Nutrition Basics

(Text Pg 141 - 145)

Nutrition:

- The process by which our body takes in and uses food for the purpose of:
  - Providing the **energy** for vital functions (e.g. breathing)
  - Promoting proper **growth and development**.
  - Preventing **chronic diseases** e.g. heart disease, cancers, diabetes, stroke, etc.
  - Helping us **perform** and look our best.

What is a Nutrient?

- Nutrients are **chemical** substances obtained from food that provide our body with **energy** and allow for **growth** and **repair**.

What are Essential Nutrients?

- Essential Nutrients are substances our body **cannot make** itself or make in sufficient amounts, thus it **must be eaten** in our diet.

What are Macronutrients?

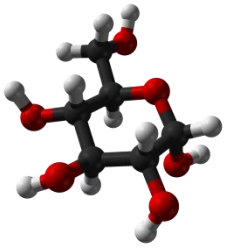
- Our direct source of energy consumed in large amounts. (3 types Carbs, Fat & Protein)
- Supply us with the **energy** for basal, lifestyle and physical activities.

Carbohydrates (4 Calories per gram)

- Carbohydrates are the most abundant class of organic compounds and most important source of energy found in living organisms.
  - Readily used first for ATP production
- Carbo – "*Carbon*" hydrate – "*water*"
- They originate as products of photosynthesis from green plants
- They come from sugars, grains, starches & fibre.

There are 3 types of carbohydrates

- ***Monosaccharides***: (Simple carbohydrates)
  - Mono – "*one*" saccharide – "*sugar*"
  - These carbs are a single sugar molecule.
  - Glucose ($C_6H_{12}O_6$) is the simplest sugar. Other examples are fructose and deoxyribose.
  - Simple carbohydrates are absorbed into your blood much faster, and while they provide some really quick energy, many foods with them may have lots of fat and lack important vitamins that your body needs.
  - Fruits like apples, bananas, grapes, and raisins contain simple sugars. Other sources of simple sugars are candy, pop, and chocolates.
  - **EXAMPLES:** glucose, fructose & galactose (GFG)



- ***Disaccharides***:
  - Di – "two" saccharide – "*sugar*"
  - These molecules contain two simple sugar molecules attached **covalent** bond.
  - All Disaccharides are formed by a process called **<u>Dehydration synthesis</u>**
  - **EXAMPLES:**
    - Maltose: 2 glucose molecules
    - Lactose: glucose and galactose molecules
    - Sucrose: glucose and fructose molecules

- ***Polysaccharides:*** (complex carbohydrates)
  - Poly – "many" saccharide – "*sugar*"
  - These carbs are made up of many sugar molecules linked together into large branching chains.

  - **Starch (Amylose)**
    - a large carbohydrate molecule used by plants to store energy.
    - Starches can have between 2000-6000 glucose molecules.
    - Starches are found in wheat, potatoes, and rice.

  - **Cellulose**
    - Indigestible non-starch polysaccharides
    - Has more of structural role of plant cells rather than energy storage.
    - Cellulose is more commonly known as "FIBRE"
      - ✓ **Soluble Fibre:** Can be fermented in the body thus some energy may be extracted (2 – 4 cals/gram) e.g. peas, beans, root vegetables, apples, carrots, broccoli.
      - ✓ **Insoluble Fibre:** Is not altered in the body, absorbs water and eases defecation. (0 cals/gram) e.g. whole grains, nuts, seeds, flax, potato skins

  - **Glycogen**
    - A large carbohydrate molecule use by animals to store energy
    - All unused, excess sugar transported by the blood are linked together to for a glycogen molecule for later use.
    - When glucose level begin to drop in the blood, glycogen can then breakdown, by way of **<u>Hydrolysis</u>**, into individual glucose units

- Complex carbs take longer to be digested, so your body needs more time to release these carbs into your blood as glucose.

- These are better when you are exercising because they will give you energy that is long lasting.
- They are also healthier than simple carbs because they usually come with lots of vitamins and minerals your body needs.

- Commonly found in foods like:
  - bread, noodles, rice, grains, vegetables (corn, potatoes, sweet potatoes, tomatoes, carrots, cucumbers, lettuce, and peppers).

- **The Glycemic Index (GI)**
  - Not all carbohydrates are created equal…
  - The GI ranks carbohydrates according to their digestion rates and their effect on our blood glucose levels.
    - ✓ ***Low GI:*** Small changes in blood insulin = healthier choice.
    - ✓ ***High GI:*** Large changes in blood insulin = greater risks.

