Tishk International University
Faculty of Applied Science
Department of Nutrition and Dietetics

Nutritional Biochemistry I/ NUT 207

TOPIC: Energy requirements of individuals

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Objectives

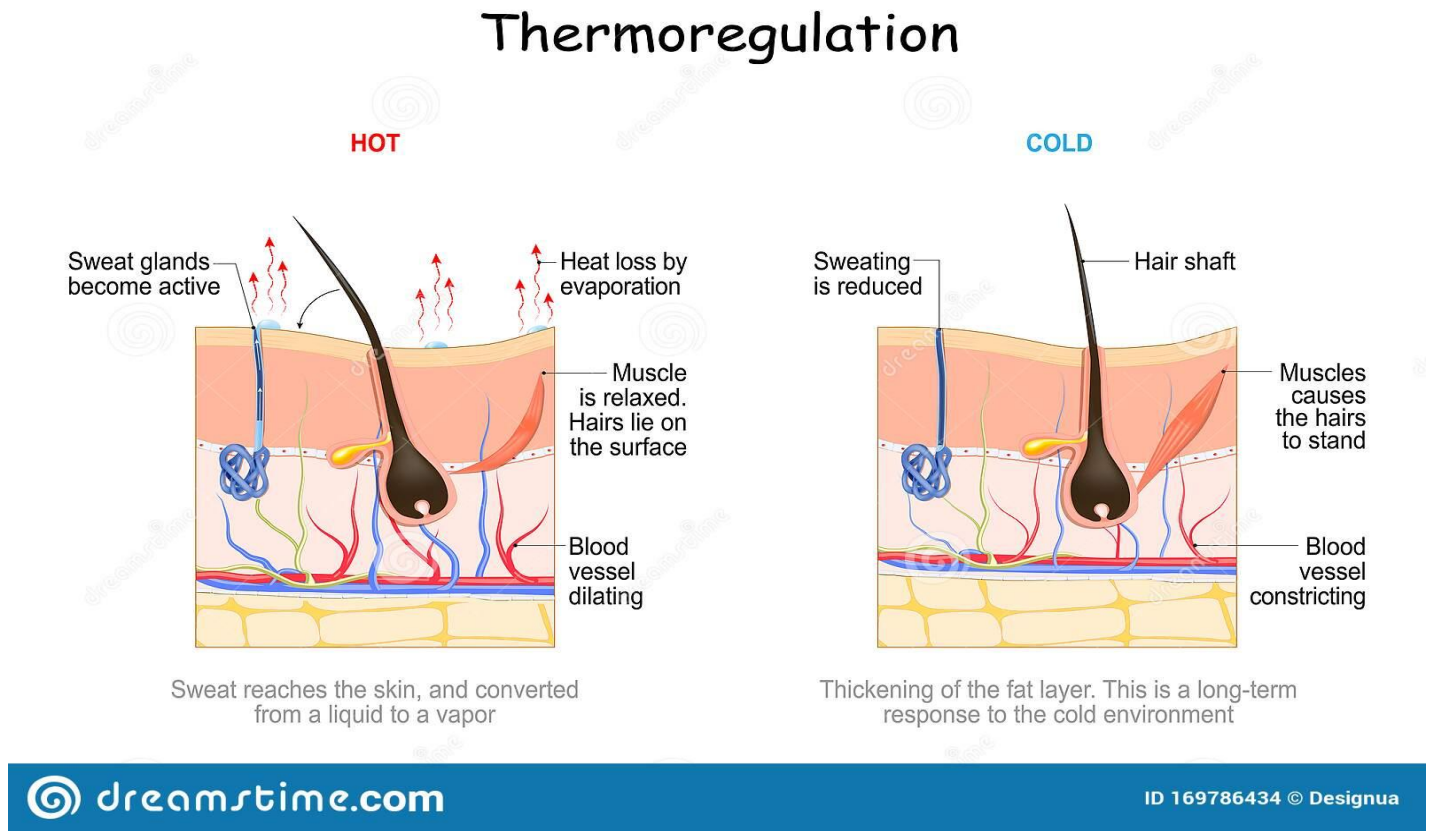
- Regulation of body temperature
- Classes of nutrients
- Nutrient requirements

Regulation of body temperature

- The ability to keep the body temperature within certain limits despite changes in external environment is called *thermoregulation*.
- There may be differences in the heat production and heat loss in different parts of the body.
- The circulating blood helps to bring it to a mean temperature.

Thermoregulation ways:

- Physiological regulation
- Behavioral regulation



Some variations observed in body temperature in relation to food are:

- Specific food intake - may cause increase or decrease in body temperature.
- Alcohol intake - produces a fall in body temperature.

