

# Composition of Food and Nutritional value



# Introduction

- Food is any nutritious substance that people eat or drink in order to maintain life.
- A variety of food is eaten according to taste, body requirement and availability.
- All living ones whether plant or animal need food for growth, repair and maintenance of body.
- Main components include **water, carbohydrates, proteins, lipids and minerals**
- Foods are derived from plants, carcasses of animals, and single-cell organisms.
- A host of other compounds present in minor quantities - Non-protein nitrogenous compounds, vitamins, colorants, flavor compounds and functional additives



# Nutrient supplied by food

- ▶ six major classes of nutrients supplied by food: **water, carbohydrates, fats, proteins, minerals** and **vitamins**.
- ▶ The nutrient classes can be grouped into two groups namely macronutrients or micronutrients.
- ▶ The macronutrients, needed in large amounts, include carbohydrates, fats, protein and water.
- ▶ The micronutrients, needed in smaller quantities, are minerals and vitamins.



# Body building material

- **Polysaccharides, proteins, and lipids** serve as the **building material** of different structures of the plant and animal tissues used for food.
  - The structures made of these materials are responsible for the form and tensile strength of the tissues, and created the necessary conditions for metabolic processes to occur.
  - These structures plays a crucial biological role in the organisms.
  - Some of the main components, as well as other constituents, are bound to different cell structures or are distributed in soluble form in the tissue fluids.
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# Energy yielding material

## Carbohydrate

- The cheapest source of food.
- Can be readily digested, absorbs and utilized for producing energy.
- The most efficient source of energy.
- Can furnish 50-70% of the total calorie intake. Carbohydrates are almost entirely derived from vegetable sources.
- Main sources: Starch in the granular form in cereals, pulses and tubers and sugars that are present in milk, fruits and vegetables and sucrose.

## Protein

- Oxidation of carbon skeletons of amino acids of proteins furnishes a minor but significant fraction of the daily energy requirement.

## Fat

- Fat (Triglyceride) from plant and animal sources rank close behind carbohydrates as major source of energy. Fat has high fuel value. It has got high capacity to be stored as energy in the body. There is little difference between animal and vegetable fat as a source of energy.

# WATER

- The content of water in various foods ranges from a few percent in dried commodities (dried milk) to 90% in many fruits and vegetables
- about 15% in grains
- 16 to 18% in % in butter
- 20% in honey
- 35% in bread,
- 65% potato and cassava
- 75% in meat and fish
- 90% in many fruits and vegetables

# Carbohydrates

- Carbohydrates are widely distributed in plant and animal tissues.
- The carbohydrates commonly occurring in foods are starch, glucose, fructose, sucrose and lactose. About 50-70 % of energy value in the average diet is provided by carbohydrates.
- They are the cheapest source of energy. Glucose derived by digestion of carbohydrates is stored as glycogen in liver and muscle tissues and used as the main source of energy in the body.
- Hence food must always contain adequate amounts of carbohydrates.

# Carbohydrate content of some important food

Name of food	Carbohydrate g/100g
Cereals and millets (rice, jowar, etc.)	63 – 79
Pulses (Bengal gram, red gram, etc.)	56 – 60
Nuts and oilseeds	10 – 25
Roots and tubers (Potato, tapioca, sweet potato, etc.)	22 – 39
Arrow root flour	85 – 87



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<b>Name of food</b>	<b>Carbohydrate g/100g</b>
Cane sugar	99
Sago	87 – 89
Honey	79 – 80
Jaggery	94 – 95
Milk (fluid)	4 – 5
Dried fruits (Raisin, dates, etc.)	67 – 77
Fresh fruits	10 - 25

# Protein

Food proteins are of two types.

- **Animal origin:** Almost completely utilized if taken alone

Example: meat, milk and eggs

- **Vegetable Protein:** Not completely digested and about 10 to 40% remain unabsorbed and excreted in the faeces.

