Introduction to Nutrition

Nutrition

- The science of foods and the nutrients and other substances they contain and of their actions within the body (including ingestion, digestion, absorption, transport, metabolism and excretion).

Foods

- Products derived from plants or animals that can be taken into the body to yield energy and nutrients for the maintenance of life and the growth and repair of tissues.

Diet

- The diet of an organism is what it eats, and is largely determined by the perceived palatability of foods.
- Dietitians are health professionals who specialize in human nutrition, meal planning, economics, preparation, and so on. They are trained to provide safe, evidence-based dietary advice and management to individuals (in health and disease), as well as to institutions.

Food Choices

- Personal preference
- Habit
- Ethnic heritage or tradition
- Social interactions
- Availability, convenience and economy

The Nutrients

- Classes of nutrients
- macronutrients
  - energy macronutrients
    - carbohydrates
    - fats
    - proteins
  - other macronutrients
    - fiber
    - water
- micronutrients
  - minerals
  - vitamins

The Nutrients

- The energy yielding nutrients are carbohydrate, fat and protein.

- In contrast to these nutrients, vitamins, minerals, and water do not yield energy in the human body.

The Nutrients

- Energy measured in calories and expressed in 1000-calorie metric units known as kilocalories.
- One calorie is the amount of heat necessary to raise the temperature of 1 gram (kg) of water
- by 1degree centigrade.
- Carbohydrates and proteins provide 17 kJ (4 kcal) of energy per gram, while fats provide 37 kJ (9 kcal) per gram.

The Nutrients

- The vitamins are also organic, but they do not provide energy. Instead they facilitate the release of energy from carbohydrate, fat and protein.

The Nutrients

- The minerals are put together in orderly arrays in such structures as bones and teeth.
- Minerals are also found in the fluids of the body and influence their properties.
- Minerals do not yield energy.

The Nutrients

- Water, indispensable and abundant, provides the environment in which nearly all the body's activities are conducted.
- Water participates in many metabolic reactions and supplies the medium for transporting vital materials to cells and removing waste products away from them.

Diet and Health

- Chronic diseases
  - Heart disease, cancers, strokes, diabetes.

- Within the range set by genetics, a person's choice of diet influences long term health.

Diet and Health

- Diet has no influence on some diseases, but is linked closely to others.

- Personal life choices, such as physical activity and tobacco or alcohol use, also affect health for the better or worse.

RESPIRATORY QUOTIENT

- Respiratory quotient is defined as the ratio of volume of carbon dioxide produced in lungs to the oxygen consumed in lungs .
- RQ of carbohydrates is 1
- RQ of fats is 0.7
- RQ of proteins is 0.8
- For a mixed diet it is between 0.7 and 1
- When the rate of utilization of fats increases in relation to carbohydrates , RQ falls

- **ENERGY REQUIREMENTS OF A NORMAL PERSON**
- While calculating the energy requirements, we have to consider the energy required for
- 1 maintenance of basal metabolic rate
- 2 Specific dynamic action or thermogenic effect of food
- 3 Extra energy expenditure for physical activities

- **SPECIFIC DYNAMIC ACTION**
- This refers to the increased heat production or increased metabolic rate following the intake of food (thermogenic effect of food)

- The phenomenon of the extra heat production by the body , over and above the calculated caloric value , when a given food is metabolized by the body is known as specific dynamic action .

- **SDA FOR DIFFERENT FOODS**
- Food containing 25 g of protein ,the heat production from the caloric value is 100 Cal
- (25 x 4 Cal)

However when 25 g of protein is utilized by the body , 130 Cal of heat is liberated.The extra 30 Cal is the SDAof protein

Consumption of 100 Cal of fats result in 113 Cal , when metabolized in the body

100 Cal of carbohydrate is 105 Cal

SDA for proteins fats and carbohydrate are 30 % 13 % and 5 % respectively .