Classes of nutrients

- There are 5 classes of nutrients that contribute to an adequate diet.
- These are divided into :
  - Macronutrients
  - Micronutrients

Macronutrients

- These are proteins, fats and carbohydrates.
- They form the main bulk of food.
- According to the dietary pattern, they contribute to the total energy intake as the following proportions;

Proteins	7 – 15 %
Fats	35 – 45 %
Carbohydrates	50 – 70 %

Cont.

- Protein, fat and carbohydrates are sometimes referred to as proximate principle.
- They are oxidized in the body to yield energy, which the body needs.
- Primary function of protein is to provide essential and non-essential amino acids for building of body proteins.
- Fats are concentrated source of energy, provide essential fatty acids which have a vitamin like function in the body.

Water

- Is the solvent of the body and transport vehicle for distributing nutrients to the tissues.

- Water, although is not a nutrient by definition, is of course required to replace the water lost in the urine, breath and sweat.

Fiber

- Also is not a nutrient but it is considered as a necessary food component.

Micronutrients

- These are vitamins and minerals.
- They are required in small amounts which may vary from a microgram to several grams.
- Vitamins and minerals play an important role in the regulation of the metabolic activity in the body and help in the utilization of proteins, fats and carbohydrates.
- Minerals are also used for the formation of body structure and skeleton.

Role of macronutrients

Carbohydrate:

1. Available or digestible carbohydrate
2. Unavailable or indigestible carbohydrate

Carbohydrate requirement

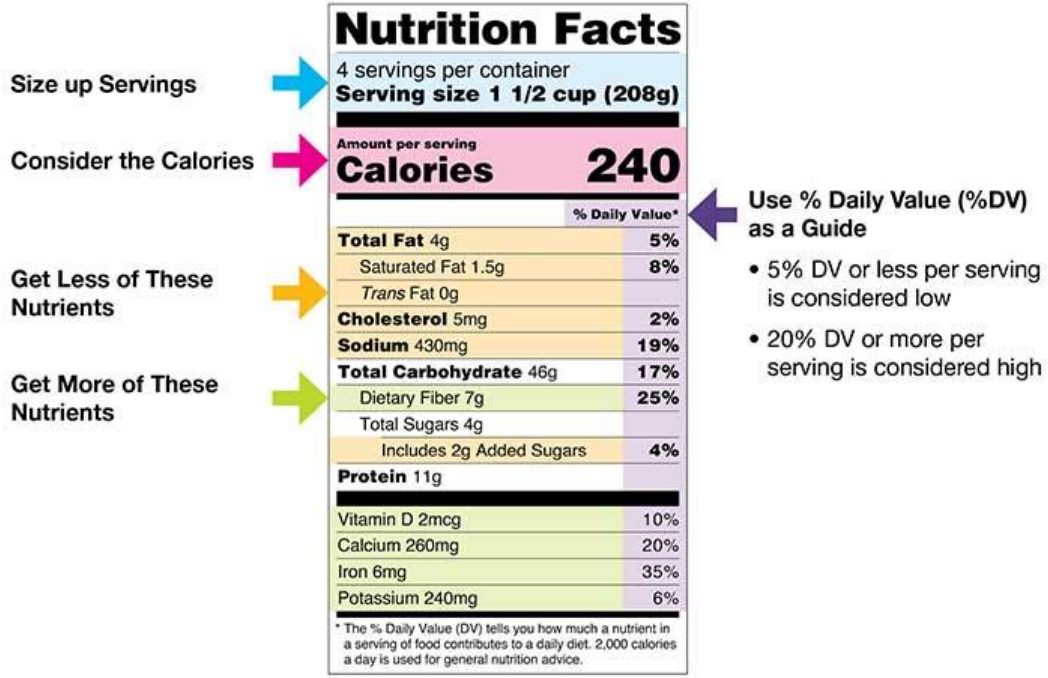
- The recommended intake of carbohydrate in balanced diet is placed so as to contribute between 50 – 70 % of total energy intake.

Dietary fiber

Is the name given collectively to indigestible carbohydrates present in foods.

These carbs. consist of:

- Cellulose
- Pectin
- Gums
- Mucilage



Importance of fiber

- Water – holding capacity: the dietary fibers have a property of holding water and swell like sponge with a concomitant increase in viscosity.
- Adsorption of organic molecules: the organic molecules like bile acids, neutral sterols, carcinogens and toxic compounds can be adsorbed on dietary fiber and facilitates its excretion.

Cont.

- Hypoglycemic effect of fiber:

The gum present in fenugreek seeds (it contains 40 % gum) is most effective in reducing blood sugar and cholesterol levels.

