agMOOCs

Energy-2

Prof. V. Vijaya Lakshmi
(PJTSAU, Hyderabad)

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Welcome back. In the last class we have seen the energy, the sources of energy, how the energy is converted and what is the amount of energy, amount of the nutrients that are required for providing energy. So but how is this energy measured. Let us see what are the units of energy.

The unit of energy which has been used in nutrition for a long time is kilocalories. So, however recently the International Union of Sciences, the International Union of Nutritional Sciences both together have adopted Joule as the unit of energy in place of kilocalories and this kilocalories is defined as the heat required to raise the temperature of 1 kg of water by one degree centigrade. That is from 14.5 to 15.5 degrees centigrade.

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 kilocalories is still popularly known and both units are used for defining the human energy requirement. Now what is the relationship between these two? Why both cannot be used together? So one kilo calorie is equal to 4.184 kilo joules and one kilo Joule is equal to 0.239 kilocalories. Therefore 1000 kilocalorie is equal to 4184 kilo joules or 4.18 mega joules and one mega joule is 239 kilocalories.

- 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:

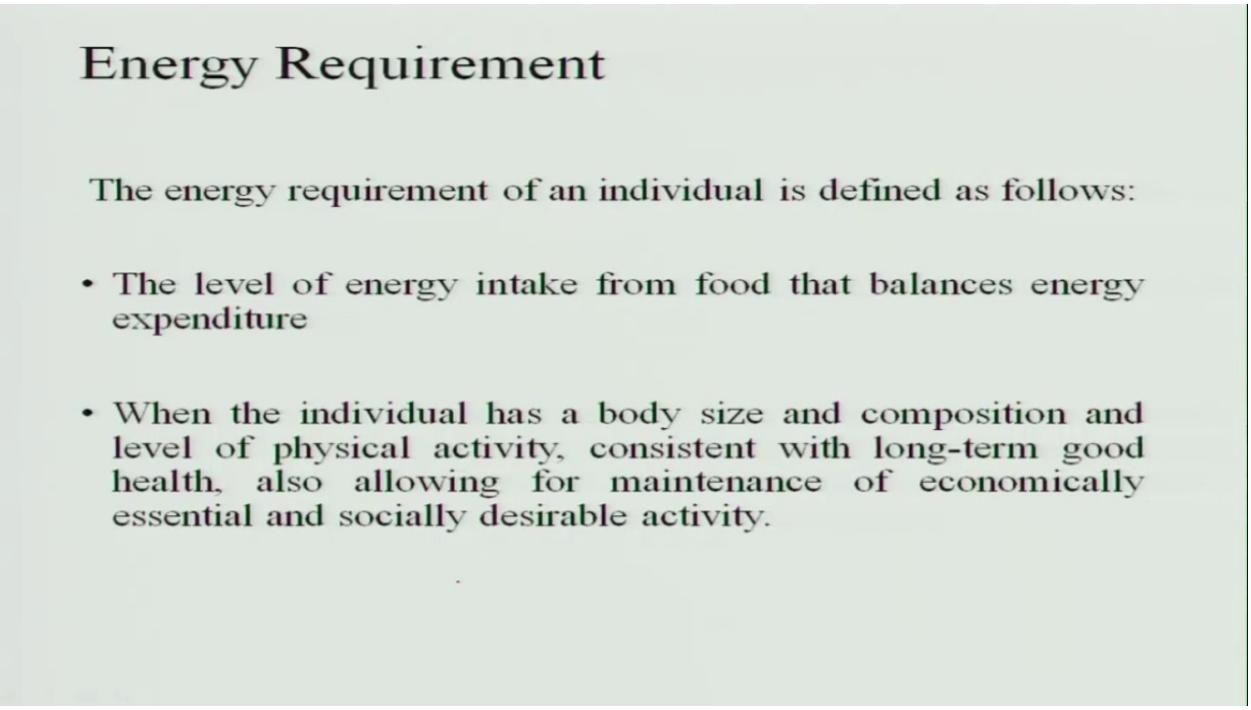
1 kcal = 4.184 KJ (Kilojoule)

1KJ = 0.239 kcal

1000 kcal = 4184 KJ = 4.18 MJ (Mega joule)

