BHARATH COLLEGE OF SCIENCE AND MANAGEMENT, THANJAVUR – 05.

DEPARTMENT OF HOTEL MANAGEMENT

FOOD SAFETY AND HYGIENE
16SMBEHM2

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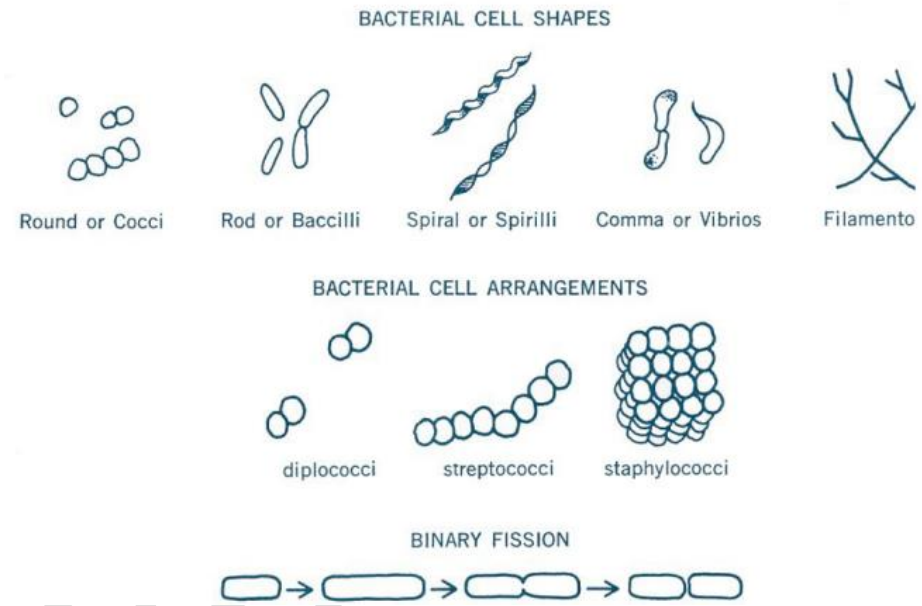
Unit – I

Bacteria

Bacteria make up the largest group of microorganisms. People often think of them only as germs and the harm they do. Actually, only a small number of bacteria types are pathogenic (disease causing). Most are harmless and many are helpful. There are thousands of different kinds of bacteria. Some differ only slightly and it takes a highly trained person to identify them. There are also groups which differ greatly in growth habits and appearance and are quite easily identified. But regardless of minor differences, most bacteria can be classified according to the five basic cell shapes illustrated.

In addition to their different shapes, their cell arrangement varies. For example, some cocci are always grouped in pairs (diplococci).



Others are arranged in chains (streptococci). Still others are bunched (staphylococci). Diplococci are the kind which cause pneumonia. Streptococci are often associated with "strep throat". Staphylococci are familiar to many because of their role in "staph infections" and some types of food poisoning. Bacteria also vary somewhat in size, but average about 1/25,000 inch. In other words, 25,000 bacteria laid side by side would occupy only one inch of space. One cubic inch is big enough to hold nine trillion average size bacteria -- about 3,000 bacteria for every person on earth. Microorganisms, including bacteria, can also be grouped according to their requirement for oxygen. Some

grow only in the presence of oxygen (aerobes). Others grow only in the absence of oxygen (anaerobes). Some are able to grow with or without oxygen (facultative anaerobes). Under natural conditions, anaerobes grow only in places protected from the air, such as deep in the soil or under water. They can also grow under man-made anaerobic conditions, such as in canned or vacuum packed foods which have not been processed or handled properly.

Sugar-Loving Yeasts

Yeasts are small, single-celled plants. They are members of the family fungi (singular, fungus), which also includes mushrooms. Fungi differ from other plants in that they have no chlorophyl. Bacteria thrive on many different types of food. But most yeasts can live only on sugars and starches. From these, they produce carbon dioxide gas and alcohol. Thus, they have been useful to man for centuries in the production of certain foods and beverages. They are responsible for the rising of bread dough and the fermentation of wines, whiskey, brandy and beer. They also play the initial role in the production of vinegar.

Growth and Importance to Food Industry

Some yeasts are psychrophilic and so they can grow at relatively low temperatures. In fact, the fermentation of wines and beer is often carried out at temperatures near 40o F. Because some kinds are psychrophiles, they can create a spoilage problem in meat coolers and other refrigerated storage areas. Unlike bacteria, which multiply by binary fission, yeasts reproduce by a method called budding. A small knob or bud forms on the parent cell, grows and finally separates to become a new yeast dell. Although this is the most common method of reproduction, yeasts also multiply by the formation of spores. Because they can grow under conditions of high salt or sugar content, they can cause the spoilage of certain foods in which bacteria would not grow. Examples are honey, jellies, maple syrup and sweetened condensed milk. Foods produced by the bacterial fermentation process, such as pickles and sauerkraut, can also be spoiled by yeasts which interfere with the normal fermentative process. Certain yeasts are pathogenic. However, yeast infections are much less common than are bacterial infections.

Moisture and Air-Loving Molds

Probably the best known microorganisms, molds are widely distributed in nature and grow under a variety of conditions in which air and moisture are present. They are also plants and a part of the fungi family. Nearly everyone has seen mold growth on damp clothing and old shoes. So, many may find it hard to believe that mold is a microorganism. However, the mold we see with the naked eye is actually a colony of

millions of mold cells growing together. Molds vary in appearance. Some are fluffy and filament-like; others are moist and glossy; still others are slimy. Growth and Importance to Food Industry Unlike bacteria, molds are made up of more than one cell. Vegetative cells sustain the organism by taking in food substances for energy and the production of new cell material. Reproductive cells produce small "seed" cells called spores. Unlike bacterial spores, mold spores are the source of new mold organisms. Bacterial spores generally form only when environmental conditions are unfavorable. Molds produce a stem consisting of several cells. Together, these cells form a "fruiting body". The fruiting body produces the spores, which detach and are carried by air currents and deposited to start new mold colonies whenever conditions are favorable. Mold spores are quite abundant in the air. So, any food allowed to stand in the open soon becomes contaminated with mold if adequate moisture is present. Some types of molds are also psychrophiles and can cause spoilage of refrigerated foods. Molds are important to the food industry. Among their many contributions are the flavor and color they add to cheeses and the making of soy sauce. They also play a role in the making of such chemicals as citric and lactic acid and many enzymes. Molds can also cause problems in foods. Certain kinds can produce poisons called mycotoxins. Mycotoxins have only recently been discovered and little is known about what causes molds to produce them. Probably the best known use of molds is in the drug industry, where they help produce such antibiotics as penicillin.

Growth Factors of Microorganisms

All microorganisms require moisture, a food source, enough time, and suitable temperatures to grow and multiply.

Moisture

Microorganisms are composed of about 80% water which is an essential requirement for microorganisms to grow. Moisture requirements vary for each species of microorganism. In general bacteria need more water than yeasts. Yeasts require more water than molds to grow. If water is not available for microorganisms in a food product, the microorganisms may remain but will not grow and multiply.

Certain components in foods will make water unavailable for microorganisms *(and thus can inhibit growth).*

Salt & Sugar

Salt and sugar added to foods "tie" up water and lower the water activity. When enough salt or sugar is added to a food, the water activity will be lowered to a level that will prevent microorganisms from growing.

- In general, bacterial growth is inhibited by the addition of 5-15% salt. Yeasts and molds can tolerate up to 15% salt.
- To inhibit mold growth, 65-70% sugar must be added. The addition of up to 50% sugar will inhibit bacteria and yeast growth.

Some microorganisms are tolerant of certain conditions.

- Halophilic (salt-liking) microorganisms require salt to be present for the organism to grow.
- Osmiophilic (sugar-liking) microorganisms, usually yeasts, grow best at high concentrations of sugar.
- Xerophilic (dry-liking) microorganisms can grow with limited moisture.

Food

Microorganisms need a source of nutrients to grow and multiply.

Time

Microorganisms need time to grow and multiply. Under favorable conditions (enough moisture and food available with the desired temperature), cell division (reproductive growth) may occur every 20 to 30 minutes. The time for a microbial cell to double is called the *generation time*.

Temperature

Microorganisms grow best within certain temperature ranges. Bacteria are classified into three groups, depending on the temperature at which the bacteria grows best.

- Psychrophilic (cold-liking) bacteria (responsible for food spoilage in refrigerators, grow rapidly at room temp.)
  - Growth range 32-77°F
  - Optimum temperature 68-77°F

- Mesophilic (middle-liking) bacteria
- Growth range 68-110°F
- Optimum temperature 68-113°F
- Thermophilic (heat-liking) bacteria
- Growth range 113-158°F
- Optimum temperature 122-131°F

Other factors affecting growth:

- Varying requirements for Oxygen (aerobic vs. anaerobic bacteria, e.g.)
- pH - acidity or alkalinity (most microorganisms prefer a pH near neutral [pH = 7.0])
- Darkness vs. Light (Ultraviolet light is lethal to microorganisms)

pH

Most bacteria prefer neutral pH (6.5-7.5). 4 Molds and yeast grow in wider pH range, but prefer pH between 5 and 6. 4 Acidity inhibits most microbial growth and is used frequently for food preservation (e.g.: pickling). 4 Alkalinity inhibits microbial growth, but not commonly used for food preservation. 4 Acidic products of bacterial metabolism interfere with growth. Buffers can be used to stabilize pH.

. **Acidophiles**: "Acid loving". u Grow at very low pH (0.1 to 5.4) u Lactobacillus produces lactic acid, tolerates mild acidity. B. **Neutrophiles**: u Grow at pH 5.4 to 8.5. u Includes most human pathogens. C. **Alkaliphiles**: "Alkali loving". u Grow at alkaline or high pH (7 to 12 or higher) u Vibrio cholerae and Alkaligenes faecalis optimal pH 9. u Soil bacterium Agrobacterium grows at pH 12.

Osmotic Pressure : Cells are 80 to 90% water. A. **Hypertonicsolutions**: High osmotic pressure removes water from cell, causing shrinkage of cell membrane (plasmolysis). Used to control spoilage and microbial growth. u Sugar in jelly. u Salt on meat. B. **Hypotonicsolutions**: Low osmotic pressure causes water to enter the cell. In most cases cell wall prevents excessive entry of water. Microbe may lyse or burst if cell wall is weak.

Beneficial Role of Microorganisms in Food Industry

Microorganisms play an important role in food industry. As already discussed in the earlier article **Contributions of Microbiology in Food Industry**, they are used in production of

various food products, and are also responsible for food spoilage thereby causing intoxication and diseases.

Microbial contamination of food products takes places usually on the way from the field to the processing plant, or during processing, storage, transport and distribution or before consumption. The microorganisms that cause food spoilage and also find the maximum exploitation in production of food and food products are mainly bacteria, molds and yeasts.

Bacteria

Bacteria are the largest group of unicellular microorganisms. The shapes of medically important bacteria are classified into-cocci, or spherical cells; bacilli, or cylindrical or rod shaped cells; and spiral or curved forms. The pathogenic or disease causing bacteria are usually gram negative, however, three gram-positive rods are known to cause food intoxications : *Clostridium botulinum,C. perfringens,and Bacillus cereus*

Some of the other most common bacteria causing food spoilage, infections and disease are *Acinetobacter, Aeromonas, Escherichia, Proteus, Alcaligenes, Flavobacterium, Pseudomonas, Arcobacter, Salmonella, Lactococcus, Serratia, Campylobacter, Shigella, Citrobacter, Listeria, Staphylococcus, Micrococcus, Corynebacterium, Vibrio Enterobacter, Paenibacillus, Weissella, Enterococcus, Yersinia*

Different strains of bacteria are also used in production of various food and dairy products. Strains of Streptococcus, *Lactobacillus Bifidobacterium*, Erwiniaetc. are used in the production of fermented food and dairy products. *Streptococcus thermophilus* and *Lactobacillusbulgaricus* are used to produce yogurt.

Molds:

Molds are multicellular filamentous fungi whose growth on foods is usually readily recognized by their fuzzy or cottony appearance. They are mainly responsible for food spoilage at room temperature 25- 30oC and low pH, and have minimum moisture requirement. Molds can rapidly grow on grains and corns when these products are stored under moist conditions. Molds require free oxygen for growth and hence grow on the surface of contaminated food.

Molds also find their use in manufacturing of different foods and food products. They are used in ripening of various types of food products as cheese (e.g. Roquefort,Camembert). Molds are also grown as feed and food and are employed to produce ingredients such as enzymes like amylase used in making bread or citric acid used in soft drinks. Molds are major contributors in the ripening of many oriental foods. A species of *Bothrytiscinerea*, is used in rotting of grape for production of wine. Lactic fermentations using molds results in a unique Finnish fermented milk called viili.

Yeasts:

Yeasts have the ability to ferment sugars to ethanol and carbon-dioxide and hence they are extensively in food industry. The most commonly used yeast, the baker's yeast is grown industrially. *Saccharomyces carlsbergensis* is most commonly used in fermentation of most beers. The other yeast strains of importance are

Brettanomyces, Schizosaccharomyce,, Candida, Cryptococcus, Debaryomyces, Zygosaccharomyces, Hanseniaspora, Saccharomyces

Points to remember

- Bacteria, molds and yeast are the most important microorganisms that cause food spoilage and also find the maximum exploitation in production of food and food products.
- Different strains of bacteria and fungus are used for fermentation of dairy products for production of a wide variety of cultured milk products. Both bacteria and fungi are used in these cheese production processes.
- Lactic acid bacteria are used for coagulation of milk that can be processed to yield a wide variety of cheeses, including soft unripened, soft ripened, semisoft, hard, and very hard types.
- Microorganisms such as *Lactobacillus and Bifidobacterium* are used as in food and health industry.
- *Spirulina,* a *cyanobacterium,* also is a popular food source sold in specialty stores.
- Molds are used for rotting of grapes for production of different varieties of wines.
- Mushrooms *(Agaricusbisporus)* are one of the most important fungi used as a food source.
- Alcoholic beverages as beer are produced by fermentation of cereals and grains using different strains of yeasts.

