Al Ameed University
College of Nursing
Subject: Nutrition and diet therapy
Stage: Third
Lecture: 4

Lipids

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Learning objectives

At the end of this lecture, the student should be able to:

1. Define concepts.
2. Identify the functions of lipids
3. Compare between saturated and unsaturated fat.
4. Differentiate between essential and nonessential fatty acids.
5. Discuss the sources of different types of fat.

Lipids

- **Lipids (fats)** are organic compounds that are insoluble in water but soluble in organic solvents such as ether and alcohol.
- They are composed of the same elements as carbohydrates(carbon, hydrogen, and oxygen) but have a higher hydrogen concentration
- **Fatty acids** are the basic structural units of most lipids.
- There are three classes of lipids ;**phospholipids, cholesterol** and **triglycerides**

FATS

Trans Fats

- Hydrogenated vegetable oils
- Fast foods
- Cakes/pastries
- Chocolate
- Deep Fried Food

Saturated Fats

Vegetable Fats

- Coconut
- Palm oil
- 3-in-1 & 2-in-1 beverages, creamer, condensed milk

Animal Fats

- Poultry skin
- Fatty meat
- Butter
- Ghee
- Tallow / lard
- Full cream dairy products

Unsaturated Fats

Polyunsaturated

- Corn oil
- Soybean oil
- Sunflower oil
- Seeds
- Cold-water fish

Monounsaturated

- Olive oil
- Canola oil
- Peanut oil
- Sesame oil
- Avocado
- Most nuts

Classification and Sources

- Fatty acids are described as **saturated**, **unsaturated and trans**

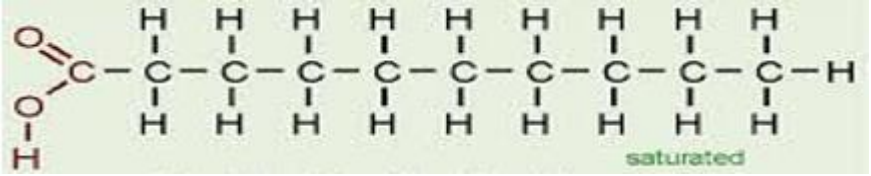
1. **Saturated fatty acids** are those in which all carbon atoms are filled to capacity (i.e., saturated) with hydrogen; an example is butyric acid, found in butter.

❖Usually soiled at room temperature.

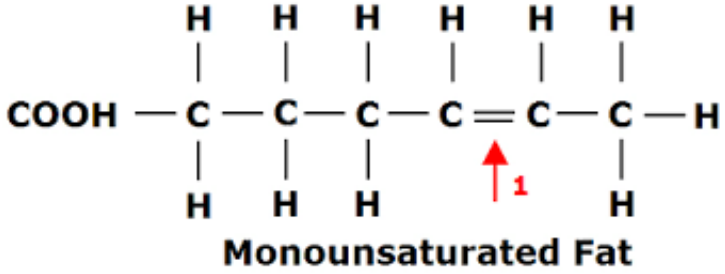
❖In general, animal food contains more saturated fatty acid than unsaturated.

❖Example: meat, poultry, egg yolks, whole milk, cheese, butter, coconut, palm oil

❖ Saturated fat is implicated in raising LDL cholesterol and raises the risk of heart disease



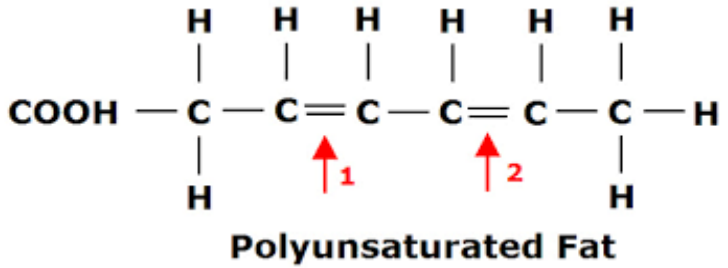
Classification and Sources



2. An unsaturated fatty acid has at least two carbon atoms that are not attached to a hydrogen atom; instead, there is a double bond between the two carbon atoms.

- Are liquid at room temperature. And it's beneficial to health.
- Fatty acids with one double bond are called **a. monounsaturated fatty acids**
- **Sources of monounsaturated fats**: Olive oil, peanut oil and avocados.

Classification and Sources



b. Poly unsaturated fatty acids are those with more than one double bond (or many carbons not bonded to a hydrogen atom)

Sources of polyunsaturated fatty acids:

- Oil fish (e.g. salmon –tuna – sardine)
- Sunflower oil, Corn oil, Soybean oil, Cotton seed oil, Sesame seed oil and Nuts
- Poly unsaturated fat from fish known as **omega 3-6-9** may help in preventing heart disease by lowering blood cholesterol and also may help in reducing the symptoms of arthritis, other joint problems and certain skin diseases.

