Energy
Units of Energy

- The unit of energy, which has been in use in nutrition for a long time, is Kilocalories (kcal).

- However, recently the International Union of Sciences and International Union of Nutritional Sciences (IUNS) have adopted Joule as the unit of energy in the place of kcal.

- Kilo calories (kcal) is defined as the heat required to raise the temperature of one kg of water by 1°C from 14.5°C to 15.5°C.
• The unit kcal is still popularly used. Both units are used in defining human energy requirement.

• The relationship between the two units of energy is as follows:

    \[ 1 \text{ kcal} = 4.184 \text{ KJ (Kilojoule)} \]

    \[ 1 \text{ KJ} = 0.239 \text{ kcal} \]

    \[ 1000 \text{ kcal} = 4184 \text{ KJ} = 4.18 \text{ MJ (Mega joule)} \]

    \[ 1 \text{ MJ} = 239 \text{ kcal} \]
Energy Requirement

The energy requirement of an individual is defined as follows:

- The level of energy intake from food that balances energy expenditure

- When the individual has a body size and composition and level of physical activity, consistent with long-term good health, also allowing for maintenance of economically essential and socially desirable activity.
• In children and pregnant and lactating women, it includes the energy needs associated with the deposition of tissues or secretion of milk at rates consistent with good health.

• For healthy and well nourished adults, it is equivalent to total energy expenditure (TEE).
Energy requirement and its components

- Basal metabolism
- Metabolic response to food
- Physical activity
- Growth
- Pregnancy
- Lactation
Basal metabolic rate (BMR)

BMR is the amount of energy expended while at rest in a neutrally temperate environment, in the post-absorptive state (meaning that the digestive system is inactive, which requires about twelve hours of fasting)
Metabolic response to food

• Eating requires energy for the ingestion and digestion of food and for the absorption, transport, interconversion, oxidation and deposition of nutrients.

• This metabolic processes increases heat production and oxygen consumption and are known by the term such as dietary induced thermogenesis
Physical activity

- **Physical activity Level (PAL):** is defined as the total energy required over 24hrs divided by the energy needed for basal metabolism over 24hrs

- **Physical activity ratio (PAR):** the energy cost of an activity per unit of time (usually a min or hour) expressed as a multiple of BMR
Growth

The energy cost of growth has two components

a) The energy needed to synthesize growing tissues
b) The energy deposited in these tissues
The energy cost of growth is about 35% of total energy requirement during the first three months of age and falls rapidly 5% by 12 months and 3% in the second year, remains 1-2% until mid adolescence and is negligible in the last teens.
Pregnancy

• During pregnancy extra energy is needed for the growth of the foetus, placenta and various maternal tissues, such as uterus, breasts and fat stores
Lactation

The energy cost of lactation has two components
1. The energy content of the milk secreted
2. The energy required to produce that milk

Well nourished lactating women can derive part of this additional requirement from body fat stores accumulated during pregnancy

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