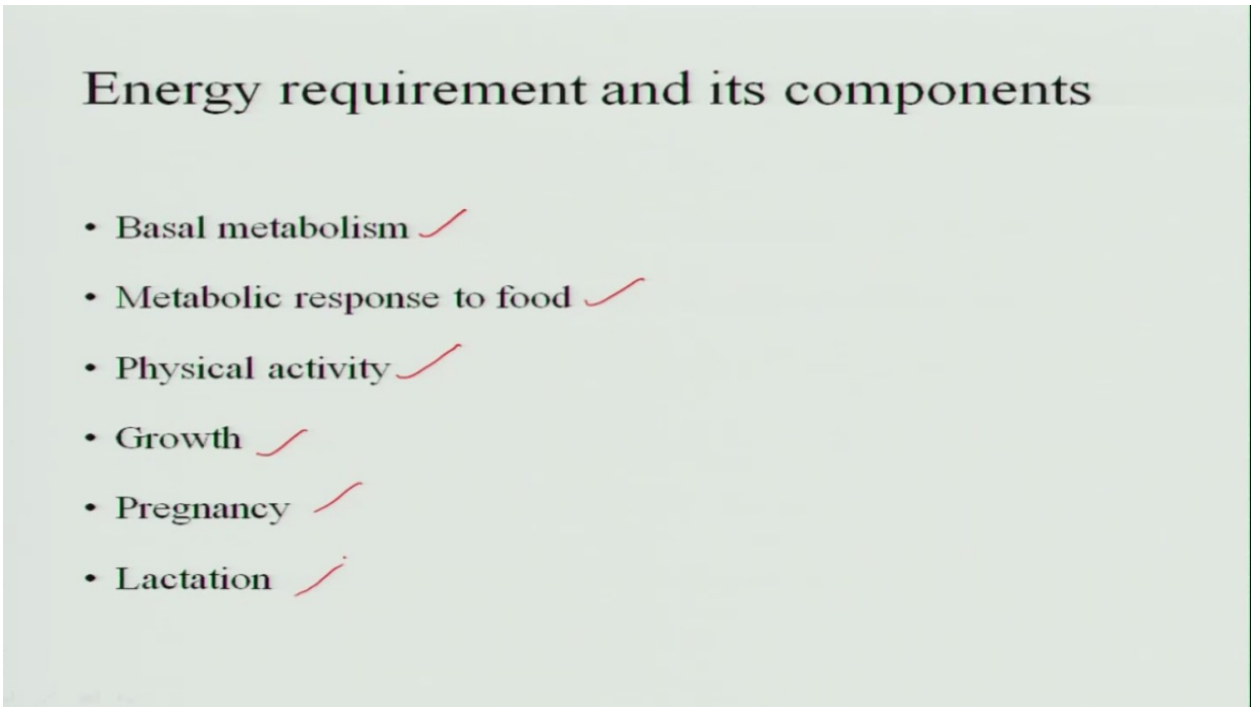
1 MJ = 239 kcal

Now energy requirement by an individual is defined as follow. The level of energy intake from the food that balances the energy expenditure is the energy requirement. So the energy input is equal to the energy output. So when an individual has a body size and composition the level of physical activity consistent with long-term good health, allowing for maintenance of economically essential and socially desirable activity is the energy balance.