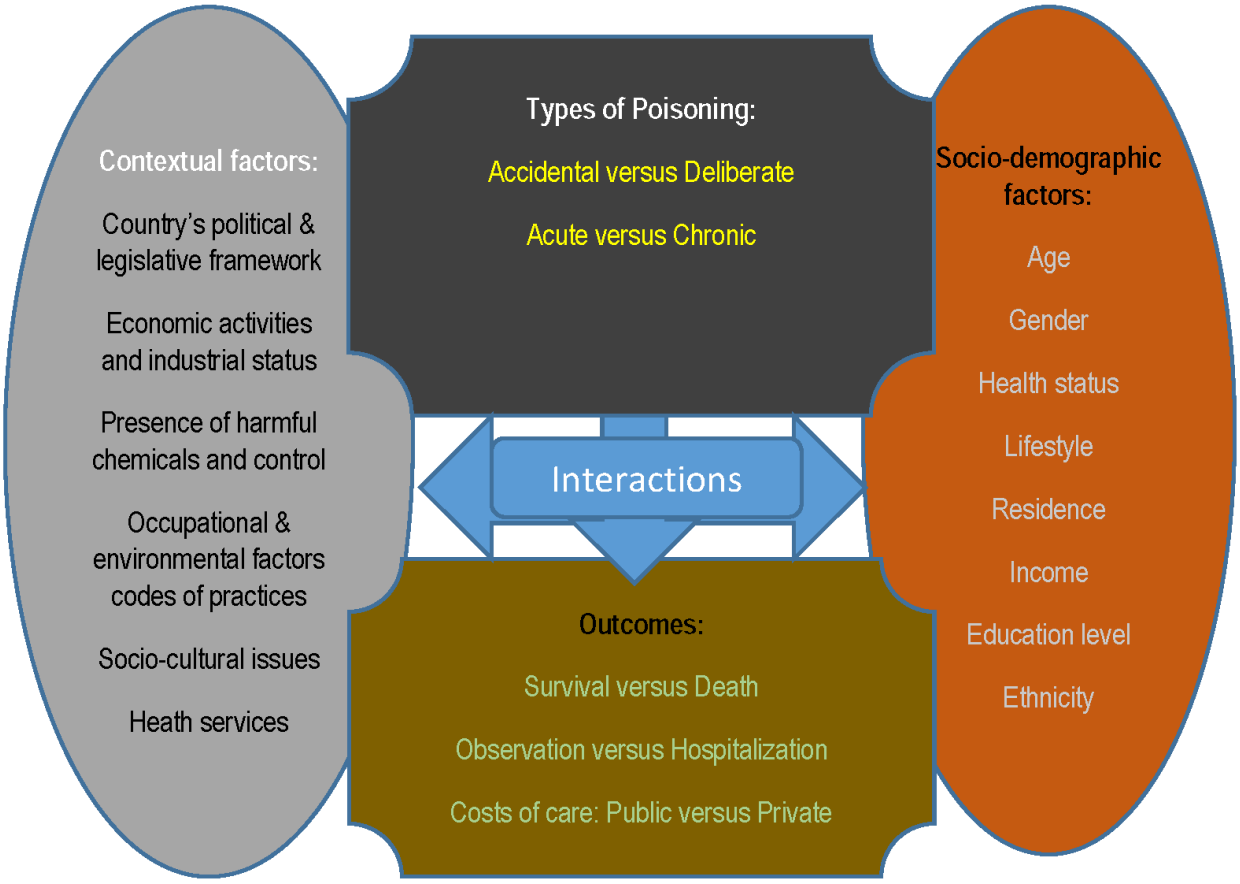
How does food poisoning occur?

Food poisoning is often confused with food allergy and food adverse effects, which are, respectively, an immune-mediated reaction and a clinically abnormal response, attributed to an exposure to a food or food additive [1, 6]. Food poisoning results from exposures to toxic agents present in the food that may lead to harmful effects based on the reaction of the body to these agents or the food itself. Exposures may happen through ingestion, contact or transdermal, or inhalation. The resulting effects of the exposure may be localized, or generalized; they may also be topical or systemic [7, 8].

At the core, the adverse functional or morphological changes observed upon clinical or histopathological examinations are almost invariably a consequence of biochemical

lesions [9]. This means that, in general, toxicity arises from interaction of the offending toxic element or its derivatives with molecular sites of the host system that leads to the derangement of the biochemical processes involved in the normal function and regulation of the cells, tissues, organs and systems of the body. Hence, it is the overloading of the biochemical processes, because of the simple presence or the excessive quantities of the offending toxic agent, beyond the capacity of the host systems to adapt and restore to these processes at their normal level that leads ultimately to cell, tissue, or organ injury or the elucidation of the toxic effects as signs and symptoms [10–12].

The most common microorganisms involved in food poisoning are bacteria such as *Bacillus cereus*, *Staphylococcus aureus*, *Clostridium botulinum*, *Vibrio cholerae*, *Escherichia coli* and *Shigella* species and others that produce toxins that cause foodborne intoxications. *Listeria monocytogenes* can grow at temperatures below 5°C and so can multiply in refrigerated food but can be eradicated by thorough cooking and by pasteurization. Other microorganisms such as *Norovirus* and *Rotavirus* as well as parasites such as *Giardia* spp. and *Cyclosporidium* spp. can also be involved [13]. The main reason why microorganisms predominate in causing food poisoning is that they have the ability to grow in the foods and to dwell there even when reduced to spores, particularly bacteria. Moreover, even when bacteria do not grow in the food itself, they may be carried by the foods that are notoriously known to be involved in outbreaks of dysentery [14, 15]. It is important to note that most foods carry microorganisms, but some foods are more prone in being potential carriers of food poisoning microorganisms; these foods are principally raw meat, poultry, milk, seafood and raw vegetables



Benefits of Bacteria

Bacteria provide vital ecosystem services. They are important decomposers. They are also needed for the carbon and nitrogen cycles. There are billions of bacteria inside the human intestines. They help digest food, make vitamins, and play other important roles. Humans also use bacteria in many other ways, including:

- Creating products, such as ethanol and enzymes.
- Making drugs, such as antibiotics and vaccines.
- Making biogas, such as methane.
- Cleaning up oil spills and toxic wastes.
- Killing plant pests.
- Transferring normal genes to human cells in gene therapy.
- Fermenting foods

What is food borne infection?

Foodborne illness is an infection or irritation of the gastrointestinal (GI) tract caused by food or beverages that contain harmful bacteria, parasites, viruses, or chemicals. Common foodborne illness symptoms include vomiting, diarrhea, abdominal pain, fever, and chills.

Diseases which result from pathogenic microorganisms are of two types: **infection** and **intoxication.**

- **Foodborne infection** is caused by the ingestion of food containing live bacteria which grow and establish themselves in the human intestinal tract.
- **Foodborne intoxication** is caused by ingesting food containing toxins formed by bacteria which resulted from the bacterial growth in the food item. The live microorganism does not have to be consumed.

For a **foodborne illness** (poisoning) to occur, the following conditions must be present:

- The microorganism or its toxin must be present in food.
- The food must be suitable for the microorganism to grow.
- The temperature must be suitable for the microorganism to grow.
- Enough time must be given for the microorganism to grow (and to produce a toxin).
- The food must be eaten.

Symptoms of Foodborne Illness

The most common symptom associated with foodborne illnesses is diarrhea. Each pathogenic microorganism has its set of characteristic symptoms.

The severity of the foodborne illness depends on the pathogenic microorganism or toxin ingested, the amount of food consumed (dose), and the health status of the individual. For individuals who have immunocompromised health conditions, or for the aged, children, or pregnant women, any foodborne illness may be life-threatening.

Food Microbiology and Foodborne Illness

(Taken from EC 92-2307 by Julie A. Albrecht and Susan S. Sumner archived/posted in Digital Commons, University of Nebraska-Lincoln)

Bacteria, yeasts, and mold are microorganisms associated with foods. The individual microorganism cannot be seen without the aid of a microscope. The size of these microorganisms are measured in microns (1 micron is 1/1000 of a millimeter or

U25,40A of an inch). More than a thousand microorganisms in a cluster are barely visible to the eye.

Microorganisms may be classified into three groups according to their activity:

1. **Beneficial microorganisms** may be used in the process of making new foods. Cheese is made with microorganisms which convert the milk sugar to an acid.
2. **Spoilage microorganisms** cause food to spoil and are not harmful to humans. A spoilage microorganism is responsible for souring milk.
3. **Pathogenic microorganisms** are disease-causing microorganisms. The living microorganism or a toxin (microbial waste product) must be consumed to cause symptoms associated with specific pathogenic microorganisms.

Microorganisms can be found virtually everywhere. Bacteria and molds are found in the soil and water. Yeasts are found mainly in the soil. Plant and animal food products support the growth of microorganisms. Bacteria have been detected on plants and animals; molds are usually found on fruits and vegetables; yeasts are generally found on fruits. Many bacteria are part of the normal *microflora* of the intestinal tracts of man and animals.

- Microorganisms may be transferred from soil and water to plants and animals.
- Raw food stuffs contain microorganisms which may be transferred to processed foods by careless handling.
- Food handlers with poor hygiene practices may transfer microorganisms to food.
- If suitable conditions exist, some of these microorganisms may grow to create a public health concern.

UNIT – II

What are the common food adulterants?

Some of the **common** adulterated **foods** are milk and milk products, atta, edible oils, cereals, condiments (whole and ground), pulses, coffee, tea, confectionary, baking powder, non - alcoholic beverages, vinegar, besan and curry powder.

Methods for Detection of common adulterants in food

1. Milk and Milk Products
2. Oil and Fats
3. Sweetening Agents
4. Food grains and their products
5. Spices
6. Miscellaneous Products

Milk and Milk Products

S. No	Food Article	Adulterant	Method for Detection	Remarks
1	Milk	water	The presence of water can be by putting a drop of milk on a polished slanting surface. The drop of pure milk either or flows lowly leaving a white trail behind it, whereas milk adulterated water will flow immediately without leaving a mark	
2		Starch	Add a few drops of tincture of Iodine or Iodine solution. Formation of blue colour indicates the presence of starch.	Iodine solution is easily available in the medical stores.
3		Urea	Take a teaspoon of milk in a test tube. Add ½ teaspoon of soybean or arhar powder. Mix up the contents thoroughly by shaking the test tube. After 5 minutes, dip a red litmus paper in it. Remove the paper after ½ a minute. A change in colour from red to blue indicates the presence of urea in the milk.	

4		Vanaspati	Take 3 ml of milk in a test tube. Add 10 drops of hydrochloric acid. Mix up one teaspoonful of sugar. After 5 minutes, examine the mixture.The red colouration indicates the presence of vanaspati in the milk.	
5		Formalin	Take 10 ml of milk in a tests tube and add 5 ml of conc. sulphuric acid from the sides of the wall without shaking. If a violet or blue ring appears at the intersection of two layers then it shows presence of formalin.	Formalin enhances the life of milk and thus is added for preservation purpose.
6		Detergent	Shake 5-10 ml. of sample with an equal amount of water lather indicates the presence of detergent.	
7	Milk	Synthetic milk	Synthetic milk has a bitter after taste, gives a soapy feeling on rubbing between the fingers and turns yellowish on heating.	
8	Synthetic milk-test for protein		The milk can easily be tested by Urease strips (available in the Medical stores) because Synthetic milk is devoid of protein.	
9		Test for Glucose/ inverted sugar	Milk does not contain glucose /invert sugar, if test for glucose with urease strip found positive.It means milk is adulterated.	If it is made synthetically by adding while colour water paint. Oils, alkali, urea and detergent etc. Glucose, inverted sugar syrup is added in milk to increase the consistency and test
10	Ghee, cottage cheese, condensed milk, khoa,	Coal Tar Dyes	Add 5 ml of dil. H_2SO_4 or conc. HCL to one teaspoon full of melted sample in a test tube. Shake well. Pink colour (in case of H_2SO_4) or crimson colour (in case of HCl) indicates coal tar dyes. If HCl does not give colour dilute it with water to get the colour.	

	milk powder etc,				
11	Sweet Curd	Vana spati	Take1 teaspoon full of curd in a test tube. Add 10 drops of hydrochloric acid. Mix up the contents shaking the test tube gently. After 5 minutes, examine the mixture. The red colouration indicates the presence of vanaspati in the curd.		
12	Rabri	Blotti ng paper	Take a teaspoon of rabri in a test tube. Add 3 ml of hydrochloric acid and 3 ml of distilled water. Stir the content with a glass rod. Remove the rod and examine. Presence of fine fibres to the glass rod will indicate the presence of blotting paper in rabri.		
13	Khoa and its products	Starc h	Boil a small quantity of sample with some water, cool and add a few drops of Iodine solution. Formation of blue colour indicates the presence of starch.		
14	Chhana or Paneer	Starc h	Boil a small quantity of sample with some water, cool and add a few drops of Iodine solution. Formation of blue colour indicates the presence of starch.		

Oil and Fats

S. No	**Food Article**	**Adulterant**	**Method for Detection**	**Remarks**

1	Ghee	Vanaspathy or Margarine	Take about one tea spoon full of melted sample of Ghee with equal quantity of concentrated Hydrochloric acid in a stoppered test tube and add to it a pinch of sugar. Shake for one minute and let it for five minutes. Appearance of crimson colour in lower (acid) of Vanaspati or Margarine.	The test is specific for seasame oil Which is compulsorily added to Vanaspati and Margarine. Some coal tar colours also give a positive test. If the test is positive i.e. red colour develops only by adding strong Hydrochloric acid (without adding crystals of sugar) then the sample is adulterated with coal tar dye. If the crimson or red colour develops after adding and shaking with sugar, then alone Vanaspati or Margarine is present
2		Mashed Potatoes, Sweet Potatoes and other starches.	The presence of mashed potatoes and sweet potatoes in a sample of ghee can easily be detected by adding a few drops of Iodine, which is brownish in colour turns to blue if mashed potatoes/sweet potatoes/other starches are present.	

3	Butter	Vanaspati or Margarine	Take about one teaspoon full of melted sample of butter with equal quantity of concentrated Hydrochloric acid in a stoppered test tube and add to it a pinch of sugar. Shake for one minute and let it for five minutes. Appearance of crimson colour in lower (acid) of Vanaspati or Margarine.	The test is specific for seasame oil which is compulsorily added to Vanaspati and Margarine. Some coal tar colours also give a positive test. If the testis positive i.e. red colour develops only by adding strong Hydrochloric acid (without adding crystals of sugar) then the sample is adulterated with coal tar dye. If the crimson or red colour develops after adding and shaking with sugar, then alone Vanaspati or Margarine is present
4		Mashed Potatoes and other starches	The presence of mashed potatoes and sweet potatoes in a sample of butter can easily e detected by adding a few drops of iodine (which is brownish in colour), turns to blue.	
5	Edible oil	Prohibited colour	Take 5 ml of sample in a test tube and add 5 ml of concentrated hydrochloric acid. Shake gently, let it stand for 5 minutes. Colour will separate in the upper layer of the solution.	
6	Coconut oil	Any other oil	Place a small bottle of oil in refrigerator. Coconut oil solidifies leaving the adulterant as a Separate layer.	

