tr>
<tr>
<td>Vegan</td>
<td>No animal foods</td>
</tr>
<tr>
<td>Ovo-vegetarian</td>
<td>Eggs allowed; no dairy or meat</td>
</tr>
<tr>
<td>Lacto-vegetarian</td>
<td>Dairy allowed; no eggs or meat</td>
</tr>
<tr>
<td>Lacto-ovo-vegetarian</td>
<td>Dairy and eggs allowed; no meat</td>
</tr>
<tr>
<td>Pesco-vegetarian</td>
<td>Dairy, eggs, and fish allowed; no other meat</td>
</tr>
<tr>
<td>Semivegetarian</td>
<td>Dairy, eggs, chicken, and fish allowed; no other meat</td>
</tr>
</tbody>
</table>

OBESITY

MALNUTRITION
Lipids - Organic compounds that supply energy & are used to build cell structures; include fats, cholesterol, & phospholipids

Lipid Sources
* triglycerides are found in plant & animal-based foods
* saturated fats should only be 10% of diet; found in meat, eggs, milk, lard, palm oil & coconut oil
* unsaturated fats are found in seeds, nuts, & plant oils
* cholesterol – found in liver & egg yolk; small amounts in whole milk, butter, cheese, & meats (plants do not contain cholesterol)

Lipid Requirements
* no more than 30% of total daily calories should be from fat
* amounts & types of lipids needed for health are unknown
* dietary fats must also supply the required amounts of fat-soluble vitamins
**Proteins** - polymers of amino acids with many functions; amino acids are absorbed & transported by the blood to cells; they form other new proteins as DNA directs; they become enzymes, structural materials, & energy sources

*deamination – occurs in the liver when amino acids lose their NH2 groups which later become urea

*using structural proteins to generate energy causes the Tissue-wasting characteristic of starvation

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**Protein Sources** - meats, dairy products, cereals, & legumes

*digestion of proteins provides amino acids for formation of enzymes & energy sources (after deamination); deaminated portions of amino acids can be broken down into CO2 & H2O to produce glucose or fat

*8 amino acids are essential for adults & must be provided by diet (10 required for children) *look at table*

*all 20 types of amino acids must be in the body at the same time for growth & tissue repair to occur

*complete proteins – in milk, meats, & eggs have essential amino acids

*incomplete proteins – in corn, lack adequate amounts of one or more essential amino acids

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**Nitrogen Balance** – in a healthy adult proteins are continuously built up & broken down; gain of body proteins equals the loss = dynamic equilibrium > nitrogen balance

*starving person has a negative nitrogen balance

growing child, pregnant woman, or an athlete in training has a positive nitrogen balance

**Protein Requirements** – amount of protein needed varies according to body size, metabolic rate, & nitrogen balance condition

*children who are growing face severe consequences if proteins are not in the diet

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**Protein Utilization**

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**Protein Digestion**

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### Energy Expenditures
- required for all metabolic processes to ensure cell survival

**Energy Values of Foods**

*expressed in calories – units of heat

*food Calorie – equals the amount of heat required to raise the temperature of a kilogram of water 1 degree C

*When energy losses due to incomplete absorption & incomplete oxidation are taken into account, 1 gram of carbohydrate or 1 gram of protein yields about 4 calories, whereas 1 gram of fat yields about 9 calories

### Energy requirements - amount of energy required varies from person to person.

*basal metabolic rate – rate at which the body expends energy under basal conditions – when a person is awake & at rest, after an overnight fast, & is a comfortable, controlled environment. (thyroid test)

*Factors that influence energy requirements include basal metabolic rate, muscular activity, body temperature, & nitrogen balance

**Energy balance** – exists when caloric intake = caloric output

*When caloric intake in the form of foods = output from the basal metabolic rate & muscular activities

*If energy balance is positive, body weight increases; if energy balance is negative, body weight decreases

### Carbohydrate, Lipid, and Protein Nutrients

<table>
<thead>
<tr>
<th>Amino Acids in Foods</th>
<th><strong>Alanine</strong></th>
<th><strong>Arginine (ch)</strong></th>
<th><strong>Asparagine</strong></th>
<th><strong>Aspartic Acid</strong></th>
<th><strong>Cysteine</strong></th>
<th><strong>Glutamic acid</strong></th>
<th><strong>Glutamine</strong></th>
<th><strong>Glycine</strong></th>
<th><strong>Histidine (ch)</strong></th>
<th><strong>Isoleucine (e)</strong></th>
<th><strong>Leucine (e)</strong></th>
<th><strong>Lysine (e)</strong></th>
<th><strong>Methionine (e)</strong></th>
<th><strong>Phenylalanine (e)</strong></th>
<th><strong>Proline</strong></th>
<th><strong>Serine</strong></th>
<th><strong>Threonine (e)</strong></th>
<th><strong>Tryptophan (e)</strong></th>
<th><strong>Tyrosine</strong></th>
<th><strong>Valine (e)</strong></th>
</tr>
</thead>
</table>

### Desirable weight – nutritional disorders reflect caloric imbalances

*adults of all ages should have similar weights based on height-weight guidelines

*person who exceeds desirable weight by 10% – 20% is called overweight

*person whose body contains excess fatty tissue is obese
Organic compounds (not carbs, proteins, or fats) that are essential for normal metabolic processes and cannot be synthesized by body cells in adequate amounts.

**Fat – soluble vitamins** – carried in lipids and are influenced by the same factors that affect lipid absorption; fairly resistant to the effects of heat; they are not destroyed by cooking or food processing (Vitamins A, D, E, & K)

**Water – soluble vitamins** – B vitamins & vitamin C; B vitamins make up a group called the vitamin B complex & oxidize carbs, lipids, & proteins
Minerals

- responsible for about 4% of body weight;
- 75% of weight of minerals are found in bones & teeth as Ca & P;
- are usually incorporated into organic molecules, although some exist in inorganic compounds;
- they comprise structural materials, function in enzymes, & play vital roles in various metabolic processes;
- mineral concentrations are generally regulated by homeostatic mechanisms; ionized forms are the physiologically active forms

Major minerals – Ca, P, K, S, Na, Cl, Mg

Trace elements – Fe, Mn, Cu, I, Co, Zn, Fl, Se, Cr
An adequate diet provides sufficient energy & essential nutrients to support optimal growth, as well as maintenance & repair, of tissues.

Individual needs vary.
Body digests itself

Kwashiorkor
Protein starvation

Marasmus
Lack of all nutrients

<table>
<thead>
<tr>
<th>18.10</th>
<th>Energy Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kcal/Day</td>
<td>Age</td>
</tr>
<tr>
<td>23-50</td>
<td>2,000</td>
</tr>
<tr>
<td>51-74</td>
<td>1,800</td>
</tr>
<tr>
<td>75+</td>
<td>1,600</td>
</tr>
</tbody>
</table>