- **SIGNIFICANCE OF SDA**
- The utilization of food by the body, certain amount of energy is consumed from the body stores .
- This is actually an expenditure by the body for the utilization of foodstuffs . It is highest for proteins and lowest for carbohydrates and for a mixed diet around 10 %
- It is therefore essential that an additional 10% calories should be added to the total energy needs towards SDA .

- **MECHANISM OF SDA**
- The exact cause is unknown.
- Generally believed that SDA of food is due to the energy required for digestion,absorption ,transport , metabolism ,and storage of food in the body .
- Intravenous administration of amino acids or the oral ingestion of proteins gives the same SDA.
- This shows that the SDA of protein is not due to their digestion and absorption .
- Hepatectomy abolishes SDA, indicating that SDA is closely related with the metabolic functions of

- Liver.
- The SDA of protein is primarily to meet the energy requirement for deamination ,synthesis of urea, biosynthesis of proteins
- Due to the the high SDA of proteins it keeps us warm and comfortable in cold weather .
- SDA of carbohydrates is for convertion of glucose and glycogen .
- SDA of fats may be due to it,s storage , mobilization , and oxiodation .

- **PHYSICAL ACTIVITY OF THE BODY**
- Physical activity of the individual is highly variable. The amount of energy needed depends mainly on the duration and intensity of muscular activity .

PHYSICAL ACTIVITY	**ENERGY REQUIR**
Sitting	25 Cal / hr
Standing	30
Writing	30
Typing	75
Car driving	60

- Cycling 150
- Running 500
- Swimming 600
- Walking upstairs 800

- ENERGY REQUIREMENTS OF HUMAN BODY
- With light work about 60 % of the calories are spent towards BMR about 30 % for physical activity and about 10 % towards SDA .

- Daily requirement of energy is variable but approx. calorie requirement of adult per day are
- Light work 2,200 – 2,500
- Moderate work 2,500 - 2,900
- Heavy work 2,900 _ 3,500
- Very heavy work 3,500 _ 4,000