Sweetening Agents

S.	Food Article	Adulterant	Method for Detection

No			
1	Sugar	Chalk powder	Dissolve 10 gm of sample in a glass of water, allow settling, Chalk will settle down at the bottom.
2		Urea	Dissolve 10 gm of sample in a glass of water, allow settling, Chalk will settle down at the bottom.
3		Chalk powder	Dissolve 10 gm of sample in a glass of water, allow to settle,chalk will settle down at the bottom.
4		Yellow colour (Non - permitted)	Take 5 ml in a tests tube from the above solution and add a few drops of conc. HCl. A pink colour in lower acid layers shows the presence of non- permitted colour.
5	Honey	Sugar solution	A cotton wick dipped in pure honey when lighted with a match stick burns and shows the purity of honey. If adulterated, the presence of water will not allow the honey to burn, If it does; it will produce a cracking sound.
6	Jaggery	Washing soda	Add a few drops of solution HCl. Effervesence shows presence of washing soda.
7	Jaggery	Chalk powder	Dissolve a little amount sample in water in a test tube,chalk powder settles down.-Or- Add a few drops of conc HCl solution,effervescence indicates the presence of adulterant.

8		Metanil yellow colour	Take ¼ of a teaspoon of the jaggery in a test tube. Add 3 ml of alcohol and shake the tube vigorously to mix up the content. Pour 10 drops of hydrochloric acid in it. A pink colouration indicates the presence of metanil yellow colours in jaggery.
9		Sugar Solution	Add a drop of honey to a glass if water, if the drop does not disperse in water it indicates that the honey is pure. However, if the drop disperses in water it indicates presence of added sugar.
10	Bura sugar	Washing soda	Add 1 ml of HCl to a little of bura sugar. Effervescence occurs if washing soda is present. Dissolve 2 gm of sugar in water; dip a red litmus paper in the solution. If washing soda is present, it will turn blue.
11	Sweetmeats, Ice-cream and beverages	Metanil yellow (a non - permitted coal tar colour)	Extract colour with luke-warm water from food articles. Add few drops of concentrated Hydro chloric acid. If magenta red colour develops the presence of metanil yellow is indicated.
12		Saccharin	i. Taste a small quantity. Saccharin leaves a lingering sweetness on tongue for a considerable time and leaves a bitter taste at the end.

Food grains and their products

S.No	Food Article	Adulterant	Method for Detection	Remarks

1	Wheat, Rice, Maize, Jawar, Bajra, Chana, Barley etc.	Dust, pebble, Stone, Straw,weed seeds,damaged grain,weevilled grain, insects, hair and excreta of rodent	These may be examined visually to see foreign matter, damaged grains, discoloured grains, insect, rodent contamination etc.	Damaged/discoloured grains should be as low as possible since they may be affected by fungal toxins, argemone seeds, Dhatura seeds etc. In moderately excessive amount can result in risk to health, Discard the damaged undesirable grains before use
2	Maida	Resultant atta or cheap flour	When dough is prepared from resultant or left out atta, more water has to be used. The normal taste of chapattis prepared out of wheat is somewhat sweetish whereas those prepared out of adulterated wheat will taste insipid.	
3	Maida/ Rice	Boric Acid	Take a small amount of sample in a test tube, add some water and shake. Add a few drops of HCl. Dip a turmeric paper strip if it turns red, boric acid is present.	
4	Wheat, bajra and other grains	Ergot (a fungus containing poisonous substance)	(i) Purple black longer sized grains in Bajra show the presence of Ergots. (ii) Put some grains In a glass tumbler containing 20 per cent salt	

			solution(20 gm common salt to 100 ml water)purple black longer size grain Ergot floats over the surface while sound grains settle down.	
5	Wheat, bajra and other grain	Dhatura	Dhatura seeds are flat with edges with blackish brown colour which can be separated out by close examination.	
6	Wheat, bajra and other grain	Karnal Bunt	The affected wheat kernel have a dull appearance, blackish in colour and rotten fish smell,	
7	Sella Rice (Parboiled Rice)	Metanil yellow(a non-permitted coal tar colour)	Rub a few grains in the palms of two hands. Yellow would get reduced or disappear. Add a few drops of dilute Hydrochloric acid to a few rice grains mixed with little water, presence of pink colour indicates presence of Metanil yellow	
8		Turmeric (colouring for golden appearance)	Take a small amount of sample in a test tube, add some water and shake. Dip Boric acid paper (filter paper dipped in Boric acid solution) If it turns pink turmeric is present	

			(ii) Take some rice and sprinkle on it a small amount of soaked lime for some time, grains will turn red if turmeric is present.	
9	Parched rice	Urea	Take 30 numbers of parched rice in a test tube. Add 5ml of distilled water in it.Mix up the contents thoroughly, by shaking the test tube. After 5 minutes, filter the water -contents, and add ½ teaspoon of powder of arhar or soybean in it. Leave it for 5 minutes, and then dip a red litmus paper in the mixture. Take out the litmus paper after 30 seconds and examine it. A blue colouration indicates the presence of urea in the parched rice.	
10	Wheat flour	Excess bran	Sprinkle on water surface. Bran will float on the surface.	
11	Wheat flour	Chalk powder	Shake sample with dil.HCl Effervescence indicates chalk	Chalk powder is used as an adulterant due to its weight.

12	Dal whole and spilt	Khesari Dal	(i) Khesari dal has edged type appearance showing a slant on one side and square in appearance in contrast to other daIs. (ii) Add 50 ml of dilute Hydrochloric acid to the sample and keep on simmering water for about 15minutes.The pink color developed indicates the presence of Khesari dal.	The test is only for Khesari dal.(Metanil yellow if present will give a similar colour immediately even without simmering).
13		Clay, stone, gravels, webs, insects, rodent hair and excreta	Visual examination will detect these adulterants	Reject if the number of Insects is large or if the odour is unpleasant and taste bitter or gritty
14		Metanil yellow (a non permitted coaltar colour)	Take 5 gms of the sample with 5ml. Of water in a test tube and add a few drops of concentrated Hydrochloric acid. A pink colour shows presence o Metanil yellow	
15	Atta, Maida Suji (Rawa)	Sand, soil, insects, webs, lumps. rodent hair and excrete	These can be identified by visual examination.	
16		Iron filings	By moving a magnet through the sample, iron filings can be separated.	
17	Bajra	Ergot infested Bajra.	Soak bajra in water, swollen and black Ergot infested grains will turn	

			light in weight and will float in water	
18	Sago	Sand or talcum	Put a little quantity of sago in mouth,it will have a gritty feel, if adulterated.Burn the sago,if pure, it will swell and leave hardly any ash. Adulterated sago will leave behind appreciable quantity of ash.	
19	Besan	Metanil Yellow	Take ½ teaspoon of the besan in a test tube. Pour 3 ml of alcohol in the test tube. Mix up the contents thoroughly by shaking the test tube. Add 10 drops of hydrochloric acid it. A pink colouration indicates presence of metanil yellow in the gram powder.	
20		Khesari Flour	Add 50 ml of dilute Hydrochloric acid to 10 gms of s ample and keep on simmering water for about 15 minutes. The pink colour, if developed, indicates, the presence of Khesari flour	The test is only for Khesari dal (Metanil yellow, if present will give a similar colour even without simmering).
21	Pulses	Lead Chromate	Shake 5 gm.Of pulse with 5 ml. Of water and add a few drops of HCl. Pink colour indicates Lead Chromate.	

Spices

S.No	Food Article	Adulterant	Method for Detection	Remarks
1	Whole spices	Dirt, dust, straw, insect, damaged seeds, other seeds, rodent hair and excrete	These can be examined visually	
2	Black pepper	Papaya seeds	Papaya seeds can be separated out from pepper as they are shrunken, oval in shape and greenish brown or brownish black in colour.	
3		Light black pepper	Float the sample of black pepper in alcohol (rectified spirit). The black pepper berries sink while the papaya seeds and light black pepper float. (ii) Press the berries with the help of fingers light peppers will break easily while black berries of pepper will not break.	
4		Coated with mineral oil	Black pepper coated with mineral oil gives Kerosene like smell.	
5	Cloves	Volatile oil extracted (exhausted cloves)	Exhausted cloves can be identified by its small size and shrunken appearance.The characteristic pungent of genuine cloves is less pronounced in exhausted cloves	
6	Cloves	Coated with mineral	Cloves coated with mineral oil gives kerosene like smell	

		oil		
7	Mustard seed	Argemone seed	Mustard seeds have a smooth surface The argemone seed have grainy and rough surface and are black and hence can be separated out by close examination. When Mustard seed is pressed inside it is yellow while for Argemone seed it is white	Use magnifying glass for identification.
8	Powdered spices	Added starch	Add a few drops of tincture of Iodine or Iodine solution. Indication of blue colour shows the presence of starch.	Iodine test for added starch is not applicable for Turmeric powder
9	Powdered spices	Common Salt	Taste for addition of common salt.	
10	Turmeric powder	Coloured saw dust	Take a tea spoon full of turmeric powder in a test tube. Add a few drops of concentrated Hydrochloric acid. Instant appearance of pink colour which disappears on dilution with water shows the presence of turmeric If the colour persists, metanil yellow (an artificial colour) a not permitted coal tar colour is present.	This test is only for Metanil yellow
11	Turmeric whole	Lead chromate	Appears to be bright in colour which leaves colour immediately in water.	

12		Chalk powder or yellow soap stone powder	Take a small quantity of turmeric powder in a test tube containing small quantity of water. Add a few drops of concentrated Hydrochloric acid, effervescence (give off bubbles) will indicate the presence of chalk or yellow soap stone powder	
13	Chillies powder	Brick powder, salt powder or talc,powder.	Take a teaspoon full of chillies powder in a glass of water. Coloured water extract will show the presence of artificial colour. Any grittiness that may be felt on rubbing the sediment at the bottom of glass confirms the presence of brick powder/sand, soapy and smooth touch of the white residue at the bottom indicates the presence of soap stone. To a little powder of chilli add small amount of conc HCl and mix to the consistency of paste,dip the rear end of the match stick into the paste and hold over the flame,brick red flame colour due to the presence of calcium slats in brick powder.	This test is only for earthy material
14		Artificial colours	Sprinkle the chilli powder on a glass of water. Artificial colorants descend as coloured streaks.	

15		Water soluble coal tar colour	Water soluble artificial color can be detected by sprinkling a small quantity of chillies or turmeric powder on the surface of water contained in a glass tumbler. The water soluble colour will immediately start descending in colour streaks	
16	Asafoetida (Hing)	Soap stone or other earthy material	Shake little portion of the sample with water and allow to settle.Soap stone or other earthy mailer will settle down at the bottom.	In compounded asafoetida due to presence of starch, a slight turbid solution may be produced.However, this will settle down after keeping
17		Starch	Add tincture of iodine, appearance of blue colour shows the presence of starch.	Compound of asafoetida contains starch which is declared on the label. This test is not applicable for compound asafoetida.
18		Foreign resin	Burn on a spoon, if the sample burns like camphor, it indicates the sample is pure.	Pure hing burns like aromatic camphor
19	Spices	Powdered bran and saw dust	Sprinkle on water surface. Powdered bran and sawdust float on the surface.	

20	Cinnamon	Cassia bark	Cinnamon barks are very thin and can be rolled. It can be rolled around a pencil or pen. It has a distinct smell. Whereas cassia ark comprise of several layers in between the rough outer and inner most smooth layers. On examination of the ark loosely, a clear distinction can be made.	
21	Cumin seeds	Grass seeds coloured with charcoal dust	Rub the cumin seeds on palms. If palms turn black adulteration is indicated.	
22	Green chilli and green vegetables	Malachite green	Take a cotton piece soaked in liquid paraffin and rub the outer green surface of a small part of green vegetable. If the cotton turns, green, we can say the vegetable is adulterated with malachite green.	
23	Green peas	Artificially coloured	Take a little amount of green peas in a 250 ml beaker add water to it and mix well. Let it stand for half an hour. Clear separation of colour in water indicates adulteration.	
24	Saffron	Dried tendrils of maizecob	Genuine saffron will not break easily like artificial.Artificial saffron is prepared by soaking maize cob in sugar and colouring it with coal tar colour. The colour dissolves in water if artificially coloured. A bit of pure saffron when allowed to	

			dissolved in water will continue to give its saffron colour so long as it lasts	

Miscellaneous Products

S.No	Food Article	Adulterant	Method for Detection	Remarks
1	Common salt	White powdered	Stir a spoonful of sample of salt in a glass of water.The presence of chalk will make solution white and other insoluble impurities will settle down.	
2	Iodized salt	Common salt	Cut a piece of potato, add salt and wait minute and add two drops of lemon juice. If iodized salt blue colour will develop. In case of common salt, there will be no blue colour.	
3	Tea leaves	Exhausted tea	ake a filter paper and spread a few te aves.Sprinkle with water to wet the filte per. If coal tar colour is present it woul mediately stain the filter paper. Wash th ter paper under tap water and observe th ains against ligh read a little slaked lime on white porcelai e or glass plate; sprinkle a little tea dust o e lime. Red,orange or other shades of colou reading on the lime will show the presenc coal tar colour. In case of genuine tea here will be only a slight greenish yellov lour due to chlorophyll, which appear afte me time.	

4		Iron fillings	By moving a magnet through the sample,iron filling can be separated.	
5		Chicory	Gently sprinkle the coffee powder sample on the surface of water in a glass.The coffee floats over the water but chicory begins to sink down within a few seconds.The falling chicory powder particles leave behind them a trail of colour, due to large amount of caramel	
6	Supari Pan Masala	Colour	Colour dissolves in water	
7		Saccharin	Saccharin gives excessive and lingering sweet taste and leaves bitter taste at the end.	
8	Catachu powder	Chalk	Chalk gives effervescence (gives off bubbles) with concentrated Hydrochloric acid	This test is only for Chalk.
9	Lemonade soda	Mineral acid	Pour 2 drops of the lemonade soda on a metanil yellow paper - strip. A violet colouration indicates the presence of mineral acid in aerated water. The colour impression gets retained even after drying the paper (you can prepare metanil yellow paper strips by soaking filter paper strips in 0.1 % aqueous solution and then drying the paper – strips)	
10	Sweet Potato	Rhodamine B colour	Take a cotton piece soaked in liquid paraffin, and rub the outer red surface of the sweet potato. If the cotton absorb colour, it indicates the use of rhodamine B colours on the outer surface of the sweet potato.	