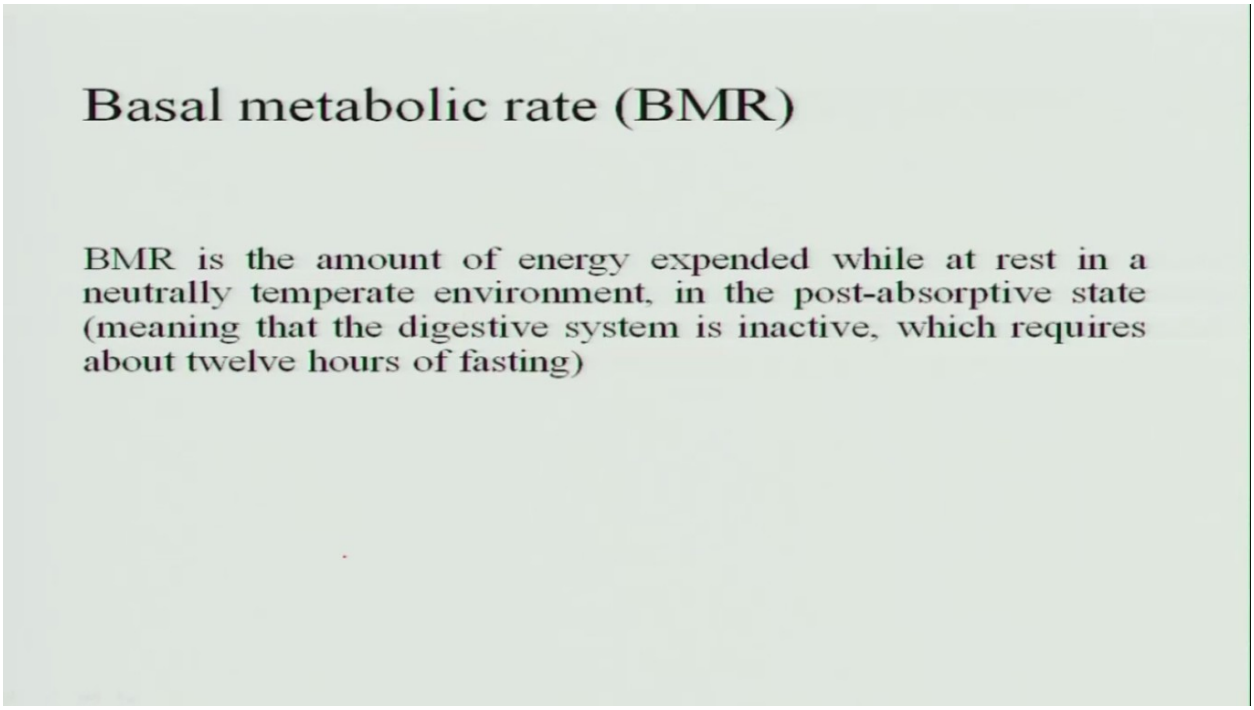


Now in children and pregnant women and lactating women it includes the energy needs associated with the deposition of tissues or for secretion of milk in case of lactating women at the rate consistent with good health for the infant. And for healthy and well nourished adults it is equivalent to the energy expenditure.

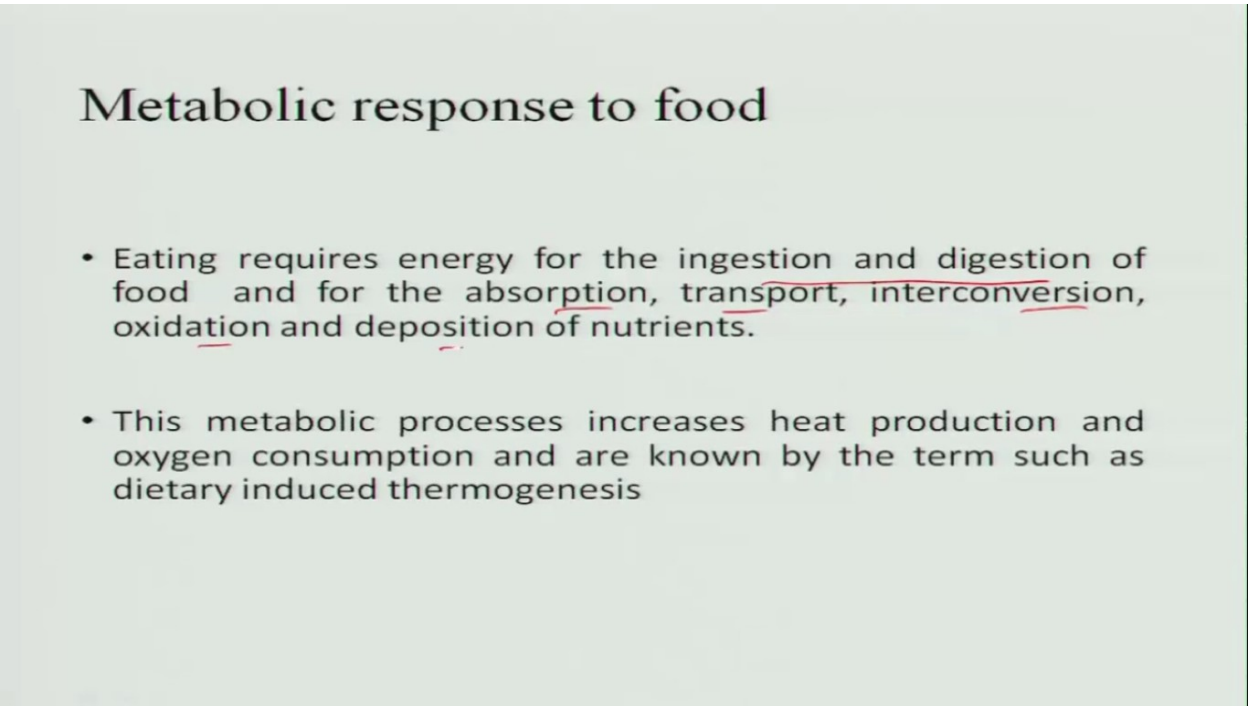
Now energy requirements and its components what are the various components that are involved into estimating the energy requirement. One is the basal metabolism. The metabolic response to food and physical activity, growth, pregnancy and lactation. So all these components are taken into account when the energy requirement is estimated for an individual.