PER HOUR

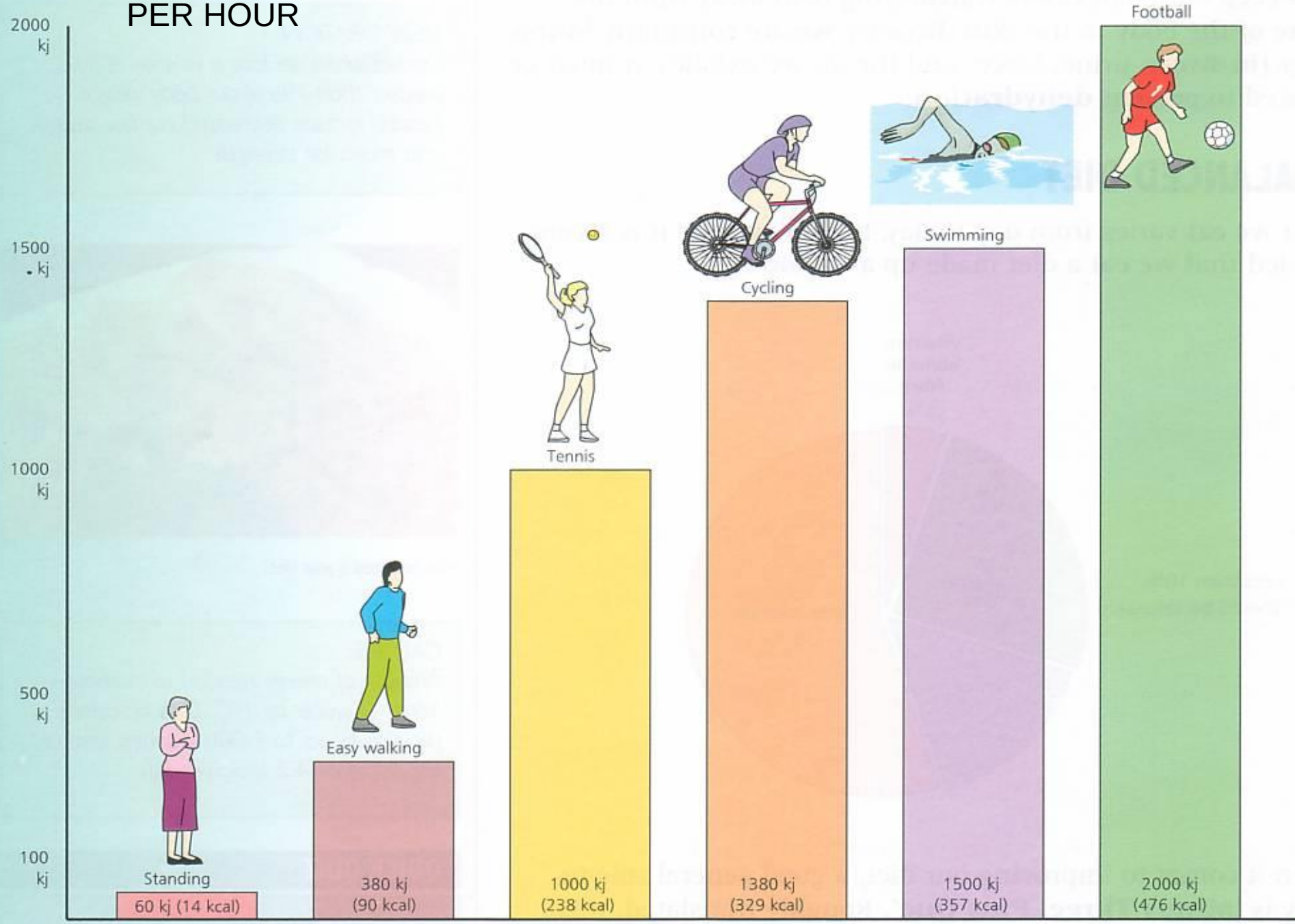
2000 kj
1500 kj
1000 kj
500 kj
100 kj
Standing
60 kj (14 kcal)
Easy walking
380 kj (90 kcal)
Tennis
1000 kj (238 kcal)
Cycling
1380 kj (329 kcal)
Swimming
1500 kj (357 kcal)
Football
2000 kj (476 kcal)

TABLE 23.4 Requirements of essential amino acids

Amino acid	Requirement (mg/kg body weight/day)
Valine	14
Isoleucine	12
Leucine	16
Lysine	12
Methionine*	10
Phenylalanine*	16
Tryptophan	3
Threonine	8

* *Cysteine and tyrosine can, respectively, spare (partly) the requirement of methionine and phenylalanine.*

Males between 15 and 18 need about 2750 calories a day.

Females between 15 and 18 need about 2100 calories a day.

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Vitamins and their function

Vitamin	Function	Found in
A	Helps with vision, keeps tissues healthy	Dairy products, fresh green vegetables, fish oil
B	Helps with growth	Milk, eggs, fish
C	Helps to heal wounds, protects against germs	Oranges, lemons, potatoes, tomatoes
D	Builds up bones and teeth	Dairy products, fish oil
E	Not yet known	Vegetable oils, wholemeal bread, dairy products
K	Helps to clot the blood	Fresh green vegetables, liver

Minerals and their function

Mineral	*Function*	*Found in*
Calcium	Hardens the bones and teeth Used during muscle contraction	Milk, cheese, green vegetables
Zinc	Keeps the skin healthy	Nuts, fish
Iron	Helps produce haemoglobin in red blood cells	Liver, egg yolk, green vegetables
Sodium	Helps the contraction of muscles and the transmission of nerve impulses	Fish, meat, eggs, salt
Potassium	Helps with the contraction of muscles Controls many chemical reactions inside cells	Most foods