11	Pulses	Lead Chromate	Shake 5 gm. Of pulse with 5 ml. Of water and add a few drops of HCl. Pink colour indicates Lead Chromate.	
12	Iodized salt	Common salt	Cut a piece of potato, add salt and wait minute and add two drops of lemon juice. If iodized salt blue colour will develop. In case of common salt, there will be no blue colour.	
13	Silver leaves	Aluminium leaves	(i)On ignition,genuine silver leaves burn away completely leaving glistering white spherical ball of the same mass whereas aluminium leaves are reduced to ashes of dark grey blackish colour. (ii)Take silver leaves in test tube,add diluted Hydrochloric acid. Appearance of turbidity to white precipitate indicates the presence of silver leaves. Aluminium leaves do not give any turbidity or precipitate. (iii) Take aluminium leaves in palm and rub between both the palms of the hand, silver leaves completely disappear in the hand; however presence of small ball in the palm indicates adulteration with aluminium leaves.	
14	Vinegar	Mineral Acid	Test with the Metanil yellow indicator paper, in case, the colour changes from yellow to pink,mineral acid is present	

Prevention of Food Adulteration Act, 1954

An Act to make provisions on the prevention of adulteration of food.

The Act seeks to prevent the adulteration of any article used as food of drinks for human consumption excluding drugs and water. The Act gives the power to the Central Government to set up at Central Committee for Food Standards and Central Food Laboratory for testing and analysing food items. Additionally, the Act also states that no persons shall import into India any food which has been adulterated or misbranded. The Act also provides penalties for contravening provisions of this Act.

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Legislation
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the first line of defence in ensuring the **food** is aptly chosen by the consumer, considering the health benefits. **Avoid** choosing products in loose packaging. Use water after properly purifying it. A combination of purification methods like water purifier, heating, etc

The **food adulteration laws** basically set this benchmark. **Adulteration** of **food** is defined as "the addition or subtraction of any substance to or from **food** so that the natural composition and quality of **food** substance is affected". [1] This results in an inferior quality of the **food**.

Causes of food adulteration:

- Food insecurity: To increase the quantity of food and distribution of nutrition.
- Traders' profit motivation: made a portion of the business strategy.
- Illiteracy of the general public: lack of awareness of sufficient food consumption.
- There is no efficient food law.
- Lack of government initiatives.

Non-permitted colour or permitted **food** colour like metanil yellow, beyond the safe limit in coloured **food** can cause allergies, hyperactivity, liver damage, infertility,

anaemia, cancer and birth defects. The best way to avoid these health problems is prevention.

What are food additives used for?

Food additives can be used to:

- improve the taste or appearance of a processed food. For example, beeswax - glazing agent (901) may be used to coat apples to improve their appearance
- improve the keeping quality or stability of a food. For example, sorbitol - humectant (420) may be added to mixed dried fruit to maintain the moisture level and softness of the fruit
- preserve food when this is the most practical way of extending its storage life. For example, sulphur dioxide - preservative (220) is added to some meat products such as sausage meat to limit microbial growth.

Many substances used as additives also occur naturally, such as vitamin C or ascorbic acid (300) in fruit, or lecithin (322), which is present in egg yolks, soya beans, peanuts and maize. The human body cannot distinguish between a chemical naturally present in a food and that same chemical present as an additive.

Labelling

Food additives in most packaged food must be listed in the statement of ingredients on the label.

Most food additives must be listed by their class name followed by the name of the food additive or the food additive number, for example, Colour (Caramel I) or Colour (150a). Most flavouring substances can be identified as either 'flavouring' or 'flavour', or by a more specific name or description. Enzymes may be identified as 'enzyme' and the specific name of the enzyme does not need to be listed.

Prevention or delay of microbial decomposition of food

- By keeping out micro-organisms (asepsis)
- By removal of micro-organisms (filtration)
- By hindering the growth or activity of micro-organisms (use of low temperature, drying, creating anaerobic conditions or using chemicals).
- By killing the micro-organisms (using heat or irradiation).

2. Prevention or delay of self decomposition of food

- By destruction or inactivation of food enzymes (blanching or boiling)

- By prevention or delay of purely chemical reactions (use of antioxidants to prevent oxidation).

3. Prevention of damage by insects, animals, mechanical causes etc (use of fumigants, cushioning, packaging etc).

1. Prevention or delay of microbial decomposition

i) By keeping out micro-organisms (Asepsis): Asepsis refers to keeping out the micro-organisms from the food by making use of either natural covering or providing artificial covering around the food. Natural barrier in foods include outer shell of the nuts (almond, walnut, pecan nut) skin/peel of fruit and vegetables (banana, mango, citrus, ash gourd etc), shells on eggs, skin or fat in meat, husk of ear corn etc. Similarly packaging prevents entry of micro-organisms in the food.
For example peach or mushroom sealed in tin can, clean vessels under hygienic surroundings helps in preventing spoilage of milk during collection and processing by keeping out the micro-organisms.

ii) By removal of micro-organisms (Filtration): Filtration of liquid foods through bacteria proof filters is a common method for complete removal of micro-organisms from the foods. Liquid foods are passed through the filters made of suitable material like asbestos pad, diatomaceous earth, unglazed porcelain etc and allowed to percolate through either with or without nano-filtration etc works on this principle. Centrifugation, sedimentation, trimming and washing etc can also be used but are not very effective.

iii) By hindering the growth and activity of micro-organisms

a. By using low temperature: Microbial growth and enzyme activity is retarded in foods by storing them at low temperatures. The food commodities can be stored under cellar storage (15oC) like root crops, potato, onion refrigerator or chilling temperatures (0-50C) like most fruits and vegetables, meat, poultry, fresh milk and milk products and under freezing temperature (-18oC to -40oC) like frozen peas, mushrooms etc.

b. By drying of food commodity: Removal of water from the food to a level at which micro-organisms fails to grow is an important method of preservation. Moisture can be removed by the application of heat as in sun drying and in mechanical drying or by binding the moisture with addition of sugar (as in jams, jellies) or salt (high salt in raw

mangoes) and making it unavailable to the micro-organisms. Examples include osmotic dehydration, dried grapes (raisins), apricots, onion, cauliflower etc.

c. By creating anaerobic conditions: Anaerobic condition can be created by removal or evacuation of air/oxygen from the package, replacement of air by carbon dioxide or inert gas like nitrogen.

- Lack of oxygen prevents growth of any surviving bacteria and their spores under such conditions.
- Production of carbon dioxide during fermentation and its accumulation at the surface makes the conditions anaerobic to prevent the growth of aerobes.
- Carbonation of drinks and storing fresh food under controlled atmospheres serves the same purpose.
- Canned food in which the food is sealed after removal of air (exhausting) illustrates this principle.
- Anaerobic bacteria and their spores present however, need to be killed to prevent the food from being spoiled.
- A layer of oil on top of any food prevents growth of microbes like moulds and yeasts by preventing exposure to air.

d. By use of chemicals: Appropriate quantity of certain chemicals added to the food can hinder the undesirable spoilage in the food by

- Interfering with the cell membrane of the micro-organisms, their enzyme activity or their genetic mechanism
- By acting as an anti-oxidant.
    - The optimum quantity of preservative as per approved regulation need to be used as higher concentrations can be a health hazard.
- Chemical preservatives are benzoic acid and its sodium salt, sorbic acid, potassium meta-bi-sulphite, calcium propionates etc.
- Common antioxidants to check off flavour (rancidity) in edible oils include butyl hydroxy anisole (BHA), butyl hydroxy toluene (BHT), tertiary butyl hydroxy quinone (TBHQ), lecithin etc.
- Addition of organic acids like citric, acetic and lactic acid in the food inhibits the growth of many organisms.

iv) By killing the micro-organisms

a) Use of heat: Coagulation of proteins and inactivation of their metabolic enzymes by application of heat leads to destruction of micro-organisms present in foods. Exposure

of food to high temperature also inactivates the enzymes present in the food. Foods can be heated either at temperature below 100oC (pasteurization) at 100oC (boiling) or at temperature above 1000C (sterilization).

i) Pasteurization (heating below 100oC): It is a mild heat treatment given to the food to kill most pathogenic micro-organisms and is used in the food where drastic heat treatment cause undesirable changes in the food. It is usually supplemented by other methods to prolong shelf life. Pasteurization is most commonly used in treatment of milk and other dairy products either as low temperature long time (LTLT) or high temperature short time (HTST) process.

- Heat treatment of milk at 62.2oC for 30 minutes refers to LTLT process.
- Heating at 72oC for 15 seconds is termed as HTST process.
- Grape wine is pasteurized at 82-85oC for 1 minute and beer is pasteurized at 600C.
- Pasteurization of juices depends upon their acidity and method of packing whether in bulk or in bottle or can.
- Bottled grape juice is pasteurized at 76.70C for 30 minutes while in bulk the juice is heated to 80-85oC for few seconds by flash treatment.
- Carbonated juice is heated at 65.6oC for 30 minutes in bottles and vinegar in bulk is held at 60-65oC for 30 minutes.

ii) Boiling (heating at 100oC): Cooking of food including vegetables, meat etc by boiling with water involves a temperature around 1000C. Boiling of food at 100oC kills all the vegetative cells and spores of yeast and moulds and vegetative cells of bacteria.

- Many foods can be preserved by boiling (e.g. milk).
- Canning of acid fruit and vegetables (tomatoes, pineapple, peaches cherries etc) is carried by boiling at about 100oC.
- Various terms used for heating of food are baking (in bread), simmering (incipient or gentle boiling), roasting (in meat) frying (shallow or deep fat frying) and warming up (small increase in temperature up to 100oC).

iii) Heating above 1000C: Heating by steam under pressure is used to obtain temperature above 1000C by using steam sterilizer or retort. The temperature in the retort increases with increase in steam pressure. The temperature in retort at mean sea level is 100oC; with 5psi pressure at 1090C; with 10psi pressure at 115.5oC and with 1 kg/cm2 (100 Pa) pressure at 121.5oC.

- For canning of mushrooms and other non-acid vegetables the processing temperature of 121.10C at 15 psi pressure are used.
- For sterilization of milk and other liquid foods like juices, ultra high temperature (UHT) process is used.
- In UHT process, the food is heated to very high temperature (1500C) for only few seconds by use of steam injection or steam infusion followed by flash evaporation of the condensed steam and rapid cooling. The process is also used for bulk processing of many foods.

b) Use of radiation: Irradiation consists of exposing the food to either electromagnetic or ionizing radiations to destroy the micro-organisms present in the food. Examples of irradiation include use of ultraviolet lamps in sterilizing slicing knives in bakeries. Gamma (?) radiation from cobalt -60 or cesium 137 source have been used for irradiation of many fruits like papaya, mango and onion, spices, fish etc. They are also used for inhibition of sprouting in onion and potatoes.

2. Prevention or delay of self decomposition of food

i) By destruction or inactivation of food enzymes (blanching or boiling): Blanching is a mild heat treatment given to vegetables before canning, freezing or drying to prevent self decomposition of food by destroying enzymes. Blanching is carried out by dipping the food commodity either in boiling water or by exposing than to steam for few minutes followed by immediate cooling.

ii) By prevention or delay of purely chemical reactions (use of antioxidants to prevent oxidation): Foods containing oils and fat turn rancid and become unfit for consumption due to oxidation. Addition of appropriate quantity of antioxidants like butyl hydroxy anisole (BHA), butyl hydroxyl toluene (BHT), tertiary butyl hydroxy quinone (TBHQ), lecithin etc prevents oxidation and preserves the food.

iii) Prevention of damage by insects, animals, rodents and mechanical causes: Use of fumigants in dried fruits, cereals etc checks the damage caused by insects and rodents. Wrapping of fruits, providing cushioning trays, using light pack and good packaging material checks the damage to fresh food commodities during handling and transportation.

Table 3.1: Methods of food preservation on the basis of food preservation

principles.

Physical method	**Method**
a)By removal of heat (Preservation by low temperature)	Refrigeration, Freezing preservation, dehydro-freezing, carbonation
b. By addition of heat (preservation by high temperature	Pasteurization (LTLT, HTST), sterilization, UHT Processing, microwave.
c. By removal of water	Drying (open sun, solar/poly tunnel solar), Dehydration (mechanical drying), Evaporation/concentration, Freeze concentration, reverse osmosis, freeze drying, foam mat drying and puff drying
d. By Irradiation	UV rays and gamma radiations
e. By non-thermal methods	High pressure processing, pulsed electric fields
Chemical methods	
a. By addition of acid (acetic or lactic)	Pickling (vegetable, olive, cucumber, fish, meat)
b. By addition of salt/brine	Salted mango/vegetable slices, salted and cured fish and meat i. Dry salting ii. Brining
c. By addition of sugar along with heating	Confectionary products like jams, jellies, preserves, candies, marmalades *etc*.
d. By addition of chemical preservatives.	i) Use of class II preservatives like Potassium meta-bi- sulphite, sodium benzoate, sorbic acid in food products. ii) Use of permitted and harmless substances of microbial origin like tyrosine, resin, niacin as in dairy products.

iii. By fermentation	i. Alcoholic fermentation (wine, beer) ii. Acetic acid fermentation (vinegar) iii. Lactic acid fermentation (curd, cheese, pickling of vegetables).
iv. By combination method	i. Combination of one or more methods for synergistic preservation. ii. Pasteurization combined with low temperature preservation. iii. Canning: heating combined with packing in sealed container. iv. Hurdle technology like low pH, salting, addition of acid, use of sugar, humectant and heating.

The term "preservatives" refers to the functional name for a wide variety of compounds that help slow or prevent bacterial growth in a wide range of products, including foods, medicines, and personal care products. These compounds can be natural or synthetic. Preservatives play important roles in many products people use every day – for example, by helping prevent the growth of harmful microorganisms and protect products from spoilage or contamination.

Preservatives in Food

Preservatives are added to food to fight spoilage caused by bacteria, molds, fungus, and yeast. Preservatives can keep food fresher for longer periods of time, extending its shelf life. Food preservatives also are used to slow or prevent changes in color, flavor or texture and delay rancidity.

Preservatives in Medicine and Pharmaceuticals

Preservatives are used commonly in medicines such as acetaminophen, insulin and cough syrup to help prevent microbial contamination. Simply, preservatives help prevent the growth of microorganisms, particularly bacteria and fungi, which may cause disease or infection.