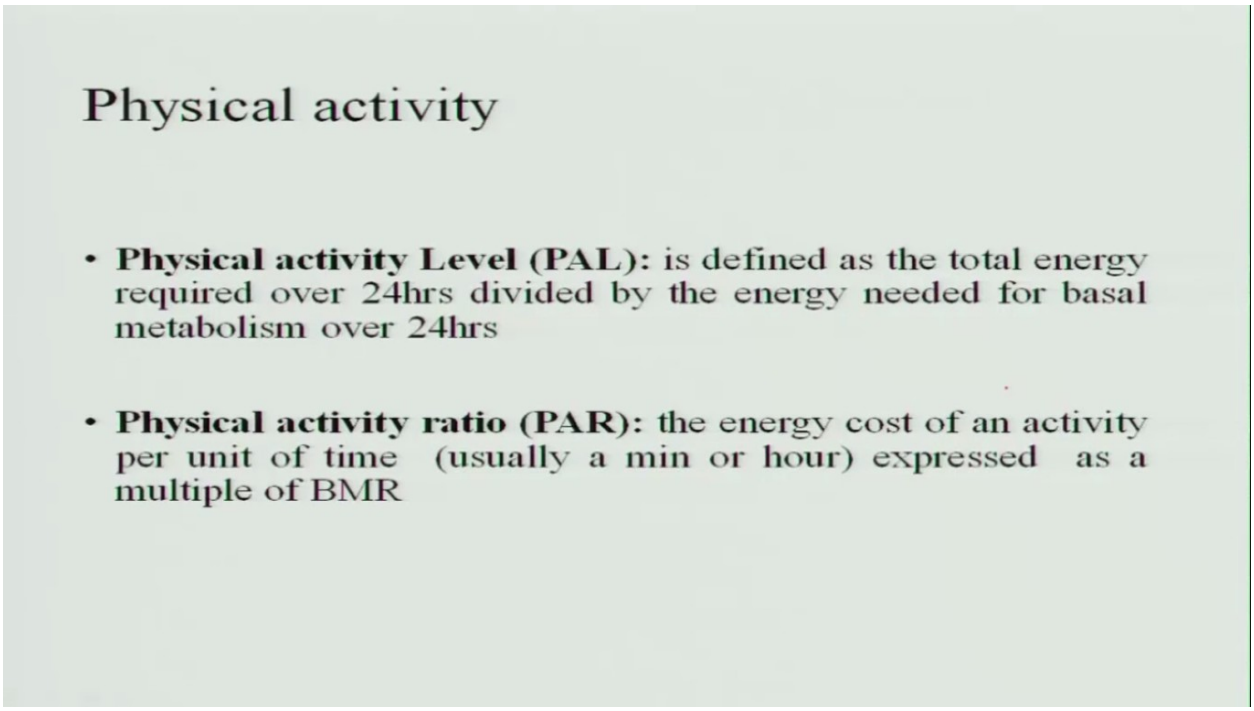
What is basal metabolic rate? It is the amount of energy that is expended while the body is at rest in a neutrally temperate environment and post absorptive state that is the digestive system is at rest or inactive for almost 12 hours of fasting. So that is called as basal metabolic rate except the vital activities are carried out.



Now metabolic response to force eating requires energy for ingestion. We also require some energy for eating and digestion of food, for absorption, transport, interconversion, oxidation, and deposition of nutrients; all these activities require energy and these metabolic processes increases the heat production and oxygen consumption. So these are known as the dietary induced thermogenesis.