- Hypocholesterolemic effects of fiber:

Fiber has cholesterol lowering effect. Fiber binds bile acids and cholesterol, increasing their fecal exertion and thus decreasing plasma and tissue CHO. level.

Significance of dietary fiber in medicine:

High fiber diet reduces the risk of:

- Coronary heart disease (CHD)
- Colon cancer
- Diabetes
- Diverticulosis
- Hemorrhoids (piles)

Activities of dietary fiber along the entire GI tract

Sites	Activity
Mouth	Stimulates saliva secretion
Stomach	Delays gastric emptying
Small intestine	Delays absorption
Large intestine	Traps water and binds cations

Adverse effect of dietary fiber

- Dietary fiber binds some mineral elements and prevents their absorption.
- Thus, high dietary fiber intake may lead to deficiency of mineral elements.

Fats

Dietary fats are high energy yielding nutrients that provide 35 to 45 % of the caloric intake.

- Fat yields 9 kcal/g.

➔ Besides satisfying metabolic energy needs

There are two essential functions of dietary fat.

1. A vehicle for the absorption of the fat soluble vitamins.
2. To supply essential fatty acids, linoleic acid and linolenic acid to the body.

Dietary lipid also increases the palatability of food and produces a feeling of satiety.

Fat requirement:

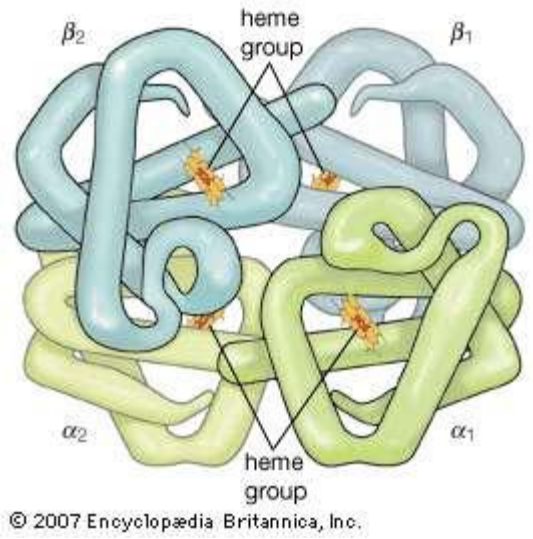
- ✓ The daily requirement of fat is not known with certainty.
- ✓ During infancy, fats contribute to a little over 50 % of the total energy intake.
- ✓ This scales down to about 20 % in adulthood.
- ✓ The CMR expert group has recommended an intake of 20 % of the total energy intake as fat of which at least 50 % of fat intake should consist of vegetable oils rich in essential fatty acids.

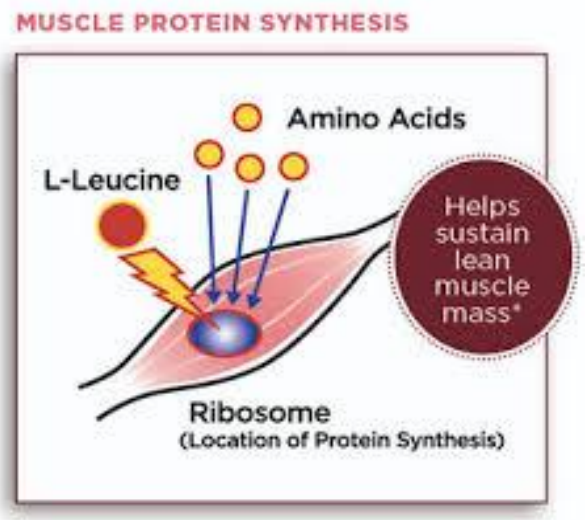
Protein and amino acids

- Proteins are important consistent of tissues and cells of the body.
- They form the important component of muscle and other tissues and vital body fluids like blood.
- Proteins that are in the form of enzymes and hormones are concerned with wide range of vital metabolic processes in the body.
- Protein as antibodies helps the body to defend against infections.

- Proteins supply essential and non- essential amino acids for the synthesis of protein and nitrogen for the synthesis of several key compounds such as neurotransmitter and heme.

- The amino acids which are not used for protein synthesis, are broken down to provide energy which is a wasteful way of using proteins.





Essential amino acids

- ✓ Any amino acid that humans either cannot synthesize or are unable to synthesize in adequate quantity is termed *"essential".*

  And rest of the amino acids are called "*non- essential"* as they can be formed in the body.

- ✓ An essential amino acid must be provided in the diet.
- ✓ Deficiency of an essential amino acid impairs protein synthesis and generally causes NEGATIVE NITROGEN BALANCE.

A **negative nitrogen balance** indicates **insufficient PROTEIN** intake (due to illness, malnutrition, or aging).

It means the patient is using protein faster than it is being synthesized.

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