Preservatives in Cosmetics and Personal Care Products

Preservatives in cosmetics and personal care products help prevent contamination and the growth of harmful bacteria in products ranging from sunscreens, lotions and shampoos to cleansers, toothpaste and makeup.

Antimicrobial preservatives in cosmetics and personal care products help prevent the growth of molds, yeasts and bacteria, guarding against contamination that can cause irritation or infections. Antioxidant preservatives also can help keep personal care products from spoiling by suppressing reactions that can occur when certain ingredients in a cosmetic or personal care product combine with oxygen in the presence of light, heat and some metals.

Preservatives in Wood

Wood treated with preservatives can be used to build telephone poles, road signs and marine pilings as well as decks, play structures and raised garden beds.

Safety of Preservatives in Food

The use of preservatives in food products is strictly studied, regulated and monitored by the U.S. Food and Drug Administration (FDA). Federal regulations require evidence that food additives are safe for their intended use.

Preservatives in foods are subject to ongoing safety review by FDA as scientific understanding and methods of testing continue to improve

Safety of Preservatives in Cosmetics and Personal Care Products

In contrast to foods, with the exception of color additives, cosmetic products and ingredients including preservatives do not need FDA premarket approval. FDA can take action against products on the market that are not in compliance with the law; for example, if the product contains any poisonous or harmful substance. FDA monitors companies that conduct product recalls and can request a product recall if the company does not issue a recall on its own.

Safety of Preservatives in Medicine and Pharmaceuticals

Preservatives in medicines and drugs are generally considered to be "inactive ingredients" by FDA. Inactive ingredients (such as dyes, preservatives, and flavoring agents) are parts of a drug or medicine that do not affect the therapeutic action of the active ingredients. FDA's *Inactive Ingredient Database* provides information on inactive ingredients present in FDA-approved drug products.

FDA, the Centers for Disease Control and Prevention (CDC), the National Institutes of Health (NIH) and other federal agencies regularly monitor and conduct research on vaccine safety.

UNIT – III

Nutrition: The process of taking in food and using it for growth, metabolism, and repair. Nutritional stages are ingestion, digestion, absorption, transport, assimilation, and excretion. 2: A nourishing substance, such as nutritional solutions delivered to hospitalized patients via an IV or IG tube.

Classification of essential nutrients

Macronutrients

'Macro' means large; as their name suggests these are nutrients which people need to eat regularly and in a fairly large amount. They include carbohydrates, fats, proteins, fibre and water. These substances are needed for the supply of energy and growth, for **metabolism** and other body functions.

Metabolism means the process involved in the generation of energy and all the 'building blocks' required to maintain the body and its functions.

Macronutrients provide a lot of calories but the amount of calories provided varies, depending on the food source. For example, each gram of carbohydrate or protein provides four calories, while fat provides nine calories for each gram.

Micronutrients

As their name indicates ('micro' means small) **micronutrients** are substances which people need in their diet in only small amounts. These include minerals and vitamins.

Although most foods are mixtures of nutrients, many of them contain a lot of one nutrient and a little of the other nutrients. Foods are often grouped according to the nutrient that they contain in abundance

Foods that contain a lot of protein are called body-building foods or **growing foods**. Foods that contain a lot of fat or carbohydrates and perhaps only a little protein are called **energy-giving foods**.

Foods in which the most important nutrients are vitamins or minerals are called **protective foods**.

Carbohydrates

Carbohydrates are referred to as energy-giving foods. They provide energy in the form of calories that the body needs to be able to work, and to support other functions.

Carbohydrates are needed in large amounts by the body. Indeed, up to 65% of our energy comes from carbohydrates. They are the body's main source of fuel because they

are easily converted into energy. This energy is usually in the form of glucose, which all tissues and cells in our bodies readily use.

For the brain, kidneys, central nervous system and muscles to function properly, they need carbohydrates. These carbohydrates are usually stored in the muscles and the liver, where they are later used for energy.

The main sources of carbohydrates are bread, wheat, potatoes of all kinds, maize, rice, cassava, '*shiro*', pasta, macaroni, '*kocho*', banana, sweets, sugar cane, sweet fruits, and honey. Other foods like vegetables, beans, nuts and seeds contain carbohydrates, but in lesser amounts.

Classification of carbohydrates

Based on the number of **sugar units**, carbohydrates are classified into three groups; these are monosaccharides, disaccharides and polysaccharides. You need to know the classes of carbohydrates to enable you to give relevant advice to patients with special needs like **diabetes** (when someone has problems regulating the amounts of glucose in their body).

Monosaccharides and disaccharides are referred to as **simple sugars** or **simple carbohydrates** that our body can easily utilise. For this reason, people with diabetes mellitus shouldn't eat too many of these carbohydrates. Examples include sugar, honey, sweet fruits and sugar cane. Polysaccharides are called **complex carbohydrates** and they need to be broken down into simple sugars to be used by our body. They can be consumed by diabetic patients without restriction. Examples include starch and cellulose.

Proteins

About 10–35% of calories should come from protein. **Proteins** are needed in our diets for growth (especially important for children, teens and pregnant women) and to improve immune functions. They also play an important role in making essential hormones and enzymes, in tissue repair, preserving lean muscle mass, and supplying energy in times when carbohydrates are not available.

Pregnant women need protein to build their bodies and that of the babies and placentas, to make extra blood and for fat storage. Breastfeeding mothers need protein to make breastmilk.

Sources of protein

The main sources of proteins are meats, chicken, eggs, breastmilk, beans, ground nuts, lentils, fish, cheese and milk.

All animal foods contain more protein than plants and are therefore usually better sources of body building foods. However, even though plant proteins (see Figure 2.1) are usually not as good for body-building as animal proteins, they can become more effective nutritionally when both are mixed with each other.

Fats and oils

Fats and oils are concentrated sources of energy and so are important nutrients for young children who need a lot of energy-rich food. Fats can also make meals more tasty and satisfying. Fat is found in meat, chicken, milk products, butters, creams, avocado, cooking oils and fats, cheese, fish and ground nuts.

Classification of fats

Fats are classified into saturated and unsaturated fats. The classification is important to enable you to advise your community about which fats can be consumed with less risk to people's health. Saturated fats are not good for a person's health.

Saturated fats are usually solid at cool temperatures. Eating too much saturated fat is not good for a person's health, as it can cause heart and blood vessel problems.

Unsaturated fats are usually liquid at room temperature. These types of fats are healthy fats. Examples include fats from fish, oil seeds (sesame and sunflower), maize oil and ground nut oil and breastmilk.

As a general rule, plant sources of fats are better for a person's health than the animal sources, because animal fats contain more saturated fats.

Water is essential for life. We need water for a number of reasons:

- For the body to make cells and fluids such as tears, digestive juices and breastmilk
- For the body to make sweat for cooling itself
- For essential body processes — most take place in water
- For keeping the lining of the mouth, intestine, eyelids and lungs wet and healthy
- For the production of urine, which carries waste from the body.

Fibre

Fibre is a mixture of different carbohydrates which are not digested like other nutrients but pass through the gut nearly unchanged. Foods rich in fibre are '*kocho*'; vegetables like cabbage, '*kosta*', carrots, cassava; fruits like banana and avocado; peas and beans; whole-grain cereals like wheat flour and refined maize or sorghum.

Fibre should be included in the diet for the following reasons:

- Fibre makes food bulky or bigger — this can help a person who is overweight to eat less food
- Fibre makes the faeces soft and bulky; this can help prevent constipation

- Fibre slows the absorption of nutrients, so it helps nutrients to enter the blood stream slowly. This is important for patients with diabetes mellitus.

Classifications of vitamins

Vitamins are classified into two groups:
Fat soluble vitamins (vitamins A, D, E and K) are soluble in fats and fat solvents. They are insoluble in water. So these are utilised only if there is enough fat in the body.
Water soluble vitamins (vitamins B and C, and folic acid) are soluble in water and so they cannot be stored in the body.
The best sources of micronutrients in our diets are fruits and vegetables. These two food groups contain essential vitamins and minerals. Animal sources of foods are also both good sources of micronutrients. However, an adequate micronutrient intake can only be achieved through sufficient intake of a balanced diet that includes plenty of fruits and vegetables. Table 2.1 overleaf sets out the functions of some of the important vitamins and examples of sources of food for each of these.

Table 2.1 Functions and sources of vitamins.

Vitamins	Function	Food sources
Vitamin A	Night vision Healing **epithelial** cells Normal development of teeth and bones	Breastmilk, tomatoes, cabbage, le Mangoes, papaya, carrots Liver, kidney, egg yolk, milk, but
Vitamin D	Needed for absorption of calcium from small intestines **Calcification** of the skeleton	Ultra violet light from the sun Eggs, butter, fish Fortified oils, fats and cereals
Vitamin K	For blood clotting	Green leafy vegetables Fruits, cereals, meat, dairy produc
B complex	Metabolism of carbohydrates, proteins and fats	Milk, egg yolk, liver, kidney and Whole grain cereals, meat, whole
Vitamin C	Prevention of **scurvy** Aiding wound healing Assisting absorption of iron	Fresh fruits (oranges, banana, m tomatoes) Breastmilk

Epithelial cells form the thin layer of tissue lining the gut, respiratory and genitourinary systems.
Calcification refers to the hardening of bones by calcium deposits.
Scurvy is a disease caused by vitamin C deficiency which leads to sore skin, bleeding gums and internal bleeding.

Vitamin C Deficiency

Acute vitamin C deficiency leads to scurvy [7,8,11]. The timeline for the development of scurvy varies, depending on vitamin C body stores, but signs can appear within 1 month of little or no vitamin C intake (below 10 mg/day) [6,7,24,25]. Initial symptoms can include fatigue (probably the result of impaired carnitine biosynthesis), malaise, and inflammation of the gums [4,11]. As vitamin C deficiency progresses, collagen synthesis becomes impaired and connective tissues become weakened, causing petechiae, ecchymoses, purpura, joint pain, poor wound healing, hyperkeratosis, and corkscrew hairs [1,2,4,6-8]. Additional signs of scurvy include depression as well as swollen, bleeding gums and loosening or loss of teeth due to tissue and capillary fragility [6,8,9]. Iron deficiency anemia can also occur due to increased bleeding and decreased nonheme iron absorption secondary to low vitamin C intake [6,11]. In children, bone disease can be present [6]. Left untreated, scurvy is fatal [6,9].
Until the end of the 18th century, many sailors who ventured on long ocean voyages, with little or no vitamin C intake, contracted or died from scurvy. During the mid-1700s, Sir James Lind, a British Navy surgeon, conducted experiments and determined that eating citrus fruits or juices could cure scurvy, although scientists did not prove that ascorbic acid was the active component until 1932 [26-28].
Today, vitamin C deficiency and scurvy are rare in developed countries [8]. Overt deficiency symptoms occur only if vitamin C intake falls below approximately 10 mg/day for many weeks [5-8,24,25]. Vitamin C deficiency is uncommon in developed countries but can still occur in people with limited food variety.

Groups at Risk of Vitamin C Inadequacy

Vitamin C *inadequacy* can occur with intakes that fall below the RDA but are above the amount required to prevent overt deficiency (approximately 10 mg/day). The following

groups are more likely than others to be at risk of obtaining insufficient amounts of vitamin C.

Smokers and passive "smokers"

Studies consistently show that smokers have lower plasma and leukocyte vitamin C levels than nonsmokers, due in part to increased oxidative stress [8]. For this reason, the IOM concluded that smokers need 35 mg more vitamin C per day than nonsmokers [8]. Exposure to secondhand smoke also decreases vitamin C levels. Although the IOM was unable to establish a specific vitamin C requirement for nonsmokers who are regularly exposed to secondhand smoke, these individuals should ensure that they meet the RDA for vitamin C [4,8].

Infants fed evaporated or boiled milk

Most infants in developed countries are fed breastmilk and/or infant formula, both of which supply adequate amounts of vitamin C [8,16]. For many reasons, feeding infants evaporated or boiled cow's milk is not recommended. This practice can cause vitamin C deficiency because cow's milk naturally has very little vitamin C and heat can destroy vitamin C [6,12].

Individuals with limited food variety

Although fruits and vegetables are the best sources of vitamin C, many other foods have small amounts of this nutrient. Thus, through a varied diet, most people should be able to meet the vitamin C RDA or at least obtain enough to prevent scurvy. People who have limited food variety—including some elderly, indigent individuals who prepare their own food; people who abuse alcohol or drugs; food faddists; people with mental illness; and, occasionally, children—might not obtain sufficient vitamin C [4,6-9,11].

People with malabsorption and certain chronic diseases

Some medical conditions can reduce the absorption of vitamin C and/or increase the amount needed by the body. People with severe intestinal malabsorption or cachexia and some cancer patients might be at increased risk of vitamin C inadequacy [29]. Low vitamin C concentrations can also occur in patients with end-stage renal disease on chronic hemodialysis [30].

Recommended Dietary Allowances (RDAs) *are the levels of intake of essential nutrients that, on the basis of scientific knowledge, are judged by the Food and*

Nutrition Board to be adequate to meet the known nutrient needs of practically all healthy persons.

The first edition of the *Recommended Dietary Allowances* (RDAs) was published in 1943 during World War II with the objective of "providing standards to serve as a goal for good nutrition." It defined, in "accordance with newer information, the recommended daily allowances for the various dietary essentials for people of different ages" (NRC, 1943). The origin of the RDAs[a] has been described in detail by the chairman of the first Committee on Recommended Dietary Allowances (Roberts, 1958). The initial publication has been revised at regular intervals; this is the tenth edition.

From their original application as a guide for advising "on nutrition problems in connection with national defense," RDAs have come to serve other purposes: for planning and procuring food supplies for population subgroups; for interpreting food consumption records of individuals and populations; for establishing standards for food assistance programs; for evaluating the adequacy of food supplies in meeting national nutritional needs; for designing nutrition education programs; for developing new products in industry; and for establishing guidelines for nutrition labeling of foods. In most cases, there are only limited data on which estimates of nutrient requirements can be based.

Estimation of physiological requirements

Where possible, the subcommittee established an RDA by first estimating the average physiological requirement for an *absorbed* nutrient. It then adjusted this value by factors to compensate for incomplete utilization and to encompass the variation both in requirements among individuals and in the bioavailability of the nutrient among the food sources. Thus, there is a safety factor in the RDAs for each nutrient, reflecting the state of knowledge concerning the nutrient, its bioavailability, and variations among the U.S. population. It is the intent of the subcommittee that the RDAs be both safe and adequate, but not necessarily the highest or lowest figures that the data might justify.