Now physical activity. You have the physical activity level which is defined as the total energy required over 24 hours divided by the energy for basal metabolism for 24 hours. That means the active state when compared to the inactive state in the body. Then physical activity ratio is the energy cost of an activity per unit time that is it can be usually per minute or per our and express as multiple of BMR.



And the energy cost of growth has two components one is the energy needed to synthesize the growing tissues and the energy deposited in these tissues. These are the two components of growth. Now energy cost of growth is about 35% of the total energy requirement during the first three months of age because the growth is very high during the infancy and gradually it falls to 5% by the 12 months of age and three months in the second year and remains 1 to 2% only for the mid adolescence and is negligible in the last teens and adulthood.

Growth

The energy cost of growth has two components

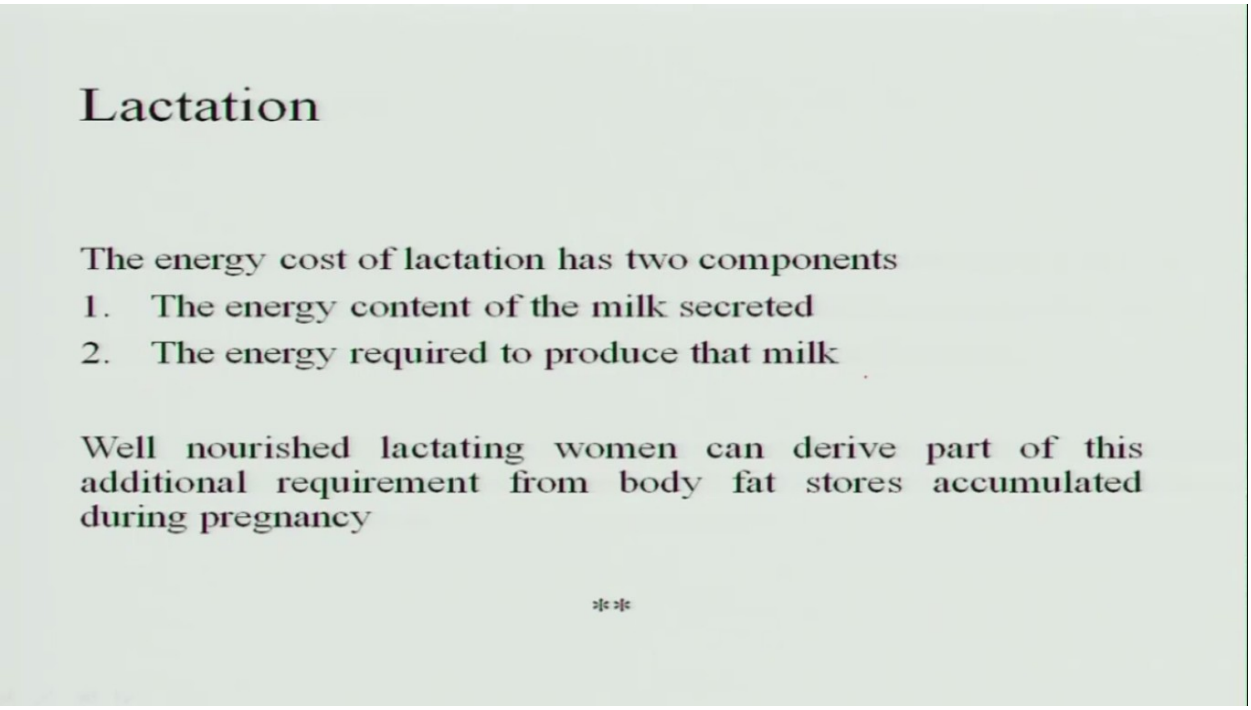
a) The energy needed to synthesis growing tissues
b) The energy deposited in these tissues

And during pregnancy extra energy is required for the growth of the foetus, placenta and various maternal tissues like the uterus, breasts, and fat stores. So that is why the energy requirement is more during pregnancy.

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

And lactation the energy costs of lactation again has two components one is for the milk that is secreted and the energy required to produce that milk. So milk production and secretion also requires energy. So these two components are calculated and the energy requirement for lactation is increased. So a well-nourished lactating women can derive part of this additional requirement from the body stores which are accumulated during pregnancy.



Therefore, the energy requirement can be calculated taking various factors into consideration and the energy that is required for growth also is considered to decide the energy requirement of an individual.

Thank you.