Example: pea, bean, pulses

- The protein in foods is present mainly as crude protein (i.e., as  $N \times 6.25$ ).
- The nitrogen-to-protein conversion factor (N:P) of 6.25 has been recommended for most plant and animal food products under the assumption that the N content in their proteins is 16% and they do not contain non-protein N.
- The N content in the proteins in various food, however, is different because it depends on the amino acid component of protein compounds, such as free peptides and amino acids, nucleic acids and their the non-protein N may constitute up to 30% of total N.
- In many of these compounds the C:N ratio is similar to the average in amino acids

## Protein contents of different groups of foods

Food groups	Protein content %
Cereals and millets	6.14
Pulses (legumes) dry	18-24
Oilseeds and nuts (except coconut)	18-40
Meat, fish and liver	18-20
Eggs	12-14



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<b>Food groups</b>	<b>Protein content %</b>
Milk (fresh)	3.5-4.0
Milk, dried whole	26-28
Milk, dried, skimmed	33-38
Vegetables, fresh Leafy	1-4
Roots and tubers	1-1.5
Other vegetables	1-7

# Lipids

➤ A group of naturally occurring substances characterized by their insolubility in water and solubility in organic solvents. They occur in plant and animal tissues.

➤ They include simple lipids, compound lipids and derived lipids.

**Simple Lipids:** Esters of fatty acids with various alcohols

Ex: Fats, waxes

**Compound Lipids:** Esters of fatty acids with alcohol and contains additional groups

Ex: Phospholipids, glycolipids, lipoproteins

**Derived Lipids:** Derivatives or hydrolyzed substances

Ex: Fatty acids, glycerol, sterols, terpenes, vitamin A, D, E and K

- Oils and fats serve as the main source of energy
- They also provide the essential fatty acids.
- It provide materials for the synthesis of cholesterol and certain hormones.
- Fat is essential for maintaining good health

## Fat contents of different groups of foods

Food groups	Fat content %
Fruits, vegetables	<1
Lean fish muscle	<1
Oilseeds and nuts (except coconut)	98
Beef ,Meat	6
Egg yolk	32
Milk (fresh)	3.5-4.0
Butter	85

# Minerals

- Minerals are naturally occurring inorganic elements in the soil which are transformed into organic compounds for use and assimilation by the human body.
- Minerals are needed in small amounts but are important for the body's basic growth and structure.
- There are about 25 minerals that are essential to life and are present in the body.
- There are certain major and minor minerals that are nutritionally important.
- Major minerals include calcium, phosphorus, magnesium, sodium, potassium, and chloride. Trace elements include iron, iodine, zinc, selenium, chromium and copper.
- Most of the important minerals are easily supplied in common foods.
- Fruits, vegetables, and cereals are the chief sources of mineral elements in diet.
- Milk products supply the majority of calcium and phosphorus in the diet.

# Mineral compositions in some food (mg/g)

<b>Crop/muscle</b>	<b>Ca</b>	<b>P</b>	<b>Mg</b>	<b>K</b>	<b>Na</b>	<b>Zn</b>	<b>Fe</b>	<b>Cl</b>
Chicken	3.3	214	30.5	294	54.6	0.41	1.0	--
Beef	4.2	216	27	417	55.2	2.92	2.0	
Pork	5.47	176	21.3	283	82.8	5.5	3.0	
<b>Pulses</b>								
Soybean	2.1	4.9	2.1	14	0.06	0.01	0.07	0.06
Peanut	0.6	3.7	1.6	7.1	0.05	0.03	0.02	0.07
<b>Vegetables</b>								
Beet root	0.3	0.5	0.01	3.4	0.9	0.01	0.01	--
Tomato	0.1	0.3	0.2	3.0	0.06	--	0.01	0.6
Green beans	0.5	0.4	0.3	2.6	--	--	--	0.4



# Vitamins

- The vitamins are organic micronutrients, required in only milligram or microgram quantities per day.
- **Classification;** They are classified into water-soluble and fat-soluble. The fat soluble vitamins A, D, E and K have diverse roles. The water soluble vitamins comprise vitamin C and B vitamins namely thiamin, riboflavin, niacin, pyridoxine, cobalamine, folate, pantothenic acid and biotin.
- Most of the B vitamins are essential components of specific coenzymes for enzymes participating in energy metabolism and other specialized activities.
- Vitamins regulate body processes such as energy production, blood clotting and calcium balance. Vitamins help to maintain organs and tissues healthy.