There is not always agreement among experts on the criteria for determining the physiological requirement for a nutrient. The requirement for infants and children may be equated with the amount that will maintain a satisfactory rate of growth and development; for an adult, it may be equated with an amount that will maintain body weight and prevent depletion of the nutrient from the body, as judged by balance studies and maintenance of acceptable blood and tissue concentrations. For certain nutrients, the requirement may be the amount that will prevent failure of a specific function or the development of specific deficiency signs—an amount that may differ greatly from that

required to maintain body stores. Thus, designation of the requirement for a given nutrient varies with the criteria chosen.

Ideally, the first step in developing a nutrient allowance would be to determine the average physiological requirement of a healthy and representative segment of each age and sex group according to stipulated criteria. Knowledge of the variability among the individuals within each group would make it possible to calculate the amount by which the average requirement must be increased to meet the need of virtually all healthy people. Unfortunately, experiments in humans are costly and time-consuming, and even under the best of conditions, only small groups can be studied in a single experiment. Moreover, certain types of experiments are not possible for ethical reasons. Thus, estimates of requirements and their variability must often be derived from limited information.

UNIT – IV

Path to improved health

It can be hard to change your eating habits. It helps if you focus on small changes. Making changes to your diet may also be beneficial if you have diseases that can be made worse by things you are eating or drinking. Symptoms from conditions such as kidney disease, lactose intolerance, and celiac disease can all benefit from changes in diet. Below are suggestions to improve your health. Be sure to stay in touch with your doctor so they know how you are doing.

- Find the strong and weak points in your current diet. Do you eat 4-5 cups of fruits and vegetables every day? Do you get enough calcium? Do you eat whole grain, high-fiber foods? If so, you're on the right track! Keep it up. If not, add more of these foods to your daily diet.
- Keep track of your food intake by writing down what you eat and drink every day. This record will help you assess your diet. You'll see if you need to eat more or less from certain food groups.
- Think about asking for help from a dietitian. They can help you follow a special diet, especially if you have a health issue.

Almost everyone can benefit from cutting back on unhealthy fat. If you currently eat a lot of fat, commit to cutting back and changing your habits. Unhealthy fats include things such as: dark chicken meat; poultry skin; fatty cuts of pork, beef, and lamb; and high-fat dairy foods (whole milk, butter, cheeses). Ways to cut back on unhealthy fats include:

- Rather than frying meat, bake, grill, or broil it. Take off the skin before cooking chicken or turkey. Try eating fish at least once a week.
- Reduce any extra fat. This includes butter on bread, sour cream on baked potatoes, and salad dressings. Use low-fat or nonfat versions of these foods.
- Eat plenty of fruits and vegetables with your meals and as snacks.
- Read the nutrition labels on foods before you buy them. If you need help with the labels, ask your doctor or dietitian.
- When you eat out, be aware of hidden fats and larger portion sizes.
- Staying hydrated is important for good health. Drink zero- or low-calorie beverages, such as water or tea. Sweetened drinks add lots of sugar and calories to

your diet. This includes fruit juice, soda, sports and energy drinks, sweetened or flavored milk, and sweetened iced tea.

Balanced nutrition and regular exercise are good for your health. These habits can help you lose or maintain weight. Try to set realistic goals. They could be making some of the small diet changes listed above or walking daily.

Doctors and dietitians suggest making healthy eating habits a part of daily life rather than following fad diets. Nutrition tips and diets from different sources can be misleading. Keep in mind the advice below, and always check with your doctor first.

- Secret diets aren't the answer. Fad or short-term diets may promise to help you lose weight fast. However, they are hard to keep up with and could be unhealthy.
- Good nutrition doesn't come in a pill. Try eating a variety of foods instead. Your body benefits most from healthy whole foods. Only take vitamins that your doctor prescribes.
- Diet programs or products can confuse you with their claims. Most people in these ads get paid for their endorsements. They don't talk about side effects, problems, or regained weight.

What are the five food groups?

Fruit and vegetables.

Starchy **food**.

Dairy.

Protein.

Fat.

Enjoy a wide range of nutritious foods.

- Children and adolescents should be encouraged to:
- eat plenty of vegetables, legumes and fruits
- eat plenty of cereals (including breads, rice, pasta and noodles), preferably wholegrain
- include lean meat, fish, poultry and/or alternatives
- include milks, yoghurts, cheeses and/or alternatives. Reduced-fat milks are not suitable for children under two years, because of their high energy needs, but reduced-fat varieties should be encouraged for older children and adolescents
- choose water as a drink and care should be taken to:
- limit saturated fat and moderate total fat intake. Low-fat diets are not suitable for infants
- choose foods low in salt

- consume only moderate amounts of sugars and foods containing added sugars.

A balanced diet is a diet that contains differing kinds of foods in certain quantities and proportions so that the requirement for calories, proteins, minerals, vitamins and alternative nutrients is adequate and a small provision is reserved for additional nutrients to endure the short length of leanness. In addition, a balanced diet ought to offer bioactive phytochemicals like dietary fiber, antioxidants and nutraceuticals that have positive health advantages. A balanced diet should offer around 60-70% of total calories from carbohydrates, 10-12% from proteins and 20-25% of total calories from fat.

HEALTH BENEFITS OF A BALANCED DIET

- Healthy eating increases energy, improves the way your body functions, strengthens your immune system and prevents weight gain. The other major benefits are:
- Meets your nutritional need. A varied, balanced diet provides the nutrients you need to avoid nutritional deficiencies.
- Prevent and treat certain diseases. Healthful eating can prevent the risk of developing certain diseases such as diabetes, cancer and heart disease. It is also helpful in treating diabetes and high blood pressure.
- Following a special diet can reduce symptoms, and may help you better manage an illness or condition.
- Feel energetic and manage your weight. A healthy diet will assist you to feel higher, provide you with more energy, and help you fight stress.
- Food is the mainstay of many social and cultural events. Apart from nutrition properties, it helps facilitate connections between individuals.

HERE ARE SOME GENERAL GUIDELINES FOR HEALTHY EATING

- The most important rule of healthy eating is not skipping any meal. Skipping meals lowers your metabolic rate. Normal eating includes 3 major meals and 2 snacks between meals. Also, Never skip breakfast. It is the foremost vital meal of the day.
- Learn simple ways to prepare food. Healthy eating doesn't have to mean complicated eating. Keep meal preparation easy, eat more raw foods such as salads, fruits and vegetable juices, and focus on the pleasure of eating healthy food rather than the calories.
- It is important to stop when you feel full. This will help you maintain your weight to an extent. This also will help you remain alert and feeling your best.
- Drink lots of water. Keep a bottle of water near you while working, watching TV, etc.
- Variety of foods should be used in the menu. No single food has all the nutrients.

- To improve the cereal and pulse protein quality, a minimum ratio of cereal protein to pulse protein should be 4:1. In terms of the grains, it will be eight parts of cereals and one part of pulses.
- Eat five portions of fruit and vegetables every day.
- Keep a supply of healthy snacks to hand. This will stop you from eating an unhealthy snack when hungry.
- Remove all visible fat from food before you cook it – take the skin off chicken and trim the white fat off any meat.
- Limit stimulants such as caffeine, alcohol and refined sugar.
- Limit the number of times you eat out to once a week. Take your own packed lunch to work.
- Only eat things you like the taste of – find what works for you and don't force yourself to eat things just because they're good for you.

People suffering from diabetes have double the risk of getting a heart attack and developing mental health issues. But the good news is, most cases of type 2 diabetes can be reversed. Taking steps to control your diabetes does not mean to live in deprivation, it rather means eating in moderation and maintaining the right balance. Here we bring to you some diet tips which will not leave you hungry or deprived.

Nutrition

No matter whether you are a diabetic or not, the nutrition needed by your body is same as for any other normal person (without diabetes). So, you don't need to consume anything special, though you need to take care of the number of calories you intake. Your choice of food matters and most importantly the carbohydrates.

Lose weight

Fortunately, you have more control over your health than you think. By eating healthy, doing some physical activity and losing weight you can control your diabetes and even reverse it in some cases. By losing just 5 to 10 per cent of your weight, you can lower your blood sugar level, lower blood pressure and lower cholesterol. Also, losing weight and eating healthy will have a profound effect on your energy, mood and sense of well-being. So even if you already developed diabetes it's not too late to make positive changes.

Diabetic diet for Indians

The per day calorie intake should be between 1500 to 1800 calories. A diabetic diet should have at least three vegetables and two fruits each day

Avoid consuming dry fruits

Dry fruits seem like a healthy snacking option but for diabetic people it's not really the case. The fructose in dry fruits may spike your sugar level. So, try having fresh fruits instead of dry fruits.

Some home remedies to control diabetes

Green tea: This tea is unfermented and hence has high polyphenol content, which has strong antioxidant and hypoglycaemic effects. The polyphenols help in controlled release of blood sugars.

Cinnamon water:

Cinnamon is an effective way of treating diabetes at home. Drinking Cinnamon with warm water on an empty stomach helps increase metabolism.

Drumstick leaves: The fibre content in these leaves increases satiety and slows down the breakdown of food.

Almonds: Eating soaked almonds every day in the morning also keeps diabetes in check.

Methi: Overnight soaked methi seeds are also considered an effective remedy.

Tomato juice: Tomato juice with salt and pepper on an empty stomach every morning also helps in controlling diabetes

Milk: This combination of carbohydrate and protein helps to keep the sugar level in control. Two cups of milk every day can be an ideal option.

Whole grains: We all know that whole grains are better than refined grains. If you want to have something like noodles or pasta it should be accompanied with lots of vegetables.

High fibre vegetables: Vegetables such as broccoli, beans, spinach, peas and leafy vegetables should definitely be included in one's daily diet. Fibre can help you feel full and satisfied, and may help regulate the blood sugar levels. And since people with diabetes are at double the risk for cardiovascular complications, fibre's ability to lower cholesterol and blood pressure levels is a great way to improve heart health.

Pulses: Pulses should be considered as an important part of the daily diet in diabetic people. The carbs in pulses do not affect the blood like other carbs sources. Pulses are also a very rich source of protein.

Fruits: Many people believe that diabetic people should not consume fruits as

they are sweet in nature. Though that is true but not for all fruits. Some fruits like mangoes, grapes and banana contain high sugar and should not be consumed. But fruits like papaya, pear, apple, guava and orange are high in fibre and can be consumed.

Omega 3 fatty acid: Mono saturated fats are good for the body. Because saturated fat raises blood cholesterol level.

Small frequent meals

Large meals spike the blood sugar level and therefore it is recommended to take small frequent meals. Small snack that you can take in between can be dhokla, butter milk, yoghurt, poha, milk, upma, fruits, salad etc.

What should be avoided

- Fatty food and sweets should be avoided.
- Artificial sweeteners used in baking.
- Regularly consuming alcohol.

Nutrition for kids is based on the same principles as nutrition for adults. Everyone needs the same types of nutrients — such as vitamins, minerals, carbohydrates, protein and fat. Children, however, need different amounts of specific nutrients at different ages.

So what's the best formula to fuel your child's growth and development? Check out these nutrition basics for girls and boys at various ages, based on the latest Dietary Guidelines for Americans.

Consider these nutrient-dense foods:

- **Protein.** Choose seafood, lean meat and poultry, eggs, beans, peas, soy products, and unsalted nuts and seeds.
- **Fruits.** Encourage your child to eat a variety of fresh, canned, frozen or dried fruits — rather than fruit juice. If your child drinks juice, make sure it's 100 percent juice without added sugars and limit his or her servings. Look for canned fruit that says it's light or packed in its own juice, meaning it's low in added sugar. Keep in mind that one-quarter cup of dried fruit counts as one cup-equivalent of fruit. When consumed in excess, dried fruits can contribute extra calories.
- **Vegetables.** Serve a variety of fresh, canned, frozen or dried vegetables. Aim to provide a variety of vegetables, including dark green, red and orange, beans and peas, starchy and others, each week. When selecting canned or frozen vegetables, look for options lower in sodium.

- **Grains.** Choose whole grains, such as whole-wheat bread, oatmeal, popcorn, quinoa, or brown or wild rice. Limit refined grains such as white bread, pasta and rice.
- **Dairy.** Encourage your child to eat and drink fat-free or low-fat dairy products, such as milk, yogurt, cheese or fortified soy beverages.

Aim to limit your child's calories from:

- **Added sugar.** Limit added sugars. Naturally occurring sugars, such as those in fruit and milk, are not added sugars. Examples of added sugars include brown sugar, corn sweetener, corn syrup, honey and others.
- **Saturated and trans fats.** Limit saturated fats — fats that mainly come from animal sources of food, such as red meat, poultry and full-fat dairy products. Look for ways to replace saturated fats with vegetable and nut oils, which provide essential fatty acids and vitamin E. Healthier fats are also naturally present in olives, nuts, avocados and seafood. Limit trans fats by avoiding foods that contain partially hydrogenated oil.

If you have questions about nutrition for kids or specific concerns about your child's diet, talk to your child's doctor or a registered dietitian.

Ages 2 to 3: Daily guidelines for girls and boys

Calories	1,000-1,400, depending on growth and activity level
Protein	2-4 ounces
Fruits	1-1.5 cups
Vegetables	1-1.5 cups
Grains	3-5 ounces
Dairy	2 cups

Ages 4 to 8: Daily guidelines for girls

Calories	1,200-1,800, depending on growth and activity level
Protein	3-5 ounces
Fruits	1-1.5 cups
Vegetables	1.5-2.5 cups
Grains	4-6 ounces
Dairy	2.5 cups

Ages 4 to 8: Daily guidelines for boys

Calories	1,200-2,000, depending on growth and activity level
Protein	3-5.5 ounces
Fruits	1-2 cups
Vegetables	1.5-2.5 cups
Grains	4-6 ounces
Dairy	2.5 cups

Ages 9 to 13: Daily guidelines for girls

Calories	1,400-2,200, depending on growth and activity level
Protein	4-6 ounces

Fruits	1.5-2 cups
Vegetables	1.5-3 cups
Grains	5-7 ounces
Dairy	3 cups

Ages 9 to 13: Daily guidelines for boys

Calories	1,600-2,600, depending on growth and activity level
Protein	5-6.5 ounces
Fruits	1.5-2 cups
Vegetables	2-3.5 cups
Grains	5-9 ounces
Dairy	3 cups

Ages 14 to 18: Daily guidelines for girls

Calories	1,800-2,400, depending on growth and activity level
Protein	5-6.5 ounces
Fruits	1.5-2 cups
Vegetables	2.5-3 cups

Grains	6-8 ounces
Dairy	3 cups

Ages 14 to 18: Daily guidelines for boys

Calories	2,000-3,200, depending on growth and activity level
Protein	5.5-7 ounces
Fruits	2-2.5 cups
Vegetables	2.5-4 cups
Grains	6-10 ounces
Dairy	3 cups

Food is more than just fuel. Your diet can help fight disease and keep you feeling younger.

