

Energy

Energy is the body's ability to do work. Everything the body does requires energy. Our body gets the energy it needs from food through a process called metabolism. The amount of energy obtained from a food depends on the nutrients it contains. Proteins, fats and carbohydrates are all good sources of energy.

Measuring energy

The amount of energy a food provides for the body is measured in kilocalories (kcal) or kilojoules (KJ).

Energy content of food

1g of protein	4 kcal/17 KJ
1g of carbohydrate	4 kcal/17 KJ
1g of fat	9 kcal/17 KJ

Ideally, 50% of our energy intake should come from carbohydrates, 35% from fats and 15% from proteins.

The role of energy in the body

Energy is needed for:

Physical activities, such as swimming, running and standing.

Growth, especially among toddlers, children and adolescents, as they are undergoing rapid growth spurts. Pregnant women also require extra energy to support the demands of their developing foetus.

Heat generation to maintain the body at a constant temperature of 37°C.

Functioning of internal organs, e.g., the heart.

Cellular activity, e.g., for nerve cells to transmit nerve impulses to and from the brain.

Basal metabolic rate (BMR)

Metabolism is the process through which the body converts the food we eat into energy. This energy is used to maintain bodily functions including breathing, blood circulation, controlling body temperature, cell growth and nerve impulses.

Basal metabolic rate (BMR) is the minimum amount of energy (kilocalories) required to maintain body functions when at rest. BMR differs from person to person. On average, an hourly BMR rate is 70 kcal for adult males and 60 kcal for adult females.

BMR accounts for 60-65% of the kilocalories burned every day.

It is measured when a person:

Is warm.

Is at complete physical and mental rest.

Has been fasting for at least 12 hours.

Factors that determine energy requirements/ BMR

Age: energy requirements gradually rise through childhood and adolescence due to growth spurts and increases in body size. Activity levels are high at this life stage, so additional energy is needed. With increasing age people's energy requirements gradually decline, as individuals stop growing and generally become less active.

Occupation: the more physically active a person's occupation the more energy is required, e.g., an active body builder requires more energy than a sedentary office worker.

Climate: a cold climate causes the body to require more energy to keep body temperature constant at 37°C. Less energy is required in warmer climates.

Activity level: the more active a person, the more energy is required, e.g., a person who runs for leisure requires more energy than a person who paints.

Health status: during times of illness, convalescents require less energy due to a lack of physical exercise.

Pregnancy/lactation: women require more energy during pregnancy to allow the developing foetus to grow. Extra energy is also required during lactation for milk production.

Gender: generally, males require more energy than females due to different body compositions. Men have a higher proportion of muscle and less body fat than women. This extra muscle requires more energy to maintain.

Size: generally, the larger the body the higher the energy requirement, as more energy is needed to maintain it, e.g., to control body temperature and to mobilise it.

Average daily energy requirements

Group	Females	Males
Children and young teenagers (5-13 years)	1,400-2,000 kcal	1,400-2,200 kcal
Adolescents (14-18 years)	1,800 kcal (sedentary) 2,000 kcal (active)	2,200 kcal (sedentary) 2,600 kcal (active)
Adults (19-50 years)	1,800 kcal (sedentary) 2,100 kcal (active)	2,000 kcal (sedentary) 2,600 kcal (active)

Older people (50+ years)	1,600 kcal (sedentary) 1,800 kcal (active)	2,000 kcal (sedentary) 2,300 kcal (active)
Pregnant women	2,400 kcal	
Lactating women	2,800 kcal	

Energy balance

All energy intake should balance energy output to maintain weight. This is known as energy balance.

A balanced diet and sufficient exercise is necessary to maintain energy balance. If energy intake exceeds energy output people gain weight, as excess energy is converted to fat and stored as adipose tissue. If energy output exceeds energy intake people lose weight.

Many people in Ireland experience energy imbalance, as their energy intake is higher than their energy output. This is due to a lack of exercise and overconsumption of empty kilocalorie foods that provide energy but have no other nutritional value, e.g., fizzy drinks and biscuits. This has led to an increase in diet-related diseases, e.g., obesity, type 2 diabetes and coronary heart disease.