Classification and Sources

3-Trans fat

- The majority of trans fats are formed when liquid oils are made into solid fats like hard margarine.
- Trans fat is made when hydrogen is added to an unsaturated fat such as vegetable oil, in a process called hydrogenation.
- Hydrogenation increases the shelf life of products containing these fats.

Classification and Sources

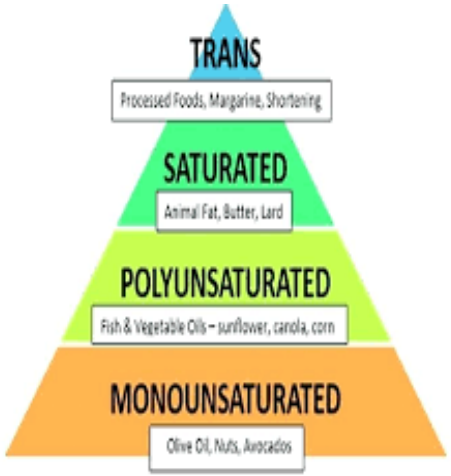
Sources of Trans fat

1. Found in deep fried foods.

2. Cakes, cookies, margarine, meat and dairy products.

3. Partially hydrogenated oils are the main dietary source of trans fats.

- **Trans fat risks**: Trans fats, like saturated fats, can increase the LDL blood cholesterol levels and increase the risk of heart disease.



Essential fatty acids

the body can make all except two **linoleic** and **linolenic acids**. These two acids must be supplied by the diet.

1. **Linoleic acid sources**: Sunflower, corn and soybean oils.
2. **Linolenic acid sources**: Soybean, walnuts and salmon.

- Based on their chemical structure, **lipids are classified** as **simple** or **compound.**
- **Glycerol**, the simple lipids, are the most common form of lipids.
- **Phospholipids** consist of glycerol molecule + 2 fatty acid chains + phosphate group, it is a principal component of cellular membrane
- **Triglycerides** (which have glycerol + 3 fatty acids) account for more than 90 % of the lipids in food and in the body.

Cholesterol is a fat-like substance that is both produced by the body and found in foods of animal origin. Most of the body's cholesterol is synthesized in the liver; however, some is absorbed from the diet (e.g., from milk, egg yolk, and organ meats).

- Cholesterol is needed to create bile acids and to synthesize steroid hormones.
- Along with phospholipids, large quantities of cholesterol are present in cell membranes as well as other cell structures.

Functions of Lipids

Lipids are stored in the body as adipose tissue. This tissue performs many essential tasks, as follows:

1. Provide 60% of energy needs at rest.
2. Thermal insulates for human body against extreme temperatures.
3. Protects against shock by providing a cushion for bones and vital organs.
4. helps to maintain cell membranes and aids in the absorption of vitamins A, D, E and K.
5. As a food ingredient, fat provides flavor. consistency, stability and satiety.

Lipid Digestion

- Although chemical digestion of lipids begins in the stomach, they are digested mainly in the small intestine, primarily by bile, pancreatic lipase, and enteric lipase, an intestinal enzyme.
- The end products of lipid digestion are glycerol, fatty acids, and cholesterol.
- For these reassembled products to be transported and used, the small intestine and the liver must convert them into soluble compounds called **lipoproteins.**

Lipids Metabolism

- Converting fat into usable energy occurs through the use of the enzyme hormone-sensitive lipase, which breaks down triglycerides in adipose cells, releasing glycerol and fatty acids into the blood.
- Only the glycerol molecules in fat can be converted to glucose.

Lipoprotein

Cholesterol and other fats cannot be dissolved in blood so bind with protein in order to transport to and from cells by special carriers called lipoprotein there are several kinds:

- Low-density Lipoprotein (LDL)
- High-density Lipoprotein (HDL)
- Very Low-density Lipoprotein (VLDL)

Low Density Lipoprotein (LDL)

- Low-density lipoprotein is the major cholesterol carrier in the blood
- If too much LDL cholesterol circulation in the blood it can slowly build up in the walls of arteries feeding the heart and brain. Together with other substances, it can form plaque a thick, hard deposit that can clot these arteries this condition is called (**atherosclerosis**).
- High level of LDL cholesterol. (160 mg\dl and above) reflects an increased risk of heart disease.
- LDL cholesterol is called **bad cholesterol**.

High Density Lipoprotein (HDL)

- About one-third to one-fourth of blood cholesterol is carried by HDL.
- Medical experts think HDL tends to carry cholesterol away from arteries and back to the liver where it's passed from the body.
- Some expert believe HDL remove excess cholesterol from the plaques and thus slow their growth.
- HDL is known as a **good cholesterol**. because a high level of seems to protect against heart attack.
- Low HDL level (less than 40 mg\dl in men and less than 50mg\dl in women). May raise stroke risk.