Eating Right

A healthy diet for men includes:

- At least 2 cups of fruits and 2½ cups of vegetables each day for vitamins, minerals, fiber and phytochemicals.
- Whole grains. Eat at least half of all grains as whole grains each day. Replace refined grains with whole-grain bread, cereal, pasta, brown rice or oats.
- At least 38 grams of fiber per day for younger men; 30 grams of fiber per day for men older than 50.
- At least two to three servings of fish per week.
- Unsaturated fats such as oils, nuts and oil-based salad dressings in place of saturated fats such as full-fat dairy foods, butter and high-fat sweets.
- 3,400 milligrams a day of potassium from fruits, vegetables, fish and dairy.

Energy Foods

Since men have more muscle and typically are bigger than women, they require more calories throughout the day. Moderately active males likely need 2,200 to 2,800 calories per day. Your energy needs depend on your height, weight and activity level.

For energy and disease prevention, men should eat whole grains such as whole-grain bread, pasta, cereal, brown rice, oats, barley, beans, lentils, fruits and vegetables. These foods are high in fiber, help manage hunger and fullness and help fend off certain cancers, such as prostate and colon.

Eating Right

Nutrient-rich foods provide energy for women's busy lives and help to reduce the risk of disease. A healthy eating plan regularly includes:

- At least three ounce-equivalents of whole grains such as whole-grain bread, whole-wheat cereal flakes, whole-wheat pasta, brown rice or oats.
- Three servings of low-fat or fat-free dairy products including milk, yogurt or cheese; or calcium-fortified soymilk. (Non-dairy sources of calcium for people who do not consume dairy products include calcium-fortified foods and beverages, canned fish and some leafy greens.)
- Five to 5-and-a-half ounce-equivalents of protein foods such as lean meat, poultry, seafood, eggs, beans, lentils, tofu, nuts and seeds.
- One-and-a-half to two cups of fruits — fresh, frozen, canned or dried without added sugars.
- Two to two-and-a-half cups of colorful vegetables — fresh, frozen or canned without added salt

Iron-rich Foods

Iron is important to good health, but the amount needed is different depending on a woman’s stage of life. For example, iron needs are higher during pregnancy and lower after reaching menopause. Foods that provide iron include red meat, chicken, turkey, pork, fish, kale, spinach, beans, lentils and some fortified ready-to-eat cereals. Plant-based sources of iron are more easily absorbed by your body when eaten with vitamin C-rich foods. To get both these nutrients at the same meal, try fortified cereal with strawberries on top, spinach salad with mandarin orange slices or add tomatoes to lentil soup.

Folate (and Folic Acid) During the Reproductive Years

When women reach childbearing age folate (or folic acid) plays an important role in decreasing the risk of birth defects. The requirement for women who are not pregnant is 400 micrograms (mcg) per day. Including adequate amounts of foods that naturally contain folate, such as oranges, leafy green vegetables, beans and peas, will help increase your intake of this B vitamin. There also are many foods that are fortified with folic acid, such as breakfast cereals, some rice and breads. Eating a variety of foods is recommended to help meet nutrient needs, but a dietary supplement with folic acid also may be necessary. This is especially true for women who are pregnant or breast-feeding, since their daily need for folate is higher, 600 mcg and 500 mcg per day, respectively. Be sure to check with your physician or a registered dietitian nutritionist before starting any new supplements.

Daily Calcium and Vitamin D Requirements

For healthy bones and teeth, women need to eat a variety of calcium-rich foods every day. Calcium keeps bones strong and helps to reduce the risk for osteoporosis, a bone disease in which the bones become weak and break easily. Some calcium-rich foods include low-fat or fat-free milk, yogurt and cheese, sardines, tofu (if made with calcium sulfate) and calcium-fortified foods and beverages, such as plant-based milk alternatives, juices and cereals. Adequate amounts of vitamin D also are important, and the need for both calcium and vitamin D increases as women get older. Good sources of vitamin D include fatty fish, such as salmon, eggs and fortified foods and beverages, like milk, as well as some plant-based milk alternatives, yogurts and juices.

Athletes and Dieting

Since teen athletes need extra fuel, it's usually a bad idea to diet. Athletes in sports where weight is emphasized — such as wrestling, swimming, dance, or gymnastics — might feel pressure to lose weight, but they need to balance that choice with the possible negative side effects mentioned above.

If a coach, gym teacher, or teammate says that you need to go on a diet, talk to your doctor first or visit a dietitian who specializes in teen athletes. If a health professional you trust agrees that it's safe to diet, then he or she can work with you to develop a plan that allows you get the proper amount of nutrients, and perform your best while also losing weight.

Eat a Variety of Foods

You may have heard about "carb loading" before a game. But when it comes to powering your game for the long haul, it's a bad idea to focus on only one type of food.

Carbohydrates are an important source of fuel, but they're *only one* of many foods an athlete needs. It also takes vitamins, minerals, protein, and fats to stay in peak playing shape.

Muscular Minerals and Vital Vitamins

Calcium helps build the strong bones that athletes depend on, and iron carries oxygen to muscles. Most teens don't get enough of these minerals, and that's especially true of teen athletes because their needs may be even higher than those of other teens.

To get the iron you need, eat lean (not much fat) meat, fish, and poultry; green, leafy vegetables; and iron-fortified cereals. Calcium — a must for protecting against stress fractures — is found in dairy foods, such as low-fat milk, yogurt, and cheese.

In addition to calcium and iron, you need a whole bunch of other vitamins and minerals that do everything from help you access energy to keep you from getting sick. Eating a balanced diet, including lots of different fruits and veggies, should provide the vitamins and minerals needed for good health and sports performance.

Protein Power

Athletes may need more protein than less-active teens, but most teen athletes get plenty of protein through regular eating. It's a myth that athletes need a huge daily intake of protein to build large, strong muscles. Muscle growth comes from regular training and hard work. And taking in too much protein can actually harm the body, causing dehydration, calcium loss, and even kidney problems.

Good sources of protein are fish, lean meats and poultry, eggs, dairy, nuts, soy, and peanut butter.

Carb Charge

Carbohydrates provide athletes with an excellent source of fuel. Cutting back on carbs or following low-carb diets isn't a good idea for athletes because restricting carbohydrates can cause a person to feel tired and worn out, which ultimately affects performance.

Good sources of carbohydrates include fruits, vegetables, and grains. Choose whole grains (such as brown rice, oatmeal, whole-wheat bread) more often than their more processed counterparts like white rice and white bread. That's because whole grains

provide both the energy athletes need to perform and the fiber and other nutrients they need to be healthy.

Sugary carbs such as candy bars or sodas are less healthy for athletes because they don't contain any of the other nutrients you need. In addition, eating candy bars or other sugary snacks just before practice or competition can give athletes a quick burst of energy and then leave them to "crash" or run out of energy before they've finished working out.

Planning a Nutritious Meal

Without adequate calories from the healthiest food sources, you will struggle to achieve your performance goals. Plan a nutritious meal by choosing at least one food from each category.

Carbohydrates	**Protein**	**Healthy Fat**
Fruit	Whole eggs (white and yolk)	Avocado
Oatmeal	Greek yogurt	Peanut butter
Starchy vegetables (sweet/white potatoes, squash)	Milk	Nuts and seeds
Non-starchy vegetables (broccoli, leafy greens)	String cheese	Olive or canola oil (the latter, if baking)
Whole-grain bread or crackers	Lean red meats	Coconut oil
High-fiber, non-sugary cereals	Poultry	Flax seed (add to baking or cooking)
Quinoa	Fish	
Brown or wild rice	Hummus	

Pears (3.1%)

The pear is a popular type of fruit that is both tasty and nutritious. It's one of the best fruit sources of fiber.

Fiber content: 5.5 grams in a medium-sized pear, or 3.1 grams per 100 grams (8).

2. Strawberries (2%)

Strawberries are incredibly delicious. Plus, they're a much healthier option than any junk food.

Interestingly, they're also among the most nutrient-dense fruits you can eat — loaded with vitamin C, manganese and various powerful antioxidants.

Fiber content: 3 grams in one cup, or 2 grams per 100 grams. This is very high given their low calorie content (9).

3. Avocado (6.7%)

The avocado is different from most fruits. Instead of being high in carbs, it's loaded with healthy fats.

Avocados are very high in vitamin C, potassium, magnesium, vitamin E and various B vitamins. They also have numerous health benefits.

Fiber content: 10 grams in a cup, or 6.7 grams per 100 grams (10).

4. Apples (2.4%)

Apples are among the tastiest and most satisfying fruits you can eat. They are also relatively high in fiber.

Fiber content: 4.4 grams in a medium-sized apple, or 2.4 grams per 100 grams (11).

5. Raspberries (6.5%)

Raspberries are highly nutritious with a very strong flavor. They're loaded with vitamin C and manganese.

Fiber content: One cup contains 8 grams of fiber, or 6.5 grams per 100 grams (12).

6. Bananas (2.6%)

Bananas are a good source of many nutrients, including vitamin C, vitamin B6 and potassium.

A green or unripe banana also contains a significant amount of resistant starch, a type of indigestible carbohydrate that functions like fiber.

Fiber content: 3.1 grams in a medium-sized banana, or 2.6 grams per 100 grams (13).

Other High-Fiber Fruits

Blueberries (2.4%) and blackberries (5.3%).

7. Carrots (2.8%)

The carrot is a root vegetable that is tasty, crunchy and highly nutritious.

It's high in vitamin K, vitamin B6, magnesium and beta-carotene, an antioxidant that gets turned into vitamin A in your body.

Fiber content: 3.6 grams in one cup, or 2.8 grams per 100 grams. This is very high given their low calorie content (14).

8. Beets (2.8%)

The beet, or beetroot, is a root vegetable that is high in various important nutrients, such as folate, iron, copper, manganese and potassium.

Beets are also loaded with inorganic nitrates, which are nutrients shown to have various benefits related to blood pressure regulation and exercise performance (15Trusted Source).

Fiber content: 3.8 grams per cup, or 2.8 grams per 100 grams (16).

9. Broccoli (2.6%)

Broccoli is a type of cruciferous vegetable and one of the most nutrient-dense foods on the planet.

It is loaded with vitamin C, vitamin K, folate, B vitamins, potassium, iron and manganese and contains antioxidants and potent cancer-fighting nutrients.

Broccoli is also relatively high in protein, compared to most vegetables.

Fiber content: 2.4 grams per cup, or 2.6 grams per 100 grams (17).

10. Artichoke (8.6%)

The artichoke doesn't make headlines very often. However, this vegetable is high in many nutrients and one of the world's best sources of fiber.

Fiber content: 10.3 grams in one artichoke, or 8.6 grams per 100 grams (18).

11. Brussels Sprouts (2.6%)

The Brussels sprout is a type of cruciferous vegetable that is related to broccoli.

They're very high in vitamin K, potassium, folate and potent cancer-fighting antioxidants.

Fiber content: 4 grams per cup, or 2.6 grams per 100 grams (19).

Other High-Fiber Vegetables

Almost all vegetables contain significant amounts of fiber. Other notable examples include kale (3.6%), spinach (2.2%) and tomatoes (1.2%).

12. Lentils (7.9%)

Lentils are very cheap and among the most nutritious foods on earth. They're very high in protein and loaded with many important nutrients.

Fiber content: 15.6 grams per cup of cooked lentils, or 7.9 per 100 grams (20).

13. Kidney Beans (6.4%)

Kidney beans are a popular type of legume. Like other legumes, they're loaded with plant-based protein and various different nutrients.

Fiber content: 11.3 grams per cup of cooked beans, or 6.4 per 100 grams (21).

14. Split Peas (8.3%)

Split peas are made from the dried, split and peeled seeds of peas.

Fiber content: 16.3 grams per cup of cooked split peas, or 8.3 per 100 grams (22).

15. Chickpeas (7.6%)

The chickpea is another type of legume that's loaded with nutrients, including minerals and protein.

Fiber content: 12.5 grams per cup of cooked chickpeas, or 7.6 per 100 grams (23).

UNIT – V

What is COSHH?

The occupational use of nanomaterials is regulated under the Control of Substances Hazardous to Health (COSHH). COSHH is the law that requires employers to control substances that are hazardous to health and includes nanomaterials. You can prevent or reduce workers' exposure to hazardous substances by:

- finding out what the health hazards are;
- deciding how to prevent harm to health (risk assessment);
- providing control measures to reduce harm to health;
- making sure they are used;
- keeping all control measures in good working order;
- providing information, instruction and training for employees and others;
- providing monitoring and health surveillance in appropriate cases;
- planning for emergencies.