Classification	Examples
Low GI	most fruits and vegetables (except potatoes and watermelon), grainy breads, pasta, legumes, milk, yogurt, some cheeses, nuts, fructose
Medium GI	whole wheat products, basmati rice, sweet potato
High GI	corn flakes, rice krispies, baked potatoes, watermelon, croissants, white bread, extruded breakfast cereals, most white rice, straight glucose (table sugar)

Proteins (4 Calories per gram)

- The "**Working Molecule**"
  - Woking protein: enzymes, antibodies, hormones, oxygen carriers, etc.
  - Structural protein: tendons and ligaments, scars, filaments of hair, etc.

- Made up of amino acids AA's (20 total; 9 essential)
  - When ingested, the body breaks them down into amino acids
  - Can be used as a source of energy when preferred supplies (carbs and fats) are low

- Needed to **grow and repair** all body tissues (e.g., muscle, skin, hair, etc.)
  - The body needs amino acids to grow new cells and to replace worn-out ones.

- ***Complete proteins:*** contain all 20 AA's (e.g. meat, eggs, cheese, milk, etc.)
- ***Incomplete Proteins:*** contain only one or more AA's (e.g. proteins in vegetables)

- The digestibility of protein varies from food to food. Amino acids from
  - **Animal proteins** are digested and absorbed at about 90%
  - **Legums** are next with about 80%
  - **Grains and other plants** vary from 60% to 80%

- The recommended intake varies from individual to individual
  - Average need is 0.8 grams of protein for every kilogram of body weight in adults
    - ✓ Can be two to three time higher for growing children
  - Average adult athletes needs are approx. 1.2 to 1.7 grams for every kilogram of body weight (depending on activity and intensity)

3) Fats (9 Calories per gram)

- Lipids are a major source of energy used by cells, however lipids are more **difficult for your body to break down.**
    - Lipids produce nearly twice the amount of energy than proteins or carbohydrates.

- Lipids are useful as insulation, necessary components of cell membranes, help absorb vitamins, and are even useful in hormone production.

- Lipids are used to store and excess energy from extra carbohydrates

- Lipids are made up of Carbon, Hydrogen, and Oxygen, organized as one ***glycerol*** molecule and three ***fatty acids***.
    - This is called a ***triglyceride***.

⇨ There several types of lipids:

1. Saturated fats

- Contain as many hydrogen atoms as possible.
- Common in animals.
- Difficult to digest.
    - have higher levels of low-density lipoprotein (LDL = raise cholesterol).

2. Unsaturated fats

- Less hydrogen atoms present in molecules.
- Commonly found in plants.
    - contain higher levels of high-density lipoproteins (HDL = lower cholesterol).

- **Mono-unsaturated** fats:
    - Considered to be the healthiest type of fat. Believed to lower cholesterol and may assist in reducing heart disease.
    - Ex. Olive oils, nuts, seeds. Commonly found in plants.
- **Poly-unsaturated** fats:
    - Found in vegetable oils like soybean, corn, sunflower and safflower. They also occur in oily fish.
    - Look for Omega-3 fatty acids (EFA's).

- Unsaturated fats in foods make it more likely to spoil, so scientists found a way to add hydrogen to these fats, creating hydrogenated fats, or **Trans fatty acids.**
    - **Trans fats** tend to raise total blood LDL cholesterol levels.

⇨ The human body can produce all but two of the fatty acids it needs. These are ***linoleic acid*** (LA = Omega 6) & ***alphalinolenic acid*** (LNA = Omega 3).

What are Micronutrients?

- Only need small amounts (micro or milligrams).
- Two types of micronutrients:

1) Vitamins (0 Calories per gram)

- Vitamins ***regulate chemical reactions*** (e.g. metabolic processes, growth & repair, blood clotting, antioxidants, etc.)
- Grouped according to chemical makeup (molecular compounds)
    - A, B, C, D, E, K, thiamine & riboflavin.
- Vitamin D is the only one our body can make when exposed to sunlight. All others must be consumed in our diet.

Vitamin deficiencies:

- May cause cellular reactions to stop altogether.
    - E.g. rickets, & scurvy

2) Minerals (0 Calories per gram)

- Assist in **carrying out vital bodily functions** (e.g. carry oxygen, muscular contractions, maintaining fluid balance, build strong bones, etc.)
- Most are found on the periodic table of elements and enter our diet through water and topsoil (veggies absorb these from the earth)!

Seven key minerals:

- Calcium (Ca),
- Phosphorus (P),
- Magnesium (Mg),
- Sodium (Na),
- Potassium (K),
- Chloride (Cl),
- Sulfur (S).

Three "trace" minerals (require < 100 mg per day)

- Iron (Fe),
- Manganese (Mn),
- Zinc (Zn)

Water

- Neither a macro- or micronutrient yet most essential for life.
- Assists with carrying nutrients, digestion & excretion.
- Should consume up to 2 litres per day.