# SOURCES OF FOOD COMPONENTS

Water	Carbo- hydrates	Proteins	Lipds	Minerals	Vitamins
Juices	Sugars	Soybean	Oils	Vegetables	Vegetables
Fruits	Honey	Beans& peas	Lard	Fruits	Fruits
Milk	Cereals	Meat	Milk, Butter, Ghee, Vanaspathy	Meat	Fish liver
Vegetables	Chocolate& sweets	Fish	Chocolate	Fish products	Meat
Jellies	Potato	Wheat	Nuts	Dairy products	Cereals
Lean fish	Cassava	Cheese	Egg yolk	Cereals	Milk
Lean meat	Fruits & Vegetables	Eggs	Pork	Nuts	Yeast



# FUNCTIONS OF FOOD

- The main food components supply the human body with the necessary building material and source of energy, as well as elements and compounds indispensable for metabolism.
  - Some plant polysaccharides are only partly utilized for energy.
  - As dietary fiber they affect, in different ways, various processes in the gastrointestinal tract.
  - The distribution of lipids in food raw materials depends on their role in the living animal and plant organisms.
  - In an animal body, lipids occur primarily as an energy rich store of neutral fat in the subcutaneous adipose tissue; as kidney, as the intramuscular fat.
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- ▶ Many of the minor components originally present in the raw materials are nutritionally essential, such as vitamins.
- ▶ Some of them, although not indispensable, can be utilized by the body, including most free amino acids, or impart desirable sensory properties to food products.
- ▶ Numerous groups, including tocopherols, carotenoids, ascorbic acid, thiols, amines, and several other non-protein nitrogenous compounds serve as endogenous muscle antioxidants, playing an essential role in postmortem changes in meat.
- ▶ A number of compounds are added intentionally during processing, to be used as preservatives, antioxidants, colorants, flavorings, sweeteners, and emulsifying agents, or to fulfill other technological purposes.



# Factors affecting food composition

## (i) Raw Materials

- The content of different components in food raw materials depends on
  - the species and variety of the animal or plant crop;
  - on the conditions of life, and age of the farm harvesting of the plants;
  - on the feeding, conditions of life, and age of the farm animals or
  - the fishing season for fish and marine invertebrates; and
  - on post harvest changes that take place in the crop during storage.

## (ii) Processed Foods

- The composition of processed foods depends on the recipe applied and on changes taking place due to processing and storage.
- These changes are mainly brought about by endogenous and microbial enzymes, active forms of oxygen, heating, chemical treatment, and processing at low or high pH.



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### **(iii) Changes occurring in food due to processing:**

- Leaching of soluble, desirable and undesirable components, such as vitamins, minerals and toxins occurs during washing, blanching and cooking. These are lost in dripping after thawing or due to cooking. Loss of moisture and volatiles occur due to evaporation.
- ❑ During salting, pickling, seasoning, frying or smoking there is leaching of nutrients and absorption of desirable or harmful compounds.
- ❑ Due to enzyme activity, desirable or harmful compounds are formed.
- ❑ Desirable or objectionable products are generated due to interactions of reactive groups induced by heating or chemical treatment, such as flavors or carcinogenic compounds in roasted meats, or trans-fatty acids in hydrogenated fats.
- ❑ Different products of oxidation of food components, mainly of lipids, pigments, and vitamins are also formed.
- ❑ There is a loss of nutrients and deterioration of dried fish due to attacks by flies, mites and beetles.



➔ Thank You.....