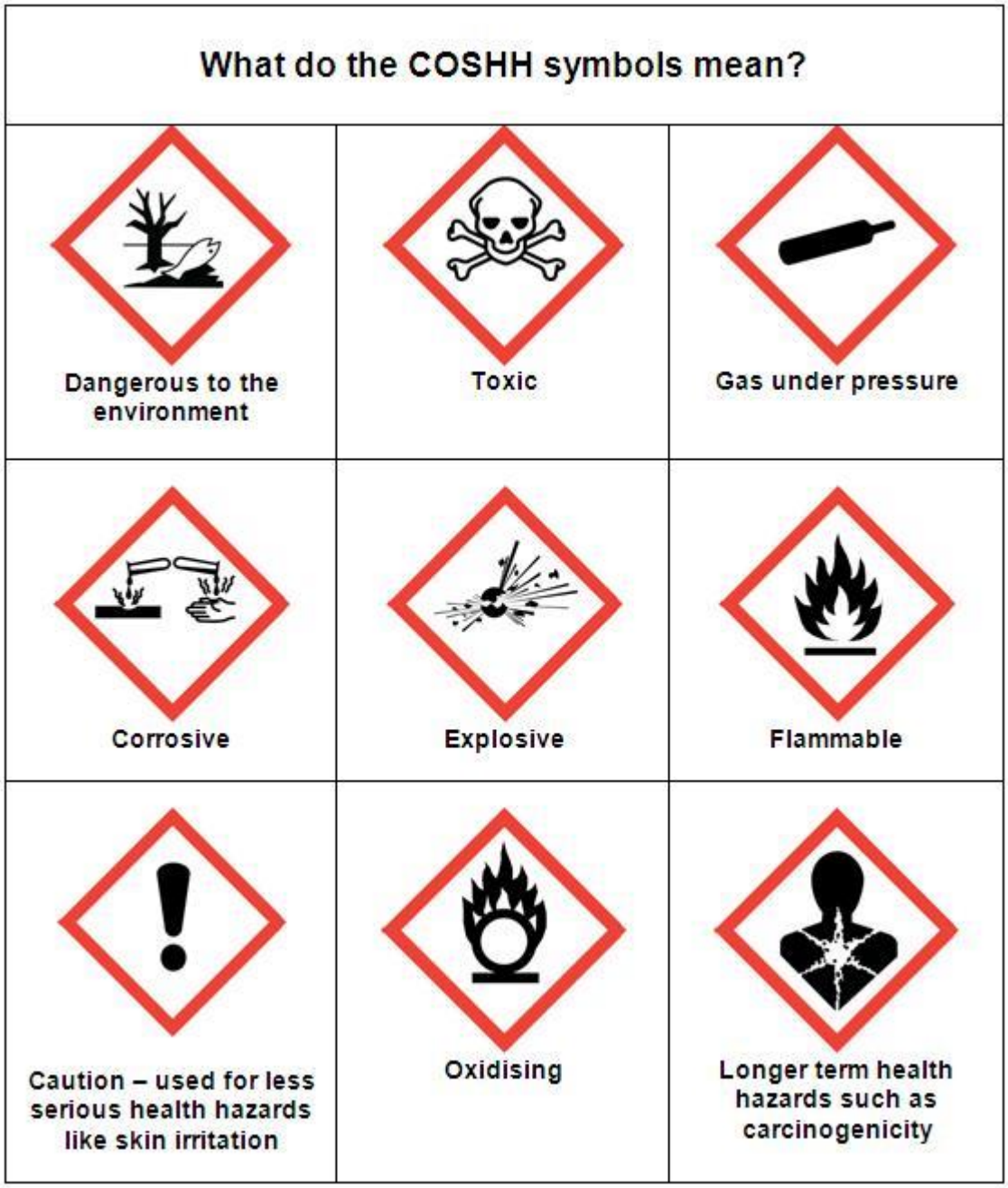
Most businesses use substances, or products that are mixtures of substances. Some processes create substances. These could cause harm to employees, contractors and other people.

Sometimes substances are easily recognised as harmful. As a new technology, the risks of exposure associated with nanomaterials are not currently fully understood. Whilst knowledge gaps exist, HSE recommends a precautionary approach to risk management with control strategies aiming to reduce exposure as much as possible.

COSHH covers

COSHH covers substances that are hazardous to health. Substances can take many forms and include:

- chemicals
- products containing chemicals
- fumes
- dusts
- vapours
- mists
- nanotechnology
- gases and asphyxiating gases and
- biological agents (germs). If the packaging has any of the hazard symbols then it is classed as a hazardous substance**.**



Concepts in accident prevention

- **Primary prevention**: removal of circumstances causing injury - eg, traffic speed reduction, fitting stair gates for young children, reducing alcohol consumption.
- **Secondary prevention**: reduces severity of injury should an accident occur - eg, use child safety car seats, bicycle helmets, smoke alarms.

- **Tertiary prevention**: optimal treatment and rehabilitation following injuries - eg, effective first aid, appropriate hospital care.

Role of clinicians in accident prevention

Clinical roles for health professionals in accident prevention

These include:

- Advice to patients: health workers are well placed to identify accident risks or medical conditions conferring risk and to advise accordingly - for example:
  - Child accident prevention:
    - Identify hazards (on home visits or if treatment sought for accidental injury).
    - Advise about prevention - eg, stair gates, keeping chemicals out of reach, etc .
  - Patients with medical conditions :
    - Identify and treat accident-causing conditions - eg, obstructive sleep apnoea, visual or balance disorders.
    - Give appropriate advice on fitness to drive.
    - Advise patients on how to minimise accident risks from their medical condition.

  Identify unacceptable risks and intervene where appropriate - for example:
  - Identify vulnerable children and adults with recurrent injuries or at high risk. This includes those who are experiencing neglect and may require child protection procedures .
  - Consider reporting to the Driver and Vehicle Licensing Agency (DVLA) patients who fail to comply with medical driving regulations, if they are a serious risk to the public.

  Accident surveillance: health professionals and their organisations can monitor injury rates and report preventable accidents. NICE recommends establishing local protocols to alert health visitors, school nurses and GPs when a child or young person repeatedly needs treatment for unintentional injuries at an emergency department or minor injuries unit[2]. On a national basis, NICE recommends ensuring that all hospital trusts are made aware of the data collection requirements for the universal and mandatory A&E (minimum) commissioning dataset.

Non-clinical interventions

These include :

- Advocacy and policy making.
- Collaboration with other agencies.

- Promoting accident prevention education and training.
- Research.

How effective are interventions by health professionals?

Research into child safety practices suggests that safety advice for families can be effective. Reviews have found that:

- Home safety education (usually given in a face-to-face setting), particularly with the provision of safety equipment, is effective in increasing safety practices[5].
- Parenting interventions (usually home-based) may be effective in preventing childhood injury[6].

Accident prevention advice

This section is intended to outline the major causes of accidents in the UK and to give health professionals some knowledge of how these can be prevented. Advice tips can be found under headings 'Safety advice for carers of young children', 'Home accident prevention' and 'Road accident prevention advice', below.

Specific medical conditions

Doctors are well placed to advise patients on accident risks relevant to their medical problems. For example:

- Sleep disorders:
  - These may be under-recognised and underdiagnosed.
  - Tools such as the Epworth Sleepiness Scale and expertise such as sleep disorder clinics are valuable.

  Diabetes:
  - Hypoglycaemia is an important cause of driving errors.
  - People with diabetes at highest risk are those with a history of mismanagement of hypoglycemia, lower limb neuropathy or greater exposure, ie high-volume driving.

  Epilepsy:
  - People with poorly controlled epilepsy can be advised how to minimise their risks of injury during a seizure - eg, take a shower instead of a bath, do not iron when alone and other tips. Identified risk factors for injuries include the number of anti-epileptic drugs, history of generalised seizures and seizure frequency.

  Attention deficit hyperactivity disorder (ADHD):
  - ADHD has been shown to be associated with an increased risk of serious transport accidents.

Accidents and children[7]

Accidents are one of the main causes of death among children aged 1-5 years. About 100,000 children are admitted to hospital annually in the UK and 2 million attend emergency departments. In a typical CCG with a population of 100,000, this equates to approximately 3,300 emergency department visits and 200 hospital admissions for child injuries .

For health workers, important points when advising on child accident prevention are:

- Offer practical advice, not just general education - eg, advise about car seats or home safety equipment.
- Use an evidence-based approach where possible and dispel myths - eg, some parents wrongly believe that cooker guards and baby walkers are safe.
- Promoting safety does not require overprotection ('wrapping children in cotton wool') - this would delay development and increase the risk of obesity.
- Promote sensible precautions in line with the child's level of development.

Safety advice for carers of young children

Falls

- Use stair gates until the child is aged 2 years; teach older children how to climb stairs but supervise them (even 4-year-olds may need some help).
- If the gaps between banisters or balcony railings are more than 6.5 cm (2.5 in) wide, cover them with boards or safety netting.
- Change your baby's nappy on the floor; don't leave your baby unattended on a bed, sofa or changing table, even for a second.
- Don't put baby seats on tables (a baby's wriggling could tip it over the edge).
- Take care to avoid tripping when carrying a baby.
- Don't let children under the age of 5 years sleep in the top of a bunk bed.
- Keep low furniture away from windows. Fit windows with safety catches (and ensure adults know where the keys are kept in case of fire).
- Use a five-point harness with a highchair.
- Don't use a baby walker.

Choking, strangulation and suffocation

- Keep all ties and cords short (eg, on curtains, blinds and switches) to avoid a child being strangled by the cord.
- Do not tie or hang things to babies' cots, and keep all toy ribbons short.
- Cut food up small enough for a child's mouth; don't give young children hard food such as boiled sweets or nuts.

- Don't leave children alone when eating; encourage them to sit still while they are eating.
- Keep small objects such as coins and buttons away from babies and toddlers.
- Keep plastic bags out of reach.

Burns and scalds

- 95% of burns and scalds happen in the home[7].
- Put cold water in a bath before hot water, check the temperature carefully; consider fitting thermostatic mixing valves.
- Keep hot drinks, teapots, matches, irons and hair straighteners out of reach.
- Use fireguards and spark guards.

Drowning

- Children can drown in a few inches of water; they must be supervised at all times when bathing and near ponds, water containers or pools.
- Garden ponds or pools must be properly fenced.

Poisoning

- Keep chemicals and medicines out of sight and reach.
- Children can often open 'child-proof' containers.

Cuts and bumps

- Use safety glass in low doors/windows, or cover with safety film.
- Keep scissors, knives and razors out of children's reach.
- Cover sharp corners; use door stoppers to prevent trapped fingers.

Home safety

- For general home safety advice, see 'Home accident prevention', below.

Car safety

- Use correct child seats.
- Twelve children aged under 10 years are killed or injured as passengers in cars every day and correct seats save lives[7].
- Put children in a rear seat of a car whenever possible.
- Do not put a rear-facing baby seat in a front car seat with an active airbag (forward-facing seats in the same position, while not illegal, are also not ideal for toddlers).
- Never leave children alone in a car.

Outdoor safety

- Find safe places to play.
- Use a harness or hold hands with small children in the street.

Elderly or disabled people and accident prevention

Frailty and health problems make the elderly, particularly those over the age of 75 years, at increased risk of accidents, usually occurring in the home. Falls are the most common cause. Inability to get up after falling puts the person at risk of hypothermia and pressure sores. Hip fractures after falls are a major cause of morbidity and mortality.

NICE and Clinical Knowledge Summaries (NICE CKS) have issued guidelines on the assessment and prevention of falls in older people[8]. They state that older people should be asked routinely if they have fallen in the previous year. Those who have fallen, or those considered at risk of falling, should have a multifactorial falls risk assessment and should be considered for interventions, including those to improve their strength and balance, and removal of any home hazards.

Environmental interventions have a role in safety for disabled or elderly people living at home - this has led to the concept of 'smart homes', which incorporate alarm or monitoring devices and other safety features . However, safety for those needing home care has many aspects; this includes not only physical safety but social and emotional well-being .

HACCP

Food hygiene legislation requires food businesses to have a food safety management system such as Hazard Analysis and Critical Control Point (HACCP) or a system based on HACCP principles. The main principle of HACCP is to try to identify a potential problem or hazard that may occur at any stage before it happens and so guarantee the quality of the food.

FOOD HYGIENE

Food hygiene is the action taken to ensure the safety and suitability of food at all stages of the food chain to prevent the contamination of food. Good food hygiene is essential to ensure that the food prepared/sold by businesses is safe. Food safety and hygiene are important both to safeguard consumer health and the reputation of food businesses.

PERSONAL RESPONSIBILITIES Bacteria live in and on the human body and can enter into food in the work-place if people do not maintain high standards of personal hygiene. Food handlers should be supervised and instructed in food hygiene matters appropriate to their work activity. Persons who are known or suspected to be suffering from or are carriers of disease which can be transmitted through food must be excluded

from food business areas. Any employee can be a direct source of contamination through the following: hands, face, head, clothing, jewellery and practices such as smoking, chewing and spitting. HANDS One of the easiest ways for bacteria to spread through the food area is through the hands of the FOOD HANDLER. Hands come into direct contact with food more than any other part of the body. The Food handler's hands also touch and can contaminate work surfaces, utensils, display shelves which in turn may transfer the bacteria to food.

Colour coding

Separation of utensils and equipment can be achieved through colour coding. With colour coding, items of equipment such as knife handlers, chopping boards and wiping cloths are given different colours to show when and where they should be used. Example of a colour coding system: Colour coding guidelines for catering frozen products

COLOUR	Knives, chopping boards, cloths etc. to be used only for
RED	Raw meat and poultry
BLUE	Fish
YELLOW	Cooked meats
GREEN	Vegetables
ORANGE	Salad and fruit
WHITE	General purpose/ bakery

STORAGE OF FOOD RAW MEAT AND POULTRY

Raw meat joints should be stored between -1 0C and + 10C, with a relative humidity of 90%. They should not touch the wall surface and only approved suppliers should be used.

EGGS

Raw eggs are a source of Salmonella; it can be present both inside the egg and on the shell, especially if contaminated with chicken faeces. Manufacturers should store eggs at a constant temperature of 200C. Fluctuations in temperature will result in condensation on the egg, leading to Salmonella being sucked into the egg form the surface. Stock rotation is necessary.

FRUITS AND VEGETABLES

Although different fruits and vegetables have their own optimal storage conditions, a general guide is to store cut or peeled fruits and vegetables under refrigeration. Usually dry stores are used to store fruits and vegetables. Fruit should be examined regularly and mouldy items are removed to prevent rapid mould spread. A stock rotation system to ensure that older products are used first must be implemented. Vigorous washing, turbulence and brushing will all help to reduce the levels of bacteria as well as remove soil, dust, insects and chemicals.

MILK AND CREAM

They need to be stored under refrigeration (below 50C) and should be placed in it or in a cold store as soon as they are received. Milk crates should not be stored below raw meat 109 ICE CREAM Ice creams need to be stored in a clean, dedicated freezer. They should be kept away from raw products. It should be discarded if ice cream has defrosted. Defrosted ice cream is a hazard, because at high temperatures it provides ideal conditions for Salmonella growth.

FLOUR AND CEREALS

They need to be stored in stainless steel containers with tight fitting lids. Large stocks of flour kept in original sacks must be stored clear of the ground and free from damp. Condensation can result on mould growth on wet flour.

STAFF RESPONSIBILITIES

Staff should be given clear instructions on how to use refrigerators. They should open doors for as little, and for as short a time, as possible. The temperature of the refrigerator should be checked regularly. Spillages should be cleared up immediately.

UNFIT FOOD OR DAMAGED STOCK

All damaged stock should be thoroughly examined and segregated before use. The suspect food should be clearly marked as ‘unfit’ or ‘not to be sold’. A dustbin should be designated for this purpose. Food with damaged packaging should not be used for food processing or offered for sale. Damaged food can expose food to physical or microbiological contamination.